CSA Group
Corporate Greenhouse Gas Inventory for North American Operations

Fiscal Year 2006-2007

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Introduction

This case study is the Canadian Standards Association (CSA) Group greenhouse gas (GHG) inventory for the 2006/2007 fiscal year.

CSA Group is an independent, not-for-profit membership association serving business, industry, government and consumers. CSA Group consists of three divisions: Canadian Standards Association, a leading solutions based standards organization, providing standards development, application products, training and advisory services; CSA International, which provides testing and certification services for electrical, mechanical, plumbing, gas and a variety of other products; and OnSpeX, a provider of consumer product evaluation, inspection and advisory services for retailers and manufacturers. During the 2006/2007 fiscal year, CSA Group also had a division known as QMI which focused on auditing organizations seeking compliance with ISO 9001 and 14001 standards.

CSA Group undertook to compile its first corporate greenhouse gas (GHG) inventory of its North American operations during fiscal year 2006/2007 to understand and manage its carbon footprint. This report presents the findings of that exercise. The report follows the CSA/ISO 14064-1 standard entitled *Specification with Guidance at the Organization Level for Quantification and Reporting of Greenhouse Gas Emissions and Removals.* The information contained in the report has been verified by an independent third party according to the CSA/ISO 14064-3 standard entitled *Specification with Guidance for the Validation and Verification of Greenhouse Gas Assertion.* The inventory is registered on the CSA's GHG CleanStart™.

Measures will be undertaken to improve CSA Group's GHG footprint internally in future years. GHG emission reductions or removals have been acquired to offset unavoidable emissions identified in the 2006/2007 inventory.

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Reporting Period

The inventory covers the 2006/2007 fiscal year from April 1st 2006 to March 31st 2007.

Organizational Boundaries

CSA Group is a global company with offices in North America, Asia and Europe. In 2006/2007 CSA Group worked in four main areas:

- Certification and testing of products for safety and performance in the Canadian and U.S. marketplace;
- Development and publication of Canadian standards in the areas of built environment, health and safety, accessibility, resource management and environmental management;
- Registration of quality (ISO 9001) and environmental (ISO 14001) management systems;
- Education and training on CSA standards.

CSA Group undertook to compile its first corporate greenhouse gas (GHG) inventory of its North American operations during fiscal year 2006/2007 to understand and manage its carbon footprint. The corporate organizational boundaries for the inventory were defined according to the requirements of **clause 4.1 of the CSA/ISO 14064-1 standard**. The following specifications were adhered to in defining organizational boundaries:

- The control approach was used for consolidation of corporate GHG emissions. Therefore 100% of emissions were accounted for at facilities or for operations where CSA Group exercised financial or operational control;
- The organizational boundaries were limited to operations within North America for purposes of practicality, data availability and economic efficiency. Since the 2006/2007 corporate CSA Group inventory was viewed as a learning experience on GHG accounting, it was determined that only corporate North American GHG emissions would be considered for this first year of GHG inventory production:
    - It was determined that staff resources and expertise for producing a GHG inventory within CSA Group were limited. It was necessary to limit the geographic scope of the first corporate GHG inventory exercise for practical reasons;
    - It was also determined that data for North American operations would likely be more readily available and accessible than for operations in Asia and Europe;
    - Also, language barriers would not need to be addressed if the geographic scope was limited to North America;
    - Finally, the budget for this first production of a corporate GHG inventory was limited and it was necessary to focus the scope to North American operations given that most of the compilation work could be performed using teleconference facilities;
    - The GHG verification process would be manageable from a cost perspective since it would not be necessary to visit distant facilities;
    - Lessons learned from the 2006/2007 inventory will be applied to conduct a cost effective inventory of CSA Group's global operations in 2007/2008.

Operational Boundaries- Selection of GHG Sources, Sinks and Reservoirs

Five GHG sources were determined to be relevant within the organizational boundaries:

- *Air Travel of Employees*
- *CSA Group Vehicle Fleet*
- *Energy Indirect Emissions*
- *Direct Building Emissions*
- *Auditor and Inspector Vehicle Emissions*

Using the ISO 14064-1 method of classification, as outlined within section 5.1 of the standard, the above identified sources of GHG were categorized into appropriate fields, as shown within Table 1.

Emission Source	CSA/ISO 14064-1 Emissions Classification
Air Travel of Employees	Other Indirect Emissions
Energy Indirect Emissions	Energy Indirect Emissions
Direct Building Emissions	Direct Emissions
Auditor and Inspector Vehicle Emissions	Direct Emissions
CSA Group Vehicle Fleet	Direct Emissions

Table 1: GHG Emissions Classification from CSA/ISO 14064-1[1]

Some potential sources were excluded. For example:

- Travel to and from airports by employees;
- Other car, bus or train travel by employees for business;
- Employee commuting;
- Travel resulting from work performed by consultants on behalf of CSA Group's divisions, such as auditors working under short term contracts for QMI or from CSA members traveling for committee meetings.

These sources were primarily excluded because there are currently no tracking systems to gather this type of information. Including this information in the "Other Indirect" Emissions category is not currently technically feasible.

[1] 'Defined Categories' from CSA/ISO 14064-1 Definitions; Section 5.1

It was considered important to include Employee Air Travel and CSA Group Fleet/Auditor and Inspector Vehicle emissions in the “Other Indirect” category as they proved significant in determining the magnitude of emissions in the corporate GHG inventory. Later inventories are expected to include a broader range of sources as well as an expanded organizational boundary.

No sinks or reservoirs were identified within the organizational or operational boundaries; therefore there are no GHG removals in this GHG inventory.

In addition, there are no CO_2 emissions from the combustion of biomass because all combustion related emissions are from fossil fuels either used for space heating, certification and testing or transportation.

Base Year

The 2006/2007 GHG inventory will form a historical base year for future inventories. This is the first corporate GHG inventory which CSA Group has completed. It is likely that the base year inventory will need to be revised as the organizational and operational boundaries of the GHG inventory are expanded.

Quantification Methodologies

The methodologies used to collect and assess emissions data varied throughout the inventory. The primary methodology used was multiplying GHG activity data by appropriate GHG emission factors. All methodologies used were selected based on their ability to provide accurate and consistent results. The use of activity data and emission factors was feasible due to the availability of both accurate activity data for the majority of sources and standard emission factors from reputable organizations.

There have been no changes to the prescribed methodologies used within this inventory, as this is the first reporting year. If changes to any of the identified methodologies occur, they will be quantified and explained in detail in future inventories. There is some room for improvement in future inventories, particularly in obtaining activity data for leased buildings and rental vehicles.

Air travel of employees - Other Indirect Emissions

1) Methodology

a) Compilation of a list of all CSA Group North America employees and accompanying spouses (when applicable) and their respective flight totals:

- Corporate Finance accessed and downloaded the CSA Group travel agent's (Carlson Wagonlit) database and retrieved a list of all of the flights taken by each employee during the time period.

- Carlson Wagonlit uses a proprietary automated analysis system. The data is processed by Carlson Wagonlit whenever reservations are made for CSA Group employees. All CSA Group North American employees are officially requested to book business flights through the Carlson Wagonlit Travel Agent. The national account manager is based in Toronto;

- The data is subject to all data protection laws and is retained by Carlson Wagonlit, as the data controller;

- Carlson Wagonlit is able to retrieve this data in report or database form for any defined time period, as was done for the 2006/07 fiscal year;

- The full report is available as an Excel spreadsheet. The column headings include:
  - i. Passenger name
  - ii. Employment status
  - iii. Country of Departure City
  - iv. Customer name (CSA Standards, QMI or CSAI)
  - v. Total miles and kilometres flown
  - vi. Departure and arrival cities
  - vii. Percent of total miles for each flight
  - viii. International or domestic
  - ix. Airline name
  - x. Date of Travel

- A report for the fiscal year 2007/08was later requested, this one including:
  i. Passenger name
  ii. Departure Date
  iii. Origin Airport Name
  iv. Destination Airport Name
  v. Flight Duration
  vi. Flown Airline Code
  vii. Service Class
  viii. Ticket Number
  ix. Sub trip Miles

  This data was then broken down by class (business, economy, first, unknown). The distance flown for all business class, first class, and any unknown class flights over 5 hours in duration (as per CSA travel policy) was summed to determine the total kilometres flown in business class. All economy class flights and any unknown class flights under five hours in duration were considered to be economy class, and the total km flown in this category was calculated. From these totals, the percentage of long-haul flights flown in business class and economy class were determined, and applied to the full data set.

- The distance of each flight was provided in standard miles. This was converted into kilometres using the conversion factor 1 mile = 1.609 km[2]. From this information the total number of short, medium and long haul kilometres flown could be found by summing the appropriate columns;

- In some cases the kilometres for a flight were either a negative number or zero. The negative distances refer to flights that were cancelled. Zero distance refers to transactions that did not involve additional flights including upgrades or changes. To clean up the spreadsheet, all zero distance flights were deleted- with no effect on the final numbers and negative flights were deleted as long as it could be seen which flight had been cancelled and that flight could also be deleted, leaving no effect on the final values;

b) Aggregation of employee flights and find total kilometres flown:

- Each flight was categorized as short, medium or long, using the following guidelines from *The Greenhouse Gas Protocol Initiative*,

[2] http://www.epa.gov/ttn/chief/ap42/appendix/appa.pdf

World Resources Institute (WRI)[3]. This was done using 'if' statements in the Excel spreadsheet.

Category	Flight Distance (km)
Short	<500
Medium	500-1600
Long	>1600

Table 2: Categories for defining air travel trip-length [4]

c) Calculation of total CO_2 emissions from all CSA Group employee flights:

The total distance travelled was calculated separately for each haul group in order to account for varying emission factors shown in Table 3. The emission factors used are highlighted in gray.

Flight Type	gCO_2/pkm
Domestic	
Weighted Average	175.3
Short-Haul	
Economy	93.7
Business	140.5
Weighted Average	98.3
Long-Haul	
Economy	80.7
Economy+	129.1
Business	234
First Class	322.8
Weighted Average	110.6

Table 3: Emission factors used for air travel[24]

- For the CSA inventory it was assumed that medium length flights were aboard aircraft with both economy and executive seating. It is CSA company policy that all flights under five hours in length are taken in economy seats and flights over five hours are taken in business class As per this policy, all short-haul flights and any long haul flights under 5

[3] http://www.ghgprotocol.org/calculation-tools/all-tools
[4] For *Air, Rail, Bus and Car Travel, Business Travel, Service Sector, Version 2.0, GHG Protocol Initiative, August 2005* http://www.ghgprotocol.org/calculation-tools/all-tools
[24] Table 4, Page 10, http://www.defra.gov.uk/environment/business/reporting/pdf/passenger-transport.pdf

hours were assumed to be economy and long haul flights over five hours were assumed to be business class.

- The total long-haul kilometres flown was multiplied by each of the percentages of long-haul flights flown in business and economy from the fiscal year 2007/08 GHG inventory to calculate the number of kilometres flown business and economy class. It has been assumed that CSA employee travel patterns remain constant year-to-year unless policy changes are made. Since no such changes have been made, and no apparent differences in travel patterns have been made, the fiscal year 2007/08 percentage of long-haul flights in business and economy class have been used for the recalculation of the fiscal year 2006/07, and will be used for all future inventories until a change in traveller patterns is found.

- The total number of kilometres in each category was multiplied by the relevant emission factor for each category to give total CO_2 emissions in grams, which was then converted to tonnes (1 tonne = 1000000 grams).

- Emissions can be further subdivided into Canadian and American based emissions based on the percentage of kilometres flown by employees from each country. Determining the country of employment of each employee is difficult from the Carlson Wagonlit data report and must be completed manually- this method will be used in future. For this inventory the data was collected in several stages. During the earlier stages, a team member from corporate finance assigned a country to each employee. From this the percentage of Canadian and US emissions was found. It is no longer known if this is completely accurate, however it was used as an estimate throughout the remainder of the inventory process. The percentage split was 62% Canadian emissions and 38% US emissions and these percentages were multiplied by the overall emission totals.

d) Verification of accuracy of results

- Results were checked using two websites: http://www.aircanada.com/en/travelinfo/traveller/zfp.html and https://www.greenmyflight.com/calculator/default.cfm;

- The air distance from Ottawa to Toronto is 363.8 km (greenmyflight.com). Emissions which Air Canada associates with this flight are 0.1 tonnes CO_2 per flight per passenger. Greenmyflight states that 49.4kg per person of emissions are released in such a flight. Using the methodology described above and the emission factor found for short flights, the amount of CO_2 emitted was approximately 34.1 kg CO_2;

363.8 km = short haul flight

$$\begin{aligned} CO_2 \text{ emissions} &= 363.8 \text{ km} * 93.7 \text{ gCO2/pkm} \\ &= 34088.06 \text{ gCO}_2 \\ &= 0.03408806 \text{ tonnesCO}_2 \end{aligned}$$

Equation 1: Calculating emissions for a flight from Ottawa to Toronto

- This is the same order of magnitude as the Greenmyflight and Air Canada estimations, making the calculated emission estimate reasonable.

2) Estimation of Uncertainty

The level of uncertainty linked to this quantification methodology and the subsequent calculations in considered low. The Carlson Wagonlit database is considered to be a robust data collection system. The potential area for error is if employees book flights through other travel agents, or directly from the airline. The percentage of employees who do this is not yet known, although all employees are requested to use Carlson Wagonlit for all flights - both domestic and international. Both the data and the emission factors used are current and relevant for the inventory. The emission factors are taken from a reputable source, DEFRA. Statistical data regarding Canadian flight patterns was taken from Statistics Canada and Transport Canada. This data is available upon request.

CSA Group Fleet Vehicles-Direct Emissions

1) Methodology

a) Compilation of a list of CSA Group North American operations vehicles:

- The CSA Group fleet consisted of sixteen vehicles during the 2006/2007 fiscal year. Of these six were Vancouver based, eight Toronto based and two based in Cleveland;

- Full details of each vehicle were provided by Corporate Finance and are shown in the primary spreadsheet.

b) Compilation of activity data for each vehicle:

- Of the above vehicles, quantity of fuel used during the fiscal year was available for all of the Toronto vehicles and one of the two Cleveland vehicles. The fuel consumption data was obtained from the corporate expense accounting system in the form of gasoline expenses. The fuel consumption was then calculated using appropriate average fuel costs for the time period. These were taken from Natural Resources Canada's Fuel Focus website[6]. Average fuel prices for the Toronto area for each month of the fiscal year were aligned with the expenses for each driver during each month so that approximate fuel consumption could be found from the gas expense amounts;

- For one of the Toronto vehicles, a maintenance vehicle, the fuel consumption was estimated by the driver of the vehicle;

- For the Richmond (Vancouver) vehicles:

    - A log book was available for one of the vehicles, a maintenance vehicle, stating the kilometres driven for each trip during the fiscal year;

[6] http://www.fuelfocus.nrcan.gc.ca/reports_e.cfm

  - Lease agreements were available for the remaining five vehicles stating the annual kilometre allowance for the vehicle – 25,000 km per year. This can be assumed to be a value of 2,083 km per month and can then be multiplied by the number of months that the vehicle was used during the fiscal year in order to find kilometres driven during the fiscal year.
  - As a check, the odometer of one of the vehicles was checked nineteen months into the lease. It read 39,706 km- an average of 2,089 km per month- very close to the estimated value chosen. Likewise, an oil change record provided for one of the vehicles showed an average of about 2000 km a month over the fifteen month period that CSA had used it.
  - In the Richmond office vehicles are rotated amongst staff throughout the year to ensure that the annual mileage limit is not exceeded - as this would result in further cost to the organization. This unfortunately makes tracking expenses difficult.
  - Lease agreements are available from the Richmond Office. Insurance policies for each vehicle are available from the Corporate Risk Management Division at the Rexdale office and provide confirmation of the dates that the vehicles were used by CSA.
  - In future all oil change certificates will be scanned and stored electronically in a central folder, so that mileage can be tracked throughout the year for each vehicle.

- No data was available for one of the vehicles in the Cleveland office. Therefore the average emissions value for the other sixteen vehicles was assumed to be the emission value for the vehicle with missing data;

- The data provided is available in the primary spreadsheet.

c) Development of emission factors for the quantification of emissions:

- The following emission factors were used from the Guidelines to the UK Government Department of Environment, Food and Rural Affairs (DEFRA) GHG Conversion Factors for Company Reporting, June 2007.

Vehicle Type	Engine Size (L)	Emission Factor (kg $C0_2$ / km)
Small Gasoline	<1.4	0.1831
Medium Gasoline	1.4-2.0	0.2162
Large Gasoline	>2.0	0.2964

Table 4: Emission Factors for Petrol Vehicle Combustion[7]

Vehicle Type	Engine Size (L)	Emission Factor (kg CO_2 / km)
Small Diesel	<1.7	0.1507
Medium Diesel	1.7-2.0	0.1881
Large Diesel	>2.0	0.2635

Table 5: Emission Factors for Diesel Vehicle Combustion[8]

Fuel Used	kg CO_2/litre of fuel
Gasoline	2.3154
Diesel	2.6304

Table 6: Emission Factors for Specific Fuel Type[9]

- The above tables contain emission factors which can be used for all of the activity data found, including kilometres driven and quantity of fuel used.

- Again it would be preferred if North American specific emission factors were used and CSA is currently updating this methodology, so that emission factors based on fuel consumption taken from the Environment Canada National Inventory Report, can be used for all vehicles.

    - This will require that the fuel economy of the vehicles is found, in order that fuel consumption can be estimated based on mileage.

[7] From the "Guidelines to DEFRA's GHG Conversion Factors for Company Reporting", Annexes updated June 2007; Table 6a.
[8] From the "Guidelines to DEFRA's GHG Conversion Factors for Company Reporting", Annexes updated June 2007; Annex 6, Table 6b.
[9] From the "Guidelines to DEFRA's GHG Conversion Factors for Company Reporting", Annexes updated June 2007; Annex 6, Table 5a.

d) Calculation of total CO_2 emissions for the fleet:

- The vehicles were categorized by type of fuel used and size of engine. This was done by typing the VIN number into a search engine, which provided a link to the appropriate page of the website www.carfax.com. The web site provides details about engine type and size along with a range of other information;

- The relevant emission factor was multiplied by the activity data to give total emissions for the year, for all vehicles for which data was available;

- For the remaining vehicle, total emissions from the sixteen other vehicles were divided by sixteen to find the average emissions per vehicle. This average was used for the remaining vehicle.

e) Computation of the amount of each specific gas type emitted:

- The *Environment Canada's National Inventory* report provides emission factors for diesel and gasoline vehicles. It outlines several vehicle categories. The ones chosen below were selected as they best represent the type of vehicles found in the CSA fleet. In some cases the use of these categories is a conservative estimate as it was not known which category the vehicle should fit into, therefore the most reasonable category with the highest emission factor was chosen.

- As with the air travel data, the total grams of emissions per litre of fuel used and the values in the tables below were used to calculate percentage of each gas released in the total emissions.

Gas Type	Gasoline Fuel Emission Factor (g / l fuel)
CO_2	2360
CH_4	0.12
N_2O	0.26

Table 7: Emission Factor for Light Duty <u>Gasoline</u> Vehicles-Tier one[10]

[10] *Environment Canada National Inventory*, Table A13-5, published April 2006.

Gas Type	Diesel Fuel Emission Factor (g / l fuel)
CO_2	2730
CH_4	0.07
N_2O	0.2

Table 8: Emission Factor for Light Duty Diesel Vehicles-Moderate Control[11]

f) Verification of accuracy of results

Using the above emission factors it is possible to determine the amounts of specific gases which make up the total emissions. The following sample calculation was performed:

[11] *Environment Canada National Inventory*, Table A13-5, published April 2006.

$$\textit{Total litres of petrol used by the Toronto fleet} = \mathbf{25309}\,l$$

$$\textit{Emission factor} = \mathbf{2.315}\ \frac{kg\ \ CO_2}{l\ \ fuel}$$

$$\textit{Total emissions from petrol vehicles in Toronto fleet}:$$

$$\mathbf{25309}\,l * \mathbf{2.315}\ \frac{kg\ \ CO_2}{l\ \ fuel} = \mathbf{58600.46}\,kg\ CO_2$$

$$\textit{Total kilometers driven by petrol vehicles in Vancouver fleet} = \mathbf{17440}\,km$$

$$\textit{Emission Factor} = \mathbf{0.2964}\ \frac{kg\ CO_2}{km}$$

$$\textit{Total emissions from petrol vehicles in Vancouver fleet}:$$

$$\mathbf{17440}\,km * \mathbf{0.2964}\ \frac{kg\ CO_2}{km} = \mathbf{5169}\,kg\ CO_2$$

$$\textit{Assume that the Cleveland vehicle with missing data is also petrol}:$$

$$\textit{Total emissions for } \mathbf{16} \textit{ vehicles with available data} = \mathbf{93.08}\ tonnes\ CO_2$$

$$\textit{Average emissions} = \frac{\mathbf{93.08}\ tonnes}{\mathbf{16}\ vehicles} = \mathbf{5.8175}\,tonnes$$

$$\textit{Total Canadian emissions from petrol} = \mathbf{63.77}\ tonnes$$

$$\textit{Amount of methane in Canadian emissions} =$$

$$\mathbf{63.77}\ tonnes\ CO_2e * \left(\frac{\mathbf{0.12}\ \frac{g\ \ CH_4}{l\ \ fuel} * \mathbf{21}\ \frac{g\ \ CO_2e}{g\ \ CH_4}}{\mathbf{2443.12}\ \frac{g\ \ CO2e}{l\ \ fuel}} \right) = \mathbf{0.07}\ tonnes\ \ CO_2e$$

$$= \frac{\mathbf{0.07}\ tonnes\ \ CO_2e}{\mathbf{21}\,\frac{tonnes\ \ CO_2e}{tonnes\ \ CH_4}} = \mathbf{0.0031}\ tonnes\ CH_4\ \ \textit{emitted from petrol vehicles in Canada}$$

Equation 2: Sample Calculation for CSA Fleet Vehicles Emissions

2) Estimation of Uncertainty

The expense tracking system provides a suitable data collection system for Toronto and Cleveland vehicles, providing that the average gas prices used come from an accurate source. Any vehicles with log books can be readily tracked. The use of lease agreements as a form of estimation is also considered acceptable, as the organization wants to keep costs to a minimum and will make an effort keep mileage below the assigned limit. The emission factors used are current and from reputable sources, although work will be done to use emission factors from North American sources.

Therefore the level of uncertainty linked to this quantification methodology and subsequent calculations is considered to be low.

Auditor/Inspector Vehicles- Direct Emissions

1) Methodology

a) Compilation of activity data from miles driven and fuel consumed in personal and rental vehicles of QMI auditors and CSA International inspectors:

- The QMI office in Toronto provided totals of miles driven in personal vehicles in Canada and the USA, as well as fuel costs in Canada and the USA for rental vehicles used. This data was for QMI employees and contract auditors;

- QMI uses software called QTools to store and track this information. Each individual enters their own fuel expenses or mileage into the software. The software is internally developed for QMI;

- The data is checked by customers, as QMI bills them for expenses and services, including travel and transportation. This check is a Quality Control measure that ensures accurate and reliable data input, as both the organization and the client are motivated to ensure that the data is accurate;

- The QTools data set for the 2006/2007 fiscal year is available from QMI Toronto in the form of three separate spreadsheets. A screen shot of the software in use is also available;

- The only information available from CSA International was the number of full time employees performing inspections. Average QMI emissions data was applied to CSA International employees. The number of inspectors in North America was provided by CSA International in Cleveland. The amount of employees working in Canada versus the USA was not known. C&T is currently in the process of updating its expense tracking system to software which will allow vehicle data to be reported in future inventories;

- In order to use the fuel cost data to calculate emissions, average fuel costs in the USA and Canada for the 2006/2007 fiscal year were required;

- USA gas prices were taken from the Energy Information Administration, http://www.tonto.eia.doe.gov/dnav/pet/pet_pri_top.asp;

Year	Month	Unleaded Regular Gasoline, U.S. City Average Retail Price
		(Nominal Cents per Gallon Including Taxes)
2006	April	275.7
2006	May	294.7
2006	June	291.7
2006	July	299.9
2006	August	298.5
2006	September	258.9
2006	October	227.2
2006	November	224.1
2006	December	233.4
2007	January	227.4
2007	February	228.5
2007	March	259.2

Table 9: Average US Unleaded Gas Prices for Fiscal Year 2006/2007[12]

- The average cost of fuel in the USA over this time period is $2.60 USD per gallon;

- Canadian gas prices were found from Statistics Canada[13];

[12] *Motor Gasoline Retail Prices, U.S. City Average.* Table 9.4, January 2008. Monthly Energy Review.
[13] http://www40.statcan.ca/l01/cst01/econ154a.htm

City	December 2003	December 2004	December 2005	December 2006	December 2007
Gasoline and fuel oil, average retail prices by urban centre (Regular unleaded gasoline at self service filling stations)					
	Regular unleaded gasoline at self service filling stations				
	cents per litre				
St. John's	80.0	91.3	99.7	100.5	116.0
Charlottetown, Summerside	68.7	84.9	94.7	96.6	107.0
Halifax	73.9	82.0	97.3	97.1	111.1
Saint John	74.8	83.6	96.3	90.6	105.8
Québec	73.9	81.3	96.9	96.9	113.9
Montréal	73.5	79.4	92.4	94.3	109.9
Ottawa	65.1	72.1	86.1	87.7	102.3
Toronto	67.8	72.5	88.5	87.5	100.6
Thunder Bay	71.7	82.5	86.0	90.8	107.3
Winnipeg	61.0	78.7	86.0	87.1	103.5
Regina	69.3	79.7	88.3	88.8	104.7
Saskatoon	66.9	81.0	89.6	90.4	104.3
Edmonton	60.4	73.7	78.9	81.6	95.7
Calgary	58.1	73.1	81.7	80.4	98.3
Vancouver	72.0	80.8	90.8	101.4	105.7
Victoria	74.5	86.5	92.3	101.0	107.4
Whitehorse	75.4	94.5	107.1	96.0	115.1
Yellowknife	89.9	95.9	106.5	102.3	116.3

Table 10: Gasoline and fuel oil, average retail prices by urban centre, 2003-2007[14]

[14] Statistics Canada, CANSIM, table (for fee) 326-0009 and Catalogue no. 62-001-X.
Last modified: 2008-01-25

- The average price of gas in December 2006 was $0.9283 CAD and the average price of gas in December 2007 was $1.069389 CAD. Accounting for nine months of the fiscal year being in 2006 and three months in 2007, the overall average is $0.96 CAD;
- In order to use consistent units of litres and kilometres the following conversions were applied 1 US gallon = 0.26418 litres and 1 mile = 1.61 kilometres[15];
- To find the fuel consumption, fuel costs for Canada and the USA were divided by the average cost per litre or gallon of fuel;

b) Development of emission factors for use in determining the total emissions from vehicles:

- The vehicles were all assumed to be large gasoline cars. This is a conservative estimate as actual vehicles used were not known;
- The same emission factors were used for the auditor/inspector vehicles as for the CSA Group fleet. These are taken from DEFRA. Once again, a new methodology using emission factors from North American organizations is being developed.

c) Calculation of total emissions for all vehicles:

- Total QMI emissions were divided by 248 (the total number of QMI employees and contractors). This value was multiplied by 95 to give emissions for CSA International full time employees;
- Emissions were found by multiplying the total kilometres driven and fuel consumption, by the appropriate emission factors;
- The emissions breakdown was completed in the same way as for the CSA Group fleet. The same emission factors from the *Canadian National Inventory Report* were used. The chosen category for emissions was Light Duty Gasoline Vehicles - Tier 1;
- The emission breakdown was completed for both USA and Canadian emissions for the QMI vehicles;

[15] http://www.epa.gov/ttn/chief/ap42/appendix/appa.pdf

- As the ratio between US and Canadian auditors was not known, it was assumed to be a 50/50 split and hence 50% of the emissions were attributed to Canadian employees and 50% to American employees.

d) Verification of accuracy results

The following sample calculation was performed:

QMI

$\textit{Canadian}$ QMI kilometers driven = 746537 km

$\textit{Emission factor} = 0.2964\ kg\,CO_2/km$

$\textit{Emissions} = 746537\ km * 0.2964\ kg\,CO_2/km = 221273.57\ kg\,CO_2$

$\textit{Total Canadian Emissions (including emissions calculated from fuel expenses)} = 352.57\ tonnes\,CO_2e$

$\textit{Emission}$ factor for N_2O = 0.26 g/L fuel

$$\text{Percentage of } N_1O \text{ in emissions} = \left(\frac{0.26\,\frac{\text{g } N_1O}{\text{L fuel}} * 310\,\frac{g\,CO_2e}{g\,N_2O}}{2443.12\,\frac{g\,CO_2e}{L\ fuel}}\right) = 3.30\%$$

$\textit{Amount}$ of QMI Canadian emissions which are $N_2O = 0.0330 * 352.57\ tonnes\,CO_2e = 11.63\ tonnes\,CO_2e$

$$= \frac{11.63\ tonnes\,CO_2e}{310\,\frac{tonnes\,CO_2e}{tonnes\,N_2O}} = 0.0375\ tonnes\,N_2O$$

$\textit{Total}$ QMI Canadian emissions in the form of N_2O (full time employees)

$$= \frac{0.0375\ tonnes\,N_2O}{248} * 58 = 0.008775\ tonnes\,N_2O$$

CSA International Inspectors

Sum of QMI Canadian and USA emissions = 765.62 $tonnes\,CO_2e$

$\textit{As}$ above 3.30% of emissions are composed of N_2O:

$0.0330 * 765.62\ tonnes\,CO_2e = 25.258130\ tonnes\,CO_2e$

Total CSA International inspector emissions in the form of N_2O

$$= 25.258130\ tonnes\,CO_2e / 248 \text{ QMI employees and contractors} / 310\,\frac{tonnes\,CO_2e}{tonnes\,N_2O}$$

$* 95$ full time CSA International employees = $0.031211\ tonnes\,N_2O$

50% of these emisssions are assumed to be from Canadian based CSA International employees

$= 0.5 * 0.031211\ tonnes\,N_2O = 0.01561\ tonnes\,N_2O$

Equation 3: Sample Calculation- Auditor and Inspector Travel

2) Estimation of Uncertainty

The QMI vehicle expenses data collection is considered to be robust. QMI collects information on all fuel expenses and the data is then checked by clients. The CSA International data collection is an estimate. In future inventories, the gas expense data of inspectors will be tracked in some way. The fuel prices and emission factors used are from reputable sources. Therefore the estimation of uncertainty for this quantification is medium. This will be reduced to low in future inventories through improvements to data collection and the estimation methodology.

Building Testing Facility Emissions- Direct Emissions

1) Methodology

a) Determination of CSA Group buildings in North America which have direct emissions due to testing facilities on site:

- Three facilities in North America have testing facilities which emit greenhouse gases: Cleveland, Irvine and Edmonton;
- The Cleveland facility uses Butane, Propane and Gasoline;
- The Irvine facility uses Butane and Propane;
- The Edmonton facility uses different types of gas, broken down into the following constituents:
  - Hydrogen
  - Acetylene
  - Ethylene
  - Methane
  - Nitrogen
  - Oxygen
- The Edmonton facility also releases carbon dioxide from the use of dry ice.

b) Compilation of activity data for each of the above locations:

- The Cleveland facility provided information of the amount of butane, propane and gasoline used each year from 2000 to 2006. This information was provided by Facilities Management at the Cleveland office. Data was provided in pounds and was converted to kilograms as follows:

1 kilogram =0.45 lb
http://www.epa.gov/ttn/chief/ap42/appendix/appa.pdf;

- From this data the average yearly consumption was found, and this was assumed to be the consumption amount for the 2006/2007 fiscal year, as the actual consumption for the time period from April 2006-March 2007 was not known. In future, efforts will be made to track the use of these gases more consistently on a monthly basis, by the use of invoices;

- To convert average weights to volumes, the density of the various compounds were found at 20 ^{o}C (it is assumed that the gases are used at room temperature, as there is no evidence otherwise). Densities for Propane and Butane were taken from the EPA AP42 Miscellaneous Data and Conversion Factor appendix[16]. These values are 0.507 kg / litre for Propane and 0.579 kg / litre for Butane;

- The density for gasoline (at 16 ^{o}C) was taken from http://www.simetric.co.uk/si_liquids.htm and was found to be 0.73722 kg / litre;

- The consumption of Propane and Butane was provided for the 2006 year from the Irvine facility. This information was provided by the facilities manager at Irvine. The values were provided in US gallons and pounds respectively. The gallon amount was converted to litres and the pounds converted to kilograms and then litres, using the above-provided density. The consumption over the 2006 year was assumed to be the same as during the 2006/2007 fiscal year;

- The Edmonton facility provided a range of volumes of gases emitted alongside the composition breakdown of the emitted gas from flame testing. The composition has been determined for either burnt or un-burnt gas by sample testing. The information was provided by Facilities Management in Edmonton. To provide a conservative value, the highest volume of gas was assumed for the year. It was also assumed that the entire volume of gas was combusted when dealing with ethylene and acetylene and that the entire volume was vented when dealing with methane. The exact volumes of gases vented or combusted is dependant on whether the testing of a device passes or

[16] http://www.epa.gov/ttn/chief/ap42/appendix/appa

fails and is therefore difficult to measure;

- Of the specific gases contained in the emissions, three were of importance to the inventory; methane, ethylene and acetylene. Methane and acetylene both have 10% composition, whilst ethylene makes up 20% of the gases. Therefore the volume of these gases emitted per year could be found my multiplying 0.10 or 0.20 by the total gas volume used for the year. This could be converted to litres, using the conversion factor 1 m^3 = 1000 litres;

- The quantity of dry ice (solid carbon dioxide) used was provided in pounds. This was converted to tonnes and it was assumed that the entire product was emitted as CO_2.

c) Compilation of emission factors to determine emissions from the volumes of gases consumed:

- Emission factors for butane, propane and gasoline were obtained from Environment Canada's *National Inventory Report*.

Substance	Emission Factors (g/L)		
	CO_2	CH_4	N_2O
Propane	1500	0.024	0.108
Butane	1730	0.024	0.108

Table 11: Emissions Factors for the Combustion of Propane and Butane [17]

Substance	Emission Factors (g/L fuel)		
	CO_2	CH_4	N_2O
Heavy Duty Gasoline Vehicle-Non Catalyst	2360	0.29	0.046

Table 12: Emissions Factor for the Combustion of Heavy Duty Gasoline[18]

[17] *Environment Canada National Inventory*, Table A13.1.13, p.421, published April 2006
[18] *Environment Canada National Inventory*, Table A13-5, p.435, published April 2006

d) Calculation of emissions of greenhouse gases from the three facilities:

- Calculating the emissions from the Cleveland and Irvine facilities involved multiplying the volumes of gas consumed by the appropriate emission factor and multiplying by the GWP for the specific gas type (GWPs found in Annex C of the ISO 14064-1 standard);

- The densities and molar masses of acetylene and methane were required in order to apply a mass balance approach to calculating emissions from the Edmonton facility;

- The density of methane was found to be 464.54 kg / m^3, from the *Introduction to Organic Chemistry*, Second Edition, 1981, Streitwieser and Heathcock. The volume of methane was calculated by multiplying the volume of gas emitted by 10% (the volume percent of methane in the gas). The mass of methane was then calculated using the approach described above. It was assumed that all of the mass consumed was also emitted as methane;

- The volume of acetylene was found my multiplying the total volume of gas by 10%. The molar mass is outlined below. The density was found in *Introduction to Organic Chemistry*, Second Edition, 1981, Streitwieser and Heathcock. A mass balance approach was able to estimate the amount of carbon in the acetylene by volume, which could be converted to carbon dioxide. This is a conservative estimate, assuming that all carbon is converted to carbon dioxide and emitted.

$$molar\ mass\ carbon = 12.0107\ g/mol$$

$$molar\ mass\ hydrogen = 1.00784\ g/mol$$

$$molar\ mass\ Acetylene\ \ HCCH = (2*12.0107)+(2*1.00794)$$

$$molar\ mass\ Acetylene\ (HCCH) = 26.03728\ g/mol = 0.02603728 kg/mol$$

$$Density\ \ Acetylene\ \ (HCCH) = 1.0967\ \ kg/m^3$$

$$\frac{1.0967\ \frac{kg}{m^3}}{0.02603728\ \frac{kg}{mol}} = 42.12037509\ \frac{mol\ HCCH}{m^3} = 0.04212037509\ \frac{mol\ HCCH}{L}$$

$$1 \div answer = \frac{mol\ HCCH}{23.741\ L}$$

Equation 4: Sample Calculation- Direct Emission from Testing Facilities

- The same approach was used for determining the emissions from ethylene;
- Total emissions for Canada and the USA were divided up by accounting for the Edmonton facility emissions for Canada and Cleveland and Irvine facilities emissions for the USA.

2) Estimation of Uncertainty

As the facilities know their consumption of materials from invoices and billing, this is considered to be an accurate methodology. Error could arise if gas cylinders aren't completely empty before being changed - making these calculations a conservative estimate because all the gas bought is assumed to be combusted or emitted. This calculation also doesn't account for situations where gases intended to be combusted aren't and vice-versa. Again where possible the most conservative situation has been chosen. Emission factors are from reputable sources. Therefore the assessment of uncertainty for this calculation is considered to be low.

In future more methodologies may need to be developed for testing facilities in Asia and Europe, which may use different gases in different processes.

Energy Usage in Buildings- Energy Indirect Emissions and Direct Emissions

1) Methodology

a) Compilation of a list of all CSA, QMI and CSA International buildings in North America- both leased and owned:

- The initial list of buildings was supplied by Corporate Facilities Management. This included if the building was owned or leased and also the square footage;
- Owned buildings have been defined as buildings which CSA has a deed for or cases where CSA leases 100% of the building. In 2006-07 CSA Group owned seven buildings; Toronto (Rexdale), Montreal (Pointe Claire), Richmond (B.C.), Edmonton (Alberta), Atlanta (Georgia), Irvine (California) and Cleveland (Ohio). The remaining

eight buildings were leased. Note that the Richmond building was sold in Jan 2008.

b) Compilation of a list of activity data for the buildings:

- For all of the owned buildings except for the Atlanta, Georgia and Irvine,California facilities, electricity invoices, natural gas invoices and natural gas meters were used to find the energy consumption for the year. Note that since the Irvine and Cleveland facilities are leased in entirety by CSA, their energy consumption has been estimated using the BEPI values shown in table 13.

- Some of the natural gas invoices recorded consumption values in Giga-joules. The emission factors used required a volume of gas in cubic meters. The 2005 Statistics Canada report of *Energy Supply and Demand* was used to find the heating value of natural gas[19]. This value is 38.26 Tera-joules per Giga-litre or 1000 cubic meters per 38.26 Giga-joules. This conversion factor was used to convert the value on the natural gas invoice to cubic meters, as required to use the emission factors. Other invoices provided the information in MCF (thousand cubic feet) and this was converted to cubic meters using the conversion factor 1 MCF= 28.317 cubic meters[20];

- To check the values on the invoices, the square footage of the building and the energy consumption values were compared to sector totals. If the percentage of the total sector floor space and total sector consumption were comparable, it was assumed that the invoice was accurate;

- Note: that the Toronto (Rexdale) building uses a 300 kW bi-fuel generator which uses both natural gas and diesel. The quantity of electricity generated is unknown, as it simply replaces the kWh from power grid during power outages. The generator is also operated occasionally to ensure it is functioning properly. The natural gas which the generator uses is metered and included in the energy consumption calculations. The approximate diesel usage per year is 450 litres; this value is based on the usage recorded in 2007. Emissions were not calculated for this source as the usage is inconsistent and the emissions insignificant in comparison to other sources;

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[19] http://dsp-psd.pwgsc.gc.ca/collection_2007/statcan/57-003-X/57-003-XIE2005000.pdf
[20] http://www.epa.gov/ttn/chief/ap42/appendix/appa.pdf

- Note: electricity emissions are considered energy indirect emissions. Natural gas emissions of owned buildings are considered energy direct emissions, as well as the emissions of buildings which are leased entirely by CSA. Natural gas emissions of leased buildings with multiple tenants are considered energy indirect emissions.

- For the leased buildings, square footage of the building was required. These values were taken from the tenancy list which is published by CSA on a regular basis. The floor space is sometimes available from the building lease agreement and therefore these values can be corroborated. It was also necessary to find out which buildings did not use natural gas- this was done anecdotally;

c) Determination of appropriate emission factors:

- Emission factors for each province and State were found from two sources. The USA data was taken from the *EGrid 2006 Version 2.1*, *Year 2004 Summary Tables*[21]. Page one of this document provides output emission rates for carbon dioxide for each state, in lb / MWh. These were converted to kg CO_2e / kWh by dividing by 2.2 lb / kg and then 1000 kWh / MWh;

- Provincial average grid emission factors for the Canadian Provinces were obtained from the *Environment Canada National GHG Inventory Report 1990-2005*[22]. The 2005 overall total grid emissions intensity values were used;

- These emission factors for electricity production could be multiplied directly by any known electricity consumption values - for the owned buildings. For the leased buildings however the electricity intensity for the building had to be determined;

- To determine the BEPI (Building Energy Performance Indicator) for each building, the Commercial and Institutional Building Energy Use Survey (CIBEUS), available from Statistics Canada was used[23] . All BEPI values are stated on an annual basis, as is required for this inventory;

[21] http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html
[22] http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/ta9_11_eng.cfm
[23] http://www.statcan.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=2943&lang=en&db=imdb&dbg=f&adm=8&dis=2

- The survey provides average electricity intensity values for all building types in Canada, for each province. These values are available in GJ / m^2 and were converted to kWh / ft^2 for use in this inventory. A base value was chosen for Toronto and thus the Ontario electricity intensity value was chosen. This is 0.76 GJ / m^2 or 20.00 kWh / ft^2;

- From this base number, the BEPI for each building was derived by comparison with weather trends in Toronto. For summer time climates, the base number was increased for warmer climates in summer and increased for colder climates in summer. The difference in heating and cooling degree days (HDD/CDD) was estimated from one location to another and used to increase or decrease the BEPI indices. For example the Edmonton facility has about half the CDD compared to the Toronto facilities and therefore the electricity weather component was halved. If there was electric heating in the building, the weather component was increased.

Location	Province/State	Base (kWh/ft^2)	Weather Extra (kWh/ft^2)	Comments
CSA Mississauga	Ontario	20.00	1.00	Chosen Base
CSA Ottawa	Ontario	20.00	1.00	Chosen Base
CSA International	California	20.00	2.00	Twice the CDD compared to Toronto, so double the weather extra
CSA International	North Carolina	21.00	10.00	Value is increased by 20% due to electrical heating in the building.
CSA International	Tennessee	20.00	2.50	2.5 times the CDD compared to Toronto.
CSA International	Texas	21.00	9.00	Value is increased by 20% due to electrical heating in the building.
CSA International	Illinois	20.00	1.00	Similar weather to Toronto
CSA International	Georgia	20.00	2.00	Twice the CDD compared to Toronto, so double the weather extra
QMI Toronto	Ontario	20.00	1.00	Chosen Base
QMI Edmonton	Alberta	20.00	0.50	Half the CDD compared to Toronto

Table 13: Determination of BEPI values

- The emission factors for natural gas consumption were estimated by an Energy Performance Contractor, with access to a database of office building efficiencies. There were two possible methods for doing this:
    - Use a bottom up approach and run various computer simulations of buildings, varying the location, size, equipment and operation. This would yield some theoretical energy indices. This approach was considered potentially time consuming and expensive;
    - Survey existing energy use databases and reports, filtering the data for specific locations and other building parameters. This

approach was determined to be quick to perform and would yield reliable, defendable values;

- A number of sources of office energy data were reviewed, including:
  - NRCan CIBEUS database;
  - NRCan OEE (Office of Energy Efficiency) publications;
  - GHG Action Plans for office building available at CSA- GHG registries;
  - Energy CAP benchmark data from the US;
  - CBECS (Commercial Buildings Energy Consumption Survey) database from the US;
  - Private office energy data taken from Canadian energy studies.

- From the reviewed publications a base value of 1.0 kWh / ft^2 was chosen for natural gas consumption. This was adjusted based on climate, in a similar way to the method used for calculating electricity consumption. The exception is that only winter temperature differences are considered important when dealing with natural gas consumption. If it was indicated that there was no natural gas used on the property - in the case of the Texas and North Carolina facilities, the gas BEPI was zero and the 1.0 kWh / ft^2 was moved to the electricity base. The electrical BEPI weather extra component was increased by 20% to account for loss of efficiency;

- Use of the BEPI values and building areas provided consumption of natural gas in kWh. This was converted to m^3 of natural gas by dividing by 10.346 kWh / m^3. This value can be derived from the published energy content of natural gas;

- Emission factors for natural gas were obtained from the *Environment Canada National Inventory Report*. Table A13-1 on page 431 provides the emission factors for Residential, Commercial and Agriculture sources as; 1891 g / m^3 for CO_2, 0.037g / m3 for CH_4 and 0.035 g / m^3 for N_2O;

- The same emission factors were used for each building regardless of country, province or State, as the content of natural gas is considered to be relatively consistent.

d) Calculation of emissions from electricity and natural gas consumption:

- To calculate emissions from the leased buildings, the known areas of the buildings were multiplied by the final BEPI factors to calculate electricity and natural gas consumption. These consumption values were then multiplied by the appropriate emission factors to calculate total emissions in tonnes of CO_2e.

e) Verification of accuracy of results:

The following sample calculation was performed:

Calculating Emissions for the Mississauga Office

$$\text{The Mississauga office is leased space of } 54{,}000\ ft^2$$

$$54000\ ft^2 * 0.092903\ \frac{m^2}{ft^2} = 5016.76\ m^2$$

$$Base = 20\ KWh / ft^2$$

$$Weather\ Extra = 1.00\ kWh / ft^2\ \text{(Same weather as Toronto)}$$

$$Total\ BEPI = 20 + 1 = 21.00\ kWh / ft^2$$

$$Annual\ electrical\ usage = 54000\ ft^2 * 21\ kWh / ft^2 = 1134000\ kWh$$

$$Emission\ factor\ for\ Toronto\ grid\ electricty = 0.220\ kg\ CO_2 / kWh$$

$$Emissions = 1134000\ kWh * 0.220\ kg\ CO_2 / kWh = 249280\ kg\ CO_2e = 249\ t\ CO_2e$$

Calculating emissions from natural gas usage at the Mississauga office

$$Base = 1.00\ kWh / ft^2$$

$$Weather\ Extra = 12.00\ kWh / ft^2\ \text{(Estimated based on data from a var iety of sources)}$$

$$Total\ BEPI = 13.00\ kWh / ft^2$$

$$Natural\ Gas\ Usage = \frac{13.00\ kWh / ft^2 * 54000\ ft^2}{10346\ kWh / m^3} = 67852\ m^3$$

$$CO_2\ emissions = 1891\ \frac{g\ CO_2}{m^3} * 67852\ m^3 = 128\ t\ CO_2e$$

$$CH_4\ emissions = 0.49\ \frac{g\ CH_4}{m^3} * 67852\ m^3 * 21 \frac{g\ CO_2e}{g\ CH_4} = 0.698\ t\ CO_2e$$

$$N_2O\ emissions = 0.049\ \frac{g\ N_2O}{m^3} * 67852\ m^3 * 310 \frac{g\ CO_2e}{g\ N_2O} = 1.04\ t\ CO_2e$$

$$Total\ emissions = 129.7\ t\ CO_2e$$

Equation 5: Sample Calculation for Building Energy Emissions

2) Estimation of Uncertainty

For CSA Group's owned buildings accurate consumption values were obtained. It currently is not possible to find such accurate values for the leased facilities. However, the estimation technique used is considered to be robust- taking into account: size of building, type of heating or cooling system and regional climate. The level of uncertainty for this methodology is therefore considered to be low. In future inventories this methodology will likely be assessed and if it is possible to obtain more activity data specific for each building, the use of that data will be the preferred method. .

GHG Inventory Data Quality Management

All data files and email correspondence concerning the completion of this GHG Inventory have been saved and filed in a secure location at the CSA Group Ottawa office. A hard-copy format filing cabinet is kept locked and a restricted access folder is available electronically. A GHG Management Handbook has also been compiled to educate CSA Group staff on the processes undertaken within this year's reporting in order to provide a tool for the completion of future inventories. This Handbook includes a list of important external contacts. An information management system document has also been prepared providing specific and detailed information about data collection, manipulation, storage and reporting for the GHG inventory. This can be used as a reference tool for existing employees and a training tool for new employees.

Ongoing monitoring continues for all aspects discussed within this report, and data availability will be updated during subsequent reports. Further directives to increase monitoring and data availability have also been discussed. In future inventories, CSA Group will try to streamline the data collection approach by drawing on those within the organization who do similar work for other purposes. The goal will be to integrate the data collection for the inventory into already established reporting procedures for the organization to ensure that all of the information is available and accessible when required.

Summary of Emissions

As the standard stipulated, emissions are to be reported by gas, by category and by source. Please refer to Tables 15-21 for finalized emissions resulting from the CSA Group North American Operations, fiscal year 2006-2007. Emissions have been broken down by specific Country to identify where potential offsets should be sourced from.

By Source

Air Travel	Tonnes			
	CO_2	CH_4	N_20	CO_2e
Canada	2144.32	0.0673	0.2102	2210.91
USA	1314.26	0.0412	0.1288	1355.07
Total	3458.58	0.1085	0.3391	3565.98

Table 14: Emissions from Air Travel

CSA Fleet Vehicles	Tonnes			
	CO_2	CH_4	N_20	CO_2e
Canada	78.45	0.0036	0.0080	81.01
USA	10.99	0.0006	0.0012	11.37
Total	89.44	0.0041	0.0092	92.39

Table 15: Emissions from Fleet Vehicles

Auditor/Inspector Vehicles	Tonnes			
	CO_2	CH_4	N_20	CO_2e
Canada	222.11	0.0077	0.0245	229.94
USA	234.15	0.0119	0.0258	242.40
Total	456.27	0.0196	0.0503	472.34

Table 16: Emissions from Auditor/Inspector Vehicles

Building Energy Emissions

Direct Building Space Heating Emissions	Tonnes			
	CO_2	CH_4	N_20	CO_2e
Canada	729.14	0.01	0.01	733.62
USA	1368.44	0.03	0.03	1376.86
Total	2097.58	0.04	0.04	2110.48

Table 17: Direct Emissions from Space Heating

Indirect Building Natural Gas Emissions	Tonnes			
	CO_2	CH_4	N_20	CO_2e
Canada	199.13	0.082	1.147	200.35
USA	16.85	0.007	0.096	16.95
Total	215.98	0.099	1.243	217.31

Table 18: Indirect Emissions from Space Heating

Building Electricity Emissions	Tonnes			
	CO_2	CH_4	N_20	CO_2e
Canada	n/a	n/a	n/a	2023.27
USA	n/a	n/a	n/a	2059.55
Total	n/a	n/a	n/a	4082.82

Table 19: Energy Indirect Emissions from Buildings

Emissions by Category

Category	Gas (Tonnes)			
	CO_2	CH_4	N_2O	CO_2e
Direct Emissions	2,658.88	9.36	0.10	2,886.17
Indirect Other Emissions	3,458.58	0.11	0.34	3,565.98
Indirect Energy Emissions	215.98	0.0042	0.0040	217.31
	n/a	n/a	n/a	4082.82
Total	6,333.44	9.47	0.44	10,752.27

Table 20: Overall Emissions by Category

GHG Assertions

1. CSA Group's, North American Operations GHG Inventory for fiscal year 2006-07 report was prepared in conformance with the CSA/ISO 14064-1 standard entitled *Specification with Guidance at the Organization Level for Quantification and Reporting of Greenhouse Gas Emissions and Removals.*

2. Emissions from CSA Group's North American Operations GHG inventory covering all buildings, employee air travel, all inspectors' and auditors' car travel and all of CSA Group's vehicle fleet for the fiscal year 2006-2007 were 10,752.27 tonnes CO_2e.

These assertions have been verified to a reasonable level of assurance by an independent third party verifier, and the verification report is available.

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