CHAPTER 12.0

Greenhouse Gas Emissions and Climate Change

12.1 Introduction

This chapter provides an evaluation of the potential effects implementation of the Chiquita Canyon Landfill (CCL) Master Plan Revision (Proposed Project) would have on greenhouse gas (GHG) emissions and climate change. This chapter includes a brief description of the existing conditions, with an overview of the regulatory, climate change, GHG emissions, and operational setting of the Proposed Project. An explanation of the impact assessment methodology and a presentation of the potential impacts of the Proposed Project and mitigation measures are also provided.

12.1.1 Climate Change

Global climate change (GCC) is expressed as changes in the average weather of the earth that are measured by temperature, wind patterns, precipitation, and storms over a long period of time [United Nations Intergovernmental Panel on Climate Change (IPCC), 2013]. Since the time that work began on this Environmental Impact Report (EIR), scientific understanding of the causes and effects of climate change, and consensus regarding the link between climate change and anthropogenic GHG emissions has increased tremendously.

The IPCC now states that the warming of the climate system is "unequivocal", "…human influence on the climate system is clear…", "…is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century", and "Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system." (IPCC, 2013). The most recent U.S. National Climate Assessment states that, "While scientists continue to refine projections of the future, observations unequivocally show that climate is changing and that the warming of the past 50 years is primarily due to human-induced emissions of heat-trapping gases", and that "Global climate is projected to continue to change over this century and beyond, but there is still time to act to limit the amount of change and the extent of damaging impacts." (U.S. Global Change Research Program, 2014). The United States Environmental Protection Agency (EPA) states that, "Greenhouse gas (GHG) pollution threatens the American public's health and welfare by contributing to longlasting changes in our climate that can have a range of negative effects on human health and the environment." (EPA, 2014a)

12.1.2 Greenhouse Gases

Gases that trap heat in the atmosphere are often called GHGs. Common GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and certain fluorinated gases. Other gases such as water and ozone are also GHGs, although are of less importance, because, for example, the atmospheric lifetime of water vapor is very short as compared to CO_2, and as such human caused impacts to water vapor concentration are of minor consequence.

Different GHGs have varying climate change impacts. The most commonly accepted metric for the radiative forcing (heat trapping) impact of GHGs is the global warming potential (GWP), which is a ratio intended to quantify the mass of CO_2 that would produce the same impacts over 100 years as one unit mass of the GHG. Most current regulatory and voluntary reporting programs in the United States currently use GWP estimates from the IPCC Fourth Assessment Report (AR4), although some may still use older estimates from the IPCC Second Assessment Report (SAR).

As an example, per IPCC AR4, the GWP of CH_4 is 25. By definition, the GWP of CO_2 is 1. N_2O and the fluorinated gases have much higher GWPs.

Emissions of individual and total gases are reported as a carbon dioxide equivalent (CO_2e) in order to provide a metric for total climate change impact. For example, the emissions of 1 ton of CH_4 and 1 ton of CO_2 would total 26 tons of CO_2e.

GHGs are emitted by both natural processes and human activities. Of the common GHGs, CO_2 and CH_4 are emitted in the greatest quantities from human activities. Emissions of CO_2 are largely byproducts of fossil fuel combustion, whereas CH_4 results from offgassing associated with agricultural practices and the decomposition of organic materials within landfills. Fluorinated gases, such as hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6), are byproducts of certain industrial processes.

GHGs in the atmosphere regulate the earth's temperature. Without the natural heat trapping effect of GHGs, the earth's surface would be about 34 degrees Celsius (°C) cooler (CAT, 2006). However, it is known that emissions from human activities, particularly the consumption of fossil fuels for electricity production and transportation, have elevated the concentration of GHGs in the atmosphere beyond the level of naturally occurring concentrations.

The following paragraphs provide information on the primary GHGs in more detail.

Carbon Dioxide. The global carbon cycle is made up of large carbon flows and reservoirs. Billions of tons of carbon in the form of CO_2 are absorbed by oceans and living biomass (i.e., sinks) and are emitted to the atmosphere annually through natural processes (i.e., sources). Solid waste landfills are a form of carbon sink. When in equilibrium, carbon fluxes among these various reservoirs are roughly balanced (EPA, 2013d). CO_2 was the first GHG demonstrated to be increasing in atmospheric concentration, with the first conclusive measurements being made in the last half of the 20th Century. As noted above, CO_2 has a GWP of one. Concentrations of CO_2 in the atmosphere have risen approximately 35 percent since the Industrial Revolution. According to the IPCC (2007), the global atmospheric concentration of CO_2 has increased from a pre-industrial value of approximately 280 parts per million (ppm) to 379 ppm in 2005. By 2011, concentrations increased to 391 ppm (IPCC, 2013).

Methane. CH_4 is an extremely effective absorber of radiation, though its atmospheric concentration is less than CO_2, and its lifetime in the atmosphere is brief (10 to 12 years) compared to some other GHGs. Based on a number of factors, scientific assessments of the climate impact of methane have increased with time. The IPCC SAR estimated the GWP of CH_4 as 21 and, as noted above, the IPCC AR4 estimates it at 25. The IPCC AR5 indicates a current understanding that the GWP may be substantially higher (IPCC, 2013), although few if any reporting organizations have adopted the higher estimates yet. Methane concentrations have increased by an estimated 150 percent since pre-industrial times (IPCC, 2013). Anthropogenic sources of CH_4 include natural gas and petroleum systems, agricultural activities, coal mining, wastewater treatment, stationary and mobile combustion, landfills, and certain industrial processes (EPA, 2013d).

Nitrous Oxide. Concentrations of N_2O also began to rise at the beginning of the industrial revolution. N_2O is produced by microbial processes in soil and water, including reactions that occur in fertilizers containing nitrogen, as well as a number of industrial processes and other sources. Concentrations of N_2O are estimated to exceed pre-industrial levels by 20 percent (IPCC, 2013). The AR4 estimate of GWP for N_2O is 298.

Fluorinated Gases (HFCS, PFCS, and SF_6). Fluorinated gases, such as HFCs, PFCs, and SF_6, are powerful GHGs that are emitted from a variety of industrial processes. Some fluorinated gases are used as substitutes for ozone-depleting substances such as chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC), and halons, which have been regulated since the mid-1980s because of their ozone-destroying potential and are being phased out under the *Montreal Protocol* and Clean Air Act Amendments of 1990. Some are used for other industrial processes, and SF_6 is used in high voltage electrical equipment. Fluorinated gases are typically emitted in smaller quantities than CO_2, CH_4, and N_2O, but each molecule can have a much greater global warming effect. AR4 estimates the GWP of SF_6 to be 22,800.

12.1.3 Global and National Greenhouse Gas Emissions

From 1750 to 2011, CO_2 emissions from fossil fuel combustion and cement production have released 365 gigatonnes of carbon (GtC) (1,340,000 million metric tons [MMT] CO_2) to the atmosphere, while deforestation and other land use change are estimated to have released 180 GtC (661,000 MMT CO_2). This results in cumulative anthropogenic emissions of 545 GtC (2,000,000 MMT CO_2) (IPCC, 2013).

Total United States GHG emissions in 2011 were estimated to be 6,702 MMT CO_2e (EPA, 2013d). Overall, total United States GHG emissions have risen by 8.4 percent from 1990 to 2011, but GHG emissions decreased from 2010 to 2011 by 1.6 percent (108.0 MMT CO_2e). The decrease from 2010 to 2011 was driven by a decrease in the carbon intensity of fuels consumed to generate electricity due to a decrease in coal consumption, with increased natural gas combustion and a significant increase in hydropower used. Since 1990, United States GHG emissions have increased at an average annual rate of 0.4 percent (EPA, 2013d). As of 2011, the primary GHG emitted by human activities in the United States was CO_2, representing approximately 83.7 percent of total GHG emissions in terms of CO_2e (EPA, 2013d). The largest source of CO_2, and of overall GHG emissions, was fossil fuel combustion. CH_4 emissions, which have declined from 1990 levels, resulted primarily from enteric fermentation associated with domestic livestock, decomposition of wastes in landfills, and natural gas systems. Agricultural soil management, stationary combustion, and mobile source fossil fuel combustion were the major sources of N_2O emissions. The emissions of substitutes for ozone-depleting substances and the production of HCFC-22 were the primary contributors to aggregate HFC emissions. Electrical transmission and distribution systems accounted for most SF_6 emissions, while PFC emissions resulted from semiconductor manufacturing and as a byproduct of primary aluminum production. Landfill emissions account for a small fraction of all GHGs emitted.

Residential and commercial end-use sectors accounted for 21 percent and 18 percent, respectively, of CO_2 emissions from fossil fuel combustion in 2011 (EPA, 2013d). Both sectors relied heavily on electricity for meeting energy demands, with 71 percent and 77 percent, respectively, of their emissions attributable to electricity consumption for lighting, heating, cooling, and operating appliances. The remaining emissions were due to the consumption of natural gas and petroleum for heating and cooking. Emissions from these end-use sectors have increased 21 and 27 percent, respectively, since 1990 due to increasing electricity consumption for lighting, heating, air conditioning, and operating appliances (EPA, 2013d).

California is a substantial contributor of global GHGs –the second largest contributor in the United States and the 14th largest contributor in the world in 2007 [California Air Resources Board (CARB), 2011a]. In 2009, California released a total of 457 MMT CO_2e, which equaled approximately 7 percent of the United States total. The primary source of GHGs in California is transportation, contributing 37.9 percent of the state's total GHG emissions. Electricity generation is the second largest source, contributing 22.9 percent of the state's GHG emissions (CARB, 2011a). Eighty-six percent of California's 2009 GHG emissions (in terms of CO_2e) were from CO_2, 7.0 percent were from CH_4, and 3.3 percent were from N_2O (CARB, 2011a). California mass emissions are relatively high due in part to the state's large size and large population. By contrast, in 2009, California had the 5th lowest CO_2 emissions per capita from fossil fuel combustion in the country (CARB, 2011a). A factor that has reduced California's per capita fuel use and GHG emissions is its mild climate compared to that of many other states.

12.1.4 Effects of Global Climate Change

GCC has the potential to affect numerous environmental resources through potential impacts related to future air temperatures and precipitation patterns. Scientific modeling predicts that continued GHG emissions at or above current rates would induce more extreme climate changes during the 21st Century than were observed during the 20th Century. The global mean surface temperature change for the period 2016–2035 relative to 1986–2005 will likely be in the range of 0.3°C to 0.7°C (IPCC, 2013). According to CARB, some of the potential global warming impacts in California may include loss in snowpack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years (CARB, 2004). Below is a summary of some of the potential effects, reported by an array of studies, which could be experienced in California as a result of GCC.

The connection between climate change and anthropogenic GHGs, and the types of impacts that will result are known with a high level of certainty. However, our ability to predict and quantify the new extremes of climate-related variables, and procedures for "downscale" modeling to estimate localized impacts, is still evolving. Thus the following discussion reviews the types of impacts considered possible.

Air Quality. Higher temperatures are conducive to some types of air pollution formation, and could potentially 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. The effect of higher temperatures will also vary depending on whether it is accompanied by drier or wetter conditions. If higher temperatures are accompanied by drier conditions, the potential for large wildfires could increase, which, in turn, would further worsen air quality. If higher temperatures are accompanied by wetter conditions, however, the rains would tend to temporarily clear the air of particulate pollution and reduce the incidence of large wildfires, thus ameliorating the pollution associated with wildfires.

Water Supply. Uncertainty remains with respect to the overall impact of GCC on future water supplies in California. Studies have found that, "[c]onsiderable uncertainty about precise impacts 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" [California Department of Water Resources (DWR), 2006]. For example, some studies identify little change in total annual precipitation in projections for California [California Climate Change Center (CCCC), 2006]. Other studies show significantly more precipitation (DWR, 2006). Even if an increase in precipitation were to occur, analysis of the impact of climate change is further complicated by the fact that no studies have identified or quantified the runoff impacts such an increase in precipitation would have in particular watersheds (CCCC, 2006).

The DWR (2006) report on climate change and its effects on the State Water Project, the Central Valley Project, and the Sacramento-San Joaquin Delta, concludes that, "[c]limate 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" (DWR, 2006).

This uncertainty serves to complicate the analysis of future water demand, especially where the relationship between climate change and its potential effect on water demand is not well understood (DWR, 2006). DWR adds that, "[i]t is unlikely that this level of uncertainty will diminish significantly in the foreseeable future."

Hydrology. As discussed above, climate changes could potentially affect the amount of snowfall, rainfall, and snowpack; 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 sea water as the oceans warm and melting of ice over land. A rise in sea levels could result in coastal flooding and erosion.

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 that certain crops, such as wine grapes, bloom or ripen, and thus affect their quality (CCCC, 2006).

While the above-mentioned potential impacts identify the possible effects of climate change at a global and potentially statewide level, in general the currently available technology and scientific modeling tools are unable to predict what, if any, impacts would occur locally.

12.2 Methodology

This section summarizes the methodology and assumptions used to calculate the GHG emissions associated with the Proposed Project. GHG emissions are expected from construction activities, including mobile combustion, and operation activities, including mobile combustion, stationary combustion, waste decomposition, and consumption of purchased electricity. GHG emission calculations and associated assumptions are included in Appendix H.

12.2.1 Emission Calculation Methodology

12.2.1.1 Construction Emissions

Short-term emissions of GHGs would be generated from construction activities including site preparation, road construction, foundation construction, and excavation. During onsite construction, activities are assumed to occur for 5 days per week, or 20 days per month.

The Proposed Project would include best management practices (BMP), required by state and local regulations, to reduce air pollutant emissions during construction; some BMPs will also reduce GHGs. Therefore, the following emission reductions were included in the unmitigated construction GHG emissions to account for implementation of BMPs:

- Equipment and vehicle idling time would be minimized.
- Equipment and vehicles would be maintained according to manufacturer's written emission-related instructions.

Construction Exhaust Emissions

CO_2 emissions from construction equipment exhaust were estimated using South Coast Air Quality Management District (SCAQMD) OFFROAD 2007 emission factors. Though CARB has released an updated version of the OFFROAD model, OFFROAD 2011, it was not used for this analysis as it provides inventory level emissions rather than equipment-specific emission factors. The construction equipment exhaust emissions, as well as emissions from trucks used for routine maintenance activities, were considered onsite emission sources, while worker commutes were considered offsite emission sources. CO_2 and CH_4 emissions from on-road vehicle exhaust emissions were estimated using EMFAC2011 average emission factors for the SCAQMD. It was assumed that maintenance trucks would travel 5 miles per day onsite and that each employee would commute a distance of 40 miles roundtrip per day. Detailed vehicle exhaust emission calculations are included in Appendix H.

12.2.1.2 Operational Emissions

GHGs would be generated over the long term from operation of the Proposed Project. Operational emissions would include routine landfill maintenance activities, worker commute trips, haul truck trips, fugitive landfill gas (LFG), LFG flares operated onsite, and electricity used to power onsite support facilities. Onsite and offsite GHG operation emissions were divided into four categories: vehicle exhaust, stationary source exhaust, fugitive LFG, and consumption of purchased electricity. Operations at the landfill are assumed to occur 6 days per week, for a total of 312 days per year.

The Proposed Project would include BMPs, required by state and local regulations, to reduce emissions during operation. Therefore, the following emission reductions were included in the unmitigated operation GHG emissions to account for implementation of BMPs:

- Equipment and vehicle idling time would be minimized.
- Equipment and vehicles would be maintained according to manufacturer's written emission-related instructions.

Mobile Source Exhaust Emissions

CO_2 emissions from off-road diesel equipment exhaust were estimated using SCAQMD OFFROAD 2007 emission factors. Though CARB has released an updated version of the OFFROAD model, OFFROAD 2011, it was not used for this analysis as it provides inventory level emissions rather than equipment-specific emission factors. CO_2 and CH_4 emissions from on-road vehicle exhaust were estimated using EMFAC2011 average emission factors for the SCAQMD. Trucks used for routine maintenance activities were considered onsite emission sources while worker commutes were considered offsite emission sources. Waste trucks travel both onsite and offsite. It was assumed that service trucks would travel 5 miles per day onsite, that waste trucks would travel 6 miles per day offsite and 4 miles per day onsite with an idling time of 3.5 minutes, and that each of the 25 onsite employees would commute a distance of 40 miles roundtrip per day. Detailed vehicle exhaust emission calculations are included in Appendix H.

Stationary Source Exhaust Emissions

CCL currently operates two onsite LFG flares. As part of the Proposed Project, two additional flares will be installed; the first in 2021 and the second in 2030. CO_2 emissions from the Proposed Project flares were estimated based on an emission factor taken from The Climate Registry's (TCR) General Reporting Protocol (TCR, 2014). Facility data indicate that, on average, 85 percent of LFG generated is recovered and combusted in the flares or existing onsite landfill gas-to-energy (LFGTE) plant. While the majority of the LFG collected is expected to go to the LFGTE plant instead of the flares, emissions from combustion of LFG in the flares would be higher. Therefore, it was conservatively assumed that 85 percent of future LFG generated would be combusted by the flares. A flare destruction efficiency of 99 percent was assumed, as required by CARB (17 CCR 95464[b][2][A][1]). Detailed stationary source exhaust emission calculations are included in Appendix H.

Calculations of stationary source emissions assuming all gas is burned in the flares are conservative. While a significant fraction of the gas will be burned for beneficial use in the LFGTE plant, combustion efficiency in the gas turbines would significantly exceed the 99 percent required for flares. Therefore, because combustion in the turbine would result in less unburned methane than estimated for the flares, the overall GHG impact must be less than estimated here.

Fugitive Landfill Gas Emissions

Fugitive LFG emissions would result from the aerobic decomposition of organic waste and the anaerobic bacterial digestion of buried waste. Facility data indicate that, on average, 85 percent of LFG generated is combusted in the flares, therefore 15 percent of LFG generated would be emitted as fugitive CO_2 and CH_4. Detailed fugitive LFG emission calculations are included in Appendix H.

Note that the CO_2 released either as fugitive emissions, or from the capture and combustion of landfill gas, is considered biogenic because it results from the decomposition of biologically-based material. Biogenic CO_2 is commonly accepted to be of negligible or "net zero" climate impact, since it results from carbon recently removed from the atmosphere by biologic activity, as compared to the carbon in fossil fuels which has been stored in geologic formations for thousands of years. Nonetheless, in accordance with SCAQMD procedures, biogenic CO_2 is included in the significance determinations for the proposed project.

Emissions from Consumption of Purchased Electricity

Operation of the Proposed Project would require the use of electricity generated by the onsite LFGTE plant, offsite power plants and other electricity generating facilities. It is expected that the LFGTE plant would generate the majority of the electricity needed for operation, however emissions from power generated offsite would be higher, therefore calculations were performed assuming all power used would be generated offsite. Indirect GHG emissions associated with electricity generation were calculated using emission factors from EPA eGRID Ninth Edition, Version 1.0 (2010 data) for the Western Electricity Coordinating Council California subregion (EPA, 2014b). Future emission factors are not available; therefore, the latest available emission factors were used to calculate emissions for all years of operation.

Increased electricity use associated with the Proposed Project would include electricity used to power new blowers. Electricity usage per year is based on the number of new blowers in operation, motor hp, assumed motor efficiency of 90 percent, and the assumption that the blowers would operate 24 hour per day, 365 days per year. Electricity used to power landfill facilities, including offices, scale house, scales, and site lighting is not expected to increase due to operation of the Proposed Project, therefore emissions were not calculated for those sources.

12.3 Regulatory Setting

The federal and state governments have been empowered by legislation and regulation including the Clean Air Act to regulate the emission of airborne pollutants. With a series of actions including the Massachusetts vs. EPA decision in the Supreme Court, the Endangerment Determination, Light Duty Vehicle Rule, and Tailoring Rule, GHGs are now subject to regulation under the federal Clean Air Act. AB32 also established the requirement to manage GHGs in California and has resulted in a series of regulatory programs. EPA is the federal agency designated to administer air quality regulation, while CARB is the state equivalent in California. Local control in air quality management is provided by CARB through county-level or regional (multi-county) air quality management districts (AQMD) and air pollution control districts (APCD). CARB establishes air quality standards and is responsible for control of mobile emission sources, while the local AQMDs and APCDs are responsible for enforcing standards and regulating stationary sources. CARB has established 14 air basins statewide.

12.3.1 Federal Regulations and Standards

12.3.1.1 Clean Air Plan

The Clean Air Plan (CAP) addresses state and federal Clean Air Act mandates, including all federal planning requirements for "maintenance" areas. State and federal planning requirements include developing control strategies, attainment demonstrations, reasonable further progress, and maintenance plans. The 2012 CAP incorporates the latest scientific and technical information and planning assumptions, including the 2012 Regional Transportation Plan/Sustainable Communities Strategy, updated emission inventory methodologies for various source categories, and latest growth forecasts from Southern California Association of Governments (SCAG).

12.3.1.2 Climate Change Regulations

The following regulations address both GCC and GHG emissions.

GHG emissions are covered by the Prevention of Significant Deterioration (PSD) and Title V operating permit programs as of January 2, 2011. These permitting programs are required under the Clean Air Act. However, the thresholds established in the Clean Air Act for determining applicability of the PSD and Title V programs (100 and 250 tons per year, respectively) were not logical for regulation of GHGs. Therefore, an approach to permitting GHG emissions under PSD and Title V was established under EPA's GHG Tailoring Rule, issued in May 2010.

The GHG Tailoring Rule set initial emission thresholds, known as Steps 1 and 2 of the Tailoring Rule, for PSD and Title V permitting based on CO_2e emissions. New facilities with GHG emissions of at least 100,000 short tons per year (tpy) CO_2e and existing facilities with at least 100,000 short tpy CO_2emaking changes that would increase GHG emissions by at least 75,000 short tpy CO_2e are required to obtain PSD permits for GHGs and all other criteria pollutants over PSD significance levels. New and existing sources with GHG emissions above 100,000 short typ CO_2e must also obtain Title V operating permits.

Step 3 of the GHG Tailoring Rule, issued on June 29, 2012, continues to focus GHG permitting on the largest emitters by retaining the permitting thresholds that were established in Steps 1 and 2. In addition, Step 3 improves the usefulness of plant-wide applicability limitations (PAL) by allowing GHG PALs to be established on CO_2e emissions, in addition to the already available PALs for mass emissions, and to use the CO_2e-based applicability thresholds for GHGs provided in the "subject to regulation" definition in setting the PAL on a CO_2e basis. Step 3 also revises the PAL regulations to allow a source that emits or has the potential to emit at least 100,000 tpy of CO_2e, but that has minor source emissions of all other regulated New Source Review pollutants, to apply for a GHG PAL while still maintaining its minor source status (EPA, 2013e).

Via the Fiscal Year 2008 Consolidated Appropriations Act (H.R. 2764, Public Law 110-161), EPA issued the Greenhouse Gas Mandatory Reporting Rule (MRR) (74 *Federal Register* [FR] 56260) on October 30, 2009. The MRR applies to fossil fuel and industrial gas suppliers, direct GHG emitters, and manufacturers of heavy duty and off-road vehicles and engines. The MRR requires that sources above certain threshold levels monitor and report GHG emissions, but does not require control or mitigation of GHG emissions. The Proposed Project will be subject to the MRR.

12.3.2 State Regulations and Standards

California Regulations. Assembly Bill (AB) 1493, requiring the development and adoption of regulations to achieve "the maximum feasible reduction of greenhouse gases" emitted by noncommercial passenger vehicles, light duty trucks, and other vehicles used primarily for personal transportation in the state was signed into law in September 2002 by Governor Davis. Governor Schwarzenegger issued Executive Order S-3-05 in 2005, which established statewide GHG emissions reduction targets. Executive Order S-3-05 provides that GHG emissions shall be reduced to 2000 levels by 2010, to 1990 levels by 2020, and to 80 percent of 1990 levels by 2050 (CAT, 2006).

In response to Executive Order S-3-05, the CalEPA created the CAT, which, in March 2006, published the *Climate Action Team Report* (the "2006 CAT Report"). The 2006 CAT Report identifies a recommended list of strategies that the state could pursue to reduce GHG emissions. These strategies could be implemented by various state agencies, within their existing authority, to ensure that the governor's targets are met. The strategies include, but are not limited to: reduction of passenger and light duty truck emissions, reduction of idling times for diesel trucks, overhaul of shipping technology and infrastructure, increased use of alternative fuels, increased recycling, and increased landfill CH_4 capture.

AB 32, the "California Global Warming Solutions Act of 2006," was signed into law in the fall of 2006. AB 32 established the goal of reducing GHG emissions to 427 MMT CO_2e per year by 2020. When signed, AB 32 directed CARB to begin developing discrete early actions to reduce GHG emissions while also preparing a scoping plan to identify how to reach the 2020 emissions cap. Major milestones of AB 32 are outlined below:

- By January 1, 2009, CARB adopted a plan indicating how emission reductions would be achieved from significant sources of GHG via regulations, market mechanisms (most notably, the Cap-and-Trade program), and other actions.
- During 2009, CARB staff drafted rule language to implement its plan and held a series of public workshops on each measure (including market mechanisms).
- On January 1, 2010, early action measures took effect.
- During 2010, CARB conducted a series of rulemakings to adopt GHG regulations, including rules governing market mechanisms.
- In January 2011, CARB completed major rulemakings for reducing GHG emissions, including market mechanisms.
- In January 2012, GHG rules and market mechanisms were adopted by CARB and became legally enforceable.
- On November 14, 2012, the first auction of GHG allowances was held.
- On January 1, 2013, enforceable compliance obligations under the Cap-and-Trade program began for Phase 1 covered sectors.

The Cap-and-Trade program is an element of AB 32 that covers major sources of GHG emissions in California, including power plants, industrial facilities, and transportation of fuels. The Cap-and-Trade Regulation (17 CCR 95801-96022) includes an enforceable GHG cap that declines over time. Each quarter, CARB auctions allowances, which are tradable permits, equal to the emission allowed under the cap. The Proposed Project would not be subject to the Cap-and-Trade regulation as emissions from biomethane and biogas produced by landfills do not have a compliance obligation (17 CCR 95852.2[a][8][B]).

As part of AB 32, GHG emissions reporting is required for industrial facilities; suppliers of transportation fuels, natural gas, natural gas liquids, liquefied petroleum gas, and CO_2; operators of petroleum and natural gas systems; and electricity retail providers and marketers. The California GHG mandatory reporting rule was originally approved in 2007 and revised in 2010, 2012, and 2013. The current regulation became effective January 1, 2014. The Proposed Project is subject to the California GHG mandatory reporting rule.

The Landfill Methane Control Measure regulation, a discrete early action GHG reduction measure as described in AB 32, became effective in June 2010. The regulation is designed to reduce methane emissions from Municipal Solid Waste (MSW) landfills and differs from federal regulations and local air district rules in that the focus is generally on methane rather than on non-methane organic compounds (NMOCs), it applies to smaller landfills (in addition to larger landfills), and has more stringent requirements for methane collection and control, component leak testing, and surface emissions monitoring.

The regulations for MSW landfills require the installation and proper operation of an LFG collection and control system if the landfill is active, inactive, or closed and has a minimum of 450,000 tons of waste-in-place, if it received waste after January 1, 1977, if the landfill gas is currently uncontrolled, and the landfill gas heat input capacity is greater than 3.0 MMBtu/hr. If a landfill can demonstrate that the landfill gas heat input capacity is less than 3.0 MMBtu/hr then it may be exempt. The ARB has a simple modeling tool on their website for calculating the heat capacity (http://www.arb.ca.gov/cc/landfills/landfills.htm).

However, landfill owners or operators with existing gas collection and control systems are not required to submit plans or install new collection and control systems. If required, a control system must be in place within 18 months of approval of the design and it must achieve 99 percent reduction of methane for most control devices (i.e. flares). The 99 percent destruction efficiency does not apply to lean burn internal combustion engines. They must reduce the outlet methane concentration to less than 3,000 ppmv.

Ongoing monitoring requirements exist to ensure the collection and control system is maintained and operated in a manner to minimize methane emissions. Surface emission monitoring must be performed quarterly to make sure methane emissions are adequately controlled. Instantaneous and integrated (averaged) surface methane concentrations must not exceed 500 ppmv and 25 ppmv, respectively. Under certain conditions, surface monitoring may be performed on an annual basis. In addition, the combustion temperature of the enclosed combustion device (i.e., flare) must be equipped with a continuous monitor.

Executive Order S-01-07 was enacted by Governor Schwarzenegger on January 18, 2007. The order mandated that a statewide goal be established to reduce the carbon intensity of California’s transportation fuels by at least 10 percent by 2020. The Low Carbon Fuel Standard (LCFS) regulations were finalized on February 1, 2010 and amended in December 2011. An enforcement injunction was placed on the LCFS in December 2011, but it was lifted April 24, 2012. As such, the LCFS regulations are currently in effect.

Senate Bill (SB) 97, signed in August 2007, acknowledged that climate change is an important environmental issue that requires analysis under CEQA. This bill directed the California Office of Planning and Research (OPR) to prepare, develop, and transmit to the Natural Resources Agency guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions by July 1, 2009.

In response to SB 97, OPR submitted its recommended amendments to the *CEQA Guidelines* for addressing GHG emissions to the Secretary for Natural Resources on April 13, 2009. Those recommended amendments were developed to provide guidance to public agencies regarding the analysis and mitigation of GHG emissions and the effects of GHG emissions in draft CEQA documents. The amendments were adopted by the Natural Resources Agency on December 30, 2009, and became effective on March 18, 2010.

SB 375, signed in August 2008, required the inclusion of sustainable communities’ strategies in regional transportation plans for the purpose of reducing GHG emissions. The bill required CARB to appoint a Regional Targets Advisory Committee by January 31, 2008, and required this committee to recommend factors to be considered and methodologies to be used for setting GHG reduction targets by December 31, 2009. Final reduction targets were established in February 2011. Santa Clarita is incorporated in the SCAG reduction targets set at an 8 percent reduction of GHG emissions relative to 2005 by 2020, and a 13 percent reduction relative to 2005 by 2035.

CEQA Requirements. GHG emissions contributing to GCC have only more recently been addressed in CEQA documents, such that CEQA and case law do not provide any time-tested guidance relative to their assessment. On October 24, 2008, CARB released a preliminary draft staff proposal titled "Recommended Approaches for Setting Interim Significance thresholds for GHGs under CEQA." This document proposed a significance threshold of 7,000 metric tons of CO_2e per year ($MTCO_2$e/yr) for industrial projects. Projects exceeding this threshold are presumed to have significant impacts related to climate change and must prepare an EIR and implement all feasible mitigation. Impacts associated with the Proposed Project are discussed in Section 12.6, and mitigation measures are discussed in Section 12.7.

As previously discussed, amendments to the *CEQA Guidelines* for addressing GHG emissions were adopted on December 30, 2009, and became effective on March 18, 2010. The amended guidelines do not establish quantitative thresholds but instead provide qualitative thresholds for comparison. Similarly, the California Air Pollution Control Officers Association (CAPCOA) issued a white paper, titled *CEQA and Climate Change*, to assess GHG emissions in January 2008. CAPCOA has not made any recommendations for use of any specific methodology in its white paper (CAPCOA, 2008). CAPCOA later released a report titled *Quantifying GHG Mitigation Measures*, to provide a common platform of information and tools to support local governments in August 2010. This report does not provide policy guidance or advocate any policy position related to GHG emission reduction (CAPCOA, 2010).

CARB Interim Significance Thresholds for GHGs under CEQA. In order to provide guidance to local lead agencies on determining the significance of GHG emissions identified in CEQA documents, the CARB staff have recommended a threshold for new industrial projects to be subject to CEQA's requirement to impose feasible mitigation. If a project exceeds this threshold, then it is considered significant and must implement all feasible mitigation. The project must also meet CARB interim performance standards for construction and transportation emissions. In addition, projects should comply with AB 32 GHG reduction goals, include emissions estimates agreed upon by CARB, have been analyzed under CEQA, and have a certified Final CEQA document. Impacts and mitigation measures associated with the Proposed Project are discussed in Sections 12.6 and 12.7, respectively.

City of Santa Clarita CAP. There is no adopted GHG Reduction Plan or applicable strategy for the County of Los Angeles at the present time. However, the City of Santa Clarita adopted a CAP in August 2012. Section 4.2 of the CAP identifies GHG mitigation measures relating to solid waste diversion, energy usage, transportation, water, and vegetation. The solid waste diversion measures are aimed to limit the amount of waste sent to landfills, and are not applicable to the construction and operation of landfills. None of the mitigation measures presented in the CAP are directly applicable to the Proposed Project; however they do include many of the interim performance standards developed by CARB.

SCAQMD Landfill Rule. The purpose of SCAQMD Rule 1150.1 is to reduce emissions from MSW landfills. The rule incorporates and clarifies many federal landfill emission regulations (40 CFR) and California regulations (AB 32). The rule requires that an LFG collection and control system reduce CH_4 emissions by 99 percent and NMOC emissions by 98 percent or reduce outlet NMOC concentration from to less than 20 ppm. It also includes requirements for flares and LFG collection systems, as well as sampling and monitoring requirements for landfills.

12.4 Regional Setting

CCL is located in the northwestern portion of unincorporated Los Angeles County. CCL is approximately 3 miles west of the intersection of Interstate 5 (I-5) and State Route 126 (SR-126). The site is located in Section 15, Township 4 North, Range 17 West, San Bernardino Baseline and Meridian. The site latitude and longitude are 34°25'N and 118°39'W, respectively. The landfill is located within a series of canyons that make up the current and future cells containing disposed waste. These canyons are oriented in a north-northeast to south-southwest manner and broaden to form the Santa Clarita River floodplain along the south. CCL is located within the planning area of the City of Santa Clarita, but is outside its city limits and sphere of influence. The landfill site is also located in the Santa Clarita Valley Area Plan (Area Plan) of the Los Angeles County General Plan and in the Castaic Area Community Standards District.

12.5 Existing Operational Project Setting

CCL actively receives waste at a roughly 200-foot by 300-foot working face within the site. Daily operations at the existing landfill consist of typical waste disposal activities and facilities that contribute GHG emissions to the ambient air in the air basin. The operation of landfills and the associated emission rates are unique in comparison to land development projects because landfill operations require the regular use of heavy duty construction equipment and collection vehicles, long-term exposure of non-vegetated soil layers, constant movement of soil and refuse, and proper onsite disposal of LFG. An LFG collection system has been installed in both closed and active landfill areas, and a 9.2-megawatt LFGTE plant and flare stations have been added to combust the collected gases. Air emissions from landfill operations are associated with fugitive LFG emissions, operation of the flare stations and LFGTE plant, construction vehicles and waste transfer trucks at refuse fill areas, construction of additional modules for waste receiving, and closure of modules that have reached capacity.

12.5.1 Landfill Gas Surface Emissions

As part of landfill operation, gas wells and pipelines are installed to capture the LFG generated by the decaying solid waste. Initially, the LFG is mostly CO_2. As the buried waste ages, the available oxygen decreases and anaerobic conditions are created, producing CH_4, a powerful GHG.

The collected gas is monitored to be sure that the collection system is collecting LFG without drawing in ambient air. The collected gas is combusted in either the LFGTE plant or a flare, which converts CH_4 into CO_2. Two LFG flares, each with a capacity of 4,000 standard cubic feet per minute, are currently in operation.

The gas wells and pipelines collect an average of 85 percent of the LFG produced, and about 15 percent of the gas generated in the landfill escapes as fugitive emissions. Several actions are taken to minimize these emissions:

- Gauge pressure is negative at the gas extraction well.
- Nitrogen and oxygen concentrations are monitored to minimize excess air infiltration.
- LFG temperatures at the gas extraction wells are monitored to limit the potential for subsurface fires.
- CH_4 concentrations across the entire landfill surface are monitored to prevent seeping of CH_4 gas from the landfill surface.

In addition to the emission sources described above, CCL has an equipment maintenance facility. Additionally, CCL intends to resume a composting operation, previously active from 1997 to 2009, in some manner in the future.

12.5.2 Mobile Source Emissions

Mobile tailpipe exhaust emissions are generated during operation of the landfill by the following activities:

- Onsite service trucks and heavy equipment
- Collection trucks, transfer trucks, and passenger vehicles that deliver various waste materials
- Passenger vehicles associated with landfill employee commuting

12.6 Potential Impacts

12.6.1 California Environmental Quality Act Guidelines

In response to SB 375, the *CEQA Guidelines* have been amended to address establishment of thresholds of significance for analysis of the potential GHG impacts of a project. The relevant portions of the *CEQA Guideline*s are excerpted below.

CEQA Guideline 15064 (h)(3). A lead agency may determine that a project's incremental contribution to a cumulative effect is not cumulatively considerable if the project will comply with the requirements in a previously approved plan or mitigation program (including, but not limited to, water quality control plan, air quality attainment or maintenance plan, integrated waste management plan, habitat conservation plan, natural community conservation plan, and plans or regulations for the reduction of GHG emissions) which provides specific requirements that will avoid or substantially lessen the cumulative problem (e.g., water quality control plan, air quality plan, or integrated waste management plan) within the geographic area in which the project is located. Such plans or programs must be specified in law or adopted by the public agency with jurisdiction over the affected resources through a public review process to implement, interpret, or make specific the law enforced or administered by the public agency.

When relying on a plan**,** regulation or program, the lead agency should explain how implementing the particular requirements in the plan**,** regulation, or program ensure that the project's incremental contribution to the cumulative effect is not cumulatively considerable.

If there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding that the project complies with the specified plan or mitigation program addressing the cumulative problem, an EIR must be prepared for the project.

CEQA Guideline 15064.4 (a). The determination of the significance of GHG emissions calls for a careful judgment by the lead agency consistent with the provisions in Section 15064. A lead agency should make a good-faith effort, based on available information, to describe, calculate, or estimate the amount of GHG emissions resulting from a project. A lead agency shall have discretion to determine, in the context of a particular project, whether to:

1. Use a model or methodology to quantify GHG emissions resulting from a project. The lead agency has discretion to select the model it considers most appropriate provided it supports its decision with substantial evidence. The lead agency should explain the limitations of the particular model or methodology selected for use; or
2. Rely on a qualitative analysis or performance based standards.

CEQA Guideline 15064.4 (b). A lead agency may consider the following when assessing the significance of impacts from GHG emissions on the environment:

1. The extent to which the project may increase or reduce GHG emissions as compared to the existing environmental setting.
2. Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project.
3. The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions. Such regulations or requirements must be adopted by the relevant public agency through a public review process and must include specific requirements that reduce or mitigate the project's incremental contribution of GHG emissions. If there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding compliance with the adopted regulations or requirements, an EIR must be prepared for the project.

12.6.2 Thresholds of Significance for the Proposed Project

The *CEQA Guidelines* present two specific questions regarding GHG emissions. The questions are listed in Table 12-1.

TABLE 12-1
California Environmental Quality Act Checklist for Greenhouse Gas Emissions

VII. GREENHOUSE GAS EMISSIONS Would the project:	**Potentially Significant Impact**	**Less than Significant with Mitigation Incorporated**	**Less-than-Significant Impact**	**No Impact**
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☐	☐
b) Conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☐

As stated in Section 12.3.2, CARB has established an interim, quantitative GHG emission significance threshold for stationary source, industrial projects where local planning agencies have not adopted specific CEQA GHG guidelines. The threshold is set at 7,000 $MTCO_2e$/yr for operations emissions excluding construction and transportation emissions. The Proposed Project is subject to this threshold; therefore, impacts associated with the Proposed Project will be deemed significant if GHG emissions exceed 7,000 $MTCO_2e$/yr. In addition, the impacts associated with the Proposed Project will be considered significant if GHG emissions hinder or delay California's ability to meet the reduction targets contained in AB 32.

To determine compliance with the two *CEQA Guidelines* questions, the operational GHG emissions of the Proposed Project will be compared to CARB's 7,000-$MTCO_2e$/yr significance threshold. If the CARB threshold is not exceeded, then significance would be determined by whether the project would significantly hinder or delay California's ability to meet the reduction targets contained in AB 32 through GHGs emitted during either construction or operation.

Calculations of projected CO_2, CH_4, and N_2O emissions are provided in the following section to identify the magnitude of potential effects of the Proposed Project. The analysis focuses on CO_2, CH_4, and N_2O as these are the GHG emissions that the Proposed Project would emit in the largest quantities compared to other GHGs (such as HFCs and PFCs).

12.6.3 Proposed Project Impacts

Potential GHG emissions from the Proposed Project implementation are described below.

12.6.3.1 Construction Emissions

Impact GHG-1: *Implementation of the Proposed Project would generate construction-related GHG emissions. However, these emissions are not included in the 7,000-$MTCO_2e$/yr threshold and would not hinder or delay California's ability to meet the reduction targets contained in AB 32. The construction equipment and work practices would meet or exceed the CARB interim performance standards for construction. Impacts from construction activities would therefore not be significant.*

Project Impact Discussion. The Proposed Project will be developed in phases with cell development in each phase, occurring over the life of the Proposed Project. Grading and site preparation associated with each subsequent phase of the Proposed Project would occur prior to the fill of the previous cell. Emissions from these activities are temporary. Preparation of new cells would occur as needed, and construction emissions from preparation of each new cell would be generally similar.

The Proposed Project would emit GHGs primarily from direct sources (combustion of fuels from employee vehicles and construction equipment). Emissions from the combustion of fuel from construction equipment and associated employee vehicles were estimated per the methodology described in Section 12.2. GHG emissions during construction would equal approximately 2,961 tons (2,687 metric tons) per year of CO_2e. Table 12-2 shows the estimated construction-related emissions.

TABLE 12-2
Total Estimated Landfill Construction Greenhouse Gas Emissions (tons per year)[a,b]

Type of Emissions[c]	CO_2	CH_4	N_2O	CO_2e
Onsite Construction Equipment (exhaust)	2,896	0[d]	N/A	2,900
Offsite Construction Mobile Sources (cars/trucks)	60	0[d]	N/A	60
Onsite Construction Mobile Sources (cars/trucks)	1	0[d]	N/A	1
Total Landfill Construction Emissions	**2,957**	**0[d]**	**N/A**	**2,961 (2,687 $MTCO_2e$/yr)**

[a] Emission estimates from analysis of operational year 2021, which is the year resulting in the greatest amount of construction-related CO_2e emissions.

[b] Unless otherwise specified, all values presented in tons per year, rounded to the nearest ton.

[c] See Appendix H for GHG calculations and assumptions.

[d] Below 0.5 tons per year

Note:

N/A = not applicable or emission factor not available

As shown in Table 12-2, the estimated GHG emissions from construction activities is 2,687 $MTCO_2e$/yr. The CARB significance threshold does not include construction emissions. Therefore, this assessment examines significance in the specific context of whether or not the Proposed Project would hinder or delay California's ability to meet the reduction targets contained in AB 32. As proposed, initial construction of the Proposed Project would occur prior to the year 2020 and would not hinder or delay the implementation of AB 32. Although construction emissions prior to 2020 would affect background GHG concentrations, AB 32 only assesses emissions (rather than concentrations) beginning in the year 2020. As such, no mitigation measures are required, and the impact of the construction of the Proposed Project would be less than significant.

Additional Mitigation Measures Required Through the CEQA Process. CARB interim performance standards for construction are required and included in the Proposed Project, including the use of limits on idling.

Effectiveness of Mitigation Measures. Impacts would be less than significant by incorporation of the CARB interim performance standards.

12.6.3.2 Operational Emissions

Impact GHG-2: *Operation of the Proposed Project would result in the generation of GHG emissions from energy use, onsite equipment exhaust, fugitive emissions of LFG, combustion of LFG, and disposal truck/worker vehicle trips. Based on the detailed analysis herein, the GHG emissions from the Proposed Project, excluding construction and transportation emissions, would exceed the 7,000-$MTCO_2e$/yr significance threshold. Therefore, GHG emissions resulting from the operation of the Proposed Project would be significant.*

Project Impact Discussion. Operational, or long-term, GHG emissions will occur over the life of the Proposed Project. The sources of operational emissions include energy use, onsite equipment exhaust, LFG generation and flaring, and disposal vehicle and other transportation emissions. Each of these emissions sources are discussed in greater detail below.

In accordance with CARB interim thresholds for GHG emissions, the equipment exhaust will not be included in the evaluation of the operational emissions impact. The Proposed Project incorporates the CARB interim performance standards for construction and transportation.

Onsite Energy Use. Operational emissions of CO_2, CH_4, and N_2O associated with onsite energy use by new blowers were quantified per the methodology described in Section 12.2. Detailed indirect electricity emission calculations are included in Appendix H.

The generation of electricity through combustion of fossil fuels yields CO_2, as well as lesser amounts of CH_4 and N_2O. These emissions are considered indirect because the Proposed Project would not generate the electricity but merely consume purchased electricity that is generated elsewhere. Table 12-3 shows the estimated operational emissions of GHGs associated with electricity consumption from the Proposed Project.

TABLE 12-3
Estimated Annual Energy-Related Greenhouse Gas Emissions[a,b]

Emission Source	Annual Emissions[c] (tons)	
	Emissions	**CO_2e**
CO_2	1,662.53	1,662.53
CH_4	0.08	1.94
N_2O	0.02	4.89
Total (CO_2e)	**1,669.36 (1,514.42 MTCO_2e/yr)**	

[a] Emission estimates from analysis of operational year 2032, which is the year resulting in the greatest amount of operation-related CO_2e emissions.

[b] See Appendix H for GHG emission factor assumptions.

[c] Emission factors taken from EPA eGRID Ninth Edition, Version 1.0 (EPA, 2014b).

***Onsite Equipment Emissions*. ** Additional heavy equipment proposed for regular onsite use includes three bulldozers, three compactors, two scrapers, one water truck, one water wagon, three trailer mounted light plants, and two tippers. Light duty cars and trucks are also expected to be regularly used onsite at the landfill. For the purpose of this analysis, it was assumed that onsite equipment would be operated for as much as 12 hours per day. It should be noted, however, that it is unlikely that all onsite equipment would be used simultaneously beginning from the first day of landfill operations. Therefore, this analysis represents a reasonable worst case scenario for potential emissions impacts. GHG emissions were calculated per the methodology described in Section 12.2. The results of this analysis are summarized in Table 12-4.

TABLE 12-4
Total Onsite Equipment Emissions[a,b]

Type of Emissions[c]	CO_2	CH_4	N_2O[d]	CO_2e
Onsite Operation Equipment (exhaust)	2,313	0[e]	N/A	2,317
Onsite Operational Mobile Sources (cars/trucks)	1,174	0[e]	N/A	1,174
Total Onsite Equipment Emissions	**3,487**	**0[e]**	**N/A**	**3,491 (3,167 MTCO_2e/yr)**

[a] Emission estimates from analysis of operational year 2032, which is the year resulting in the greatest amount of operation-related CO_2e emissions.

[b] Unless otherwise specified, all values are in tpy, rounded to the nearest ton.

[c] See Appendix H for GHG calculations and assumptions.

[d] EMFAC2011 does not contain emission factors for N_2O, and it does not predict CH_4 emission factors for medium and heavy duty diesel trucks.

[e] Below 0.5 tons per year.

Note:

N/A = not applicable or emission factor not available

Landfill Gas Emissions. LFG results from the anaerobic decomposition of organic materials within a landfill. LFG is principally composed of CH_4 and CO_2 but also includes nonmethane organics, reactive organic compounds, sulfur compounds, and a variety of other air pollutants as discussed in Chapter 11.0, Air Quality. The existing facility operations include a LFG containment system, which spans the extent of the landfill to limit emissions into the atmosphere and prevent subsurface migration of LFG to adjacent properties. According to the *Landfill Gas Report* by Golder Associates (the Golder Report), methane content in the LFG at CCL is 50 percent by volume (Golder, 2011). CO_2 content was conservatively assumed to be 50 percent for this analysis.

The Golder Report (2011) determined that estimated LFG recovery is 85 percent using EPA LandGEM Model Version 3.02. LFG emissions of N_2O are given a value of 0 grams per standard cubic foot by CARB (CARB, 2011b). Therefore, negligible N_2O emissions would result from LFG. Total CH_4 and CO_2 emissions from fugitive LFG emissions, conservatively assuming 85 percent recovery, are shown in Table 12-5.

TABLE 12-5
Estimated Maximum Annual Landfill-Gas-Related Greenhouse Gas Emissions[a,b]

Emission Source	Annual Emissions (tons)[c]	
	Emissions	CO_2e
Biogenic CO_2	34,386	34,386
CH_4	12,533	313,314
N_2O	N/A	N/A
Project Total (CO_2e)	**347,700 (315,429 MTCO_2e/yr)**	

[a] Emission estimates from analysis of operational year 2032, which is the year resulting in the greatest amount of operation-related CO_2e emissions.

[b] See Appendix H for GHG emission factor assumptions.

[c] Emission calculations assume 85 percent recovery.

Note:

N/A = not applicable or emission factor not available

Flaring Emissions. Emissions would be generated by flaring of collected LFG. CO_2 emissions from flaring were calculated based on source testing and projected LFG generation. Detailed flaring emission calculations are included in Appendix H. Table 12-6 shows the estimated operational flaring emissions, conservatively assuming 85 percent recovery of LFG and a flare destruction efficiency of 99 percent. As noted above, from a GHG accounting perspective, it is conservative to assume that all gas is combusted in flares at this efficiency versus with the higher destruction efficiency achieved in gas turbines in the LFGTE plant.

TABLE 12-6
Estimated Maximum Annual Flaring Greenhouse Gas Emissions[a,b]

Emission Source	Annual Emissions (tons)[c]	
	Emissions	CO_2e
Biogenic CO_2	91,908	91,908
CH_4	390	9,751
N_2O[3]	N/A	N/A
Project Total (CO_2e)	**101,659 (92,223 MTCO_2e/yr)**	

[a] Emission estimates from analysis of operational year 2032, which is the year resulting in the greatest amount of operation-related CO_2e emissions.

[b] See Appendix H for GHG emission factor assumptions.

[c] Emission calculations conservatively assume 85 percent recovery.

Note:

N/A = not applicable or emission factor not available

Disposal Vehicle/Transportation Emissions. Emissions would be generated by heavy duty trucks transporting refuse to the landfill, as well as recycling and other trucks, and employee and vendor vehicles. In accordance with CARB interim thresholds for GHG emissions, the vehicle exhaust will not be included in the evaluation of the operational emissions impact. The Proposed Project incorporates the CARB interim performance standards for transportation for all vehicles in the project proponent's control.

Emissions were calculated per the methodology described in Section 12.2. Table 12-7 shows the estimated mobile emissions of GHGs.

TABLE 12-7
Estimated Annual Offsite Mobile (Vehicle) Emissions of Greenhouse Gases[a,b]

Emission Source	Annual Emissions (tons)	
	Emissions	CO_2e
CO_2	1,132	1,132
CH_4	0[c]	0[c]
N_2O[d]	N/A	N/A
Project Total (CO_2e)	**1,132 (1,027 $MTCO_2e/yr$)**	

[a] Emission estimates from analysis of operational year 2032, which is the year resulting in the greatest amount of operation-related CO_2e emissions.

[b] See Appendix H for GHG emission factor assumptions and calculations.

[c] Below 0.5 tons per year.

[d] EMFAC2011 does not contain emission factors for N_2O, and it does not predict CH4 emission factors for medium and heavy duty diesel trucks.

Note:

N/A = not applicable or emission factor not available

Subsequent Phase Preparation. As discussed above, the Proposed Project is to be constructed over time in phases, and grading and site preparation associated with these phases would occur prior to the fill of the previous cell. Preparation of a new cell would occur as needed, depending on the duration of each operational phase. GHG emissions from these temporary activities would occur during operation of the landfill and be included as construction impacts. Therefore, in accordance with the CARB interim guideline, emissions from cell construction are not being included in operational GHG calculations. In order to provide a comprehensive estimate of these construction emissions, emissions associated with a prospective phase are included in Table 12-2.

Combined Operational Emissions for Comparison to the Threshold. Table 12-8 combines all of the applicable sources of GHG emissions associated with the operation of the Proposed Project to be compared with the CARB interim threshold, which total approximately 409,166 $MTCO_2e/yr$. Per CARB, this total excludes construction and transportation emissions. This total represents roughly 0.09 percent of California's total 2009 emissions of 457 MMT. These emissions projections indicate the majority of the Proposed Project's potential GHG emissions are associated with LFG.

TABLE 12-8
Projected Maximum Landfill Operational Greenhouse Gas Emissions for Comparison to the Threshold (tons)[a,b]

Type of Emissions[c]	Biogenic CO_2	Anthropogenic CO_2	CH_4	N_2O	CO_2e
Flares	91,908	N/A	390	N/A	101,659
Landfill Gas	34,386	N/A	12,533	N/A	347,700
Indirect Electricity	N/A	1,663	0[d]	0[d]	1,669
Total Landfill Operational Emissions for Comparison to the Threshold	**126,294**	**1,663**	**12,923**	**0[d]**	**451,028 (409,166 $MTCO_2e$/yr)**

[a] Emission estimates from analysis of operational year 2032, which is the year resulting in the greatest amount of CO_2e emissions.

[b] Unless otherwise specified, all values in tons per year, rounded to the nearest ton.

[c] See Appendix H for GHG emission calculations and assumptions.

[d] Below 0.5 tons per year.

Note:

N/A = not applicable or emission factor not available

Project-Level Significance Determination. The GHG emissions from applicable sources associated with the Proposed Project are estimated to equal approximately 409,166 $MTCO_2e$/yr. The impacts of the Proposed Project exceed the CARB significance threshold; therefore, the Proposed Project impacts would be significant.

Project Design Elements that Avoid or Reduce Impacts. Appendix B of *CEQA and Climate Change* (CAPCOA, 2008) identifies mitigation measures and the corresponding reductions in GHG emissions and a range of percentage reductions for a variety of categories including bicycles, pedestrian pathways, parking, design, mixed-use, energy, and construction features. The ranges are indicative of the GHG emission reductions corresponding to each of the features, from a numerical low to high (CAPCOA, 2008). Similarly, Chapter 7 of *Quantifying Greenhouse Gas Mitigation Measures* provides mitigation fact sheets for certain industries, including solid waste. The fact sheets include a list of mitigation measures and their associated GHG emission reductions (CAPCOA, 2010). The existing landfill facility and the Proposed Project both include an LFGTE plant, which is an emissions reduction measure comparable to mitigation measures recommended in the CAPCOA White Paper and report.

LFG will continue to be actively managed using a comprehensive LFG collection and removal system as required by federal and state regulations.

Carbon "Sink" and Sequestration. Emissions of GHGs from fuel use and organic matter decomposition is an inevitable consequence of management of the solid waste produced by society. It must be acknowledged, however, that the disposal of waste in landfills also causes substantial amounts of carbon to be removed from the carbon cycle and permanently sequestered.

Ownership of the sequestration benefits is a complex topic that EPA and other organizations have not attempted to solve. The waste materials are abandoned by their owners, however, and disposed of in the landfill. This discussion considers the carbon sequestration in the landfill, which may prospectively be an offset claimed against the landfill emissions.[1]

Nonetheless, EPA, IPCC, and CEC all recognize landfills as carbon sinks and quantify such storage in national and state-wide GHG budgets. For example, in the recent Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2012 (EPA, 2014c), EPA provides methodology and results for carbon storage via disposal of food scraps and yard trimmings in landfills. The document is clear that the attempt is not to only quantify storage for these waste types; rather, these are specifically identified because other waste types are accounted in other portions of the budget: “Carbon storage estimates are associated with particular land uses. For example, harvested wood products are accounted for under Forest Land Remaining Forest Land because these wood products are considered a component of the forest ecosystem. The wood products serve as reservoirs to which C resulting from photosynthesis in trees is transferred, but the removals in this case occur in the forest.”

The IPCC approach is similar in the 2006 Guidelines for National Greenhouse Gas Inventories (IPCC, 2006). Volume 5 of the guidelines covers waste including carbon stored in solid waste disposal sites (SWDS). “Some carbon will be stored over long time periods in SWDS. Wood and paper decay very slowly and accumulate in the SWDS (long-term storage). Carbon fractions in other waste types decay over varying time periods (see Half-life under Section 3.2.3.). The amount of carbon stored in the SWDS can be estimated using the [first order decay] model (see Annex 3A.1). The long-term storage of carbon in paper and cardboard, wood, garden and park waste is of special interest as the changes in carbon stock in waste originating from harvested wood products which is reported in the AFOLU volume (see Chapter 12, Harvested Wood Products).”

Finally, the 2006 Inventory of California GHG Emissions and Sinks (CEC, 2006) is also similar. CEC indicates that, “Lumber and urban wood wastes disposed at landfills contain significant amounts of lignins, which contain carbon, which is sequestered in anaerobic landfills.” Quantification of storage for wood products and other organics was included in the inventory.

Unfortunately, none of these methologies is adequate for analysis of site-specific carbon balance. Again, the purpose for all three was to produce national or state-wide GHG inventories without assigning emissions to particular locations. Thus, comprehensive analysis of landfill storage using these references would require combining procedures from multiple sections, including the noted landfill discussions, and in particular also portions of Agriculture, Forestry, and Other Land Use (AFOLU) analyses.

Perhaps the most comprehensive reference which could be applied for site-specific analysis is the “Current MSW Industry Position and State-of-the-Practice on LFG Collection Efficiency, Methane Oxidation, and Carbon Sequestration in Landfills” produced by SCS Engineers on behalf of the Solid Waste Industry for Climate Solutions (SCS Engineers, 2008). In this document, the authors present recommended procedures for analysis of carbon storage in landfills, combining data from EPA, IPCC, various researchers, and other sources. Estimates are presented regarding content and long term storage of carbon for individual and combined waste streams.

[1] Clear and consistent guidance regarding both the “ownership” of or claim to, and methods for estimation of, this sequestration do not currently exist. Thus this EIR does not attempt to “net” this storage of carbon in the landfill against the reported emissions of GHG from the landfill, or claim that such storage offsets the landfill emissions. Rather, the intent of this discussion is to point out that the carbon storage in the landfill – the carbon sequestered -- may approach or exceed the rate of emissions from the landfill operation. In particular, producers of raw materials that may ultimately end up as landfill waste could potentially claim “right” to the sequestration, and thus try to offset such storage against landfill emissions could potentially represent double counting. As noted above, however, once a generator of waste disposes of waste, it is abandoned and no longer owned by the generator. One example of potential confusion is harvested wood products. Most carbon offset methodologies for forest projects quantify the storage of carbon in wood, including harvested wood products. The methodologies specify procedures for estimation of volume of wood waste that would end up in landfills or otherwise be stored, including estimation of fractions that would remain permanently fixed. Thus it is possible that the carbon in a portion of the wood-derived products in the landfill have already been claimed as a carbon offset, and thus used to displace GHG emissions from industry or other sources. However, this would apply to only a portion of the waste stored, making analysis complex.

Using this methodology, SCS Engineers has estimated the amount of carbon sequestered in the landfill from waste disposal operations in the landfill extension. Utilizing average waste composition factors established by CalRecycle (successor to the California Integrated Waste Management Board), SCS has determined that over the estimated landfill expansion life, CO_2e stored in the landfill is approximately 21.6 million tons, a substantial quantity (SCS Engineers, 2008, 2014; see Appendix H).

Additional Mitigation Measures Required Through the CEQA Process. Required mitigation strategies such as the LFG collection system are in place and will continue to operate. Additional mitigation techniques are presented in Section 12.7.

The CARB interim threshold guidelines require the implementation of all feasible mitigation measures. Mitigation measures to reduce the emissions of GHGs are listed below.

- Idling of heavy duty hauling trucks and off-road mobile sources of any type in excess of 5 minutes, will be restricted.
- When supplemental landfill equipment is purchased, new commercially available equipment will be purchased that meets or exceeds California's emission standards in effect at the time of purchase.
- Onsite vehicles and equipment will be properly maintained per manufacturer's specifications.

In addition to the above measures, within 3 years of final project permitting, the applicant will submit a GHG Reduction Plan that investigates the feasibility of additional GHG reduction measures the Proposed Project could implement to achieve additional reductions in annual GHG emissions. CARB interim performance standards and any future requirements SCAQMD may promulgate will be considered in the Plan, together with the landfill facility's evaluation of sequestered tons.

12.6.3.3 Conclusion

As shown in Table 12-8, operation of the Proposed Project would result in the generation of GHG emissions in exceedance of the 7,000-MTCO2e/yr significance threshold. In accordance with *CEQA Guidelines* for GHGs Question (a), operation activities may result in a potentially significant impact on the environment. Subject to applicable laws and regulations, the emissions from operational activities, may, however, be counterbalanced to a degree by the landfill's carbon sequestration as noted above. However, mitigation strategies, including the required LFG collection system, are being implemented to reduce the Proposed Project's climate change impacts to the furthest extent possible.

12.7 Mitigation Measures

Under CEQA, any project that is determined to have significant impacts must impose all feasible mitigation. Potential mitigation strategies for GHGs are included in California Attorney General's Office's "Addressing Climate Change at the Project Level," OPR's 2008 Technical Advisory, "CEQA and Climate Change: Addressing Climate Change through [CEQA]," CAPCOA's 2008 white paper, and the 2010 *CEQA Guidelines* amendments. The following mitigation measures will be implemented in addition to the required LFG collection system:

GHG-1 The CARB interim performance standards will be implemented and include the following:

- Idling of heavy duty hauling trucks and off-road mobile sources of any type in excess of 5 minutes, will be prohibited.
- When new landfill equipment is purchased, new commercially available equipment will be purchased that meets or exceeds California's emission standards in effect at the time of purchase.
- Onsite vehicles and equipment will be properly maintained per manufacturer's specifications.

GHG-2 Within 3 years of project approval, the applicant will submit a GHG Reduction Plan.

GHG-3 The smallest equipment possible will be used for operations at the landfill to minimize tailpipe exhaust emissions.

GHG-4 Energy conservation practices will be followed, including turning off all unnecessary lights.

12.8 Significance After Mitigation

As stated in Section 12.6.3.3, the emissions generated from the operation of the Proposed Project are significant according to the CARB significance threshold. The impacts associated with the Proposed Project will be mitigated after implementation of mitigation to the fullest extent possible, again in accordance with CARB CEQA significance thresholds. Implementation of the above mitigation measures would result in less- than-significant impacts associated with GHG and Climate Change.

12.9 Cumulative Impacts

12.9.1 Potential Cumulative Impacts

Climate Change. As discussed above, no approved thresholds or methodologies are currently available for determining the significance of a project's potential contribution to GCC in CEQA documents. An individual project (unless it is a large-scale construction project, such as a dam or new freeway project, or a large fossil – fuel-fired power plant) is unlikely to generate sufficient GHG emissions to directly influence GCC; therefore, analysis of a project's contribution to GCC is inherently cumulative and to a considerable degree speculative. The following is a good faith effort at disclosing and evaluating the Proposed Project's potential impact as a portion of climate change impacts associated with build out in the context of the Santa Clarita Valley Specific Area Plan in Los Angeles County. The EIR for the Santa Clarita Valley Area Plan, *One Valley, One Vision,* was finalized in January 2012, and the Santa Clarita Valley Area Plan was adopted in November 2012.

Cumulative build out of the Santa Clarita Valley area would increase GHG emissions by increasing overall population, square footage of commercial, industrial, and other supplementary uses, and by increasing traffic and the associated transportation emissions that make up 38 percent of statewide GHGs. Without corresponding GHG reduction strategies across all new projects and development, significant impacts would occur. However, the analysis of the Proposed Project demonstrates that potential GHG mitigated emissions impacts are not significant, and therefore would not hinder or delay California's attainment of AB 32 objectives. The GHG effects of the Proposed Project are therefore not a significant cumulative impact.

Under AB 32, it is also relevant to consider whether the impacts of climate change would significantly impact the Proposed Project. AB 32 indicates that "the potential effects of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidence of infections, disease, asthma, and other health-related problems" (State of California 2006, AB 32, §38501[a]). The 2006 CAT Report identifies further possible effects of climate change. As indicated in the CCCC report that assesses the risk of climate change to California, the following is a summary of the potential risks to California:

- A reduction in the Sierra snowpack which could result in a risk to hydropower
- A reduction in the Sierra snowpack that could result in a loss of winter recreation from insufficient snow for skiing and snowboarding
- A decrease in water supply could negatively impact the food supply
- Climate change could increase temperatures, leading to decreased supply of certain agricultural products such as wine, fruit, nuts, and milk
- Climate change could result in plant and animal species relocating to cooler, more habitable "up-slope" locations

- Climate change could negatively affect the health and productivity of California's forests
- Climate change could result in up to a 55 percent increase in wildfires
- A rise in sea levels could result in increased coastal floods and shrinking beaches.

The timing, severity, or precise distribution of these potential long-term impacts cannot be predicted. Most would affect nearly all Californians regardless of where they live or how their housing or workplaces were sited, designed, and developed. Of these potential effects, an increase in wildland fire danger would be most likely to impact the Proposed Project. The project site is located in a high fire hazard area, and an increase in overall wildland fire danger would increase exposure of people or structures to a risk of loss or injury.

12.9.2 Mitigation Measures Required for Cumulative Impacts

Mitigation measures for cumulative impacts are the same as the mitigation measures presented in Section 12.7. No additional mitigation measures are required.

12.9.3 Significance After Mitigation

As stated in Section 12.6.3.3, the emissions generated from the operation of the Proposed Project are significant according to the CARB significance threshold. The impacts associated with the Proposed Project will be less-than-significant after implementation of mitigation to the fullest extent possible, in accordance with CARB CEQA thresholds.