AECOM
2022 J Street
Sacramento, CA 95811
www.aecom.com

916.414.5800 tel
916.414.5850 fax

Memorandum

To	Matt Walsh Solano County Department of Resource Management	Page	1
CC			
Subject	Technical Memo – Solano County GHG Emissions Inventory and Projections		
From	Jeff Henderson and George Lu		
Date	March 5, 2010		

INTRODUCTION

The purpose of a greenhouse gas (GHG) emissions inventory is to identify sources and levels of GHG emissions to enable policy makers to implement cost-effective GHG-reduction strategies, in policy areas over which they have operational or discretionary control.

Solano County and AECOM have developed a GHG emissions inventory (inventory) for community-wide and municipal GHG emission sources for the 2005 base year in the unincorporated County area. This inventory will be used to establish an emissions baseline for the Climate Action Plan (CAP).

The GHG inventory is expressed by sector. A "sector" is a distinct subset of a market, society, industry, or economy, whose components share similar characteristics. With respect to GHG inventories, sectors can be thought of as public or private, with associated subsectors, although the Intergovernmental Panel on Climate Change (IPCC) defines sectors that cut across the public and private sectors: such as energy, industrial processes and waste. For purposes of the Solano County GHG inventory, the government-related (i.e., municipal) and communitywide emissions are separated, and further broken down into categories of energy consumption (residential/commercial/industrial), transportation (on-road mobile sources), solid waste, and agriculture.

No government agency in California, including the California Air Resources Board (ARB), local air districts, or the Governor's Office of Planning and Research (OPR) has established a standard protocol for the development of community-wide GHG emissions inventories. Therefore, the County has flexibility in defining the methodology to be used for the inventory.

Table 1 and Exhibits1, 2 and 3 summarize the magnitude and relative contribution of 2005 baseline and 2020 projected emissions for each sector. A summary of the baseline (2005) GHG emissions, 2020 projections, and calculation methodologies employed are provided in the sections that follow.

Table 1 Solano County Unincorporated Area GHG Baseline (2005) and Projected (2020) Emissions		
Emissions Sector	**Baseline (2005) MT CO_2e (Percent of Total Emissions)**	**Projected (2020) MT CO_2E (Percent of Total Emissions)**
Residential – Electricity	17,525 (1.0%)	19,040 (1.0%)
Residential – Natural Gas	7,470 (0.4%)	8,542 (0.4%)
Commercial/Industrial – Electricity	35,692 (2.0%)	37,551 (2.0%)
Commercial – Electricity	7,671 (0.4%)	8,070 (0.4%)
Commercial – Natural Gas	31,854 (1.8%)	33,094 (1.7%)
Industrial – Electricity	3,592 (0.2%)	3,595 (0.2%)
Industrial – Natural Gas	15,689 (0.9%)	12,277 (0.6%)
Industrial – Off-Road and Stationary Sources	890,695 (50.1%)	890,695 (46.4%)
Transportation – Motor Vehicles	473,862 (26.6%)	596,827 (31.1%)
Transportation – Rail and Boats	17,403 (1.0%)	18,715 (1.0%)
Solid Waste	76,778 (4.3%)	86,410 (4.5%)
Agriculture	201,888 (11.3%)	201,888 (10.5%)
Total	**1,780,120 (100%)**	**1,916,703 (100%)**

Sources: Solano County 2009; AECOM 2010.

Notes: Emissions may not appear to add exactly due to rounding.
MT CO_2e = metric tons carbon dioxide equivalent

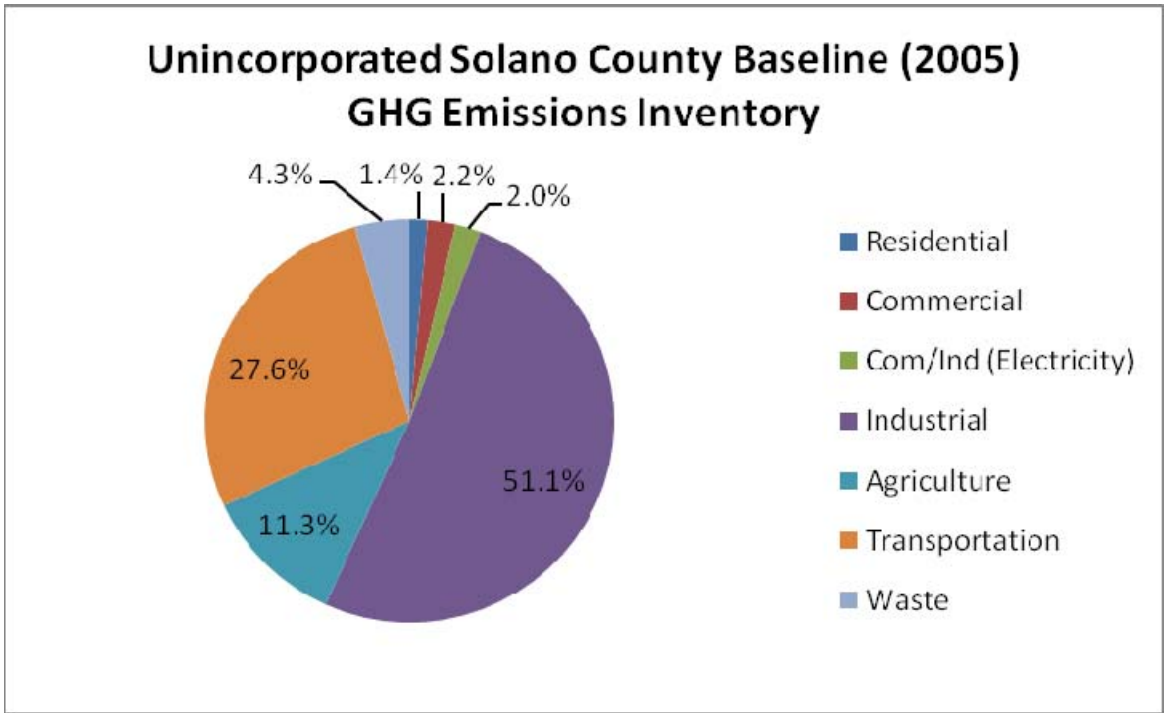

Exhibit 1: Unincorporated Solano County Baseline (2005) GHG Emissions by Sector

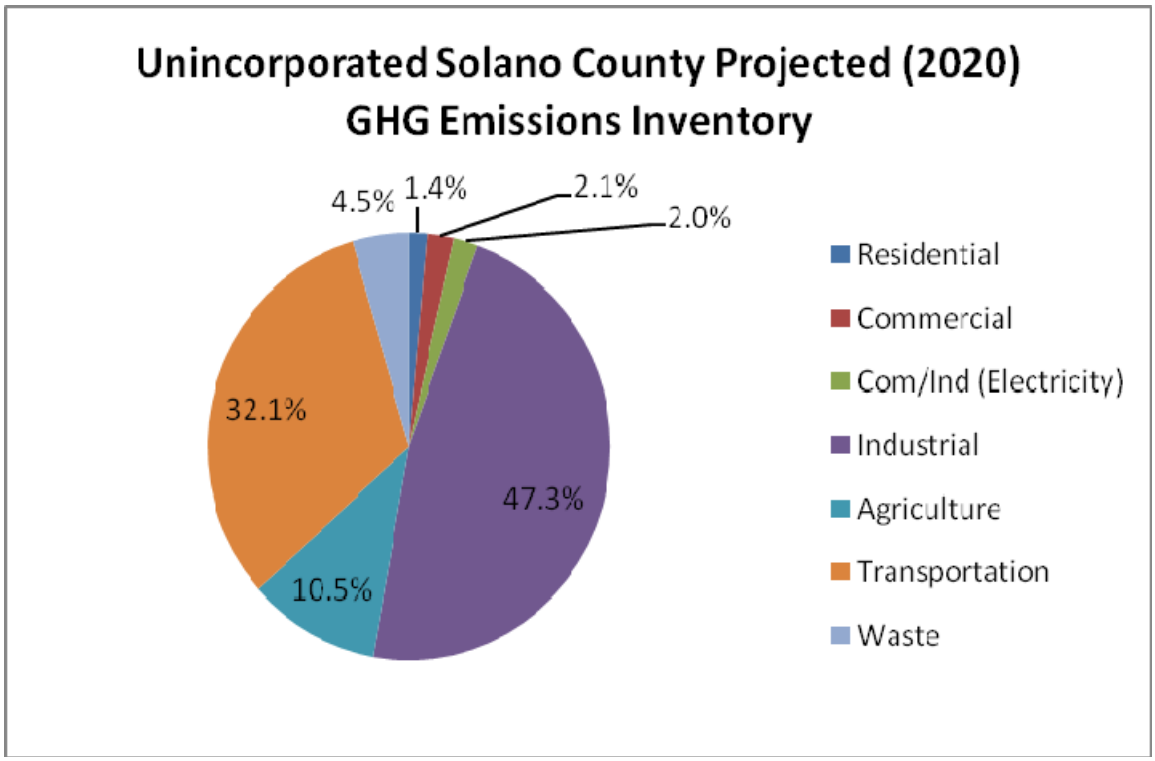

Exhibit 2: Unincorporated Solano County Projected (2020) GHG Emissions by Sector

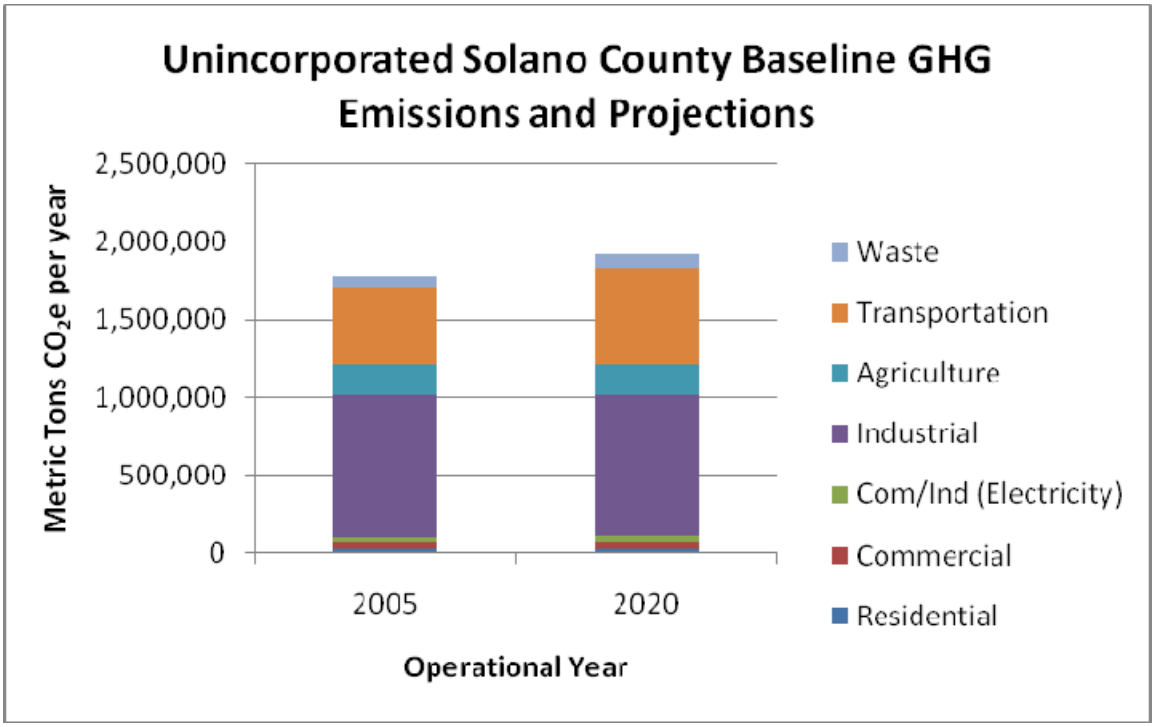

Exhibit 3: Unincorporated Solano County GHG Emissions by Sector: 2005 and 2020

2005 GHG EMISSIONS INVENTORY

In 2010, the County developed a greenhouse gas (GHG) emissions inventory for the operational year 2005, which represents baseline conditions for the Climate Action Plan (CAP). The following sections describe the methods used to develop the County's 2005 GHG emissions inventory.

Energy Consumption

The energy consumption sector includes electricity and natural gas combustion processes used to generate energy used in residential, commercial, and industrial contexts. Pacific Gas and Electricity (PG&E) supplies both electricity and natural gas to the unincorporated County.

Residential

PG&E provided 2005 residential electricity and natural gas consumption data for the unincorporated County. An electricity delivery emission factor verified by the California Climate Action Registry (CCAR) and a natural gas delivery factor verified by CCAR and the California Energy Commission (CEC) was used to quantify GHG emissions associated with residential energy consumption.

Commercial and Industrial

Similar to the methods described above for the Residential subsector, PG&E provided commercial electricity and natural gas consumption data for the unincorporated County. Energy consumption data provided by PG&E is subject to the 15/15 Rule. As part of PG&E's 15/15 Rule, any aggregated information provided by the utilities must be made up of at least 15 customers and a single customer's load must be less than 15% of an assigned category. If the number of customers in the compliled data is below 15, or if a single customer's load is more than 15% of the total, categories must be combined before the information is released (e.g., aggregate commercial and industrial energy consumption). The 15/15 Rule was triggered for both non-governmental electricity users and total natural gas consumption data. Therefore, a portion of the commercial and industrial sectors' data was aggregated as one single sector. The lack of detailed information available from PG&E as a result of the 15/15 Rule limits the ability of planners and decision-makers to evaluate the contribution of specific energy use sectors. However, Bay Area Air Quality Management District (BAAQMD) staff was able to provide a percentage split between commercial and natural gas consumption (Tholen, pers. comm., 2009) as applied to the BAAQMD portion of the County. The natural gas consumption for commercial and industrial uses for the entirety of unincorporated Solano County was separated using this information. However, electricity consumption for both commercial and industrial uses was still aggregated as a single source for non-government uses. Nevertheless, the disaggregation of natural gas consumption allows the CAP to isolate emission reductions associated with natural gas reduction measures.

Industrial Sources

The Industrial subsector also included GHG emissions associated with stationary sources and off-road equipment. Stationary sources include facilities with a non-mobile emission source (e.g., emergency generator, turbine). Off-road equipment includes construction; lawn and garden equipment; industrial buildings, facilities and processes; and light-commercial equipment. The BAAQMD and the Yolo-Solano Air Quality Management District (YSAQMD) provided GHG emissions data for stationary sources located in the unincorporated County. Off-road equipment emissions were calculated from the BAAQMD's GHG emissions inventory using a top-down method. Off-road equipment GHG emissions were allocated to the County based on the County's population as a proportion of the total San Francisco Bay Area Air Basin (SFBAAB) population.

Transportation

The County's Transportation sector is comprised of local roadway and state highway vehicle miles traveled (VMT). Local roadway VMT was determined using the California Department of Transportation's (Caltrans) Highway Performance Monitoring System (HPMS) data and state highway VMT was provided by the Metropolitan Transportation Commission (MTC). Emission factors for gasoline- and diesel-fueled vehicles were obtained from the California Air Resources Board's (ARB's) vehicle emissions model, EMFAC2007 (ARB 2009).

The Transportation sector also included GHG emissions associated with boat and locomotive activity within the unincorporated County. Boat and locomotive GHG emissions were calculated from the BAAQMD's GHG emissions inventory using a top-down method. Boat and locomotive GHG emissions were allocated to the County based on the unincorporated area population relative to the total BAAQMD population.

Addressing Pass-Through VMT on State Highways

For the transportation sector, the County obtained separate VMT data for automobiles traveling on local roadway systems and state highways. It is anticipated that transportation-related CAP measures would be able to affect VMT from local roadways and state highways differently because of the jurisdictional limits of the County. Due to the geographic location of the County between the San Francisco Bay Area and the Sacramento Metropolitan area, a portion of the vehicle trips along state highways within the County would be pass-through trips. An example of a pass-through highway trip is a trip that originates in Sacramento County, and drives through Solano County along Interstate 80 en route to a destination in Contra Costa County. The vehicle trip did not begin nor end in Solano County and therefore the County does not have much ability to affect these trips and their associated emissions.

Approximately 1,837,431,501 annual VMT were associated with state highways in the unincorporated County in 2005, while 161,625,649 annual VMT were associated with local roadways in the unincorporated County. To avoid including activities and emissions that cannot be affected by the CAP, a methodology was developed in consultation with the Metropolitan Transportation Commission (MTC) to separate the portion of locally-generated (i.e., within the County) state highway VMT from the County's baseline emissions inventory. This methodology is designed to omit pass-through highway trips from the baseline emissions inventory by determining the ratio of locally-generated highway VMT to total state highway VMT within the unincorporated County. The analysis determined that approximately 38% of total state highway VMT in unincorporated Solano County was assumed to occur from trips internal to the unincorporated area. The County's total 2005 state highway VMT (1,837,431,501 VMT/year) was multiplied by 38% to estimate the locally-generated state highway VMT that would contribute to the County's GHG emissions baseline (approximately 692,928,621 VMT/year). Under this adjusted baseline scenario, local roadway VMT in the County contributes 18.9% of total annual VMT, whereas internal state highway VMT contributes 81.1% of total annual VMT. Attachment A provides a detailed description of the methodology employed to disaggregate through-trips from the baseline emissions inventory.

Solid Waste

Although both landfills are located within the County, unincorporated County residents and businesses only contribute a portion of the solid waste disposed at each landfill. Therefore, in order to avoid double counting the solid waste emissions and to isolate those waste emissions that can be affected by policies developed in the County's CAP, the solid waste emissions associated with the County were subtracted from the total Hay Road and Potrero Hills landfill emissions. The baseline GHG emissions inventory includes separate line items for the Hay Road landfill, Potrero Hills landfill, and the unincorporated

County's solid waste and alternative daily cover. Waste reduction measures in the CAP would only affect the County's solid waste and alternative daily cover, whereas waste management measures would affect all waste categories. Landfill emissions were quantified using the ARB's Landfill Emissions Tool, which allows the user to "build" a landfill by inputting the historical tons of disposed solid waste. The County-generated solid waste was calculated using ICLEI's CACP software, which allows the user to enter the annual solid waste and alternative daily cover tons (ICLEI 2009).

Agriculture

Agricultural Equipment

GHG emissions associated with agricultural equipment were calculated from the BAAQMD's GHG emissions inventory using a top-down method. Agricultural equipment GHG emissions were allocated based on the County's relative portion of land (i.e., acres) relative to the land area of the SFBAAB.

Livestock

The County's livestock subsector includes GHG emissions from enteric fermentation and manure management. The County's FARM Coordinator estimated the number of each type of livestock within the unincorporated area for the baseline year 2005. GHG emissions associated with enteric fermentation and manure management for each animal was calculated using emission activity data (i.e., grams of emission per head of livestock) from the ARB's GHG emissions inventory (ARB 2009).

Soil Fertilization

ARB recommends that GHG inventories be developed using bottom-up quantification rather than top-down methods. To develop a bottom-up calculation for soil fertilization, the University of California at Davis' *Current Cost and Return Studies*, which provide cost-effective fertilization rates for a variety of crop types, were used to estimate the amount of nitrogen applied to crops within the County (UC Davis 2010). The fertilization rates were multiplied by the corresponding acres of each crop type from the *Solano County 2005 Crop and Livestock Report* to obtain total nitrogen applied for soil fertilization in 2005 (Solano County 2006). The IPCC emission factor for nitrous oxide (N_2O) volatization was used to calculate N_2O emissions resulting from soil fertilization. This bottom-up quantification method allows incentivized reduction measures (e.g., minimizing fertilizer application) to influence specific crop types and fertilization rates.

Residue Burn

Using methods identical to the ARB GHG emissions inventory (ARB 2009), the County added GHG emissions associated with residue burn of row crops. The residue burn emissions represent approximately 3% of the total agricultural sector.

Pesticide Application

During a CAP Focus Group meeting, a member posed a question regarding the ability of pesticides to act as GHGs. This concern was addressed by reviewing pesticide application databases from the California Department of Pesticide Regulation to determine the amount of sulfuryl fluoride and methyl bromide used within the County (California Department of Pesticide Regulation 2009). These two pesticides are known GHGs. Sulfuryl fluoride has been used as a substitute for methyl bromide and has been designated a global warming potential (GWP) between 120 to 7,600. For the purposes of the inventory, a conservative GWP of 4,000 was used to calculate GHG emissions associated with the application of sulfuryl fluoride. Although methyl bromide is in the process of being phased-out, the pesticide application database still shows the use of methyl bromide in the County. The MT CDE of methyl bromide was calculated using a GWP of 5. Including these GHG emission sources allows the County greater opportunity to reduce agricultural and total GHG emissions in the CAP.

2020 GHG EMISSIONS PROJECTIONS

In order to determine the reductions necessary to achieve Solano County's GHG reduction target, the unincorporated County GHG emissions were projected for the calendar year 2020 under a trend scenario. In other words, projections were developed assuming that historical data and trends of one or more specific indicators (e.g., vehicle miles traveled, energy demand, and/or population) are representative of future year consumption rates for energy, water, and waste. Assuming that current trends and practices continue to occur, the County's GHG emissions are anticipated to increase to 1,916,703 MT CO_2e in 2020, an increase of approximately 8% over the 2005 baseline level. In comparison, population is expected to increase approximately 21% within the unincorporated County between 2005 and 2020 according to the Association of Bay Area Governments' (ABAG) 2009 Projections (ABAG 2009). This trend of GHG emissions increasing at a lower rate than population could be explained by advancements in emissions technology (e.g., more fuel efficient vehicles) outweighing the increase in future per capita activity levels (i.e., energy consumption, waste disposal, water consumption, and vehicle miles traveled).

A description of the methodology and information sources used to project the County's 2020 GHG emissions for each end-use sector (e.g., energy, transportation, waste, agriculture) is provided below. All GHG emissions have been calculated in MT CO_2e, which accounts for the GWP of N_2O, CH_4, and other GHGs. A summary of the unincorporated County's GHG emissions for the baseline year (2005) and 2020 was provided in Table 1 and Exhibits 1, 2 and 3.

Energy Consumption

In order to estimate GHG emissions associated with energy consumption in the unincorporated County in 2020, an annual average growth rate was applied to baseline (2005) electricity and natural gas consumption rates. The U.S. Department of Energy (DOE) Energy Information Administration (EIA) publishes annual reports that forecast electricity and natural gas consumption by land use type (i.e., residential, commercial, and industrial) for regions throughout the U.S. The Pacific Region forecasts from the *2010 Annual Energy Outlook* were used to calculate the annual average growth rate in electricity and natural gas consumption for residential, commercial, and industrial land uses in the unincorporated County (EIA 2010).

As a result of PG&E's 15/15 Rule, the baseline inventory aggregated the non-government (i.e., private consumers) commercial and industrial electricity consumption. Therefore, the non-government commercial and industrial electricity consumption was projected using the average of the commercial and industrial annual average growth rates from EIA. The 15/15 Rule also affected total commercial and industrial natural gas consumption. However, using information provided in the BAAQMD emissions inventory, natural gas consumption for commercial and industrial uses was separated (Tholen, pers. comm., 2009). Although a portion of Solano County is not located in the SFBAAB, for purposes of this analysis, the BAAQMD-provided natural gas commercial-industrial split was used for the entire unincorporated County.

For 2020, annual average growth rates were developed from EIA forecasts from 2008 to 2020. The growth rates were then applied to the baseline energy consumption (i.e., kilowatt-hours or therms) to project 2020 electricity and natural gas consumption for residential and commercial/industrial land uses. Table 2 presents the annual average growth rates for land uses and energy sources between 2008-2020 provided by EIA.

The Industrial sector also contains off-road equipment and stationary source GHG emissions. For the purposes of these projections, both of these sources were assumed to remain constant between 2005 and 2020. For off-road equipment, the level of landscape maintenance, construction, industrial, and light commercial operations were assumed to increase slightly in 2020 due to growth. However, advancements in emissions and equipment technology (e.g., off-road equipment tier standards) would offset operations growth. The same assumption was applied to stationary sources within the County. These are qualitative assumptions to support the CAP.

Table 2
Summary of Energy Consumption Growth Rates from Energy Information Administration

Sector - Energy Source	Average Annual Growth Rate (2007-2020)
Residential – Electricity	0.60%
Residential – Natural Gas	0.95%
Commercial – Electricity	0.72%
Commercial – Natural Gas	0.25%
Industrial – Electricity	0.05%
Industrial – Natural Gas	-1.62% [1]
Commercial/Industrial – Electricity	0.38%

Source: EIA 2010.
[1] The negative average annual growth rate indicates a decrease in natural gas consumption for industrial land uses.

The baseline year (2005) emissions inventory calculations were based on PG&E-specific emission factors for electricity and natural gas consumption. The electricity delivery factor was verified by CCAR and the natural gas delivery factor was verified by CCAR and the CEC. Although it is anticipated that electricity, and to a lesser extent, natural gas delivery emission factors would decrease with time and improved technology, these are the most accurate emission factors for the County's energy consumption available at this time.

As shown above in Table 1, the GHG emissions associated with residential energy consumption in the County (i.e., electricity and natural gas) are projected to increase by 2,587 MT CO_2e between 2005 and 2020, a 10% net increase. GHG emissions associated with commercial and industrial energy consumption (i.e., electricity and natural gas consumption, not including off-road equipment and stationary sources) are projected to decrease by 1,550 MT CO_2e between 2005 and 2020; a 3% net decrease.

Transportation
The 2020 transportation sector was projected using historical Solano County-specific vehicle travel data (e.g., VMT) from Caltrans and the MTC. An annual average VMT growth rate of 0.4% was calculated based on historical VMT data on local public roads in unincorporated Solano County from 1999 to 2005 (Caltrans 2009). For the state highway VMT, Caltrans' historical data (1999 to 2005) for state highway VMT within Solano County was used to develop an annual average VMT growth rate (3.3%) (Caltrans 2009). The appropriate annual average growth rate was then applied to the County's baseline VMT data to estimate the County's 2020 VMT.

In order to calculate projected CO_2 emissions from the transportation sector, a Solano County-specific emission factor for gasoline and diesel fuel in units of grams per gallon was obtained from EMFAC2007 (ARB 2009). Forecasted Solano County vehicle activity data (i.e., population, VMT, and fuel consumption) in 2020 by vehicle class, obtained from EMFAC2007, was used to calculate weighted-

average fuel efficiencies (i.e., miles per gallon) for gasoline and diesel vehicles. The projected 2020 VMT data for gasoline and diesel (described above) was then divided by the weighted-average fuel efficiencies to calculate gallons of gasoline and diesel fuel consumed. The total gallons of gasoline and diesel fuel consumed were then multiplied by the EMFAC2007 Solano County-specific emission factors to calculate CO_2 emissions.

Emission factors for N_2O and CH_4 in units of grams per mile were obtained from the CCAR *General Reporting Protocol* Version 3.1 (CCAR 2009). The *General Reporting Protocol* provides N_2O and CH_4 emission factors for gasoline- and diesel-fueled vehicles by vehicle class. The emission factors for gasoline and diesel vehicles were weighted using Solano County-specific vehicle class population and distribution from EMFAC2007. Weighted N_2O and CH_4 emission factors for gasoline and diesel vehicles were then multiplied by the projected 2020 VMT to calculate N_2O and CH_4 emissions. Finally, N_2O and CH_4 were weighted by their GWP and added to CO_2 emissions to obtain MT CO_2e.

As shown in Table 1, the County's total transportation-related GHG emissions are expected to increase by 124,277 MT CO_2e between 2005 and 2020, a 25% net increase. Although local roadway VMT is anticipated to slightly increase in 2020, the GHG emissions associated with local roadway VMT are projected to decrease due to increases in fuel efficiency, emissions technology, and vehicle turnover which outweigh the increase in VMT. However, when local roadway emissions are added to the increase in state highway VMT, the total transportation emissions result in a net increase of GHG emissions.

The transportation sector also includes GHG emissions from boats and locomotives operating within the County. The EIA Energy Outlook reports contain forecasted energy consumption associated with boats and locomotives. Similar to the method for energy consumption, the annual average growth rates in energy consumption from 2008-2020 for boats and rails from the 2020 EIA Energy Outlook Report were applied to 2005 boat and rail emissions to estimate 2020 GHG emissions (EIA 2010). Boat and locomotive GHG emissions are anticipated to increase by 922 and 390 MT CO_2e between 2005 and 2020, respectively, which represents an approximate 7.5% and 7.6% increase, respectively.

Solid Waste

Municipal solid waste generation occurs during the day-to-day activities of citizens and/or employees within the County. Therefore, 2020 solid waste disposal was projected using population and job projections from the ABAG 2009 Projections, assuming that solid waste disposal is directly correlated with the number of residents and jobs within the unincorporated County. The 2009 ABAG Projections are anticipated to be the most applicable and accurate indicator of the County's population and employment growth. In order to account for the relative contributions of residential and commercial land uses to the County's total solid waste generation, the ratio of solid waste generated by residential and commercial land uses, provided by CalRecycle, was used to calculate a composite and weighted annual average growth rate (CalRecycle 2010). The weighted annual average growth rate was then applied to the baseline waste emissions to estimate 2020 solid waste-related GHG emissions.

Agriculture

The future of the County's agricultural industry is a multi-faceted and complex subject. During a CAP Focus Group meeting, several farmers expressed highly variable predictions for the future of the County's agricultural industry. ARB has not yet established indicators or a methodology to evaluate the change in California's agricultural sector over the next 10 years. It is acknowledged that from 2005 to 2020, crop types will fluctuate as a result of economic, resource-limiting, and climate factors. Agricultural land is not anticipated to increase in size due to the spread of urbanization. However, the rise in the

County's and state's population is expected to put pressure on agricultural lands across California to intensify practices and increase yields. Therefore, due to the intricate and debatable nature of the agricultural industry's future, emissions within the Agriculture sector were assumed to remain constant from 2005 to 2020.

GOVERNMENT-RELATED EMISSIONS

Government-related (municipal) GHG emission sources, which include government buildings, vehicle fleets, solid waste, streetlights, and other government-owned/operated facilities, can be considered a subset of the community-wide emissions inventory. Government emissions were inventoried for year 2005 based on the availability of data. Government-related emissions are summarized in Table 3 and Exhibit 4.

Table 3
Solano County 2005 Government-Related Greenhouse Gas Emissions

Government Sector	MT CO_2e	Percent
Buildings and Facilities	6,668	38.9%
Vehicle Fleet	4,001	23.3%
Streetlights and Traffic Signals	37	0.2%
Electric Power	6,401	37.3%
Airport	52	0.3%
Total	**17,159**	**100%**

Source: Data compiled by AECOM 2009 from the Solano County Greenhouse Gas Emissions Inventory.

Notes: CO_2e = carbon dioxide equivalent; MT= metric tons.

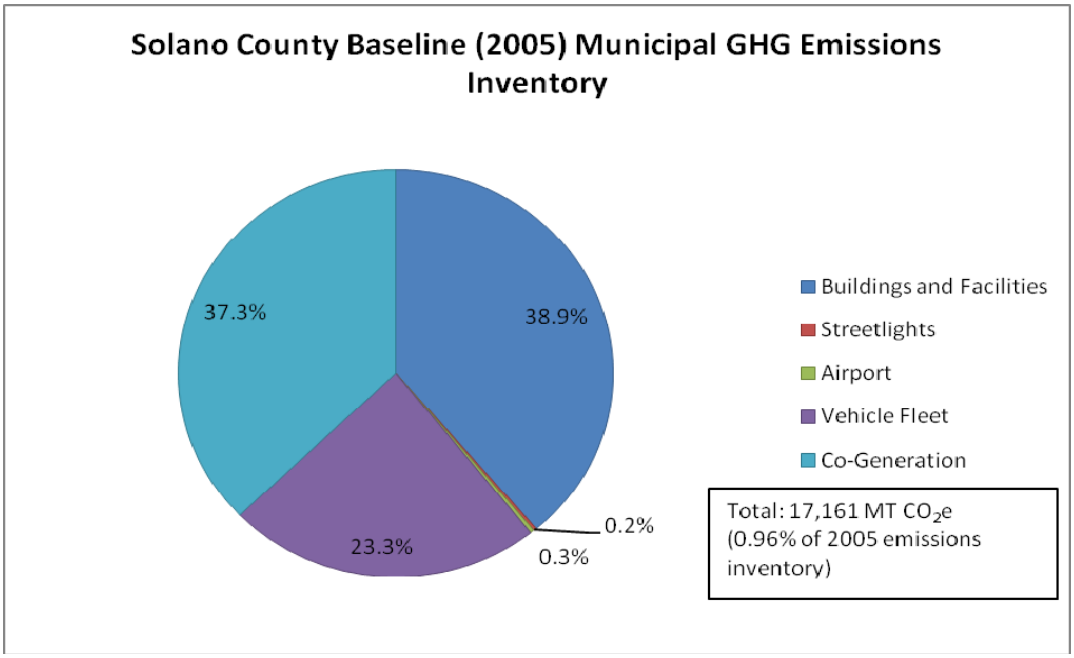

Exhibit 4: Solano County 2005 Municipal GHG Emissions Inventory by Source

As shown in Exhibit 5, Solano County's current municipal emissions make up approximately 0.96% of the unincorporated County's communitywide emissions profile.

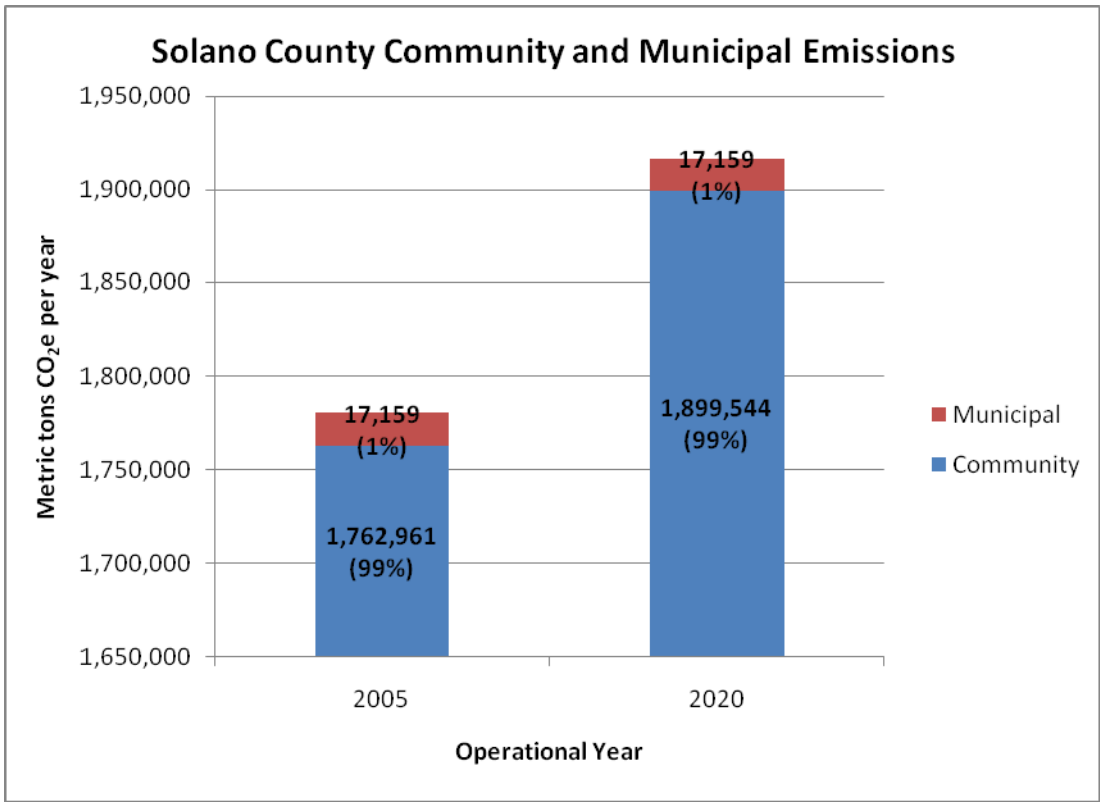

Exhibit 5: Solano County Community and Municipal Emissions – 2005 and 2020

REFERENCES

Association of Bay Area Governments (ABAG). 2009. *Projections 2009.*

California Air Resources Board. 2009. EMFAC 2007 Release. Available: <http://www.arb.ca.gov/msei/onroad/latest_version.htm>. Accessed January 13, 2010.

California Air Resources Board (ARB). 2009. Greenhouse Gas Inventory Data – 2000-2006. Available: < http://www.arb.ca.gov/cc/inventory/data/data.htm>. Accessed February 8, 2010.

California Climate Action Registry. 2009 (January). *General Reporting Protocol Version 3.1*. Available at <http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html> Accessed February 27, 2009.

California Department of Pesticide Regulation. 2009. 2005 Annual Pesticide Use Report Indexed by Commodity: Solano County. Available: <http://www.cdpr.ca.gov/docs/pur/pur05rep/comcnty/solano05_site.pdf>. Accessed February 8, 2010.

California Department of Transportation. 2009. Vehicle Miles of Travel on State Highway System. Available: <http://www.dot.ca.gov> . November 30, 2009.

California Department of Transportation. 2010. HPMS Data Library. Available: <http://www.dot.ca.gov/hq/tsip/hpms/datalibrary.php>. Accessed January 13, 2010.

CalRecycle. 2010. Jurisdiction Profile Overview for Solano County (unincorporated). Available: <http://www.calrecycle.ca.gov/Profiles/Juris/JurProfile1.asp?RG=U&JURID=499&JUR=Solano%2DUnincorporated>. Accessed February 8, 2010.

Energy Information Administration. 2010. Annual Energy Outlook 2010: Supplemental Tables: Consumption & Prices by Sector & Census Division. Available at < http://www.eia.doe.gov/oiaf/aeo/supplement/supref.html>. Accessed February 20, 2010.

ICLEI. 2009. CACP Solano County GHG Emissions Inventory provided by Kathleen Hart, Solano County. November 30, 2009.

Solano County Department of Agriculture. 2006. 2005 Crop and Livestock Report. Available: < http://www.co.solano.ca.us/depts/agriculture/agriculture/crop_report.asp>. Accessed December 10, 2010.

Tholen, Greg. Bay Area Air Quality Management District 2009. Email to Heather Phillips of AECOM regarding relative proportion of Commercial/Industrial sector natural gas emissions from BAAQMD's GHG Emissions Inventory (December 2008).

UC Davis Department of Agricultural and Resource Economics. 2010. Current Cost and Return Studies. Available: < http://coststudies.ucdavis.edu/current.php>. Accessed February 8, 2010.

ATTACHMENT A:
THROUGH-TRIP DISAGGREGATION METHODOLOGY

MTC's 2006 Bay Area Simplified Simulation of Transportation Energy and Greenhouse Gases (BASSTEGG) provides data for each Travel Analysis Zone (TAZ) within Superdistricts 25 and 26, which represent the unincorporated areas of Solano County. This data was used to approximate 2005 conditions. Output from the BASSTEGG model includes locally-generated (internal) average VMT per household (HH) per TAZ and total internal VMT per TAZ. The data was sorted in ascending order by average VMT per HH per TAZ. The data ranged from an average of 40.07 VMT/HH/day to 76.63 VMT/HH/day across the TAZs in the unincorporated County.

A distribution of estimated worker-commute trip times (i.e., duration [minutes] of commute trip) for each census tract was collected for the unincorporated County and aligned with corresponding TAZs. Assuming that commute trips that exceeded 20 minutes would use the highway system, the frequency of commute trips greater than 20 minutes was used to calculate the percentage of vehicle trips that would likely use the highway system. Residents that would work from home were not included in this percentage. A range of 47-79% of trips in the County's TAZs was therefore assumed to use the highway system.

A gradient of 40-80% was applied to the ascending dataset of average VMT/HH/TAZ to represent the length of the trip that would occur on the highway system. In other words, it was assumed that 40-80% of a highway trip's distance would occur on a highway segment, with an incremental increase of approximately 2% highway VMT for each TAZ in the dataset.

The percentage of locally-generated VMT occurring on state highways per TAZ was then multiplied by total VMT/TAZ and summed to derive the total locally-generated state highway VMT in the unincorporated County.