City of Brisbane

2010 Community Greenhouse Gas Inventory Report

Updated June 26, 2014

Prepared by DNV GL through the RICAPS program of the City/County Association of Governments of San Mateo County

Acknowledgements

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1. Executive Summary

The City of Brisbane is pleased to present the following 2010 Community Greenhouse Gas (GHG) Inventory. This 2010 GHG inventory builds on the baseline inventory for 2005 that was previously completed, and helps Brisbane to evaluate progress made since the baseline inventory.

In the base year of 2005, the City of Brisbane emitted approximately 158,096 metric tons of carbon dioxide equivalent ($MTCO_2e$) from the residential, commercial, industrial, transportation, solid waste, and municipal sectors.[1] This 2005 inventory total does not include emissions from Direct Access natural gas. Emissions from Direct Access natural gas were found to be double-counted in the 2005 baseline inventory, and are thus subtracted from the 2005 total to increase the accuracy of the 2005 baseline.

In comparison, the City of Brisbane emitted 142,843 $MTCO_2e$ from these same sectors and sources in 2010, a decrease of 15,253 $MTCO_2e$, or 10 percent of 2005 baseline emissions.

Some sectors and sources were included in this 2010 GHG inventory that were not included in the baseline inventory; these emissions include: diesel emissions from Caltrain and freight Trains; water conveyance; wastewater treatment; and stationary sources. These emissions total 5,183 $MTCO_2e$ and comprise 4 percent of the 2010 inventory. With these sources added, the total 2010 emissions are 148,025 $MTCO_2e$, which is a 6 percent decrease from 2005 emissions. Also, these new sources were added as a result of the development of a national protocol for inventorying community-scale GHG emissions adopted in 2012. Table 1 provides a summary of total citywide (i.e. community and municipal) GHG emissions.

The results of this 2010 inventory will be used to determine if the Brisbane is on the trajectory needed to reach the California state 2020 GHG reduction target; if not, a new or changed set of policies or programs at the local level may be needed in order for Brisbane to reach the 2020 and future reduction targets.

[1] Carbon dioxide equivalent (CO_2e) is a unit of measure that normalizes the varying climate warming potencies of all six GHG emissions, which are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). For example, one metric ton of methane is equivalent to 21 metric tons of CO_2e. One metric ton of nitrous oxide is 310 metric tons of CO_2e.

Table 1: 2010 Community Emissions by Sector

Sectors Included in the Baseline Inventory	GHG Emissions (metric tons CO_2e)	Percentage of GHG Emissions
Residential	5,847	4.0%
Commercial/Industrial	19,976	13.5%
Transportation – Local roads	21,076	14.2%
Transportation – State highways	82,113	55.5%
Transportation – Off-road equipment	6,635	4.5%
Solid Waste – Landfills	6,111	4.1%
Solid Waste – Disposed Waste	1,084	0.7%
SUBTOTAL	**142,843**	**96.5%**
New Sectors (not included in the Baseline Inventory)	**GHG Emissions (metric tons CO_2e)**	**Percentage of GHG Emissions**
Stationary Sources	2,449	1.7%
Transportation – CalTrain	2,280	1.5%
Transportation - Freight Trains	301	0.2%
Wastewater	72	0.05%
Water	82	0.1%
SUBTOTAL	**5,183**	**3.5%**
GRAND TOTAL OF 2010 EMISSIONS	**148,025**	**$MTCO_2e$**
Total of 2005 Baseline Emissions*	**158,096**	**$MTCO_2e$**
Total Decrease from the 2005 Baseline	**-10,071 -6%**	**$MTCO_2e$**

* Total 2005 baseline emissions exclude previously-reported Direct Access natural gas. The Direct Access natural gas consumption was erroneously double-counted in the baseline 2005 inventory.

2. Why the City Has a Greenhouse Gas Inventory

Like local governments across the U.S. and the world, Brisbane has made a commitment to addressing the challenge of climate change. Many local governments have authority over land use and transportation patterns, as well as solid waste disposal, green building, and other key issues related to GHG emissions. Thus, local governments can help influence residents, businesses, public sector entities and other organizations within their boundaries to reduce emissions through local policies and programs designed to increase sustainability.

2.1 Objective of the Greenhouse Gas Inventory

In November 2009, all San Mateo County member jurisdictions completed their 2005 community and municipal GHG inventories as part of a joint effort with ICLEI, Joint Venture Silicon Valley Network, and the County of San Mateo, funded by C/CAG.

This 2010 GHG inventory builds upon the baseline inventory and will be used to continue to track sources and quantify the volumes of GHG emissions resulting from activities taking place throughout the community of Brisbane. Furthermore, this inventory helps Brisbane to evaluate progress made since the 2005 baseline inventory. The results of this 2010 inventory will be used to identify trends in emissions from 2005 to 2010, and to determine if the city is on track to meet GHG reduction targets.

The inventory was completed through RICAPS, the Regionally Integrated Climate Action Planning Suite. Climate action planning is a complex process that can be cost prohibitive for cities to undertake on their own. Because of this, the City and County Association of Governments (C/CAG) has developed RICAPS to aid cities and towns in San Mateo County in developing their own climate action plans and GHG inventories. RICAPS is a comprehensive program that includes climate action planning tools, technical assistance, and monthly meetings to discuss climate action plans, GHG emission inventories, tracking of data, and the implementation of sustainability programs at the local level. This inventory was completed by C/CAG and the RICAPS consultant on behalf of the City of Brisbane.

3. Inventory Methodology

3.1 Understanding a Greenhouse Gas Emissions Inventory

This report presents emissions from the Brisbane community as a whole. Emissions from government operations are a subset of the community inventory. For example, data on commercial energy use by the community includes energy consumed by municipal buildings, and community vehicle-miles-traveled estimates include miles driven by municipal fleet vehicles. Because emissions from municipal operations are under direct control of Brisbane and can be directly reduced through city actions, the details of these emissions (i.e. the amount of emissions from the city's fleet, buildings, streetlights, etc.) are often presented in a separate inventory report.

3.2 New Community Emissions Protocol and New Emissions Sources

The Community Greenhouse Gas Emissions Protocol was released by ICLEI in October 2012, and represents a new national standard in guidance to help U.S. local governments develop effective community GHG emissions inventories. It establishes reporting requirements for all

community GHG emissions inventories, provides detailed accounting guidance for quantifying GHG emissions associated with a range of emission sources and community activities. The new protocol also provides a number of optional reporting frameworks to help local governments customize their community GHG emissions inventory reports based on their local goals and capacities. The State of California Governor's Office of Planning and Research recommends that California local governments follow the new national Community Protocol when undertaking their GHG emissions inventories. To the greatest extent possible, this inventory follows the Protocol. This inventory also follows the standard outlined in BAAQMD's GHG Plan Level Quantification Guidance (dated May 2012).[2]

The 2005 baseline inventory included the following emissions sources, which are also recommended to be included by the new Protocol:

- Stationary fuel use (mostly natural gas);
- Electricity use;
- On-road and off-road transportation;
- Landfills
- Solid waste disposal.[3]

Some community-wide GHG emissions data as well as the new national Community GHG Protocol were not available at the time the baseline 2005 inventory was completed. Due to new data becoming available and due to the completion of the new Protocol, the following emission sources have been added to this inventory:

- Use of energy for potable water treatment and distribution, and emissions related to wastewater treatment[4]
- CalTrain (passenger rail)

[2] The following are emission sources are mentioned in the BAAQMD GHG Plan Level Guidance, but were excluded from the City's inventory because they are not applicable in Brisbane, or because data were not available: airports and sea ports, non-road vehicle use for aircraft and marine vessels (planes, ships), and other water travel.

[3] All of these emissions sources, with the exception of off-road transportation and landfills, are considered by the new Protocol to be among the **five basic emissions generating activities**, which should be included in any community-wide inventory. See footnote 4 for the fifth key emission source.

[4] This source is the fifth of the **five basic emissions generating activities** that are recommended by the new Community Protocol. For the other four key emission sources, see footnote 3.

- Freight rail
- Expanded stationary fuel use, including diesel and propane[5]

3.3 Emission Sectors and Sources

Table 2 summarizes the sectors, emissions sources, and energy types included in this GHG inventory.

Table 2: Sectors and Emissions in the GHG Inventory

Sector	Emissions sources	Energy types
Residential	Energy and water use in residential buildings	Electricity Natural gas
Commercial	Energy and water use in commercial, government and institutional buildings	
Industrial	Energy and water use in industrial facilities, and processes	
Transportation and Land Use*	All road vehicles Diesel fuel from commuter rail and freight trains Off-road vehicles/equipment	Gasoline Diesel
Waste	Landfills within the city's boundary Waste disposal	Landfill gas (methane)
Wastewater	Process and fugitive emissions from treating wastewater, and associated stationary emissions	Not applicable
Water	Use of electricity to treat and distribute potable water	Electricity
Stationary Sources	Stationary combustion of fuel in various equipment, such as boilers, backup generators, and industrial processing equipment	Various – may include natural gas, propane, and diesel

* Some sectors may be updated in a new version of the BAAQMD GHG Plan Level Quantification Guidance.[6]

3.4 Quantifying Greenhouse Gas Emissions

All emissions sources in this inventory are quantified using calculation based methodologies, which calculate emissions using activity data and emission factors. To calculate emissions accordingly, the basic equation below is used:

[5] This data source includes stationary fuel use in facilities that are permitted by or otherwise must report emissions to the Bay Area Air Quality Management District (BAAQMD). Data were not available for this source for the 2005 inventory.
[6] For updates to the GHG Plan Level Quantification Guidance, check the BAAQMD website: http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx

Activity Data x Emission Factor = Emissions.

Activity data refer to the relevant measurement of energy use or other GHG-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled.

Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. metric tons of CO_2 per kWh of electricity). Please see Appendix B for a detailed listing of the emission factors and the assumptions and methodologies used in composing this inventory. Key activity data are listed in Section 4: Inventory Results of this report.

As per the new Community GHG Protocol, emissions can be considered in the context of sources located within the community, and activities in the community. Alternative frameworks are available to consider community GHG emissions. The emissions by sources and activities and these new frameworks are discussed in Appendix A.

3.5 Community Profile

To put emissions inventory data in context (and for comparison), it is helpful to review some basic information about community such as population and number of households. This information is provided in Table 3.

Table 3: 2005 and 2010 Community Information[7]

Year	Population	Households	Jobs
2005	3,700	1,690	8,180
2010	4,282	1,821	8,690

4. Inventory Results

4.1 2010 Emissions Inventory Summary

In the base year of 2005, the City of Brisbane emitted approximately 158,096 metric tons of carbon dioxide equivalent (CO_2e) from the residential, commercial, industrial, transportation,

[7] Population data from the U.S. Census. 2005 Households and Jobs from ABAG projections. 2010 Households and Jobs also from the US Census, found at: bayareacensus.ca.gov/cities/Brisbane.htm

waste, and municipal sectors.[8] The 2005 inventory total does not include emissions from Direct Access natural gas. Emissions from Direct Access natural gas were found to be erroneously double-counted in the 2005 baseline inventory, and are thus subtracted from the 2005 total to increase the accuracy of the 2005 baseline.

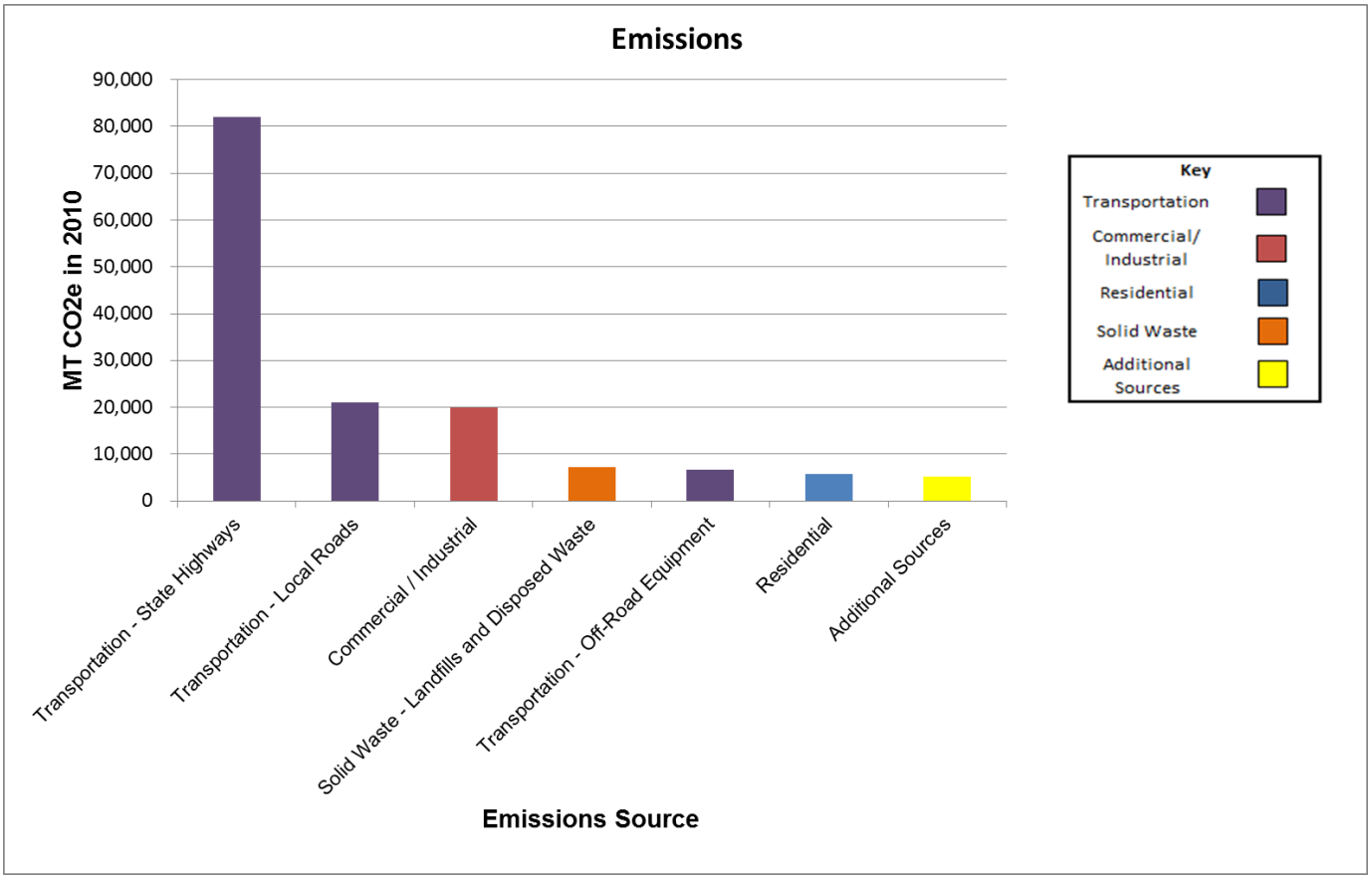
In comparison, the City of Brisbane emitted 142,843 metric tons of CO_2e from these same sectors and sources in 2010, a decrease of 15,253 metric tons of CO_2e, or 10 percent of 2005 baseline emissions. While the emission sources and data sources have remained mostly unchanged, some of the methodologies used for calculating emissions have been updated since the 2005 inventory was completed. Thus, the comparison from 2005 to this 2010 inventory is not an exact comparison, but does show a general trend of the decrease of emissions.

Some sectors and sources were included in this 2010 GHG inventory that were not included in the baseline inventory; these emissions include: diesel emissions from Caltrain and freight trains; water conveyance; wastewater treatment; and stationary sources. These emissions make up 4 percent of the 2010 inventory. With these sources added, the total 2010 emissions are 148,025 $MTCO_2e$, which is a 6 percent decrease from 2005 emissions.

Table 4 provides a summary of total citywide (i.e. community and municipal) GHG emissions, and Figure 1 shows the proportion of Brisbane's total GHG emissions from all major sources for 2010.

[8] Carbon dioxide equivalent is a unit of measure that normalizes the varying climate warming potencies of all six GHG emissions, which are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). For example, one metric ton of methane is equivalent to 21 metric tons of CO_2e. One metric ton of nitrous oxide is 210 metric tons of CO_2e.

Figure 1: Community Emissions by Sector (2010)



As shown above, the largest category of emissions is related transportation on state highways, followed by transportation on local roads, and building energy use in the commercial/industrial sector.

Table 4: 2010 Community Emissions by Sector

Sectors Included in the Baseline Inventory	2005 GHG Emissions (metric tons CO_2e)	2010 GHG Emissions (metric tons CO_2e)	Increase or Decrease in GHG Emissions (metric tons CO_2e)	Percentage of 2010 GHG Emissions
Residential	5,711	5,847	+136	4.0%
Commercial/Industrial	23,588	19,976	-3,612	13.5%
Transportation – Local roads	21,463	21,076	-387	14.2%
Transportation – State highways	95,352	82,113	-13,239	55.5%
Transportation – Off-road equipment	6,287	6,635	+348	4.5%
Solid Waste – Landfills	4,212	6,111	+1,899	4.1%
Solid Waste – Generated Waste	1,483	1,084	-399	0.7%
SUBTOTAL	**158,096**	**142,843**	**-15,291**	**96.5%**
New Sectors (not included in the Baseline Inventory)	**2005 GHG Emissions (metric tons CO_2e)**	**2010 GHG Emissions (metric tons CO_2e)**	**Increase or Decrease in GHG Emissions (metric tons CO_2e)**	**Percentage of 2010 GHG Emissions**
Stationary Sources	Not available	2,449	Not applicable	1.7%
Transportation – CalTrain		2,280		1.5%
Transportation – Freight Trains		301		0.2%
Wastewater		72		0.0%
Water		82		0.1%
SUBTOTAL		**5,183**		**3.5%**
GRAND TOTAL OF 2010 EMISSIONS		**148,025**	**metric tons CO2e**	
Total of 2005 Baseline Emissions*		**158,096**	**metric tons CO2e**	
Total Decrease		**-10,071 -6%**	**metric tons CO2e**	

*Total 2005 baseline emissions exclude previously-reported Direct Access natural gas. The Direct Access natural gas consumption was erroneously double-counted in the baseline 2005 inventory.

4.2 Understanding Emission Totals

As noted in the Community GHG Protocol, the potential for double counting in community inventories tends to occur for a number of reasons. Thus, although Table 4 and Figure 1 in the section above refer to emissions totals for 2010, there is some reduction of accuracy in the final totals. Any potential double-counting has been minimized to the greatest extent possible.

In this inventory, the following emission sectors should be considered carefully when reviewing emission totals. Issues of double counting have been addressed as follows:

Stationary Sources: The data source for stationary sources includes any fuel combustion in a stationary source, and may include the combustion of utility-supplied natural gas. (The data for

stationary sources also includes the combustion of other fuels, such as propane or diesel fuel in backup generators.) Utility-supplied natural gas usage is also accounted for in the "Commercial/Industrial" sector, and there is no way to determine the quantity of natural gas fuel use that is double-counted. In some cases, large stationary sources were omitted from this inventory to avoid double-counting of emissions.

Water: Emissions related to water consumption include electricity use for pumps and other equipment needed to treat and distribute the water, both inside and outside the city boundaries. Some of this electricity, if used within the city boundaries to pump water, is already included in the Commercial/Industrial sector. Most of the water in Brisbane is from the San Francisco Public Utilities Commission water system, which brings water from the Hetch Hetchy reservoir area to the San Francisco Peninsula. Therefore, it is assumed that most of this water-related energy use and associated emissions occur outside the city boundaries and that very little of the energy use and emissions are double-counted.

4.3 Commercial/Industrial and Residential Energy Emissions

Residential and Commercial/Industrial Energy emissions include all of the electricity and natural gas consumed within Brisbane's boundaries in 2010. Most of this energy use occurs in buildings, although some energy use may occur in other equipment, such as outdoor lighting, traffic control signals, or sewer or water pumps. This sector includes energy use as reported by PG&E, as well as estimated use of Direct Access energy, which is energy purchased on the wholesale market, rather than from PG&E. Direct Access energy typically is used by large commercial and industrial customers; data on Direct Access energy use was provided by the California Energy Commission for all of San Mateo County, and this energy use was estimated for Brisbane based on the ratio of Direct Access energy use to other commercial/industrial energy use in the County. This methodology is consistent with the 2005 baseline emissions inventory process.

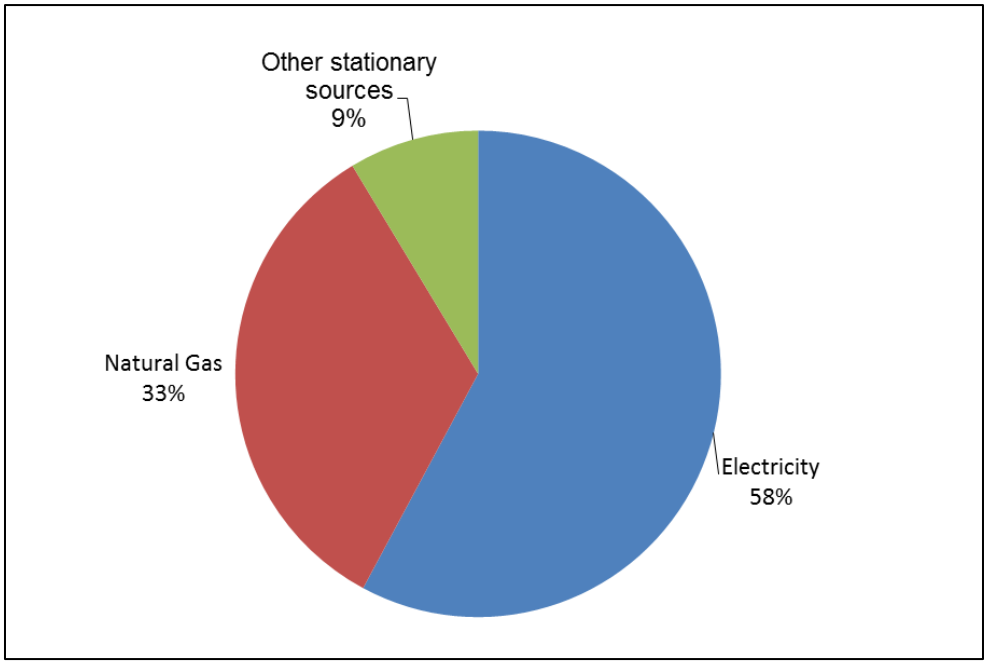
Stationary source emissions were added to the 2010 due to a new data source becoming available from the BAAQMD. These emissions are from stationary propane equipment, stationary diesel equipment (such as diesel generators) and other fuels. A summary of energy use in each sector in 2005 and 2010 and resulting emissions are shown in Table 5. Figure 2 shows a breakdown of emissions by energy use (electricity and natural gas). Electricity use is measured in kilowatt-hours (kWh), while natural gas use is measured in therms.

Table 5: 2010 Residential/Industrial Energy Use and Emissions, 2005 and 2010

Emissions Sector	Source	2005 Energy Use Data	2010 Energy Use Data	Increase or Decrease in Energy Use	2005 Emissions (in $MTCO_2e$)	2010 Emissions (in $MTCO_2e$)	Increase or Decrease in Emissions (in $MTCO_2e$)
Residential	Electricity (kWh)	8,556,529	9,203,728	+647,199	1,912	1,868	-44
	Natural Gas (therms)	710,229	748,593	+38,364	3,799	3,979	+180
Commercial / Industrial	Electricity (kWh)	58,391,941	58,489,002	+97,061	13,054	11,871	-1,183
	Natural Gas (therms)*	973,605	1,032,324	+58,719	5,207	5,487	+280
	Direct Access Electricity (kWh)	12,200,943	7,810,421	-4,390,523	5,327	2,618	-2,709
Stationary Sources	Multiple Fuels	Not available				2,449	Not available
				TOTAL	**29,299**	**28,273**	**-1,026**

* 2005 Commercial/Industrial Energy Use data and Emissions for natural gas exclude previously-reported Direct Access natural gas. The Direct Access natural gas consumption was erroneously double-counted in the baseline 2005 inventory.

Figure 2: Building Energy Use – Fuel Type



4.4 Transportation Emissions

Transportation emissions are from four key sources:

- Vehicle travel on roads
- Off-road equipment, such as construction equipment, airport ground support equipment, or lawn and garden maintenance equipment
- CalTrain (added in the new protocol)
- Freight trains (added in the new protocol)

Vehicle travel on roads includes emissions from private, commercial, and fleet vehicles driven within the City's geographical boundaries as well as the emissions from transit vehicles and the City-owned fleet and other public sector fleets. The key data collected for transportation emissions in vehicles is vehicle miles traveled (VMT). Vehicle travel on roads can be further broken down into travel on local roads, and travel on state highways.

Community-wide VMT estimates are highly dependent on the accounting rules and analytical tools used. Two general approaches are allowed in the Community GHG Protocol; the in-boundary method, in which all VMT from within the limits of the jurisdiction are included; and the origin-destination method, in which trips are allocated to each jurisdiction based on whether they started or ended in the jurisdiction. Notably, the in-boundary method includes "pass-through" traffic, or trips that do not start or end in the jurisdiction, but the origin-destination method does not include these trips. All VMT from trips that start and end within the jurisdiction are included in both methods.

This inventory uses the in-boundary method, for the sake of consistency with the 2005 inventory, and because the data for this method are easily obtained and simpler to gather. For Brisbane, estimates of VMT for on-road vehicular transportation were obtained from the Caltrans Highway Performance Monitoring System (HPMS) database results for year 2010.[9] The HPMS database provided VMT data for local roads and county-wide VMT for state highways; countywide state highway VMT is allocated to Brisbane based upon the proportional state highway roadway mileage located in the jurisdiction compared to the county as a whole.

[9] Caltrans HPMS, 2010 California Public Roads Data. Available at: http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2010PRD.pdf

Off-road equipment includes lawnmowers, garden equipment, and construction, industrial, and light commercial equipment. The California Air Resources Board OFFROAD 2007 model was used to calculate offroad emissions for San Mateo County and county-wide emissions were then allocated to Brisbane based on Brisbane's portion of population and number of jobs.

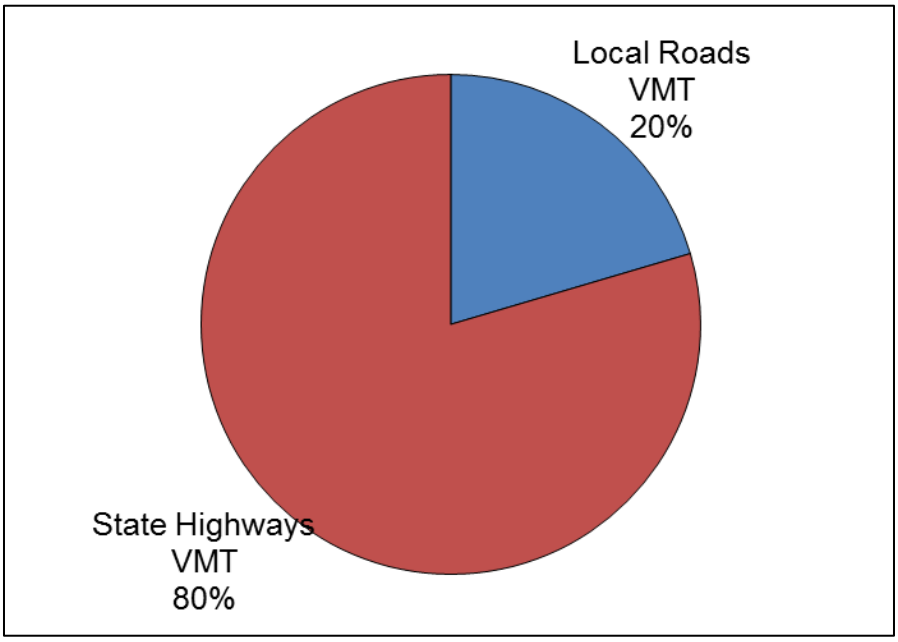
CalTrain operates seven days a week and provides commuter train service from San Francisco to San Jose; some trains also go from San Jose to Gilroy. The City of Brisbane has one CalTrain station. Freight trains operate on the CalTrain tracks in the evenings, after CalTrain operations are done. For both CalTrain and freight train operations, the total countywide emissions were calculated, and then were allocated to Brisbane based on miles of track within the city boundaries. CalTrain and freight train emissions were not included in the 2005 baseline inventory, and thus are a new source of community emissions to be tracked henceforth.

A summary of transportation data and associated emissions from both 2005 and 2010 is included in Table 6. Figure 3 shows a breakdown of 2010 on-road emissions from vehicles based on whether the travel occurred on local roads or state highways.

Table 6: 2010 Transportation Data and Emissions, 2005 and 2010

Emissions Sector	Source	2005 Activity Data	2010 Activity Data	Increase or Decrease in Activity Data	2005 Emissions (in $MTCO_2e$)	2010 Emissions (in $MTCO_2e$)	Increase or Decrease in Emissions (in $MTCO_2e$)
Vehicle travel on roads	Local Roads VMT	43,960,600	45,161,450	+1,200,850	21,463	21,076	-387
	State Highways VMT	195,297,995	175,954,804	-19,343,191	95,352	82,113	-13,239
Offroad Equipment	Various	Not applicable; emissions are modeled and are not based on a single data source			6,287	6,598	+311
CalTrain	Gallons of Diesel Fuel	Not available	221,160	Not applicable	Not applicable	2,280	Not applicable
Freight Trains	Gallons of Diesel Fuel		29,155			301	
				TOTAL	**123,102**	**112,367**	**-10,735**

Figure 3: Vehicle Transportation Emissions – Highways v. Local Travel



4.5 Solid Waste

Solid waste is divided into two similar but separate sources: landfills and generated solid waste.

4.5.1 Landfills

There are two closed landfills located in Brisbane; the Sierra Point Disposal Site and the Brisbane Landfill. Both landfills are owned and operated by private companies; the Sierra Point Disposal Site is owned by Gibson Speno Company and the Brisbane Landfill is owned by Sunquest Properties. No data are available for the Sierra Point Disposal Site, so this site is excluded from the 2010 GHG inventory although it was included in the 2005 baseline inventory.

Emissions from landfills are modeled based on a variety of factors, including whether it is open or closed; the amount of waste-in-place, the amount of rainfall in the area; and whether the landfill has a landfill gas collection system. For the Brisbane Landfill, data were not available, although the landfill does report some information on emissions to the Bay Area Air Quality Management District; this publicly-reported data is used as a proxy for landfill emissions calculations in this 2010 inventory. Emissions from the Brisbane Landfill were not included in the baseline 2005 inventory.

4.5.2 Generated Waste

Solid waste is generated by residents and visitors, businesses, public entities, and other organizations in the community. Emissions from waste result from organic materials decomposing in the anaerobic (non-oxygen) environment of a landfill and produces methane. Organic materials (e.g., paper, plant debris, food waste, and so forth) generate methane while non-organic materials do not (e.g., metal, glass, and so forth). The majority of solid waste is disposed of at the Ox Mountain Landfill in Half Moon Bay; small amounts of waste are disposed of at the Altamont Landfill and the Zanker Material Processing Facility.

In addition to solid waste disposal, this category includes alternative daily cover, which is used to cover the landfill each day in order to control vectors, odors, fires, blowing litter, and scavenging. The total amount of solid waste generated and alternative daily cover is taken from the CalRecycle jurisdictional database for the 2010 calendar year. Emissions from the waste are modeled using the assumption that the waste will begin decomposing in the year it was deposited, and will continue to decompose and to generate methane emissions for 100 years.

A comparison of the total generated and landfilled solid waste as well as total alternative daily cover waste from 2005 and 2010 and associated emissions is shown in Table 7.

Table 7: 2010 Generated Waste Data and Emissions, 2005 and 2010

Emissions Sector	2005 Waste Amount (tons)	2010 Waste Amount (tons)	Increase or Decrease in Waste Amount (tons)	2005 Emissions (in $MTCO_2e$)	2010 Emissions (in $MTCO_2e$)	Increase or Decrease in Emissions (in $MTCO_2e$)
Disposed waste	7,981	5,497	-2,484	1,457	855	-373
Alternative Daily Cover	1,286	972	-314	26	228	+1,286
TOTAL:	**9,267**	**6,469**	**-2,798**	**1,483**	**1,084**	**-399**

4.6 Water

The emissions from water are a new source for the 2010 inventory. Consumption of water in the community is associated with GHG emissions due to the energy use that is needed to extract, treat, and distribute water to the end-user. In Brisbane, water is provided by the City of Brisbane and the Guadalupe Valley Municipal Improvement District (GVMID). A large percentage of the water consumed is purchased from the SFPUC, and the water source is the Hetch Hetchy reservoir in the Yosemite area of the Sierra Nevada mountains. This water is mostly transported

in a gravity-based system, although a modest amount of energy is needed for water transportation, treatment and distribution.

In San Mateo County, water is provided by 17 different agencies or water districts. None of the agencies or districts provide water to a single jurisdiction. In other words, municipal jurisdictional boundaries are not the same as the water district/agency boundaries. For example, the City of Brisbane water agency also provides water to portions of unincorporated San Mateo County. Thus, water use data is not tracked by a city's geographic boundary. As a result, this inventory utilizes an average water use factor, in gallons per capita per day, for the City of Brisbane water agency and the GVMID, and then apportions water use to Brisbane based on population. The water use factor used is gross gallons per capita per day, which includes both residential and nonresidential water usage. Once the water use for Brisbane is estimated, the total water use is multiplied by an energy emissions factor to estimate the energy usage associated with water extraction, treatment, and delivery. The emissions factor of 0.0035 kWh per gallon of water is used to estimate electricity use from water consumption, and this electricity use is then used to estimate emissions. This emissions factor is based on estimated energy consumed for water distribution in Northern California as reported by the California Energy Commission.

In addition, water data is reported by fiscal year, which runs from July to June. To estimate water use for calendar year 2010, this inventory uses an average of the gross per capita water use from FY2009-2010 and FY2010-2011.

As noted above, a small portion of emissions from water use are likely double-counted, to the extent that electricity for water distribution is consumed within the city's boundaries. Also, emissions from water consumption were not included in the 2005 inventory. Table 8 shows a summary of the water consumption data and associated emissions.

Table 8: 2010 Water Data and Emissions, 2010

Emissions Sector	City of Brisbane Water Use Factor	2010 Brisbane Population	Estimated 2010 Water Consumption (gallons/year)	Estimated 2010 Embedded Energy in Water Use (kWh)	2010 Emissions (in MTCO2e)
Water	136.88 gallons per capita per day	4,282	213,929,363	310,198	82

4.7 Wastewater

The emissions from wastewater are a new source for the 2010 inventory. There is not a wastewater treatment plant located in Brisbane. Wastewater from Brisbane is treated by the Southeast Water Quality Control Plant owned and operated by the City of San Francisco. Emissions from wastewater treatment plants are based on stationary fuel use other than natural gas (such as diesel), as well as the types of treatment in place for the wastewater. In addition to energy-related emissions, wastewater treatment leads to process and fugitive emissions of methane and/or nitrogen oxide. Natural gas and electricity used at the wastewater treatment plant are included in the Energy section of this inventory.

Because the wastewater treatment plant serves multiple jurisdictions, this inventory includes an estimate of wastewater emissions allocated to Brisbane based on population. However, data were not available for the Southeast Water Quality Control Plant, so this inventory utilizes an average emissions per capita rate for all the wastewater treatment plants in San Mateo County in order to estimate the emissions allocated to Brisbane. The allocation of emissions by population is shown in Table 9.

Table 9: 2010 Wastewater Data and Emissions, 2010

Emissions Sector	Wastewater Emissions Factor	2010 Brisbane Population	Estimated 2010 Allocated Wastewater Emissions (in $MTCO_2e$)
Wastewater	.0167 MTCO2e/ person	4,282	72

4.8 Stationary Sources

Stationary sources include boilers, generators, co-generation, and industrial processing equipment and may include a number of fuel types, including natural gas, propane, and diesel. As noted in the Section 4.2, some of these emissions may be double-counted in this 2010 inventory. The data for stationary sources is from the BAAQMD; these emitting facilities receive a permit from or must otherwise report emissions to the BAAQMD. The data provided by the BAAQMD includes total GHG emissions from all fuel consumption, but does not include details on the amounts or types of fuel consumed.

One of the stationary sources listed in the BAAQMD data has been omitted from this inventory to avoid double counting of emissions; this source is the Brisbane Landfill owned by Sunquest Properties, which is included in the Solid Waste sector of this inventory.

The remaining stationary sources include emissions from 12 sources totaling 2,449 $MTCO_2e$ in 2010. This data was not available for the 2005 inventory so no comparison is presented.

5. Conclusion

Climate change is a global problem and only through local solutions designed to meet the needs of our community can we mitigate and adapt to its impacts and protect the environment. While the challenge of climate change is unprecedented, local-level solutions can reduce emissions, increase efficiency, promote economic development, and improve quality of life for residents.

The City of Brisbane has taken a significant step to tracking emissions in order to build a more sustainable future for its residents and businesses. The results of this inventory may be used to develop new policies and programs that may be needed to reach the 2020 target and other future GHG emission reduction targets. While the City appears to be on the correct reduction trajectory to reach 2020 reduction targets, the City will continue to track emissions and monitor progress so that the 2020 reduction target and all future reduction targets are achieved.

Appendix A: Additional Ways to Look at GHG Emissions

Sources and Activities

Communities contribute to GHG emissions in many ways. Two central categorizations of emissions are used in the community inventory: 1) GHG emissions that are produced by "sources" located within the community boundary, and 2) GHG emissions produced as a consequence of community "activities".

Source	Activity
Any physical process inside the jurisdictional boundary that releases GHG emissions into the atmosphere	The use of energy, materials, and/or services by members of the community that result in the creation of GHG emissions.

By reporting on both GHG emissions sources and activities, local governments can develop and promote a deeper understanding of GHG emissions associated with their communities. A purely source-based emissions inventory could be summed to estimate total emissions released within the community's jurisdictional boundary. In contrast, a purely activity-based emissions inventory could provide perspective on the efficiency of the community, even when the associated emissions occur outside the jurisdictional boundary. The division of emissions into sources and activities replaces the scopes framework that is used in government operations inventories, but that does not have a clear definition for application to community inventories.

Significantly Influenced Emissions Frame

Following the Community Protocol, this inventory report organizes emissions in several frames. Each frame includes a particular set of emissions sources and activities, and each helps to tell a different story about community emissions. This report looks at Brisbane's community emissions through the following frames:

- Local Government Significant Influence
- Household Consumption

Brisbane has chosen first to focus on emissions over which the City government has significant influence. This frame emphasizes policy relevance, highlighting a set of emission sources and activities that Brisbane has the greatest opportunity to address. This frame includes all of the five Basic Emissions Generating Activities required by the community protocol. Table 10 summarizes significantly influenced emissions by source and activity.

Table 10: Significantly Influenced GHG Emissions by Sector, Source and Activity

Sector	Sources ($MTCO_2e$/year)	Activities ($MTCO_2e$/year)	Total ($MTCO_2e$/year)
Residential	3,979	1,868	5,847
Commercial / Industrial	7,936	14,489	22,425
Transportation and Mobile Sources	112,404	NA	112,367
Solid Waste	6,111	1,084	7,195
Wastewater Treatment Facility Process and Effluent	NA	72	72
Water Use	NA	82	82
TOTALS	**130,431**	**17,595**	**148,025**
Percentage of Total CO_2e	88%	12%	100%

In Table 10, sources in the residential and commercial/industrial sector include natural gas consumption, while activities refer to electricity consumption. Also, sources in the solid waste sector include the landfill located in the city, while activities refer to solid waste generated in the city but disposed outside of the city.

Brisbane will focus on these emissions sources and activities in developing a climate action plan. The total significantly influenced emissions of 160,944 metric tons CO_2e also formed the baseline for setting an emissions reduction target and measuring future emissions reductions.

Household Consumption Frame

The second frame through which Brisbane has chosen to look at emissions is that of household consumption. The household consumption frame helps to illustrate the full, life cycle impacts of residents' activities. Household consumption includes lifecycle emissions associated with household electricity use, household natural gas use, household personal vehicle

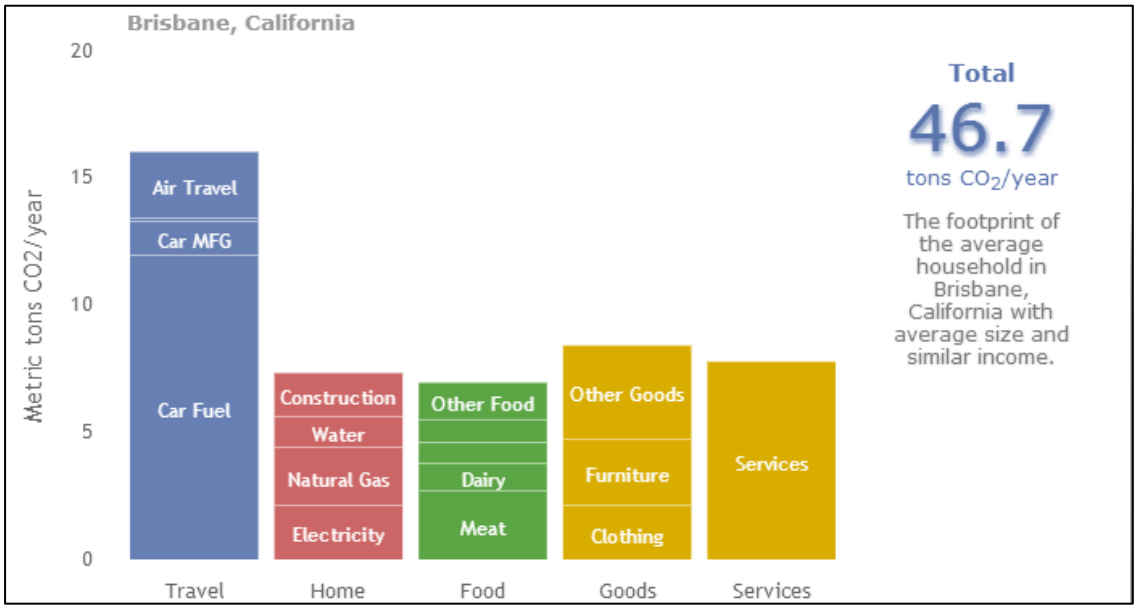
transportation, household use of public transportation, household use of water and wastewater services, household production of garbage, and household use of materials and services. Many of these emissions overlap with those looked at through the local government influence and communitywide activities frames. But the household consumption frame also includes emissions that are not included in the other frames, in particular emissions from goods and services that are produced outside the community and consumed inside the community.

The Environmental Protection Agency (EPA) has undertaken significant effort to ensure that a consumption-based approach has been included in the new national community-level emissions inventory protocol. Consumption-based emissions for communities in the U.S. are often – but not always – higher than in-boundary emissions. Consumption based emissions are also larger than geographic emissions for the nation as a whole, although communities with small residential populations, limited government presence, and large industrial or tourism activities (businesses serving non-resident customers) would find their consumption-based emissions to be relatively small. But regardless of whether consumption based emissions are larger or smaller, some of the emissions are *different*, and they represent additional ways in which the community contributes to climate change and by extension, additional opportunities for the community to reduce its contribution to climate change. Table 11 shows total household consumption emissions for Brisbane, while Figure 4 shows household consumption emissions for an average household in Brisbane.

Table 11: Total Household Consumption Emissions for Brisbane (Source: Cool Climate Calculator)

Average Household Emissions ($MTCO_2e$/Year)	Number of Households	Total Household Consumption Emissions ($MTCO_2e$/Year)
46.7	**1,730**	**80,791**

Figure 4: Household Consumption Emissions for an Average Household in Brisbane



Looking at the household emissions frame shows that Car Fuel and Services are large contributors to emissions, comparable in size to all items in the Food, Goods, and Home categories. The EPA is promoting a range of actions that can help to reduce these emissions, including materials management (source reduction, durable transport packaging, materials and equipment sharing, including cars, bikes tools, etc.), reduction of wasted food, and sustainable purchasing practices by governments, businesses, and households.

Consumption emissions for an average household were obtained from the calculator at http://coolclimate.berkeley.edu. Residents who want to learn more about consumption-based emissions from their own household can use the calculator to obtain emissions based on their personal energy use, transportation and purchasing.

Appendix B. Detailed Data, Data Sources, and Methodologies

GHG emissions can be quantified in two ways:

- Measurement-based methodologies refer to the direct measurement of GHG emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility.
- Calculation-based methodologies calculate emissions using activity data and emission factors. To calculate emissions accordingly, the basic equation below is used: Activity Data x Emission Factor = Emissions

All emissions sources in this inventory are quantified using calculation based methodologies. Activity data refer to the relevant measurement of energy use or other GHG-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. metric tons of CO_2 per kWh of electricity).

All calculation methodologies in this inventory follow the guidance in the Community GHG Protocol to the greatest extent possible.[10] Different methodologies are used only if the methodology in the Community GHG Protocol could not be used due to lack of data or lack of appropriate assumptions. All methodologies used are described in more detail in this Appendix.

As per the new Community GHG Protocol, emissions can also be considered in the context of sources located within the community, and activities of the community. Other new frameworks are also available to consider community GHG emissions. The emissions by sources and activities and these new frameworks are discussed in Appendix A: Additional Ways to Look at GHG Emissions.

This inventory calculates emissions for carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Each of these gases is then converted into carbon-dioxide equivalents (CO_2e) using the appropriate Global Warming Potential (GWPs), as per the guidance in the Community GHG Protocol. The GWPs used in this inventory are shown in Table 12.

[10] Available for download from the following website: http://www.icleiusa.org/tools/ghg-protocol/community-protocol

Table 12: Global Warming Potentials

Greenhouse gas:	CO2	CH4	N2O
GWP:	1	21	310

Commercial/Industrial and Residential Energy Emissions

The emissions from electricity and natural gas were calculated based on guidance in the Community GHG Protocol, Appendix C: Built Environment Activities and Sources. Emissions from stationary combustion of natural gas were calculated based on method BE1.1, and emissions from electricity were calculated based on method BE.2.2.

Commercial/industrial and residential activity data for 2010 (utility-purchased electricity and natural gas use within the City) were obtained from PG&E.[11] In addition, Direct Access electricity consumption was provided by the California Energy Commission (CEC).[12] The Direct Access data from the CEC included consumption by the entire County, which was then apportioned to Brisbane. More specifically, the ratio of countywide Direct Access electricity to utility-supplied nonresidential electricity is multiplied by the jurisdiction's utility-supplied nonresidential electricity use to determine the amount of Direct Access electricity in that jurisdiction. All the natural gas consumption, regardless of whether it was purchased from PG&E or not, was included in the data provided by PG&E.[13] However, Direct Access electricity consumption (which is not purchased from PG&E) was not included in the data provided by PG&E, which is why it was estimated based on County-wide data from the CEC.

Direct emissions from natural gas combustion were calculated using standard emission factors for natural gas based on the emission factors in the Community GHG Protocol. Indirect emissions from electricity generation were calculated using the verified emission factors reported by PG&E for its 2010 operations for CO_2.

For Direct Access CO2 emissions, and all electricity-related CH4, and N2O emissions, the California grid-average electricity emission factors were used. These emission factors were found by taking the total state-wide electricity-related GHG emissions (reported by California Air Resources Board [ARB]), and dividing by the total electricity consumption (reported by the

[11] The contact person is: Sapna Dixit, sapna.dixit@pge.com. Data can also be requested by sending an email to: ghgdatarequests@pge.com
[12] Data obtained from Steven Mac at the California Energy Commission, Steven.Mac@energy.ca.gov
[13] Confirmed by email correspondence with Sapna Dixit of PG&E, December 11, 2013.

CEC.) This methodology of calculating emission factors for Direct Access CO2 emissions, and all electricity-related CH4 and N2O emissions, was also used for the 2005 baseline inventory.

Table 13 summarizes the emission factors used for electricity, while Table 14 shows the emission factors used to calculate natural gas emissions.

Table 13: Electricity Emission Factors

Type of Electricity	Emission Factor	Source
PG&E-Supplied Electricity	CO2: 0.445 lbs/kWh	PG&E Emission Factors White Paper: http://www.pge.com/includes/docs/pdfs/shared/environment/calculator/pge_ghg_emission_factor_info_sheet.pdf
All Electricity	CH4: 28.97 lbs/GWh N2O: 5.99 lbs/GWh	ARB electricity emissions from both electricity generated in-state and imported electricity: http://www.arb.ca.gov/app/ghg/2000_2011/ghg_sector.php CEC electricity consumption: http://energyalmanac.ca.gov/electricity/system_power/2010_total_system_power.html Note: ARB electricity emissions were divided by CEC electricity consumption to calculate the emission factors.
Direct Access electricity	CO2: 0.7364 lbs/kWh	

Table 14: Natural Gas Emission Factors

Greenhouse Gas	Emission Factor	Source
CO_2	53.02 kg/MMBtu	Table B.1, Community GHG Protocol, Appendix C, page 60.
CH_4 – industrial sources	0.001 kg/MMBtu	Table B.3, Community GHG Protocol, Appendix C, page 64.
CH_4 – residential and commercial sources	0.005 kg/MMBtu	
N_2O	0.0001 kg/MMBtu	

It is important to note that emissions associated with the generation of electricity, which make up a significant portion of the GHGs associated with building energy, can vary widely from year

to year. The GHG emissions associated with electricity use purchased from PG&E is based on an emissions factor specific to PG&E's territory and is calculated annually by PG&E and then made available to cities. The source of the emission factor used for the 2010 baseline inventory is the Greenhouse Gas Emission Factors white paper provided by PG&E.[14] This factor varies year over year because PG&E's electricity sources change. For instance, the utility specific emissions factor for PG&E in 2006 was 455.81 lbs/MWh whereas in 2008 it was 641.35 lbs/MWh. For PG&E, the variance is typically dependent on the availability of hydroelectric resources. During low precipitation years, there is less water available to generate emissions-free hydropower. Because of this, PG&E must compensate by supplying more electricity generated from natural gas or coal.

Transportation

On-road Emissions

As with many Bay Area cities, vehicle travel in Brisbane is the largest single source of GHG emissions. Most methods for estimating transportation emissions are based on vehicle miles traveled (VMT). Community-wide VMT estimates are highly dependent on the accounting rules and analytical tools used. Two general approaches are allowed in the Community GHG Protocol; the in-boundary method, in which all VMT from within the limits of the jurisdiction are included; and the origin-destination method, in which trips are allocated to each jurisdiction based on whether they started or ended in the jurisdiction. Notably, the in-boundary method includes "pass-through" traffic, or trips that do not start or end in the jurisdiction, but the origin-destination method does not include these trips. Trips that start and end within the jurisdiction are included in both methods.

This inventory uses the in-boundary method, for the sake of consistency with the 2005 inventory, and because the data for this method are easily obtained and simpler to gather. For Brisbane, estimates of VMT for on-road vehicular transportation were obtained from the Caltrans Highway Performance Monitoring System (HPMS) database results for year 2010.[15] The HPMS database provided VMT data for local roads and county-wide VMT for state highways; countywide state highway VMT is allocated to Brisbane based upon the proportional

[14] The emission factor were found at the following webpage: http://www.pge.com/includes/docs/pdfs/shared/environment/calculator/pge_ghg_emission_factor_info_sheet.pdf
[15] Caltrans HPMS, 2010 California Public Roads Data. Available at: http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2010PRD.pdf

state highway roadway mileage located in the jurisdiction compared to the county as a whole. Brisbane is estimated to have 4.2% of the state highways in San Mateo County, and thus was allocated 4.2% of the state highways VMT in San Mateo County.

Outputs from ARB's EMFAC2011 model were used to calculate CO_2, CH_4, and N_2O emissions; emissions are calculated separately for local roads and for state highways. Emissions are also calculated separately for gasoline and diesel VMT and associated fuel consumption. Emission calculations are associated with local conditions and vehicle fleet information. Emission factors and certain other assumptions were provided by the BAAQMD;[16] the following tables summarize the emission factors and other assumptions provided by the BAAQMD.

Table 15: Transportation Emission Factors

CO_2 Emission Factors		CH_4 Emission Factors		N_2O Emission Factors	
Gasoline	Diesel	Gasoline	Diesel	Gasoline	Diesel
8,370	10,079	0.058	0.046	0.07	0.05
Grams/gallon	Grams/gallon	Grams/mile	Grams/mile	Grams/mile	Grams/mile

Table 16: Transportation Assumptions

VMT Mix		Fuel Efficiency	
Gasoline	Diesel	Gasoline	Diesel
96.8%	3.2%	19.9 miles/gallon	8.7 miles/gallon

Additional assumptions are as follows: local Road and state highway VMT data is in Daily VMT (DVMT); Annual VMT = DVMT x 365. VMT is converted into gasoline VMT and diesel VMT, based on VMT mix shown in Table 16. Then gasoline VMT and diesel VMT are converted into gallons of fuel using fuel efficiencies in Table 16. CO_2 is calculated from resulting fuel consumption. Methane and nitrous oxide emissions are calculated directly from gasoline VMT and diesel VMT.

[16] The contact person is: Abby Young, ayoung@baaqmd.gov

Off-Road Emissions

To estimate mobile off-road emissions, total countywide non-point source off-road emissions were obtained from CARB's Off-Road 2007 Vehicle Model.[17] Off-road emissions sources include the following: agricultural equipment; airport ground support equipment; construction and mining equipment; entertainment equipment; industrial equipment; lawn and garden equipment; light commercial equipment; oil drilling; pleasure craft; railyard operations; recreational equipment; and transport refrigeration units. County-wide emissions were apportioned to Brisbane either as a proportion of the City's population to overall County population OR as a proportion of City's jobs to overall County jobs. The exceptions are the following sources: airport ground support equipment, which were allocated to San Mateo County, since all the airports in the county are in the unincorporated County areas; and railyard operations, which were evenly allocated to the 12 jurisdictions that have rail lines within their boundaries. A summary of the off-road emissions sources and the allocation methodology for each is provided in Table 17. Brisbane is estimated to have 1% of the total population in the County, and 2% of the total jobs in the County.

Table 17: Off-Road Emissions Sources and Allocation Methodology

Off-Road Emissions Source	Allocate by:
Agricultural Equipment	Number of Jobs
Airport Ground Support Equipment	100% of these emissions are allocated to San Mateo County.
Construction and Mining Equipment	Number of Jobs
Entertainment Equipment	Number of Jobs
Industrial Equipment	Number of Jobs
Lawn and Garden Equipment	Population
Light Commercial Equipment	Number of Jobs
Oil Drilling	Number of Jobs
Pleasure Craft	Population
Railyard Operations	Emissions will be evenly allocated to the following 12 jurisdictions with rail lines: Atherton, Belmont, Brisbane, Burlingame, Menlo Park, Millbrae, Redwood City, San Bruno, San Carlos, San Mateo (City), San Mateo

[17] The model can be downloaded from the following website: http://www.arb.ca.gov/msei/categories.htm

Off-Road Emissions Source	Allocate by:
	(County), South San Francisco.
Recreational Equipment	Population
Transport Refrigeration Units	Number of Jobs

2010 population data is from the US Census[18], while 2010 jobs data are from Association of Bay Area Governments (ABAG) projections.[19]

CalTrain Emissions

CalTrain is a commuter rail service that operates on diesel fuel, and runs from Gilroy to San Jose to San Francisco over 77 miles of track. Caltrain passes through 12 jurisdictions in San Mateo County on the portion of the rail line that goes from San Jose to San Francisco; of these 12 jurisdictions, 11 of them have one or more Caltrain stations. (Caltrain track passes through portions of unincorporated San Mateo County, but these portions of the Caltrain track do not have a station.) However, the portion that runs from Gilroy to San Jose only includes limited operations. Thus, this analysis includes a weighting of the total track-miles in San Mateo County based on the number of trains that operate between Gilroy and San Jose compared to the number of trains that operate from San Jose to San Francisco. (The methodology for this weighting, or attribution, in consistent with equation TR.4.D.1 in the Community GHG Protocol, Appendix D.)

The overall methodology used to calculate CalTrain diesel emissions is from the Community GHG Protocol, Appendix D, Transportation. Specifically, sections TR.4.A and TR.4.B and equations TR.4.A.2 and TR.4.B.2 are used. As directed in the Community GHG Protocol, emission factors for diesel fuel use in locomotives were taken from Chapter 13 of The Climate Registry's General Reporting Protocol.[20]

Total diesel fuel usage by Caltrain was found in the 2010 National Transit Database[21], and then is allocated to each of the San Mateo County jurisdictions based the weighted track distance in San Mateo County, and also based on the estimated track mileage in each jurisdiction. The

[18] http://www.census.gov/2010census/
[19] http://www.abag.ca.gov/planning/currentfcst/
[20] http://www.theclimateregistry.org/resources/protocols/general-reporting-protocol/
[21] National Transit Database (Energy Consumption table for 2010).
http://www.ntdprogram.gov/ntdprogram/datbase/2010_database/NTDdatabase.htm

track mileage in each jurisdiction was estimated using maps of each jurisdiction. Emission factors for diesel fuel combustion were used to calculate emissions in each jurisdiction.

Caltrain also reported gasoline and diesel use in busses for 2010 in the National Transit Database, but this fuel consumption and associated emissions are not calculated in this worksheet, but instead are included in the on-road vehicle emissions included elsewhere in this inventory.

A summary of the track-miles in each jurisdiction in San Mateo County is provided in Table 18 below. Emission factors used to estimate diesel emissions from CalTrain are shown in Table 19.

Table 18: Miles of Rail Track by Jurisdiction

Jurisdiction	Estimated miles of track:
Brisbane	2.72
South San Francisco	2.64
San Bruno	1.55
Millbrae	1.24
Burlingame	2.87
San Mateo	4.35
Belmont	1.40
San Carlos	1.84
Redwood City	1.76
Unincorporated San Mateo County	0.62
Atherton	0.70
Menlo Park	1.63
Total:	23

Table 19: Emission Factors for Diesel Used for Trains

Greenhouse Gas	Emission Factor	Units
CO_2	0.01021	$MTCO_2$ per gallon
CH_4	0.0000008	$MTCH_4$ per gallon
N_2O	0.0000003	MTN_2O per gallon

Source: The Climate Registry General Reporting Protocol, Default Emission Factors and standard GWPs.[22]

[22] http://www.theclimateregistry.org/resources/protocols/general-reporting-protocol/

Freight Train Emissions

The methodology for estimating freight train emissions is taken from the Community GHG Protocol, Appendix D, section TR.3. Specifically, the equation used to estimate emissions is TR.3.1. This methodology suggests finding the tonnage of freight moved and multiplying by the miles of track to estimate the ton miles of goods moved. However, the tonnage of freight moved is unavailable, so this analysis uses an estimate of ton miles per mile of track from the California State Rail Plan, and then multiplies the ton miles per mile of track by the miles of track in San Mateo County to find the ton miles moved in San Mateo County. The total ton miles are then used to estimate diesel fuel using a standard factor of 457 ton miles per gallon of diesel (provided in the Community GHG Protocol).

As directed in the Community GHG Protocol, emission factors for diesel fuel use in locomotives were taken from Chapter 13 of The Climate Registry's General Reporting Protocol; these emission factors are the same as those used to estimate emissions from CalTrain shown in Table 19.

The train track passes through 12 jurisdictions in San Mateo County; emissions from diesel fuel consumption in San Mateo County are then allocated to each jurisdiction based on their portion of the track in their boundaries.

Freight trains are operated on the Caltrain track line at night, after the Caltrain operations have ended. According to the 2013 California State Rail Plan, the volume of freight trains operating on the Caltrain track is unknown.[23] However, freight trains are only operated at night. According to one observer, freight trains make up less than 5% of train traffic on the Caltrain track.[24]. At the current 92 Caltrain trains per weekday, 5% would equal 4.6 trains/day, which is used in this analysis as a conservative estimate of freight trains operating on the line.

Thus, this analysis estimates that 4.6 million gross ton-miles per mile of freight are carried on the Caltrain tracks each year. This is the smallest number category in the 2013 California State Rail Plan and reflects a light amount of freight operations on the Caltrain line, at an estimated 4.6 trains/day. A summary of these calculations are shown in Table 20.

[23] California State Rail Plan, Exhibit 6.8 on page 138. Webpage: http://californiastaterailplan.dot.ca.gov/docs/Final_Copy_2013_CSRP.pdf
[24] http://caltrain-hsr.blogspot.com/2009/08/effect-of-heavy-freight.html

Table 20: Freight Train GHG Calculations

Ton-miles in all of San Mateo County	Ton-miles per gallon of diesel	Gallons of diesel used in San Mateo County	Total GHG emissions from diesel fuel use ($MTCO_2e$/year)	Percentage of San Mateo County rail that is located in Brisbane	Estimated GHG emissions in Brisbane ($MTCO_2e$/year)
114,333,333	457	250,182	2,579	12%	301

It is unknown whether there are switching yards in San Mateo County; thus, the emissions from switching yards are excluded from this analysis.

Solid Waste

Landfills

Currently, the only open landfill in San Mateo County is located in the unincorporated County area. Therefore, there is little chance of double-counting landfill emissions for the jurisdictions in San Mateo County, with the exception of the County of San Mateo. This section of the inventory includes estimated GHG emissions from closed or otherwise inactive landfills in San Mateo County.

Some GHG emissions from landfills are also provided by the BAAQMD, but their methodologies differ from those in the LGOP and in the Community GHG Protocol, so BAAQMD landfill emissions data are not used in this analysis.

Landfills for which no data was available were excluded from this inventory. Also, this analysis uses the methodologies in the Community GHG Protocol, Appendix E, in particular calculation method SW.1.1, which uses the California First Order Decay (FOD) model. When data are not available to use calculation methodology SW.1.1, this analysis is based on methodologies in the Local Government Operations Protocol.

This inventory includes emissions from the Brisbane Landfill. The Sierra Point Disposal Site was excluded due to lack of data. Some GHG emissions from landfills are also provided by the BAAQMD, but their methodologies differ from those in the LGOP and in the Community GHG Protocol. However, no other data source exists for the Brisbane Landfill, so the BAAQMD landfill emissions data is used in this analysis.

Solid Waste Disposal

Emissions were calculated using equation SW.4.1 of the Community GHG Protocol, Appendix E (page 24), as well as emission factors from Table SW.5 from the same document. In general, waste disposal to the landfill and the amount of Alternative Daily Cover is provided for each jurisdiction in the CalRecycle Disposal Reporting System database.[25] Waste characterization data from the California Waste Characterization Study of 2008[26] are used to determine what percentages of materials are in the disposed waste stream. For Alternative Daily Cover, the waste characterization is provided in the CalRecycle Disposal Reporting System by jurisdiction.

Tonnages of each waste material disposed are summed, and then multiplied by emission factors in the Community GHG Protocol to determine total emissions from disposed waste. A summary of the waste characterization results used for landfilled waste is shown in Table 21.

Table 21: Waste Characterization for Landfilled Waste

Waste Type	Percentage of All Waste Disposed in the Landfill
Corrugated Containers	4.8%
Newspaper	1.3%
Office Paper	1.9%
Magazines/Third Class Mail	0.7%
Food Scraps	15.5%
Grass	1.9%
Leaves	1.9%
Branches	0.60%
Dimensional Lumber	14.5%

Source: Waste Characterization is based on the California 2008 Statewide Waste Characterization Study.[27]

- Used the subcategory of "Uncoated Corrugated Cardboard" in the Waste Characterization Study for "Corrugated Containers" in the table above.
- Used the subcategory of "Newspaper" in the Waste Characterization Study for "Newspaper" in the table above.

[25] CRiS: CalRecycle Countywide, Regionwide, and Statewide Jurisdiction Diversion Progress Report
[26] http://www.calrecycle.ca.gov/Publications/Documents/General/2009023.pdf
[27] Used Table 7 on page 24 showing the composition of California's Overall Disposed Waste Stream. http://www.calrecycle.ca.gov/Publications/Documents/General/2009023.pdf

- Used the subcategories of "White Ledger Paper" and "Other Office Paper" in the Waste Characterization Study for "Office Paper" in the table above.
- Used the subcategory of "Magazines and Catalogs" in the Waste Characterization Study for "Magazines/Third Class Mail" in the table above.
- Used the subcategory of "Food" in the Waste Characterization Study for "Food Scraps" in the table above.
- Used half of the subcategory of "Leaves and Grass" for "Grass" in the table above. The other half of the subcategory of "Leaves and Grass" was assigned to "Leaves" in the table above.
- The subcategory of "Branches and Stumps" was also assigned to "Branches" in the table above.
- Used the subcategory of "Lumber" for "Dimensional Lumber" in the table above.

For ADC, this inventory only calculates emissions from the ADC category of "Green Waste," and assumes that 50% of Green Waste is Grass, and 50% of Green Waste is Branches.

The emission factors used in this inventory are shown in Table 22.

Table 22: Emission Factors for Disposed Waste

Corrugated Containers (MT CH_4 per wet short ton of waste)	Newspaper (MT CH_4 per wet short ton of waste)	Office Paper (MT CH_4 per wet short ton of waste)	Magazines /Third Class Mail (MT CH_4 per wet short ton of waste)	Food Scraps (MT CH_4 per wet short ton of waste)	Grass (MT CH_4 per wet short ton of waste)	Leaves (MT CH_4 per wet short ton of waste)	Branches (MT CH_4 per wet short ton of waste)	Dimensional Lumber (MT CH_4 per wet short ton of waste)
0.120	0.043	0.203	0.049	0.078	0.038	0.013	0.062	0.062

Water Conveyance

As per the Community GHG Protocol, this inventory includes energy-related emissions associated with water delivery and treatment. Some of these emissions may occur within the community boundaries; as explained in the Community GHG Protocol, there is risk of some double-counting in this emissions sector.

Water is provided by 17 different agencies or water districts in San Mateo County. None of the agencies or districts provides water to a single jurisdiction. In other words, municipal jurisdictional boundaries are not the same as the water district/agency boundaries. Thus, water use data is not tracked on a city jurisdictional level. As a result, the community inventories for the jurisdictions in San Mateo County will use an average water use factor, in gallons per capita per day, for all of the water agencies that serve their jurisdiction, and then will apportion estimated water use to each city based on population. The water use factor used is gross gallons per capita per day, which includes both residential and nonresidential water usage. Once the water use for each jurisdiction is estimated, the total water use is multiplied by an energy emissions factor to estimate the energy usage associated with water extraction, treatment, and delivery.

The energy emissions factor used is: 1,450 kWh/million gallons of water, and is taken from the Community GHG Protocol, Appendix F, Table WW.16.1. The emissions factor for Northern California was used. This emissions factor was adapted from California's Water-Energy Relationship, Final Staff Report, California Energy Commission, 2005.[28]

In addition, water data is reported by fiscal year, which runs from July to June. To estimate water use for calendar year 2010, this inventory uses an average of the gross per capita water use from FY2009-2010 and FY2010-2011. The source of the retailer water use information is the BAWSCA Annual Survey, FY2009-2010,[29] and BAWSCA Annual Survey, FY 2010-2011.[30] Emissions emitted were then calculated using the verified 2010 PG&E emission factor for CO_2 and California grid-average emission factors for CH_4 and N_2O, as described in the Energy section above.

Wastewater

This sector incorporates estimated emissions from the Southeast Water Quality Control Plant in San Francisco.

Emissions were estimated for the City using an average per-captia emissions factor from all the wastewater treatment plants in San Mateo County, which was allocated to Brisbane based on population.

[28] http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF, Table 1-3.
[29] http://bawsca.org/docs/0910SurveyDraft_041511.pdf
[30] http://bawsca.org/docs/BAWSCASurvey10-11_final-v3.pdf

Stationary Sources

Total stationary source emissions were provided by the Bay Area Air Quality Management District, and are also available publicly on the agency's website.[31] Facilities only report total biogenic and non-biogenic emissions, in $MTCO_2e$; this data does not include raw fuel use. It is assumed that activity data and emission factors are used to calculate stationary fuel use emissions.

Total non-biogenic emissions were summed for each jurisdiction. However, stationary source emissions from wastewater treatment plants were subtracted from the total stationary source emissions to avoid double counting, since the wastewater treatment emissions are included in the Wastewater sector of this inventory. Emissions from landfills are also subtracted from the stationary source totals in this section to avoid double counting, since those emissions are included in the Landfill sector of this inventory. Please see Appendix C for a full listing of all sources and emissions included in the Stationary Source sector of this inventory.

Agriculture

The methodology for estimating agricultural emissions in the Community GHG Inventory (Appendix G) is centered around the number and type of livestock in each jurisdiction. The only jurisdiction expected to have significant amounts of livestock raised for commercial purposes (including dairy cows, beef cows, swine, sheep, goats, or horses) is San Mateo County. Due to the difficulty of obtaining data on livestock counts, the agriculture sector was excluded from this analysis.

[31] Website:
http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/Emission%20Inventory/2010_GHG_Facilities.ashx

Appendix C. Detailed Stationary Sources Emissions Information

The following stationary source emissions data are reported by the BAAQMD and are included in this inventory.

Table 23: Stationary Source Emissions Data

Plant #	Plant Name	Plant Address	CO2 Equivalent Emissions (Metric Tons/ Year)
14100	Bebe Inc.	400 Valley Dr.	2.54
13842	City of Brisbane	111 Valley Dr.	3.16
15664	City of Brisbane - Harbormaster	400 Sierra Point Pkwy	0.20
20311	City of Brisbane City Hall	50 Park Place	0.18
16554	City of Brisbane Lake Street Pump Sta.	Lk Strt At Gln PkWay	0.71
19810	EBI Aggregates	#1 Old Quarry Rd.	2,402.17
16576	Equity Office Properties	1000 Marina Blv.	1.02
18394	InterMune Inc.	3260 Bayshore Blv.	1.80
18145	PBMS Brisbane (Pitney Bowes)	280 Valley Dr.	1.78
4021	SFPP, LP	950 Tunnel Ave.	13.22
16845	SPRINT, Envrn Health & Safety	1 West Hill Dr.	15.64
13313	VWR Scientific Products	3745 Bayshore Blv.	6.58
		Total:	**2,449**

Appendix D: Community Inventory Scoping and Reporting Tool

Table 24 provides a summary of the community inventory scoping and reporting tool, which is recommended for use in the new Community GHG Protocol. The table shows emissions sources and activities that are included in the community inventory, as well as those potential sources that are excluded.

The following abbreviations are used in this table:

IE – Included Elsewhere: Emissions for this activity are estimated and presented in another category of the inventory. The category where these emissions are included should be noted in explanation.

NE – Not Estimated: Emissions occur but have not been estimated or reported (e.g., data unavailable, effort required not justifiable).

NA – Not Applicable: The activity occurs but does not cause emissions; explanation should be provided.

NO – Not Occurring: The source or activity does not occur or exist within the community.

SI – Local Government Significant Influence

CA – Community-Wide Activities

HC – Household Consumption

Table 24: Summary of Included and Excluded Emissions

Emissions Type		Source or Activity?	Required Activities	Included under reporting frameworks:			Excluded (IE, NA, NO, or NE)	Explanatory Notes	Emissions ($MTCO_2e$)
				SI	CA	HC			
Built Environment									
Use of fuel in residential and commercial stationary combustion equipment		Source AND Activity	x	x				Includes natural gas supplied by PG&E and other fuels. Emissions from other fuels supplied by the BAAQMD.	11,916
Industrial stationary combustion sources		Source		x				Some of these sources are likely included in the data provided by the BAAQMD.	
Electricity	Power generation in the community	Source					NO	There are no large power plants in the community.	
	Use of electricity by the community	Activity	x	x				Includes data from PG&E and estimated Direct Access electricity	16,357
District Heating/ Cooling	District heating/cooling facilities in the community	Source					NO	No known district heating/cooling in the community.	
	Use of district heating/cooling by the community	Activity					NO	No known district heating/cooling use in the community.	
Industrial process emissions in the community		Source					NE	No data available	
Refrigerant leakage in the community		Source					NE	No data available	
Transportation and Other Mobile Sources									
On-road Passenger Vehicles	On-road passenger vehicles operating within the community boundary	Source	x	x				Included in the Transportation sector.	103,189
	On-road passenger vehicle travel associated with community land uses	Activity					NE	These are upstream emissions; specific data not available.	
On-road Freight Vehicles	On-road freight and service vehicles operating within the community boundary	Source		x				Included in the Transportation sector.	

	On-road freight and service vehicle travel associated with community land uses	Activity					NE	These are upstream emissions; specific data not available.	
On-road transit vehicles operating within the community boundary		Source		x				Included in the Transportation sector. Data specific to transit vehicles not available but are aggregated with the rest of the community-wide vehicle use.	
Transit Rail	Transit rail vehicles operating within the community boundary	Source		x				Includes CalTrain emissions	2,280
	Use of transit rail travel by the community	Activity					NE	No data available	
Inter-city passenger rail vehicles operating within the community boundary		Source					NO	This source would include Amtrak, which does not pass through the jurisdiction.	
Freight rail vehicles operating within the community boundary		Source		x				Includes freight train emissions	301
Marine	Marine vessels operating within the community boundary	Source					NE	No data available	
	Use of ferries by the community	Activity					NE	No data available	
Off-road surface vehicles and other mobile equipment operating within the community boundary		Source		x				Included in the Transportation sector.	6,635
Use of air travel by the community		Activity				x		Included in Appendix A Household Emissions totals, but data not available separately for this source.	
Solid Waste									
Solid Waste	Operation of solid waste disposal facilities in the community	Source		x				There is one landfill in the jurisdiction that is included.	6,111
	Generation and disposal of solid waste by the community	Activity	x	x				Included in the Solid Waste sector.	1,084
Water and Wastewater									

Potable Water - Energy Use	Operation of water delivery facilities in the community	Source					IE	These emissions are included in the Water sector and are not shown separately.	
	Use of energy associated with use of potable water by the community	Activity	x	x				Included in the Water sector.	82
Use of energy associated with generation of wastewater by the community		Activity	x	x			IE	Included in the Energy sector.	
Centralized Wastewater Systems - Process Emissions	Process emissions from operation of wastewater treatment facilities located in the community	Source		x				No WW TP exists in Brisbane	
	Process emissions associated with generation of wastewater by the community	Activity	x	x				Included in the Wastewater sector.	72
Use of septic systems in the community		Source AND activity					NE		
Agriculture									
Domesticated animal production		Source					NO		
Manure decomposition and treatment		Source					NO		
Upstream Impacts of Community-Wide Activities									
Upstream impacts of fuels used in stationary applications by the community		Activity					NE		
Upstream and transmission and distribution (T&D) impacts of purchased electricity used by the community		Activity					NE		
Upstream impacts of fuels used for transportation in trips associated with the community		Activity					NE		
Upstream impacts of fuels used by water and wastewater facilities for water used and wastewater generated within the community boundary		Activity					NE		

Upstream impacts of select materials (concrete, food, paper, carpets, etc.) used by the whole community	Activity				x	NE	Some sources included in Appendix A Household Emissions totals, but data not available separately for this source.	
Independent Consumption-Based Accounting								
Household Consumption (e.g., gas & electricity, transportation, and the purchase of all other food, goods and services by all households in the community)	Activity				x		Included in Appendix A Household Emissions totals, but data not available separately for this source.	
Government Consumption (e.g., gas & electricity, transportation, and the purchase of all other food, goods and services by all governments in the community)	Activity					NE	Not estimated separately at this time.	
Life cycle emissions of community businesses (e.g., gas & electricity, transportation, and the purchase of all other food, goods and services by all businesses in the community)	Activity					NE	Not estimated at this time.	
							TOTAL:	**148,025**