South San Francisco Scavenger Company, Inc.

Climate Action Management Plan:

Climate Registry & Avoided Emissions Reporting

Calendar Year 2015

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Prepared by:

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Introduction

South San Francisco Scavenger Company, Inc. (SSFSC) together with their partner company Blue Line Transfer Inc., have been leaders in recycling and refuse services in the Bay Area since 1914, providing material collection services to the communities of Brisbane, Millbrae and South San Francisco, in addition to providing international waste management services for San Francisco International Airport.

SSFSC provides a full range of pre- and post-collection services to assure efficient, responsive, and hands-on waste management in the face of rapidly changing regulatory and environmental challenges. Since moving to their current location in 2001, SSFSC and Blue Line Transfer and Materials Recovery Facility (MRF) continue to upgrade their processing equipment to accommodate increased diversion of construction and demolition debris, wood waste, plastics, commercial food waste and other materials.

Since its inception SSFSC has been on the cutting-edge of the latest advances in waste management technology and service. In 2013, SSFSC began construction on the nation's first anaerobic digestion facility that processes food scraps into compressed natural gas (CNG), which fuels their collection fleet. This facility began operation in January 2015.

Company Information

Company Name:	South San Francisco Scavenger Co., Inc.
Corporate Address:	500 East Jamie Court South San Francisco, CA 94080
Inventory Contact:	Doug Button, President (650) 589-4020
Technical Assistance Providers:	Monica White Edgar & Associates 916-739-1200 monica@edgarinc.org

GEOGRAPHIC SCOPE AND REPORTED GASES

SSFSC has committed to voluntarily estimate its greenhouse gas (GHG) emissions beginning with base year 2006 and continuing annually up to the most recent Calendar Year 2015 (CY2015). All previous calendar years (2006-2014) have been successfully verified. Understanding how the greenhouse gas emissions have changed from these activities, and how those impacts are mitigated, will allow greenhouse gas emissions to be considered in a quantifiable manner when implementing future programs and management strategies.

The geographic scope of this inventory is North America. However the entire operation is limited to one facility in South San Francisco, California. Additionally, SSFSC has chosen to report emissions of all gases from all sources within its operational control, management control boundary. All direct and indirect emissions (Scope 1 and Scope 2 Emissions) from sources under SSFSC's operational control have been included in this inventory, following The Climate Registry (TCR) General Reporting Protocol, Version 2.0. This protocol has been followed and recorded, however unlike previous years, SSFSC will not be verified by TCR for 2015 as the data pertaining to the first two months of the anaerobic digestion system is unavailable. Estimations for these two months have been made, however these estimations exceed TCR's 5% threshold for verification.

TCR's protocol does not require the reporting of avoided emissions from recycling or composting (Scope 3 Emissions) for verification. However, SSFSC voluntarily tracks and calculates their Scope 3 Emissions in order to provide a complete picture of their carbon management.

ORGANIZATIONAL BOUNDARY

This report provides estimates of all the associated GHG emissions for the operations and facilities that SSFSC wholly owns, and the indirect emissions associated with landfilling and recycling activities. For those operations in which SSFSC has a partial ownership or working interest, or holds an operating lease, there are two accounting options for reporting GHG emissions:

1. Management control:

• Report 100% of emissions for facilities which participant has operational or financial control;

• Report 0% of emissions for facilities which participant does not have operational or financial control.

2. Equity share: Percentage of emissions accounted for as proportionate to ownership.

SSFSC has chosen to delineate its organizational boundary using the operational criteria under management control, and SSFSC has 100% management and operational control over the Jamie Court facility, including Blue Line Transfer.

CATEGORIES OF EMISSIONS AND SOURCE IDENTIFICATION

The General Reporting Protocol of The Climate Registry (TCR GRP, Version 2.0) is being followed in the preparation of this greenhouse gas emissions inventory. Emissions in the following categories are being accounted for:

Scope 1: Direct emissions from sources owned or controlled by the member:

1. Mobile combustion sources (fleets). These types of emissions are principally from collection vehicles (on-road) and equipment (off-road) used at the Material Recovery Facility.

2. Stationary combustion sources Non-mobile fuel consuming sources, such as: natural gas from utility provider (i.e. water heaters, drying facilities), diesel-powered generators/compressors, oxy-acetylene torches, propane powered stationary sources, etc.

3. Process functions Some manufacturing processes produce emissions, e.g. MSW combustion, cement production. There are no known process function emissions from these facilities.

4. Fugitive emissions Fugitive emissions of hydrofluorocarbons from vehicle cooling systems are estimated.

Scope 2: Indirect emissions from sources that occur because of a participant's actions:

1. Purchased and consumed electricity. This is derived from utility invoices.
2. Purchased and consumed heat, steam or cooling. These types of energy sources aren't used by these facilities.

Scope 3: Optionally reported indirect emissions outside of the participant's boundary:

1. Biogenic emissions resulting from the use of biofuels including biodiesel and the on-site generated renewable compressed natural gas (RNG)
2. Avoided emissions from diverting waste from a landfill.
3. Life Cycle of emissions of materials recycled.

EMISSIONS SOURCES

The emission source identification procedure involved a systematic review of company facilities and operations by the SSFSC GHG Inventory Management Team and their technical assistance providers. Emissions from each source are discussed below. Global Warming Potentials (GWP) used in the analysis are 21 for methane, and 310 for nitrous oxide. GWPs for other gases are stated in the relevant sections of this document.

Scope 1

Direct emissions from mobile combustion

Direct emissions from SSFSC vehicles contributed approximately **88%** of the SSFSC inventory. A complete list of vehicles is included in **Appendix D**.

Direct emissions from stationary combustion

These emissions represent **12%** of the total for the reporting year. The primary source is natural gas purchased from PG&E and acetylene used in welding torches.

Fugitive Emissions

Fugitive emissions are made up of leakage from vehicle refrigerant systems, building air conditioning systems and carbon dioxide used in welding torches. This category makes up **less than 1%** of the inventory.

Scope 2

Indirect emissions from imported electricity

Electricity is purchased from PG&E for use at Jamie Court. Electricity use represents approximately **6%** of emissions.

A summary and further analysis of Scope 1 and 2 Emissions is included later in this report. A full description of the assumptions and methodology used to calculate these emissions can be found in **Appendix A**.

Scope 3

Biogenic Fuels

SSFSC uses some biofuels to run their vehicles, including renewable natural gas produced from the anaerobic digestion unit. The emissions from these biofuels are considered biogenic, and therefore reported under Scope 3 emissions. They are reported to TCR although they are not included in the total emissions summary. In 2015 these fuels accounted for in **826.76 MT of biogenic CO_2.**

Recycling and Composting (Optional Reporting)

In the optional reporting category, SSFSC is including avoided indirect emissions from compost production, anaerobic digestion of organic waste, and from recycling other components of the waste stream. In 2015, SSFSC avoided a total of **47,943 $MTCO_2e$.**

A summary of these avoided emissions is included in the Scope 3 Emissions section of this report, and a more detailed technical report is included in **Appendix B**.

Scope 1 & 2 Emissions Summary and Analysis

A summary of emissions for each category for all years is provided in **Table 1** on the next page, with the percent weight of emission sources for the current year (CY2015). CY2006 -2014 have been successfully verified. For all emission years direct mobile combustion represents the largest percentage of emissions. See **Figure 1** below for a visual representation.

Overall the emissions inventory has decreased by **10%** from CY2006, which is a result of SSFSC's continuous transition to low carbon fuels. Stationary emissions from natural gas usage fluctuate year by year due to the number of international airline waste sanitation cooks. **Table 2** (also on the next page) provides the total quantities of fuel and energy usage by major source categories.

Figure 1: Emissions Summary by Categories- All Years

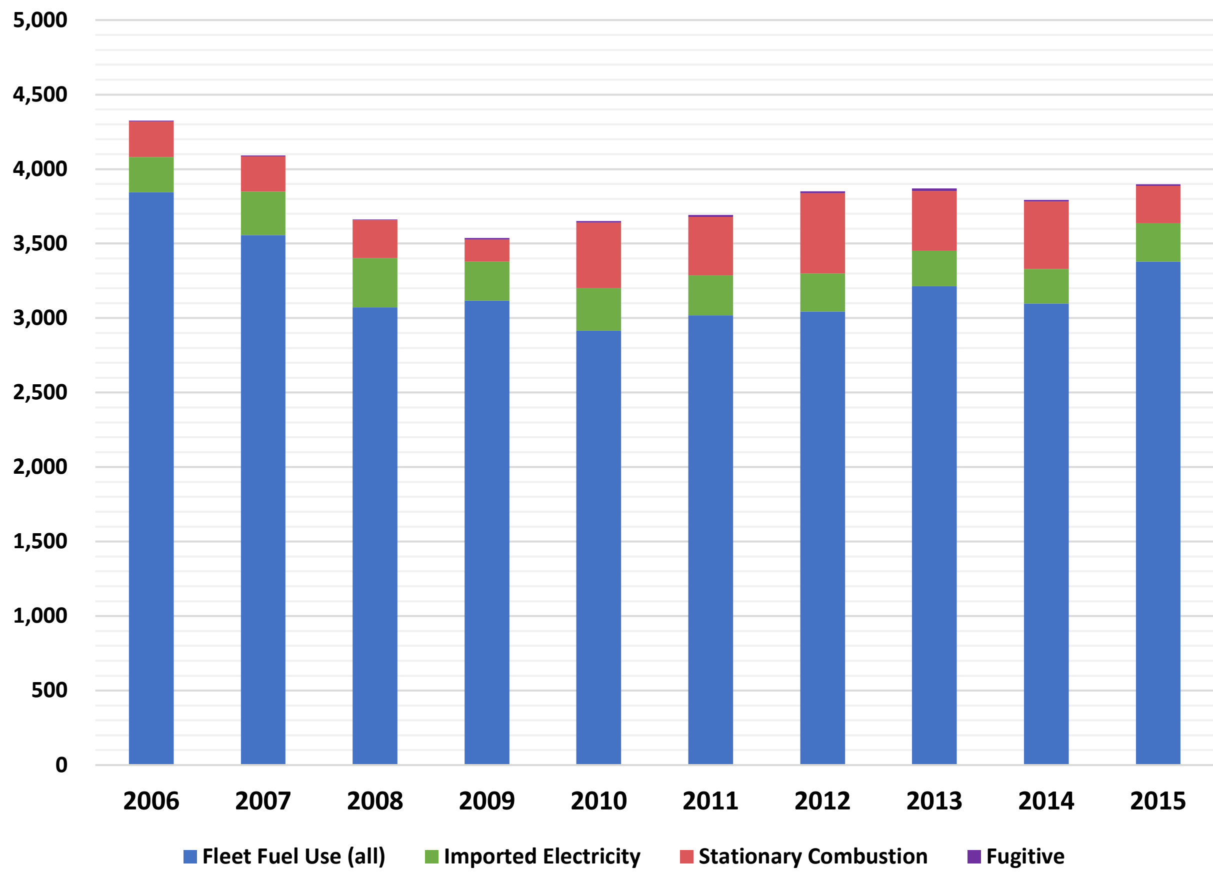


Table 1: $MTCO_2e$ (metric tons) Emission Summary - All Years

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Mobile Combustion	3,844	3,556	3,073	3,117	2,916	3,018	3,043	3,213	3,098	3,416
Indirect Emissions	235	293	330	262	285	269	257	238	231	258
Fugitive Emissions	5	5	5	11	11	11	12	17	11	11
Stationary Emissions	240	236	255	147	438	393	539	403	453	216
Total	4,325	4,090	3,663	3,537	3,651	3,691	3,850	3,871	3,793.72	3,900.53
% Change from previous year	NA	-5%	-10%	-3%	3%	1%	4%	1%	-2%	3%
% Change from base year	0%	-5%	-15%	-18%	-16%	-15%	-11%	-11%	-12%	-10%

Table 2: Fuel and Energy Usage Summary- CY2006 - CY2015

Product	Unit	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Natural Gas[1]	MMBtu	4,489	4,407	4,767	2,644	8,123	7,216	10,024	7,480	8,382	11,228
Electricity	MWh	1,130	1,012	1,129	895	920	868	858	793	830	870
Diesel	Gallon	351,683	328,665	283,500	281,981	255,778	257,620	245,238	248,629	230,587	243,787
Gasoline	Gallon	16,951	19,617	14,948	13,921	7,765	6,903	5,355	6,151	5,752	5,065
CNG	DGE	4,810	4,508	6,176	17,713	28,466	31,847	52,948	70,320	95,346	115,657
AD RNG	DGE										47,510
Biodiesel	Gallon	0	30,861	56,229	43,716	50,919	53,194	50,823	52,294	46,588	46,269

[1] Includes the 10,644 MMBtu used by the international waste cooker. The anaerobic digester's boiler was a new source in 2015, adding 3,194 MMBtu.

Comparison to Business-as-Usual

AB 32 requires a greenhouse gas reduction of approximately 15% below a "business-as-usual" (BAU) scenario by 2020 from a 2006 base year. This BAU, which is calculated as the emissions that would have occurred in the absence of mitigation strategies, provides a baseline for measuring the efficacy of various programs. SSF has been implementing de-carbonization measures to reduce its greenhouse gas emissions for several years, and therefore already produces less emissions than it would have under a business-as-usual scenario. For SSFSC, these mitigation measures include the use of CNG vehicles, bio-diesel fuel, solar panels, and most recently, renewable natural gas (RNG) produced on site at its anaerobic digestion facility. These technologies offset the use of carbon-intensive energy sources, thus providing a reduction in emissions.

SSFSC had substantial increases in service in 2015, yet was able to maintain emissions levels consistent with previous years. This was achieved in large part due to the on-site fuel production provided by the anaerobic digestion facility. This facility, which produced over **47,510 DGE** of RNG fueled collection vehicles using a carbon-negative source of fuel: organic waste. Any collection vehicle's fuel need which could not be met by the RNG production, was fueled with CNG. As a result, only SSFSC's transfer vehicles required diesel in 2015.

Figure 2 below compares the emissions that SSFSC produced to the BAU alternative. Under the hypothetical business-as-usual scenario, SSFSC's collection vehicles use an entirely diesel fleet and meets all of its electricity needs using only grid electricity. The emissions from the BAU estimated by converting all actual fuel and energy use into thermal equivalents (BTUs) and calculating the amount of diesel fuel that would have been required in the absence of alternative fuels. This process is repeated for grid electricity. These BAU emissions are then compared with the estimated actual emissions as calculated using the Climate Registry's General Reporting Protocol for each year.

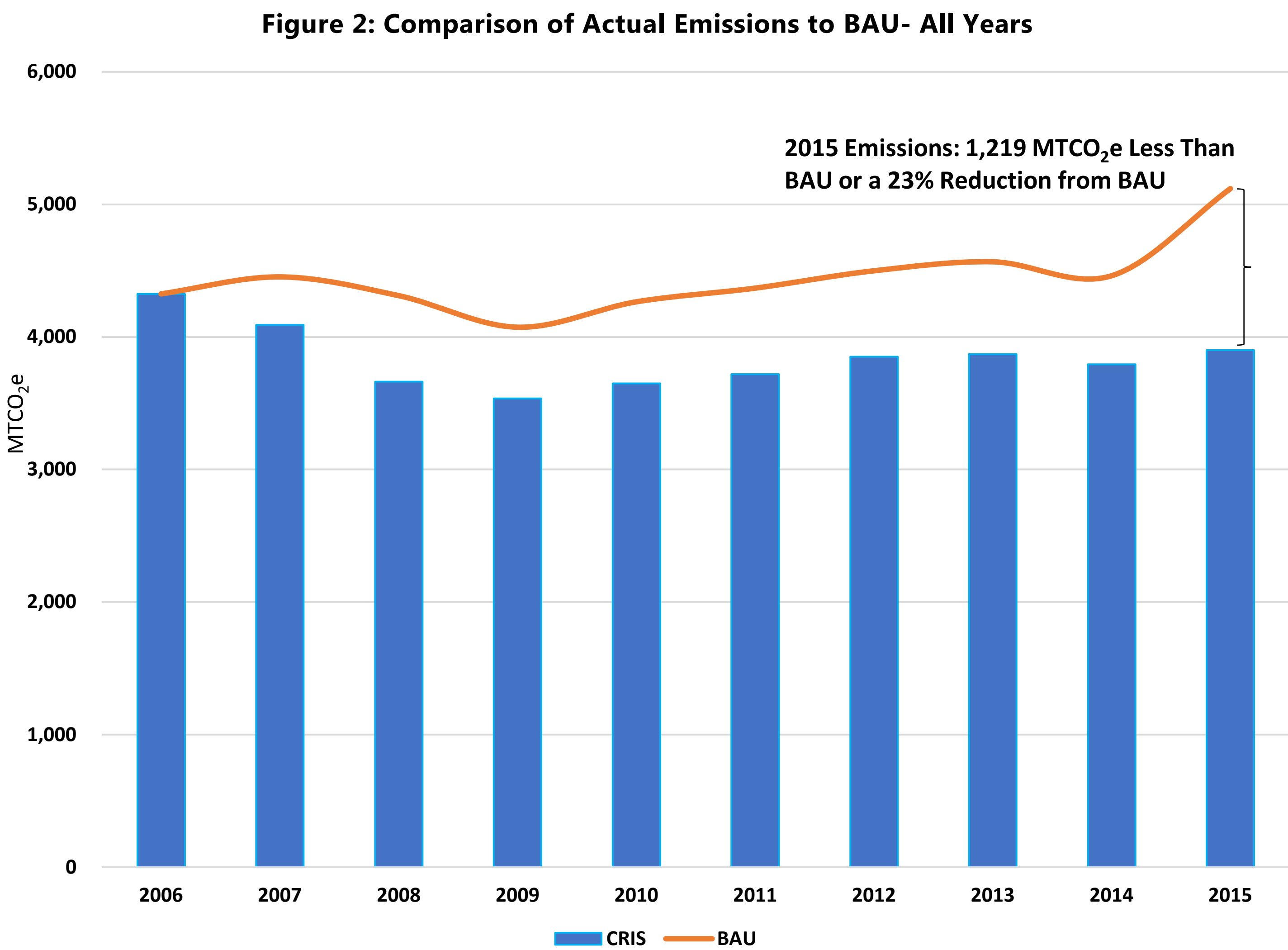


Figure 2: Comparison of Actual Emissions to BAU- All Years
2015 Emissions: 1,219 $MTCO_2e$ Less Than BAU or a 23% Reduction from BAU
$MTCO_2e$
6,000
5,000
4,000
3,000
2,000
1,000
0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
CRIS
BAU

SCOPE 3 EMISSIONS SUMMARY AND ANALYSIS

The Climate Registry classifies emissions that are within a company's value chain, but beyond their direct control (i.e., not included in Scope 1 or 2) as Scope 3 Emissions. Part of a company's value chain is responsible management of materials and waste and are evaluated in this Section. This "Avoided Indirect Emissions" (AER) analysis provides a complete evaluation of how much greenhouse gas (GHG) a company has prevented through the responsible management of its waste. These calculations include considerations for the entire life cycle of discarded material, and thereby provide a more complete analysis of these benefits above and beyond reporting operational emissions through platforms like The Climate Registry.

Although the GHG benefits of recycling, composting, and repurposing waste are substantial, they are often not immediately visible and easily quantifiable. The calculations included in this report make these benefits more tangible by offering an accurate and salient estimation of the GHG benefits of recycling and composting. As the legislative environment changes in California, these calculations will become instrumental in the evaluation of progress towards a number of State goals which include:

AB 32 Scoping Plan 2 Vision and Avoided Emissions Reporting AB 32 was signed into law in 2006, and is a statewide goal of reducing greenhouse gas emissions to 1990 levels by the year 2020. The AB 32 Scoping Plan, adopted in 2008 by CARB, included mandatory commercial recycling with a target of avoiding 5 $MMTCO_2e$ in 2020. AB 341 (Chesbro, 2011) was adopted into law which requires recycling services be offered for businesses with more than 4 cubic years of solid waste services per week, and for multi-family residencies with more than 5 units. Recycling reduces the demand for raw or virgin materials, while re-manufacturing with recycled materials generally reduces overall energy use. Recycling also results in increased carbon sequestration by forests since fewer trees need to be harvested for wood and paper products. Additionally, well-managed composting ultimately results in increased soil carbon storage, and end use of compost results in reduced demand for water, fertilizer, and other soil inputs. Organic woody materials that are not use for composting are used in the production of biomass energy, which reduces the demand for fossil fuels.

'Net-Zero' GHG Emissions by 2030 to 2035

The AB 32 Scoping Plan First Update was adopted on May 15, 2014 by CARB which states the following:

Net-Zero has been defined by the California Air Resource Board as when an organization's avoided indirect emissions offset their operational emissions. By reporting the progression of operational vs avoided emissions, it is possible to evaluate the achievement of this goal now, already showing compliance. To meet Net-Zero, one's avoided emissions must be greater or equal to one's operational emissions.

Net-Zero Equation:

Operational Emissions – Avoided Emissions = 0

SSFSC tracks its avoided emissions and fully offset its direct emissions **12** times in 2015 - ***well beyond Net-Zero!*** A detailed report on how these avoided emissions from recycling, composting, and avoided landfill disposal are calculated is provided in the full report found in **Appendix B**.

Achieving Net-Zero GHG Emissions from the Waste Sector by Mid-term

Beyond 2020, additional reductions in GHG emissions from the Waste Sector will be needed to achieve a Net-Zero GHG emissions goal. To achieve these reductions, even greater diversion of organics and other recyclable commodities from landfills must be realized and further expansion and enhancement of the alternative non-disposal pathways must be developed. In addition, greater emphasis will need to be placed on reducing the volume of waste generated, recycling/reusing products at the end-of-life and remanufacturing these materials into beneficial products. To achieve Net-Zero, the direct GHG emissions from the Waste Sector would have to be fully offset by avoided GHG emissions. Avoided GHG emissions are reductions in life-cycle GHG emissions that would occur because waste is shifted from landfilling to alternative non-disposal pathways.

AB 32 Scoping Plan – First Update May 15, 2014

Figure 3: Operational vs. Avoided Emissions - All Years

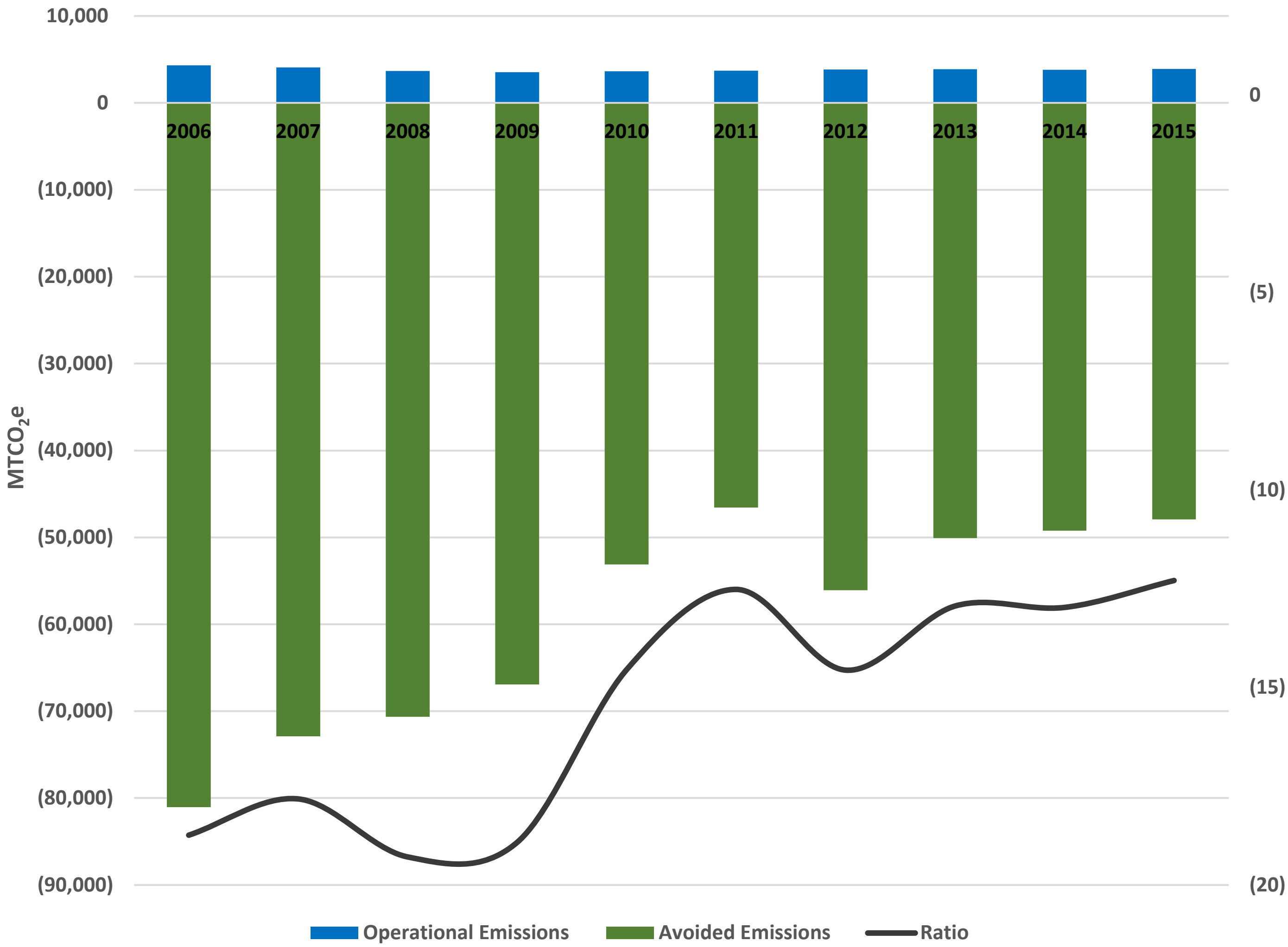


Table 3: Operational vs. Avoided Emissions, $MTCO_2e$

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Operational Emissions	4,325	4,090	3,663	3,537	3,651	3,691	3,850	3,871	3,794	3,901
Avoided Emissions	(81,045)	(72,893)	(70,655)	(66,921)	(53,108)	(46,567)	(56,062)	(50,078)	(49,214)	(47,943)
Ratio	(19)	(18)	(19)	(19)	(15)	(13)	(15)	(13)	(13)	(12)

Eliminate the Disposal of Organic Materials at Landfills

The AB 32 Scoping Plan First Update included a series of waste management activity as listed which includes the elimination of organic material at landfills and developing the compost and anaerobic digestion infrastructure.

Waste Management Actions	Lead Agency	Expected Completion Date
Eliminate the disposal of organic materials at landfills.	CalRecycle ARB	2016
Implement financing or incentive mechanisms for in-State infrastructure development to support Waste Sector goals.	CalRecycle ARB	TBD
Develop actions to address cross-California agency and federal permitting and siting challenges associated with composting and anaerobic digestion.	ARB	2014
Identify opportunities for additional methane control at new and existing landfills, and use of captured methane as a fuel source for stationary and mobile applications.	ARB	TBD in the SLCP Plan
Develop new emission reduction factors to estimate GHG emission reduction potential for various recycling and remanufacturing strategies.	ARB CalRecycle	TBD
Identify improvements to the procurement of recycled-content materials through the State Agency Buy Recycled Campaign reform.	CalRecycle DGS	2014

AB 32 Scoping Plan – First Update May 15, 2014

AB 1826 (Chesbro, 2014) was signed into law on September 29, 2014 to phase in the collection of commercial organic waste, which begins to address the AB 32 Scoping Plan target of eliminating the disposal of organic material at landfills. AB 1826 was chaptered into law with the following threshold rates and dates of compliance:

(1)On and after April 1, 2016, a business that generates eight cubic yards or more of organic waste per week shall arrange for recycling services specifically for organic waste in the manner specified in subdivision (b).

(2)On and after January 1, 2017, a business that generates four cubic yards or more of organic waste per week shall arrange for recycling services specifically for organic waste in the manner specified in subdivision (b).

(3)On and after January 1, 2019, a business that generates four cubic yards or more of commercial solid waste, as defined in Section 42649.1, per week, shall arrange for recycling services specifically for organic waste in the manner specified in subdivision (b).

(4)On or after January 1, 2020, if the department determines that statewide disposal of organic waste has not been reduced to 50 percent of the level of disposal during 2014, a business that generates two cubic yards or more per week of commercial solid waste shall arrange for the organic waste recycling services specified in paragraph (3), unless the department determines that this requirement will not result in significant additional reductions of organics disposal.

Recycling & Composting Program Results

SSFSC has active programs in place to divert organics from landfilling, and has plans to expand those services to 2020. Through its composting activities alone in 2015, SSFSC has provided diverted **3,564 tons** of such organic waste, and in the process avoided **2,210 MTCO$_2$e**. In addition, SSFSC's anaerobic digestion diverted another 8,051 tons of organic waste, transforming the waste material into vehicle fuel.

Table 4 summarizes the emissions SSFSC was able to avoid through its resource recovery programs. **Table 5** shows the tonnage changes over the last 9 years.

Table 4: Avoided Emissions by Category 2015 (MTCO$_2$e)

End Use	Tons	Avoided Landfill Emissions	Estimated Landfill Emissions	Avoided Emissions From End Use	Total Avoided Emissions
Recycled	29,565	(2,140)		(53,572)	(55,713)
Composted	3,564	(1,390)		(820)	(2,210)
Combusted	14,430	(561)		(2,973)	(3,534)
Digested	8,051				(4,020)
Landfill Beneficial	18,340		426		426
Landfill Waste	155,366		17,108		17,108
Total	229,317	(4,092)	17,534	(57,365)	(47,943)

- Numbers in parentheses represent avoided emissions.
- Negative landfill emissions are avoided by not landfilling materials; the positive landfill emissions are actual emissions generated by landfilling waste, alternative daily cover, and the residual fraction.
- Benefits from anaerobic digestion are calculated as a singularly and are not separated into avoided emission from landfilling versus avoided emissions from end-use.

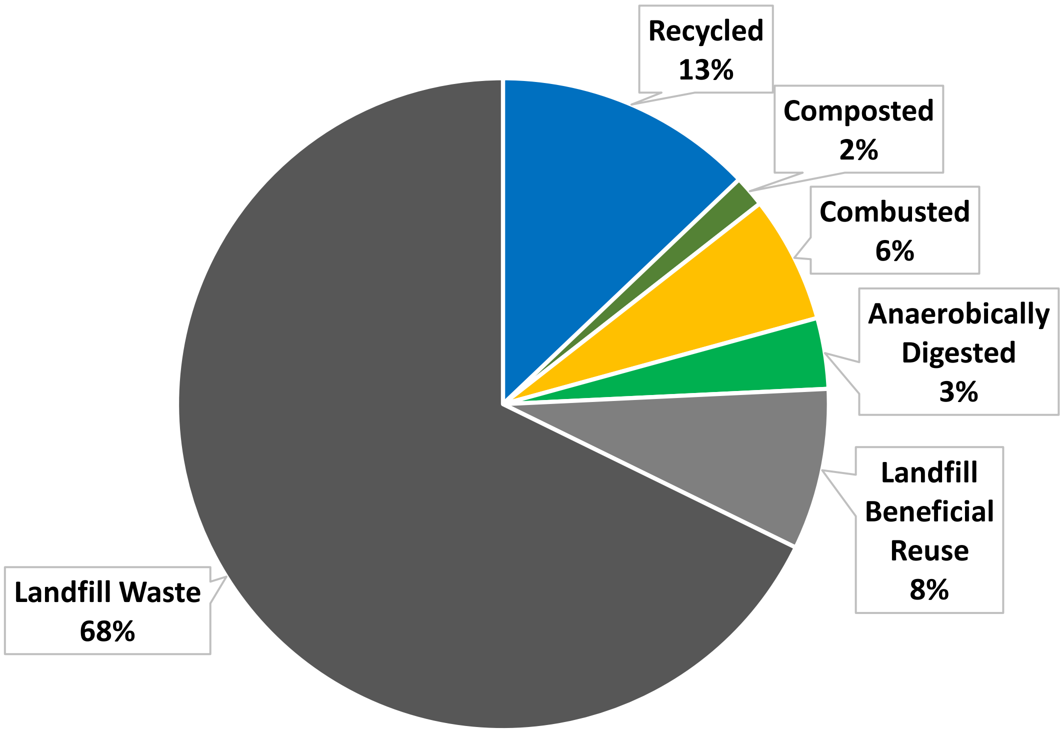
Table 5: Tonnage Trend by Category 2006-2015

End Use	2010	2011	2012	2013	2014	2015
Recycled	19,230	18,226	15,545	16,197	16,834	29,565
Composted	9,385	9,836	10,940	10,855	9,348	3,564
Combusted	16,856	18,409	16,670	15,318	17,895	14,430
AD						8,051
Landfill Beneficial Reuse	13,432	18,502	19,069	23,317	26,124	18,340
Landfill Waste	121,789	131,153	134,899	135,726	141,161	155,366
Total	**180,692**	**196,126**	**197,123**	**201,412**	**211,363**	**229,317**
Recycling Rate	**33%**	**33%**	**32%**	**33%**	**33%**	**32%**

Materials Diversion

In 2015, SSFSC managed **17,953 tons** more than it did in 2014 and recycled 32% of the total inbound tons. These diversion numbers are expected to increase as additional programs are implemented to divert a greater level of C&D materials, commercial recyclables, and organics. The chart below further details the characteristics of SSFSC's diverted materials.

Figure 4: Material End-Use by Category - 2015



Methodology

This report uses the most up-to-date scientifically and legislatively accepted methods to calculate life-cycle greenhouse gas emissions. Both the California Air Resources Board (CARB) model and the Environmental Protection Agency's 'Waste Reduction Model' (WARM) serve as a complementary basis for these calculations. Those emissions that are avoided through the prevention of virgin resource use are modeled best with CARB, which has the additional benefit of using California-specific data in its calculations. WARM calculations are able to model the avoided emissions at the other half of the product life cycle by accurately tabulating the emissions that would have occurred under a landfilling scenario. The synthesis of these two models allow for a complete and unbiased measurement of the greenhouse gas prevented through resource recovery programs. A more detailed description of the methodology and assumptions used to calculate the avoided indirect emissions can be found in **Appendix B.**

INVENTORY MANAGEMENT

Edgar & Associates, Inc. (Technical Assistance Provider) relied on information and activity data provided by SSFSC to calculate GHG emissions.

Appendix A

Scope 1&2 Emissions

Assumptions & Methodology

ASSUMPTIONS AND METHODOLOGY

The following subsections contain information on data collection, emissions factors, and other assumptions and methodologies for each of the reporting categories in the SSFSC GHG Inventory for Scope 1 & 2 Emissions Reporting.

DIRECT EMISSIONS FROM MOBILE SOURCES

Direct emissions from mobile sources include the combustion of fuels in vehicles that are owned and controlled by SSFSC. The SSFSC fleet consists largely of trucks for collection and transport of waste and recyclables and off-road equipment used to manage the recycling facility.

Source Identification

SSFSC provided fuel use data for bio-diesel, diesel, gasoline, compressed natural gas (CNG), renewable compressed natural gas (RNG), and propane.

Data Collection and Management

All bio-diesel, diesel, and gasoline use is tracked by on-site purchase records. The purchase records were cross-referenced against an internal accounting spreadsheet to ensure all information was collected accurately. CNG and RNG data is recorded by tracking the on-site meters at the anaerobic digestion facility. These meters are summarized in the table below.

FUEL TYPE	METER NAME	UNITS
RNG	CH_4 GAT 371	Percentage Methane
RNG	BioCNG Product SCF	Standard Cubic Feet: Cumulative
RNG (Tail Gas)	CPL Tail Gas SCF	Standard Cubic Feet: Cumulative
RNG (Lean Gas)	CPL Lean Gas SCF	Standard Cubic Feet: Cumulative
Natural Gas (to Boiler)	CPL Line CNG SCF	Standard Cubic Feet: Cumulative
Natural Gas (Fleet and Boiler)	Gas Meter 1 EC38	1,000's of Std. Cubic Feet: Cumulative

<u>Renewable Compressed Natural Gas Data Acquisition</u>

SSFSC's compressed natural gas fleet uses pipeline fossil-based CNG as well as renewable CNG produced from the anaerobic digestion of organic waste. SSFSC did not receive invoices for the pipeline CNG until November 2015, and the RNG fuel is produced on site and therefore also is not invoiced. Usage from these fuel sources is therefore estimated using meter readings from the facility itself.

There are two meters required for determining the RNG fuel production. One is a computerized methane monitoring system that measures the methane concentration in the product biogas. Although the methane concentration can fluctuate day to day, the biogas typically has a methane concentration between 90%-95%. The second meter required for determining RNG production is a flow meter. This flow meter, "BioCNG Product SCF", measures the volume of biogas flowing to the vehicles. This meter counts cumulative flow and is read daily. The difference from one day's reading until the next day's reading is the daily flow.

With the concentration meter and the flow meter, biomethane fuel production is then calculated as:

$$(\text{Methane Concentration of Gas}_{\%}) \times (\text{Flow of Gas}_{SCF}) = \text{Biomethane to Fleet}_{SCF}$$

Translating the amount of methane gas used in fuel to diesel gallon equivalents (DGE) then involves a conversion of standard cubic feet of methane to units of energy. This is calculated using the lower heating value of methane (962 BTU/scf) and Ultra Low Sulfur Diesel (127,464).

Fossil Compressed Natural Gas Data Acquisition

Pipeline natural gas is a supplement to the RNG used in the SSFSC's fleet, and it is also used to fuel the boiler which heats up percolate for the anaerobic digestion process. This gas shares an inbound pipeline and meter, 'EC 38' which measures flow into the facility. In order to determine how much natural gas is used in the fleets, SSFSC must subtract off the amount of natural gas going to the boiler from the total amount entering the facility. Fortunately, there is a meter measuring the pipeline CNG inflow to the boiler so this amount need not be estimated. With the methane flow known, and using the same BTU values discussed above, the DGEs of CNG entering the vehicles is calculated as:

$$(\text{Total CNG Inflow to Facility}_{SCF}) - (\text{Flow to Boiler}_{SCF}) = (\text{Fleet CNG Flow}_{SCF})$$

$$(\text{Fleet CNG Flow}_{SCF}) \times 962 \text{ BTU/SCF} \div 127{,}464 \text{ BTU/DGE} = \text{DGE}$$

Note that the amount used in the boiler is still reported upon, but is included as a stationary emission rather than a mobile emission. Biogenic boiler gas, coming from the lean gas or tail gas, is metered and counted as a biogenic emission.

Estimation for Unmetered Days

SSFSC does not take meter readings on weekends or holidays. For these days, flow is estimated as occurring evenly through every unmetered day. In other words, if the meters read 10,000 scf on Friday and 13,000 scf Monday. The average daily increase in SCF, in this example 1,000 scf, was assumed to be the flow for those unrecorded days.

Day	Friday	Saturday *(estimated)*	Sunday *(estimated)*	Monday
Reading	10,000 total SCF	*11,000 total SCF*	*12,000 total SCF*	13,000 total SCF

Flow	1,000 SCF	*1,000 SCF*	*1,000 SCF*	1,000 SCF

For The Climate Registry reporting purposes this estimate of daily data is used to account for total RNG used for the fleet. Annual flow is the sum of these daily readings.

Estimation for Months with Incomplete Data

January and February of 2015 were months during the initial setup of operations that had production of RNG and use of natural gas, but did not have complete data. On-site meter readings did not begin until March of 2015 for RNG Production. These months' usage must therefore be estimated. The average usage of other months, adjusted for the relative length of months (February being the shortest month would not be expected to have the same monthly usage as January, the longest month) was used as estimates for these months.

Similarly, January through May pipeline natural gas usage had to be estimated using averages, as recording of meter EC78 began in June. Complete data for the system did not begin until June of 2015. RNG was estimated for January and February and pipeline CNG was estimated for January-May.

Quantification Method

Carbon Dioxide

Carbon dioxide (CO_2) emissions from mobile sources are calculated by applying the CO_2 emissions factors for diesel, motor gasoline and compressed natural gas based on total annual fuel consumption, following the methodology in The Climate Registry (TCR), General Reporting Protocol (GRP), Version 2.0. The following emission factors are used:

Diesel: 10.21 kg CO_2/gallon

Motor Gasoline: 8.78 kg CO_2/gallon

CNG: 0.054 kg CO_2/scf

RCNG: 0.054 kg CO_2/scf - *biogenic*

Bio-Diesel: 10.21 kg CO_2/gallon - *biogenic*

CH_4 and N_2O Emissions

Simplified Estimation Methods were used to calculate emissions of CH_4 and N_2O because verifiable mileage data for all vehicles was no available for all years. This includes emissions for the biogenic fuel sources. This methodology is provided in the updated 2016 Climate Registry Default Emissions Factors, Table 13.9.

CH_4 Emissions: 6.49×10^{-05} metric tons CH_4/metric tons CO_2

N_2O Emissions: 4.17×10^{-05} metric tons N_2O/metric tons CO_2

DIRECT EMISSIONS FROM STATIONARY SOURCES

Direct emissions from stationary sources included imported natural gas, propane, two sources of biogenic gases (lean and tail gas from the AD System and the gas cleaning system respectively) and acetylene used for welding torches.

Emissions from Imported Natural Gas

Natural gas purchase information was provided by PG&E invoices. The total therms were reconciled at year beginning and end for mid-month billing to ensure that only fuel used within the calendar year was included in the inventory. Emissions for pipeline Natural Gas used in the AD System boiler was read by a sub-meter as reported in the Mobile Emissions section above.

Emissions from Portable Equipment

SSSFSC identified their small portable stationary equipment which used propane and welding torches which combusted acetylene.

Emissions from Biogenic Gases

Biogenic gases used in the AD System boilers are used to heat percolate that would be added to the System. These gases were used to reduce the need for pipeline gas. Daily flow to the boiler is tracked using two separate submeters that are recorded daily.

Source Identification

Stationary sources of emissions were identified through consultation with SSFSC staff familiar with their facilities.

Data Collection & Management

Imported Natural Gas:

Imported natural gas quantities were obtained from PG&E invoices. Original invoices are on file at SSFSC.

Portable Equipment:

Total acetylene and propane usage information was gathered from vendor invoices. Original invoices are on file at SSFSC.

Quantification Method

Imported Natural Gas

Emissions were quantified using the methodology described by the TCR's GRP Version 2.0. Emissions due to imported natural gas are calculated using the following emission factors:

CO_2 Emissions: 53.06 kg CO_2/MMBtu

CH_4 Emissions: 0.9 g CH_4/MMBtu

N_2O Emissions: 0.9 g N_2O/MMBtu

AD Boiler Biogenic Gases

Emissions were quantified using the methodology described by TCR's GRP Version 2.0. Since the gases are high in methane and similar to pipeline gas we used the same emission factors to estimate methane and nitrous oxide emissions.

CO_2 Emissions: 53.06 kg CO_2/MMBtu - *biogenic*

CH_4 Emissions: 0.9 g CH_4/MMBtu

N_2O Emissions: 0.9 g N_2O/MMBtu

Portable Equipment

Emissions were quantified using the methodology described by the TCR's GRP Version 2.0. Emissions due to combusted propane and acetylene are calculated using the following emission factors:

Acetylene
CO_2 Emissions: 0.1053 kg CO_2/SCF

Propane

CO_2 Emissions: 5.72 kg CO_2/MMBtu

CH_4 Emissions: 10 g CH_4/MMBtu

N_2O Emissions: 0.6 g N_2O/MMBtu

INDIRECT EMISSIONS FROM PURCHASED AND CONSUMED ELECTRICITY

Electricity is purchased from PG&E. Total purchased electricity for Jamie Court was summarized from the invoices. The total kWhs were reconciled at year beginning and end for mid-month billing to ensure that only electricity used within the calendar year was included in the inventory.

Jamie Court has solar panels on-site which were operational starting in 2009. However, these solar panels did not generate excess electricity; therefore none was sold back to the Grid.

Source Identification

The accounts department was able to provide invoices from PG&E and compared to the previous reporting year for completeness.

Data Collection and Management

Purchased electricity quantities were obtained from invoices. Original invoices are on file at SSFSC.

Quantification Method

Emissions were quantified using the methodology described in the TCR GRP Version 2.0 and using the PG&E PUP and eGRID emission factors, detail below.

<u>eGRID Factors</u>

CO_2 Emissions:	650.31 lbs CO_2/MWh
CH_4 Emissions:	31.12 lbs CH_4/GWh
N_2O Emissions:	5.67 lbs N_2O/GWh

FUGITIVE EMISSIONS

<u>Refrigerant Leakage from Vehicles:</u>
There are 33 vehicles that have air conditioning. Because specific information for some vehicles was not available, the maximum charge of 1.5 kg refrigerant is used for all vehicles, both small and large.

<u>Refrigerant Leakage from Building Air Conditioning:</u>

SSFSC has 16 building AC units. 15 of those units use R-22, which is a non-reportable gas. The remaining unit uses R-410A (GWP = 1,725) and the emissions from its use are 0.243 pounds of CO_2-e.

Source Identification

<u>Vehicles</u>: SSFSC maintains a list of on and off-road equipment for the facility.

Building air-conditioning: SSFSC requested a list of air conditioning equipment installed at the facility from the maintenance provider.

Data Collection and Management

Equipment lists are kept current as equipment is acquired or retired.

Quantification Method

Refrigerant Leakage from Vehicles:
All vehicles which have AC emissions use HFC-134a. The total charges for all vehicles were multiplied by the 20% leak rate (provided in the GRP) and then by the GWP of 1,300 to calculate total CO_2e.

Refrigerant Leakage from Building Air Conditioning:
The building HVAC systems use R-410a. The total charge for the HVAC systems was multiplied by the 10% leak rate (provided in the GRP) and then by the GWP of 1,725 to calculate total CO_2e.

SIMPLIFIED ESTIMATION METHODS

The TCR recognizes that for many organizations, identifying, quantifying, and reporting the entirety of GHG emissions is expensive and burdensome, especially for those with many small facilities that represent a small fraction of their total emissions. Additionally, those emissions that were calculated using non-GRP methods must be shown under a simplified estimation method.

The Registry allows the simplified estimation of emissions sources that when summed together result in less than 5% of the sum of Scope 1 and Scope 2 emissions for the organization. The 5% threshold can represent any combination of sources or gases.

Simplified estimation methods were used for welding gases, fugitive refrigerant emissions from buildings and vehicles, and fire extinguisher leakage emissions. In addition, for 2015 only, estimates of natural gas for the on-site CNG fueling station, biogenic CNG for the fueling station, pipeline natural gas, and biogenic gases to the boilers were estimated for several months in the beginning of the year. Because of this the total SEMs for 2015 is above the required 5% threshold. Since there is no way for SSFSC to re-create this data with a higher level of accuracy we will report to TCR, but not seek verification until 2016 where more accurate data can be used to estimate emissions. The total percentage for all emission sources by year from simplified methods are shown below.

Simplified Estimation Emissions – All Years

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total % for all sources	0.14%	0.14%	0.14%	0.29%	0.32%	2.14%	2.08%	1.77%	3.7%	10.17%

Appendix B

Scope 3 Emissions

Assumptions & Methodology

ASSUMPTIONS AND METHODOLOGY FOR CALCULATING SCOPE 3 EMISSIONS

AVOIDED EMISSIONS FROM WASTE RECYCLING, COMPOSTING, AND COMBUSTION

South San Francisco Scavenger Company (SSFSC) facilitates GHG emission reductions by recycling, furnishing feedstock for biomass energy, composting, and extracting energy from organic waste with its new anaerobic digestion facility. Recycling reduces the demand for raw or virgin materials, while re-manufacturing with recycled materials generally reduces overall energy use. Recycling also results in increased carbon sequestration by forests since fewer trees need to be harvested for wood and paper products. Additionally, well-managed composting ultimately results in increased soil carbon storage, and end use of compost results in reduced demand for water, fertilizer, and other soil inputs. Organic materials not used for composting are used in the production of biomass energy onsite in the anaerobic digester, or sent off site to a biomass conversion facility. This electrical production offsets the demand for fossil fuels and coal. Measuring the positive impacts of these endeavors, in metric tons of carbon dioxide equivalent reductions ($MTCO_2e$), is the focus of this report.

GREENHOUSE GAS ESTIMATION METHODOLOGY

Greenhouse gas emissions, both generated and avoided emissions, are estimated using three sources: 1) California Air Resources Board (CARB) emission reduction factors for recyclables and compost (CARB 2011/2016), 2) the U.S. EPA Waste Reduction Model (WARM), and 3) the Low Carbon Fuel Standard (LCFS) pathway for determining the carbon intensity of the high-solids anaerobic digester fuel.

The CARB Compost Emissions Reduction Factor (CERF) and Recycling Emissions Reduction Factors (RERFs) are used nearly exclusively to estimate emission impacts from providing compost feedstock and recycling. The WARM model is used to estimate emissions from landfilling materials. Both of these sources use a life-cycle approach. If neither CARB nor WARM have relevant emissions factors for a given material, other appropriate sources are used.

It should be noted that CARB and WARM estimates of actual or avoided emissions for a given solid waste management scenario are assigned on an annual basis. For instance, all avoided emissions from recycling are reported in the current year, even though they may not enter the manufacturing process in the same year that they enter the recyclables market. Likewise, the total amount of landfill gas emissions that would occur from a given amount of landfilled organic waste are reported in the current year, even though it may take many years for the decomposition of the organic material to reach completion.

BIOGENIC VS. ANTHROPOGENIC EMISSIONS

Biogenic emissions are plant derived emissions, such as decay or combustion of plant based materials that are part of the active or short term carbon cycle. Plant based energy and waste materials are part of a short-term carbon cycle of harvest and regrowth, which doesn't affect the overall greenhouse gas concentration of the atmosphere beyond what would normally occur in nature. Conversely, burning fossil fuels that have been stored for millennia in underground oil or coal reserves, for example, does increase the atmospheric greenhouse gas concentration and is an anthropogenic emission. Anthropogenic emissions are a sole result of human activities and are counted as part of an entity's greenhouse gas footprint. Biogenic emissions are not. For instance, burning fossil fuels is anthropogenic, but burning biodiesel is biogenic (i.e. B20 is 20% biogenic) and reported separately in a traditional greenhouse gas emissions inventory. In terms of modeling the emissions impacts of recycling and disposal, landfill methane is considered an anthropogenic emission, but if burned and converted to carbon dioxide it is considered biogenic because the natural decomposition of the organic waste would have resulted in carbon dioxide emissions anyway. Methane is 21 times more powerful as a greenhouse gas than carbon dioxide over a 100 year life cycle, so this distinction is important.

AVOIDED EMISSIONS VS. GENERATED EMISSIONS

Greenhouse gas (GHG) accounting typically assigns a negative number to avoided emissions, such as fossil fuel emissions that are offset by biomass energy generation or soil carbon storage from compost use. Emissions that enter the atmosphere are given a positive number, such as transportation fuel combustion or fugitive landfill methane. The net result may be either positive or negative depending on whether the total avoided emissions are greater or less than the total generated emissions. In this report, avoided emissions are presented in parentheses.

CALIFORNIA AIR RESOURCES BOARD EMISSION REDUCTION FACTORS

CARB prepared two documents presenting the development of GHG emission reduction factors, one for compost and the other for recyclables. CARB has also developed the Low Carbon Fuel Standard (LCFS) which is used to calculate the benefit of high solids anaerobic digestion (HSAD).

Compost:

CARB uses a life-cycle method to quantify the California-specific greenhouse gas emission reductions from using compost and the greenhouse gas emissions associated with compost management. Compost application to agricultural fields increases soil health while providing multiple co-benefits. Compost application reduces the amount of synthetic fertilizer and herbicides required for plant growth, decreases soil erosion, and diverts methane producing organics from landfills. Composting material also causes greenhouse gas emissions during the collection of the initial feedstock, the delivery of the compost, the use of energy and water to manage the compost pile, and emissions are produced as microorganisms convert the initial feedstock to compost. It is generally accepted that methane and nitrous oxide emissions are generated during composting. CARB includes these considerations using a baseline scenario of open windrow composting.

The CARB method also includes additional GHG benefits from compost use that aren't considered in the WARM Model, which only includes soil carbon storage benefits.

The following equation is used to calculate the compost emission reduction factor (CERF):

$$CERF = (ALF_b + ((E_b + F_b + H_b) * C_{use})) – E_{total}$$

Where:

CERF = Compost emission reduction factor ($MTCO_2e$/ton of feedstock)
ALF_b = Emission reductions associated with the avoidance of methane emissions at landfills ($MTCO_2e$/ton of feedstock)
E_b = Emission reduction associated with decreased soil erosion ($MTCO_2e$/ton of compost)
F_b = Factor to account for the reduced fertilizer use ($MTCO_2e$/ton of compost)
H_b = Factor to account for the reduced herbicide use ($MTCO_2e$/ton of compost)
C_{use} = Conversion factor used to convert from tons of compost to tons of feedstock
E_{total} = Emissions due to the composting process ($MTCO_2e$/ton of feedstock)

<u>Recyclables:</u>
CARB developed emission reduction factors to quantify the benefits associated with recycling. The life-cycle approach used in this method incorporates avoided emissions from manufacturing using recyclables, the use of raw materials in the manufacturing process (e.g., harvested wood), transportation emissions, and recycling efficiency. The following equation is used to calculate each recycling emission reduction factor (except dimensional lumber):

$$RERF = ((MS_{virgin} – MS_{recycled}) + FCS – T_{remanufacture}) * R_{use}$$

Where:

RERF = Recycling emission reduction factor ($MTCO_2e$/ton of material)
MS_{virgin} = Emissions associated with using 100% virgin inputs for manufacturing the material ($MTCO_2e$/ton of material)
$MS_{recycled}$ = Emissions associated with using 100% recycled inputs for manufacturing the material ($MTCO_2e$/ton of material)
FCS = Forest carbon sequestration ($MTCO_2e$/ton of material)
$T_{remanufacture}$ = Transportation emissions associated with remanufacture destination ($MTCO_2e$/ton of material)

R_{use} = Recycling efficiency (fraction of material remanufactured from ton of recycled material)

The above equation uses an approach similar to one established by the WARM model. This method modified WARM's approach to include California-specific data and added a model to evaluate forest carbon sequestration.

US EPA WARM MODEL

The US EPA's Waste Reduction Model (WARM) uses a life-cycle analysis approach that considers emissions associated with acquisition of raw materials, emissions during the manufacturing process, and transportation emissions. GHG emissions reductions are calculated by comparing the emissions from an alternative scenario (where diversion activities occur) with the emissions associated with the baseline scenario (where all materials are landfilled). In this way, the reduction in GHG emissions from increasing the recycling rates of various commodities can be estimated. For this analysis, the WARM model is used to estimate landfill emissions and for several recycled materials, such as carpet, that were not included in CARB's analysis.

<u>Landfilled Organics in WARM:</u> Since many organic materials do not completely decompose in landfills, some of the biogenic carbon is stored there; thus, WARM credits landfilling as a biogenic carbon sink for such materials. WARM provides an estimate of the amount of biogenic carbon stored in organic material, such as paper, when it is landfilled. It then subtracts the amount of stored biogenic carbon in the landfill from the landfill generated emissions to arrive at a "net" GHG emission generation. For some materials (notably, wood, yard trimmings, leaves, branches, mixed organics, newspaper, and phone books), the result is that WARM GHG impacts for organic materials are calculated as negative.

The policy of the State of California is to reduce and minimize the amount of waste that is landfilled (Assembly Bill 341 and Assembly Bill 939 (1989), et al). It is a core value of CalRecycle that all materials be properly managed in order to minimize the generation of waste (source reduction), maximize the diversion of materials from landfills, and manage all materials to their highest and best use, in accordance with the waste management hierarchy and in support of the California Global Warming Solutions Act of 2007. It is also a strategic directive of CalRecycle to assist in the development of viable, sustainable markets to divert materials from landfills and encourage source reduction and recycling. Specifically, CalRecycle intends to reduce the amount of organics in the waste stream by 75% by 2020. CalRecycle staff's position is that it is technically correct to quantify and report the amount of carbon stored in a landfill; however, it should not be interpreted as offsetting landfill methane emissions. Therefore, in this analysis the biogenic storage is factored out in the interpretation of the WARM model results. Essentially, the WARM Model approach to calculating landfill emissions is the following:

Net WARM calculated landfill emissions =

Landfill fugitive and operational emissions (positive) + ***biogenic carbon storage (negative)*** *+ avoided fossil fuel emissions from energy generation (negative)*

Since carbon storage and avoided fossil fuel emissions are negative, the net emissions from WARM are often negative for organics. The approach used by this GHG assessment tool is to remove the biogenic carbon storage from the calculation. To arrive at actual landfill GHG emissions from WARM, the energy offsets would also have to be removed. However, they are much less significant than the carbon storage amount and represent a reduction of fossil fuel emissions.

The biogenic carbon storage is factored out by:

1. Starting with the WARM-calculated emissions for the organic tonnages landfilled.
2. Using the WARM biogenic carbon storage factors (WARM model version 14, USEPA 2016. Available at http://epa.gov/epawaste/conserve/tools/warm/pdfs/Landfilling.pdf) to calculate the amount of biogenic carbon storage that WARM attributes to each organic material.
3. Subtracting the biogenic carbon storage amount from the WARM output to remove it from the net emissions estimate.

WARM has a material category called Mixed Municipal Solid Waste (MSW); whose material characteristics match the national landfilled solid waste profile from the EPA's "Recycling and Disposal in the United States: Facts and Figures,". To improve accuracy, this analysis uses the solid waste characterization information (2008) for the State of California as the basis of the WARM analysis.

SITE SPECIFIC INFORMATION

For SSFSC, WARM inputs for each category (tonnage) were based on annual 2015 tonnages from accounting spreadsheets provided by SSFSC. Table 1 summarizes the WARM categories that were included in the analysis for SSFSC, along with a listing of materials that were included in each category.

Additional information used in the model include:

- SSFSC sends its waste to the Ox Mountain Landfill, which collects landfill gas and uses it to generate electricity. The landfill gas collection efficiency chosen in the WARM model is for the Californian efficiency scenario, which assumes the following landfill gas capture rates:

Year 0: 0%; Year 1: 50%; Years 2-7: 80%; Years 8 to 1 year before final cover: 85%; Final cover: 90%

- Round-trip transport distances are:
  - Ox Mountain Sanitary Landfill = 38 miles;
  - Potrero Hills Landfill = 122 miles;
  - Recycling Management Facility (Port of Oakland) = 42 miles;
  - Combustion Facility = 235 miles;
  - Composting Facility = 152 miles;

- CARB emissions factors already account for transportation distances based on a product by product basis. For example, 77% of PET plastic is estimated as having an end destination in China. The emissions factor for PET therefore includes an assumption of 7,000 miles of Ocean going vessel travel, 1,000 miles of rail travel, and 200 miles of truck travel for 77% of this type of plastic.

Material Categories for GHG Emission Modeling

The material inputs to the WARM and CARB model are shown in Table 1, where the correlation between SSFSC's material categories and WARM material categories is presented.

Table 1: Material Inputs to the WARM and CARB Models

WARM Category	Material Name at Facility	Management Scenario
Aluminum Cans	Aluminum	Recycled
Steel Cans	Scrap Metal, Tin	Recycled
Glass	Glass	Recycled
HDPE	HDPE	Recycled
PET	PET	Recycled
Corrugated Containers	Cardboard	Recycled
Newspaper	Newspaper	Recycled
Mixed Plastics	Film Plastics	Recycled
Carpet	Carpet, Carpet Pad Out	Recycled
Personal Computers	Ewaste	Recycled
Concrete	Inerts	Recycled
Tires	Tires Out	Recycled
Drywall	Sheetrock	Recycled
Food Waste	Food Waste	Composted
Dimensional Lumber	Biomass	Combusted
ADC	C&D Fines, ADC	Landfill
MSW	Garbage	Landfill

Note: Construction and demolition waste fines are used at the landfill for alternative daily cover, but are conservatively modeled a being landfilled rather than as offsetting other construction materials. Inert dirt is modelled as "Concrete" under WARM, as it is the category of best fit.

COMPOST EMISSIONS

SSFSC sends some of its digestate and other organic waste to a composting facility for processing. To calculate the emissions associated with composting, greenhouse gas (GHG) emission factors developed by CARB for open windrow composting were used. Transportation emissions assume a 152 mile round trip to the facility.

PRESENTATION OF RESULTS

The approach taken in this report is to categorize the materials managed by the facility as either landfilled or recovered. The recovered group includes compost, anaerobic digestion, and biomass energy feedstock in addition to recyclables. Estimates for GHG reductions for recovered materials were made using emissions factors published by the California Air Resources Board (CARB). WARM emissions estimates are used for those materials processed for which CARB has no published emission factor. With the exception of composted material, emissions associated with the landfilling of materials are also calculated using WARM. The presentation of results proceeds as follows:

- The emissions that would have occurred if the recycled material had been landfilled instead of recycled are presented (Table 2)
- The avoided emissions from the use of the recycled materials are presented (Table 3)
- The emissions from landfilling the solid waste and residuals that are currently landfilled are presented (Table 4)
- The summary of the avoided emissions by category (Table 5)

From this information, the overall emissions reduction from recycling can be ascertained, as well as the benefits from increasing the recycling rate of specific materials.

The following table describes the emissions that would have occurred if the recovered material would have produced if it were landfilled instead. The third column in this table is taken directly from the WARM model. The fourth column shows how much of WARM's estimate is attributed to carbon storage. The final column, which is the result used for this analysis, is the emissions from landfilling without the inclusion of carbon storage.

Table 2: Emissions if the Composted and Recycled Material Had Been Landfilled Instead (WARM)

Commodity	Tons Recycled	Emissions if Landfilled	Carbon Storage Adjustment	Landfill Emissions with Carbon Storage Factored $MTCO_2e$
Aluminum Cans	39	0.91	0	1
Steel Cans	3,170	73.57	0	74
Glass	874	20.29	0	20
HDPE	527	12.23	0	12
PET	297	6.90	0	7
Corrugated Containers	6,558	(3,406.85)	(4,722)	1,315
Newspaper	4,159	(4,562.01)	(4,950)	388
Carpet	5	0.12	0	0
Personal Computers	115	2.66	0	3
Concrete	13,616	316.04	0	316
Tires	39	0.90	0	1
Drywall	165	(9.56)	(13)	4
Food Waste	3,564	1,390.12		1,390
Dimensional Lumber	14,430	(15,168.12)	(15,729)	561
TOTAL:	47,560	(21,323)	(25,414)	4,092

Notes:

- $MTCO_2e$ is metric tons carbon dioxide equivalence.
- Numbers in parentheses represent avoided emissions.
- CS = Carbon Storage
- The 2016 Compost Emission Reduction Factors for Food Waste and Mixed Organics do not include carbon storage. However, avoided landfill emissions are estimated.

The overall avoided emissions from recycling are presented here in Table 3. The values in the third column are the avoided emissions from the use of recycled materials. The fourth column is carried over from the avoided landfill emissions, and the fifth column is the sum of the third and fourth columns.

Table 3: Avoided Emissions from Materials that are Currently Recycled, Composted or Used for Biomass Electricity Generation

Commodity	Tons Recycled	Avoided Emissions from Use of Recycled Materials $MTCO_2e$	Avoided Landfill Emissions $MTCO_2e$	Overall Avoided Emissions from Recycling $MTCO_2e$
Aluminum Cans	39	(503)	1	(504)
Steel Cans	3,170	(4,755)	74	(4,828)
Glass	874	(175)	20	(195)
HDPE	527	(422)	12	(434)
PET	297	(416)	7	(423)
Corrugated Containers	6,558	(32,792)	1,315	(34,108)
Newspaper	4,159	(14,142)	388	(14,529)
Carpet	*5*	*(12)*	*0*	*(12)*
Personal Computers	*115*	*(287)*	*3*	*(290)*
Concrete	*13,616*	*(59)*	*316*	*(375)*
Tires	*39*	*(14)*	*1*	*(15)*
Drywall	*165*	*5*	*4*	*2*
Food Waste	3,564	(820)	1,390	(2,210)
Dimensional Lumber	14,430	(2,973)	561	(3,534)
TOTAL:	47,560	(57,365)	4,092	(61,456)

Notes:

- Materials calculated using WARM Emissions factors shown in ***Italics.***
- $MTCO_2e$ is metric tons carbon dioxide equivalence.
- Numbers in parentheses represent avoided emissions.

In addition to providing materials for recycling, composting, and biomass energy feedstock, SSFSC disposed of **155,366** tons of solid waste in 2015 in various landfills. The emissions generated by the landfilling of this material are presented below in Table 4. The tonnages shown in the second column are distributed according to the California Statewide Waste Characterization (2008).

Table 4: Emissions from the Landfilled Waste Assuming a California Waste Profile (WARM)

Commodity	Tons Landfilled	WARM Landfill Emissions $MTCO_2e$	Carbon Storage Adjustment $MTCO_2e$	Actual Landfill Emissions $MTCO_2e$
Aluminum Cans	238	5.52	-	5.52
Steel Cans	3,787	87.90	-	87.90
Copper Wire	793	18.40	-	18.40
Glass	3,847	89.28	-	89.28
HDPE	8,951	207.75	-	207.75
LDPE	6,245	144.95	-	144.95
PET	993	23.04	-	23.04
Corrugated Containers	4,857	(2,523.19)	(3,497.31)	974.11
Magazines/3rd class mail	897	(621.00)	(762.33)	141.33
Newspaper	1,877	(2,059.21)	(2,234.17)	174.96
Office Paper	1,491	255.37	(178.87)	434.24
Phonebooks	73	(80.52)	(82.22)	1.70
Dimensional Lumber	18,508	(19,454.06)	(20,173.71)	719.65
Yard Trimmings	4,844	(1,928.95)	(2,615.69)	686.74
Grass	2,952	(49.64)	(413.30)	363.66
Leaves	2,952	(2,011.89)	(2,332.21)	320.32
Branches	2,660	(2,512.66)	(2,819.97)	307.31
Mixed Paper (general)	11,704	(6,193.50)	(8,075.72)	1,882.21
Food Waste	28,145	3,704.79	(1,970.16)	5,674.95
Mixed Organics	13,663	(1,619.45)	(4,098.85)	2,479.40
Mixed MSW	12,863	(863.07)	(2,701.18)	1,838.11
Carpet	9,086	210.88	-	210.88
Personal Computers	1,379	32.00	-	32.00
Concrete	10,718	248.76	-	248.76
Tires	198	4.60	-	4.60
Drywall	1,646	(95.61)	(131.69)	36.07
TOTAL:	155,366	(34,979.52)	(52,087.37)	17,107.85

Notes:

- $MTCO_2E$ is metric tons carbon dioxide equivalence.
- Numbers in parentheses represent negative amounts.

NOTE ON ALTERNATIVE DAILY COVER

Alternative daily cover, which is comprised of mixed inerts, is modelled separately. In total, **18,340 tons** of C&D fines were used producing an estimated GHG impact of **426** $MTCO_2e$.

CALCULATION OF ANAEROBICALLY DIGESTED MATERIALS BENEFIT

The high solids anaerobic digestion system (HSAD) at SSFSC is an innovative system, and it is the first of its kind in the United States. As such, neither the USEPA nor CARB have included such a system directly into their avoided emissions methodology. The WARM model does, in fact, include an anaerobic digestion pathway, however this pathway is for anaerobic digestion systems that convert biomethane into *electricity*, whereas the facility at SSFSC converts this energy into vehicle fuel.

The California Air Resources Board's CERF pathway may be used for modelling the composting benefit of the digestate, however this pathway would not capture the fuel benefit of the biomethane produced at the facility.

To reconcile these models, and include the HSAD into the overall avoided emissions calculation for SSF, a combination model of the LCFS and the CERF is needed. The LCFS portion, which captures the fuel benefits of the HSAD system may be adjusted so as not to double count the composting benefit of the material. Similarly, the CERF model may be adjusted so as not to double count the avoided landfill benefit of the AD feedstock. The combination model, summarized below, has determined that the **6,295,074 standard cubic feet** of methane produced from the **8,051 tons** of feedstock material produces a total GHG benefit of **4,020 $MTCO_2e$.** The formula for this calculation is as follows:

Total GHG Benefit = LCFS Benefit (as a function of energy produced) – LCFS compost benefit (function of tonnage) + CERF benefit (function of tonnage excluding landfill benefit.

Calculation of Anaerobic Digestion Benefit

LCFS Fuel Benefit		**LCFS Compost Benefit**		**Yard Waste: CERF Benefit**	
SCF Methane Biogas	6,295,074	Inbound Material	8,051	Inbound Material	3,975
BTU/ ft^3	962	$MTCO_2e$/Ton Inbound	-0.05	$MTCO_2e$/Ton Inbound	-0.44
BTU	6.06E+09	$MTCO_2e$	-402.55	Implicit LCFS ALF Benefit	-1,749
MJ/BTU	0.0011				
MJ	6,389,272			**Food Waste: CERF Benefit**	
gCO_2e/MJ	-22.93			Inbound Material	4,076
gCO_2e	-1.5E+08			$MTCO_2e$/Ton Inbound	-0.62
$MTCO_2e/gCO_2e$	0.000001			Implicit LCFS ALF Benefit	-2,527
$MTCO_2e$	-146.506				
				Total Avoided Emissions:	**-4,020**

SUMMARY OF RESULTS

The GHG impacts are presented by category of end use below in Table 5.

Table 5: GHG Emissions by Category

End Use	Tons	Avoided Landfill Emissions	Estimated Landfill Emissions	Avoided Emissions From End Use	Total Avoided Emissions
Recycled	29,565	(2,140)		(53,572)	(55,713)
Composted	3,564	(1,390)		(820)	(2,210)
Combusted	14,430	(561)		(2,973)	(3,534)
Anaerobic Digestion	8,051				(4,020)
Landfill Beneficial	18,340		426		426
Landfill Waste	155,366		17,108		17,108
Total	229,317	(4,092)	17,534	(57,365)	(47,943)

Notes:

- Numbers in parentheses represent avoided emissions.
- Negative landfill emissions are avoided by not landfilling materials; the positive landfill emissions are actual emissions generated by landfilling waste, alternative daily cover, and the residual fraction.

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Appendix C

Fleet List

Unit #	Vehicle/Equipment Type	Model Year	Fuel Type	A/C?	Mobile	Stationary?	Notes
101	PICK UP	2004	UNLEADED	Y	X		
102	AUTO	2006	**HYBRID/GAS**	Y	X		
103	AUTO	2006	UNLEADED	Y	X		
201	SERVICE TRUCK	2009	B-20	Y	X		
202	SWEEPER	2009	B-20	Y	X		
203	STAKE BED	2009	**HYBRID/B-20**	Y	X		
204	FORK TRUCK	2009	**HYBRID/B-20**	Y	X		
270	SERVICE TRUCK	1980	UNLEADED	N	X		
275	TRACTOR	1991	B-20	Y	X		
277	TRACTOR	1995	B-20	Y	X		
278	TRACTOR	1996	B-20	Y	X		
279	TRACTOR	1997	B-20	Y	X		
289	ROLL OFF	1990	B-20	N	X		
297	PICK UP	1994	B-20	Y	X		
298	ROLL OFF	1994	B-20	N	X		
299	ROLL OFF	1994	B-20	N	X		
301	REAR END LOADER	1995	B-20	N	X		
302	REAR END LOADER	1995	B-20	N	X		
304	FLAT BED	1995	UNLEADED	Y	X		
305	ROLL OFF	1995	B-20	N	X		
306	SERVICE TRUCK	1995	GAS	Y	X		
307	FRONT END LOADE	1996	B-20	N	X		
308	FORK TRUCK	1996	GAS	Y	X		
309	REAR END LOADER	1996	B-20	N	X		
310	REAR END LOADER	1997	B-20	N	X		
311	REAR END LOADER	1997	B-20	N	X		
312	REAR END LOADER	1997	B-20	N	X		
313	ROLL OFF	1999	B-20	N	X		
314	ROLL OFF	1999	B-20	N	X		
315	FRONT END LOADE	1999	B-20	N	X		
316	FORK TRUCK	2000	B-20	Y	X		
317	FRONT END LOADE	2000	B-20	N	X		
318	ROLL OFF	2001	B-20	N	X		
319	ROLL OFF	2002	B-20	N	X		
400	TRACTOR	2000	B-20	Y	X		
401	TRACTOR	2003	B-20	Y	X		
402	TRACTOR	2003	B-20	Y	X		
403	TRACTOR	2003	B-20	Y	X		
404	TRACTOR	2008	B-20	Y	X		
405	TRACTOR	2009	B-20	Y	X		
406	TRACTOR	2009	B-20	Y	X		
501	ROLL OFF	2004	B-20	Y	X		
502	ROLL OFF	2008	**CNG**	Y	X		
503	ROLL-OFF	2008	**CNG**	Y	X		
601	AUTOMATED SIDE L	2004	B-20	N	X		
602	AUTOMATED SIDE L	2004	B-20	N	X		
603	AUTOMATED SIDE L	2004	B-20	N	X		
604	AUTOMATED SIDE L	2004	B-20	N	X		
605	AUTOMATED SIDE L	2004	B-20	N	X		
606	AUTOMATED SIDE L	2004	B-20	N	X		
701	AUTOMATED SIDE L	2004	B-20	N	X		
702	AUTOMATED SIDE L	2004	B-20	N	X		
703	AUTOMATED SIDE L	2004	B-20	N	X		
704	AUTOMATED SIDE L	2004	B-20	N	X		
705	AUTOMATED SIDE L	2004	B-20	N	X		
706	AUTOMATED SIDE L	2004	B-20	N	X		

707	SHRED TRUCK	2007	B-20	Y	X		
708	AUTOMATED SIDE L	2009	**CNG**	Y	X		
709	AUTOMATED SIDE L	2009	**CNG**	Y	X		
801	AUTOMATED SIDE L	2004	B-20	N	X		
802	AUTOMATED SIDE L	2004	B-20	N	X		
901	FRONT END LOADE	2003	B-20	Y	X		
902	FRONT END LOADE	2003	B-20	N	X		
903	FRONT END LOADE	2005	**CNG**	Y	X		
904	FRONT END LOADE	2006	B-20	Y	X		
905	FRONT END LOADE	2008	B-20	Y	X		
R7	SIDE LOADER	1998	B-20	N	X		
R9	SIDE LOADER		B-20	N	X		
	HAMMEL		RED DEISEL	N			
	BOILER		NATURAL GAS	N		X	
#2	FORK LIFT	1996	RED DEISEL	N			
#3	FORK LIFT	1992	RED DEISEL	N			
#5	FORK LIFT	1999	RED DEISEL	N			
#6	FORK LIFT	1984	RED DEISEL	N			
#7	FORK LIFT	2003	RED DEISEL	N			
#8	FORK LIFT	2008	RED DEISEL	N			
1	EXCAVATOR	1999	RED DEISEL	N			
2	EXCAVATOR	2002	RED DEISEL	N			
325	WHEEL LOADER	2005	RED DEISEL	N			
544E	WHEEL LOADER	1986	RED DEISEL	N			
544H	WHEEL LOADER	1992	RED DEISEL	N			
544K	WHEEL LOADER	2008	RED DEISEL	N			
644H	WHEEL LOADER	2003	RED DEISEL	N			
644J	WHEEL LOADER	2009	RED DEISEL	N			
	SCISSOR LIFT		UNLEADED	N			
	BOOM LIFT		DIESEL	N			

Appendix D

Draft CRIS Report

(no verification in 2015)

South San Francisco Scavenger Company Inc.	Detail Report - Control (Private)	Complete Inventory 2015

Description:

Industry: 56 - Administrative and Support and Waste Management and Remediation Services

Address:	500 E. Jamie Court South San Francisco, California US	Contact:		Website:	

Reporting Information

Reporting Protocol: General Reporting Protocol 2.0 and associated updates and clarifications

GWP Standard: SAR

Base Year:

Consolidation Methodology: Operational Control Only

Status: Draft

Verification Information

Verification Body:

Level of Assurance: Reasonable

Entity Emissions | Total in metric tons of CO2e

Scope 1 - Direct Emissions	Total CO_2e (t)	CO_2 (t)	CH_4 (t of CO_2e)	N_2O (t of CO_2e)	HFC (t of CO_2e)	PFC (t of CO_2e)	NF_3 (t of CO_2e)	SF_6 (t of CO_2e)
Stationary Combustion	817.612137	813.03846	0.330921	4.242756	0	0	0	0
Mobile Combustion	3,379.255395	3,331.646506	4.540701	43.068188	0	0	0	0
Fugitive	11.433112	0.047787	0.003198	0.047213	11.334914	0	0	0
Total	4,208.300645	4,144.732753	4.87482	47.358157	11.334914	0	0	0
NetTotal	4,208.300645	4,144.732753	4.87482	47.358157	11.334914	0	0	0

Scope 2 - Market Based - Indirect Emissions	Total CO_2e (t)	CO_2 (t)	CH_4 (t of CO_2e)	N_2O (t of CO_2e)	HFC (t of CO_2e)	PFC (t of CO_2e)	NF_3 (t of CO_2e)	SF_6 (t of CO_2e)
Purchased Electricity - Market Based	257.623326	256.671638	0.257939	0.693749	0	0	0	0
Total	257.623326	256.671638	0.257939	0.693749	0	0	0	0
NetTotal	257.623326	256.671638	0.257939	0.693749	0	0	0	0

Biogenic - Direct Emissions	Total CO_2e (t)	CO_2 (t)	CH_4 (t of CO_2e)	N_2O (t of CO_2e)	HFC (t of CO_2e)	PFC (t of CO_2e)	NF_3 (t of CO_2e)	SF_6 (t of CO_2e)
Mobile Biomass Combustion	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
NetTotal	0	0	0	0	0	0	0	0

Optional - Optional Emissions	Total CO_2e (t)	CO_2 (t)	CH_4 (t of CO_2e)	N_2O (t of CO_2e)	HFC (t of CO_2e)	PFC (t of CO_2e)	NF_3 (t of CO_2e)	SF_6 (t of CO_2e)
Biomass - Scope 3	253.169854	251.756385	0.089676	1.323793	0	0	0	0
Total	253.169854	251.756385	0.089676	1.323793	0	0	0	0
NetTotal	253.169854	251.756385	0.089676	1.323793	0	0	0	0

Entity Emissions | Total in metric tons of gas

Scope 1 - Direct Emissions	Total CO_2e (t)	CO_2 (t)	CH_4 (t)	N_2O (t)	HFC (t of CO_2e)	PFC (t of CO_2e)	NF_3 (t)	SF_6 (t)
Stationary Combustion	817.612137	813.03846	0.015758	0.013686	0	0	0	0
Mobile Combustion	3,379.255395	3,331.646506	0.216224	0.13893	0	0	0	0
Fugitive	11.433112	0.047787	0.000152	0.000152	11.334914	0	0	0
Total	4,208.300645	4,144.732753	0.232134	0.152768	11.334914	0	0	0

Scope 2 - Market Based - Indirect Emissions	Total CO_2e (t)	CO_2 (t)	CH_4 (t)	N_2O (t)	HFC (t of CO_2e)	PFC (t of CO_2e)	NF_3 (t)	SF_6 (t)
Purchased Electricity - Market Based	257.623326	256.671638	0.012283	0.002238	0	0	0	0
Total	257.623326	256.671638	0.012283	0.002238	0	0	0	0

Biogenic - Direct Emissions	Total CO_2e (t)	CO_2 (t)	CH_4 (t)	N_2O (t)	HFC (t of CO_2e)	PFC (t of CO_2e)	NF_3 (t)	SF_6 (t)
Mobile Biomass Combustion	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0

Optional - Optional Emissions	Total CO_2e (t)	CO_2 (t)	CH_4 (t)	N_2O (t)	HFC (t of CO_2e)	PFC (t of CO_2e)	NF_3 (t)	SF_6 (t)
Biomass - Scope 3	253.169854	251.756385	0.00427	0.00427	0	0	0	0
Total	253.169854	251.756385	0.00427	0.00427	0	0	0	0

Simplified Estimation Methods (SEMs)

	Total Estimated CO_2e (t)	Total Emissions (t of CO_2e)	Estimated CO_2e as a Percentage of Total*
Location Based	0	0	N/A
Market Based	857.053422	4,465.92397	19.190954160218%

*Total based on scope 1, scope 2 & biomass emissions

Facility Emissions | SSF Facility

Equity share - 100% | Entity controls the facility emissions - Yes

550 E. Jamie Court, South San Francisco, California, 94080, US

Scope 1 - Direct Emissions	Total CO_2e (t)	CO_2 (t)	CH_4 (t)	N_2O (t)	HFC (t of CO_2e)	PFC (t of CO_2e)	NF_3 (t)	SF_6 (t)
Stationary Combustion	817.612137	813.03846	0.015758	0.013686	0	0	0	0
Fugitive	11.433112	0.047787	0.000152	0.000152	11.334914	0	0	0
Total	829.045249	813.086247	0.01591	0.013839	11.334914	0	0	0

Scope 2 - Market Based - Indirect Emissions	Total CO_2e (t)	CO_2 (t)	CH_4 (t)	N_2O (t)	HFC (t of CO_2e)	PFC (t of CO_2e)	NF_3 (t)	SF_6 (t)
Purchased Electricity - Market Based	257.623326	256.671638	0.012283	0.002238	0	0	0	0
Total	257.623326	256.671638	0.012283	0.002238	0	0	0	0

Optional - Optional Emissions	Total CO_2e (t)	CO_2 (t)	CH_4 (t)	N_2O (t)	HFC (t of CO_2e)	PFC (t of CO_2e)	NF_3 (t)	SF_6 (t)
Biomass - Scope 3	253.169854	251.756385	0.00427	0.00427	0	0	0	0
Total	253.169854	251.756385	0.00427	0.00427	0	0	0	0

Source Emissions | Acetylene

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Stationary Combustion	CO2	Fossil Fuel-derived Fuels (gaseous)	All	Unspecified Technology	Emission Factor	No	Heat Content: 0.00147 MMBtu/scf;	Acetylene	1,015 scf	0.1053 kg/scf	2016 Default Emission Factors - Table #12.1	0.10688	0.10688
Stationary Combustion	CH4	Fossil Fuel-derived Fuels (gaseous)	All	Unspecified Technology	Not Reporting	No	Heat Content: 0.00147 MMBtu/scf;	Acetylene	1,015 scf		2016 Default Emission Factors - Table #12.9	0	0
Stationary Combustion	N2O	Fossil Fuel-derived Fuels (gaseous)	All	Unspecified Technology	Not Reporting	No	Heat Content: 0.00147 MMBtu/scf;	Acetylene	1,015 scf		2016 Default Emission Factors - Table #12.9	0	0

Source Emissions | AD Boiler - Pipeline Natural Gas

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Stationary Combustion	CO2	Natural Gas	Commercial	Boilers	Emission Factor	No	Heat Content: 1026 Btu/scf;	Unspecified (Weighted U.S. Average)	3,832.82 MMBtu	53.06 kg/MMBtu	2016 Default Emission Factors - Table #12.1	203.369328	203.369328
Stationary Combustion	CH4	Natural Gas	Commercial	Boilers	Emission Factor	No	Heat Content: 1026 Btu/scf;	Unspecified (Weighted U.S. Average)	3,832.82 MMBtu	0.9 g/MMBtu	2016 Default Emission Factors - Table #12.8	0.00345	0.07244
Stationary Combustion	N2O	Natural Gas	Commercial	Boilers	Emission Factor	No	Heat Content: 1026 Btu/scf;	Unspecified (Weighted U.S. Average)	3,832.82 MMBtu	0.9 g/MMBtu	2016 Default Emission Factors - Table #12.8	0.00345	1.069356

Source Emissions | Anaerobic Digestion Electricity - Market Based

7347658712-3. 5000036603. AD usage.

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Purchased Electricity - Market Based	CO2	Regional Grid-Average	2015	Unspecified Technology	Emission Factor	No		WECC California	123.07 MWh	650.31 lb/MWh	2016 Default Emission Factors - Table #14.1	36.302655	36.302655
Purchased Electricity - Market Based	CH4	Regional Grid-Average	2015	Unspecified Technology	Emission Factor	No		WECC California	123.07 MWh	31.12 lb/GWh	2016 Default Emission Factors - Table #14.1	0.001737	0.036482
Purchased Electricity - Market Based	N2O	Regional Grid-Average	2015	Unspecified Technology	Emission Factor	No		WECC California	123.07 MWh	5.67 lb/GWh	2016 Default Emission Factors - Table #14.1	0.000317	0.098121

Source Emissions | Argon/CO2

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Fugitive	CO2	N/A	All	Unspecified Technology	PreCalculated	No		N/A				0.047787	0.047787
Fugitive	CH4	N/A	All	Unspecified Technology	PreCalculated	No		N/A				0.000152	0.003198
Fugitive	N2O	N/A	All	Unspecified Technology	PreCalculated	No		N/A				0.000152	0.047213

Source Emissions | Biogenic - Boiler Lean Gas

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Biomass - Scope 3 (Optional)	CO2	N/A	All	Unspecified Technology	PreCalculated	No		N/A				8.9777	8.9777
Biomass - Scope 3 (Optional)	CH4	N/A	All	Unspecified Technology	PreCalculated	No		N/A				0.000152	0.003198
Biomass - Scope 3 (Optional)	N2O	N/A	All	Unspecified Technology	PreCalculated	No		N/A				0.000152	0.047213

Source Emissions | Biogenic - Boiler Tail Gas

Modelled as Natural Gas using Default Emissions factors.

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO_2e (t)
Biomass - Scope 3 (Optional)	CO_2	N/A	All	Unspecified Technology	PreCalculated	No		N/A				242.778685	242.778685
Biomass - Scope 3 (Optional)	CH_4	N/A	All	Unspecified Technology	PreCalculated	No		N/A				0.004118	0.086478
Biomass - Scope 3 (Optional)	N_2O	N/A	All	Unspecified Technology	PreCalculated	No		N/A				0.004118	1.27658

Source Emissions | Facility Electricity - Market Based

7711205693-0, 6335120783-0 Are the two accounts tabulated here.

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO_2e (t)
Purchased Electricity - Market Based	CO_2	Regional Grid-Average	2015	Unspecified Technology	Emission Factor	No		WECC California	747.07 MWh	650.31 lb/MWh	2016 Default Emission Factors - Table #14.1	220.368984	220.368984
Purchased Electricity - Market Based	CH_4	Regional Grid-Average	2015	Unspecified Technology	Emission Factor	No		WECC California	747.07 MWh	31.12 lb/GWh	2016 Default Emission Factors - Table #14.1	0.010546	0.221457
Purchased Electricity - Market Based	N_2O	Regional Grid-Average	2015	Unspecified Technology	Emission Factor	No		WECC California	747.07 MWh	5.67 lb/GWh	2016 Default Emission Factors - Table #14.1	0.001921	0.595628

Source Emissions | Natural Gas - International Waste Cooker

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Stationary Combustion	CO2	Natural Gas	Commercial	Boilers	Emission Factor	No	Heat Content: 1026 Btu/scf;	Unspecified (Weighted U.S. Average)	10,643.6 MMBtu	53.06 kg/MMBtu	2016 Default Emission Factors - Table #12.1	564.749416	564.749416
Stationary Combustion	CH4	Natural Gas	Commercial	Boilers	Emission Factor	No	Heat Content: 1026 Btu/scf;	Unspecified (Weighted U.S. Average)	10,643.6 MMBtu	0.9 g/MMBtu	2016 Default Emission Factors - Table #12.8	0.009579	0.201164
Stationary Combustion	N2O	Natural Gas	Commercial	Boilers	Emission Factor	No	Heat Content: 1026 Btu/scf;	Unspecified (Weighted U.S. Average)	10,643.6 MMBtu	0.9 g/MMBtu	2016 Default Emission Factors - Table #12.8	0.009579	2.969564

Source Emissions | Natural Gas Usage

8888038631-8, and the NEW 11513.

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Stationary Combustion	CO2	Natural Gas	Commercial	Boilers	Emission Factor	No	Heat Content: 1026 Btu/scf;	Unspecified (Weighted U.S. Average)	583.97 MMBtu	53.06 kg/MMBtu	2016 Default Emission Factors - Table #12.1	30.98534	30.98534
Stationary Combustion	CH4	Natural Gas	Commercial	Boilers	Emission Factor	No	Heat Content: 1026 Btu/scf;	Unspecified (Weighted U.S. Average)	583.97 MMBtu	0.9 g/MMBtu	2016 Default Emission Factors - Table #12.8	0.000526	0.011037
Stationary Combustion	N2O	Natural Gas	Commercial	Boilers	Emission Factor	No	Heat Content: 1026 Btu/scf;	Unspecified (Weighted U.S. Average)	583.97 MMBtu	0.9 g/MMBtu	2016 Default Emission Factors - Table #12.8	0.000526	0.162927

Source Emissions | Propane

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Stationary Combustion	CO2	Petroleum Products	Commercial	Unspecified Technology	Emission Factor	No	Heat Content: 0.091 MMBtu/gal;	Propane (Liquid)	2,416.9 gal	5.72117 kg/gal	2016 Default Emission Factors - Table #12.1	13.827496	13.827496
Stationary Combustion	CH4	Petroleum Products	Commercial	Unspecified Technology	Emission Factor	No	Heat Content: 0.091 MMBtu/gal;	Propane (Liquid)	2,416.9 gal	10.02 g/MMBtu	2016 Default Emission Factors - Table #12.9	0.002204	0.046279
Stationary Combustion	N2O	Petroleum Products	Commercial	Unspecified Technology	Emission Factor	No	Heat Content: 0.091 MMBtu/gal;	Propane (Liquid)	2,416.9 gal	0.6 g/MMBtu	2016 Default Emission Factors - Table #12.9	0.000132	0.040908

Source Emissions | Refigerants HFC-23

Assuming 2% Leakage

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Fugitive	HFC-23	N/A	All	Unspecified Technology	PreCalculated	Yes		N/A				0.000454	5.307038

Source Emissions | Refrigerants 410-A

Assumed 10% Leakage.

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Fugitive	R-410A	N/A	All	Unspecified Technology	PreCalculated	Yes		N/A				0.00011	0.190135

Source Emissions | Refrigerants HFC 134a

Refrigerant. 20% Leakage Assumed.

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Fugitive	HFC-134a	N/A	All	Unspecified Technology	PreCalculated	Yes		N/A				0.004491	5.837741

Facility Emissions | SSF Fleet

Equity share - 100% | Entity controls the facility emissions - Yes

N/A, N/A, California, N/A, US

Scope 1 - Direct Emissions	Total CO_2e (t)	CO_2 (t)	CH_4 (t)	N_2O (t)	HFC (t of CO_2e)	PFC (t of CO_2e)	NF_3 (t)	SF_6 (t)
Mobile Combustion	3,379.255395	3,331.646506	0.216224	0.13893	0	0	0	0
Total	3,379.255395	3,331.646506	0.216224	0.13893	0	0	0	0

Biogenic - Direct Emissions	Total CO_2e (t)	CO_2 (t)	CH_4 (t)	N_2O (t)	HFC (t of CO_2e)	PFC (t of CO_2e)	NF_3 (t)	SF_6 (t)
Mobile Biomass Combustion	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0

Source Emissions | Biodiesel

Biogenic Portion of the Biodiesel.

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Mobile Biomass Combustion - Biomass	CO2	Alternative Fuels	Medium and Heavy Duty Vehicles	Unspecified Technology	Emission Factor	No		Biodiesel (BD20)	46,269 gal			0	0
Mobile Combustion	CH4	Alternative Fuels	Medium and Heavy Duty Vehicles	Unspecified Technology	Not Reporting	No		Biodiesel (BD20)	0	0.005 g/mi	2016 Default Emission Factors - Table #13.6	0	0
Mobile Combustion	N2O	Alternative Fuels	Medium and Heavy Duty Vehicles	Unspecified Technology	Not Reporting	No		Biodiesel (BD20)	0	0.005 g/mi	2016 Default Emission Factors - Table #13.6	0	0

Source Emissions | CNG - Pipeline Natural Gas

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Mobile Combustion	CO2	Alternative Fuels	Medium and Heavy-Duty Vehicles	Unspecified Technology	Emission Factor	Yes	Heat Content: 1027 Btu/scf;	Compressed Natural Gas (CNG)	14,660,353.03 scf	0.05444 kg/scf	2016 Default Emission Factors - Table #13.1	798.109619	798.109619
Mobile Combustion	CH4	Alternative Fuels	Medium and Heavy-Duty Vehicles	Unspecified Technology	PreCalculated	Yes	Heat Content: 1027 Btu/scf;	Compressed Natural Gas (CNG)	0	1.966 g/mi	2016 Default Emission Factors - Table #13.6	0.051797	1.087744
Mobile Combustion	N2O	Alternative Fuels	Medium and Heavy-Duty Vehicles	Unspecified Technology	PreCalculated	Yes	Heat Content: 1027 Btu/scf;	Compressed Natural Gas (CNG)	0	0.175 g/mi	2016 Default Emission Factors - Table #13.6	0.033281	10.317163

Source Emissions | Gasoline Usage

based on total CO2.

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Mobile Combustion	CO2	Motor Gasoline	Gasoline Medium and Heavy-Duty Trucks and Busses	Uncontrolled	Emission Factor	No	Heat Content: 5.25 MMBtu/bbl;	All	5,064.84 gal	8.78 kg/gal	2016 Default Emission Factors - Table #13.1	44.469269	44.469269
Mobile Combustion	CH4	Motor Gasoline	Gasoline Medium and Heavy-Duty Trucks and Busses	Uncontrolled	PreCalculated	Yes	Heat Content: 5.25 MMBtu/bbl;	All	0	0.4604 g/mi	2016 Default Emission Factors - Table #13.4	0.002886	0.060607
Mobile Combustion	N2O	Motor Gasoline	Gasoline Medium and Heavy-Duty Trucks and Busses	Uncontrolled	PreCalculated	Yes	Heat Content: 5.25 MMBtu/bbl;	All	0	0.0497 g/mi	2016 Default Emission Factors - Table #13.4	0.001854	0.574854

Source Emissions | On-Road Diesel Fuel Usage

based on total CO2, updated EFs used. Includes CH4 and N20 emissions from Biofuel portion of B20.

Activity Type	Gas	Fuel Type	End Use Sector	Technology	Calculation Method	SEM	Aditional Information	Fuel	Fuel Quantity	Emission Factor (EF)	EF Reference	Gas Quantity	CO2e (t)
Mobile Combustion	CO2	Diesel Fuel	Diesel Medium and Heavy-Duty Trucks and Busses	Medium and Heavy-Duty Vehicles (Model Years 1960-2011)	Emission Factor	No	Heat Content: 5.8 MMBtu/bbl;	All	243,787.23 gal	10.21 kg/gal	2016 Default Emission Factors - Table #13.1	2,489.0676 18	2,489.0676 18
Mobile Combustion	CH4	Diesel Fuel	Diesel Medium and Heavy-Duty Trucks and Busses	Medium and Heavy-Duty Vehicles (Model Years 1960-2011)	PreCalculate d	Yes	Heat Content: 5.8 MMBtu/bbl;	All	0	0.0051 g/mi	2016 Default Emission Factors - Table #13.5	0.16154	3.39235
Mobile Combustion	N2O	Diesel Fuel	Diesel Medium and Heavy-Duty Trucks and Busses	Medium and Heavy-Duty Vehicles (Model Years 1960-2011)	PreCalculate d	Yes	Heat Content: 5.8 MMBtu/bbl;	All	0	0.0048 g/mi	2016 Default Emission Factors - Table #13.5	0.103794	32.176171