

Prince George Airport Authority: Greenhouse Gas Report



Fiscal Year 2007

strategic
transportation
& tourism
solutions



Prepared for
Prince George Airport Authority

Prepared by
Inter VISTAS Consulting Inc.

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Executive Summary

This Greenhouse Gas Report has been conducted on behalf of Prince George Airport Authority (PGAA) for the fiscal year 2007, January 1 to December 31. The report follows the accounting and reporting guidelines of *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard, Revised Edition* published by World Resources Institute and the World Business Council for Sustainable Development. This Protocol is the international accounting tool most widely used by government and business leaders to understand, quantify and manage greenhouse gas emissions. A copy of these documents can be downloaded from the GHG Protocol website, www.ghgprotocol.org.

This report provides an inventory and reduction plan for the greenhouse gas emissions associated with airport operations. Emissions are allocated to one of three groups based on control and ownership:

- 1) **Prince George Airport Authority** – emissions from sources that are under the direct control or ownership of PGAA.
- 2) **Tenants/Air Carriers** – emissions from sources on airport property, which are under the direct control or ownership of an airport tenant or air carrier.
- 3) **Public** – emissions resulting from use of the airport, which are under the direct control or ownership of the general public.

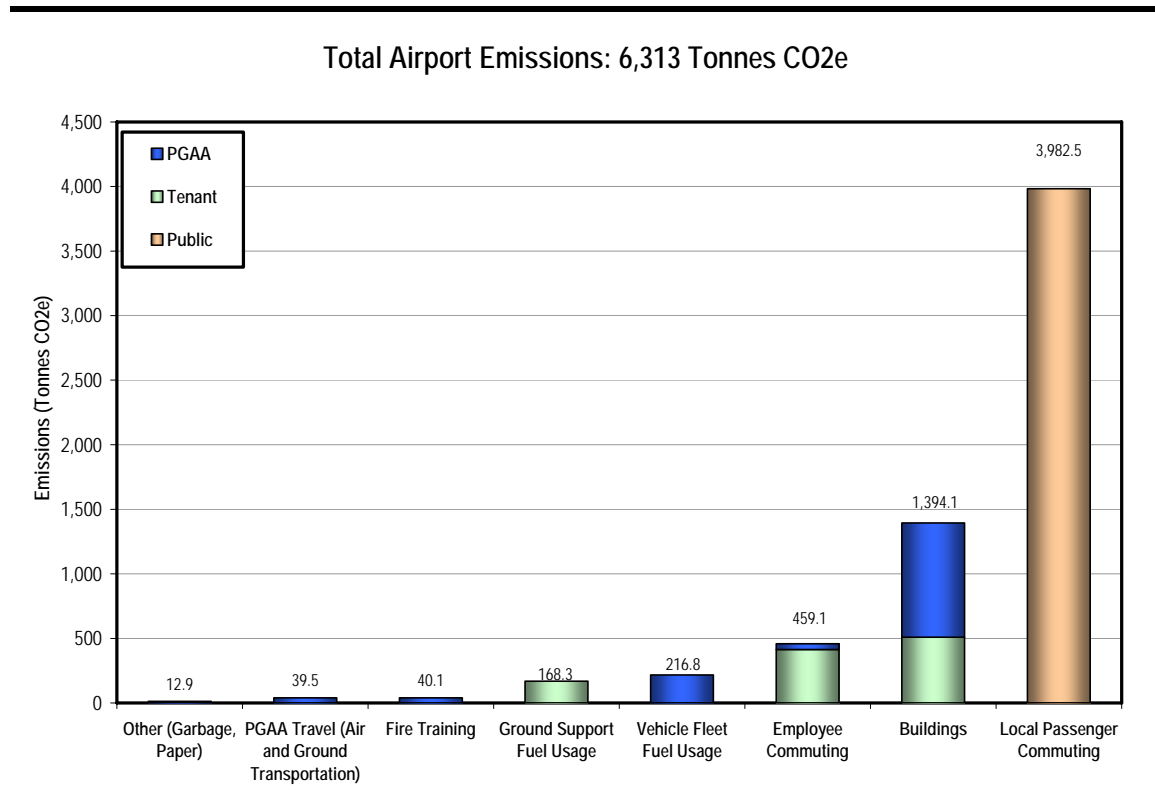
In fiscal year 2007, the total greenhouse gas emissions generated from the operation of the Prince George Airport were 6,313.3 metric tonnes of carbon dioxide equivalent. Of this total, PGAA's operations accounted for 1,239.0 tonnes (19.6%); airport tenants' operations contributed 1,091.9 tonnes (17.3%); and the general public produced 3,982 tonnes (63.1%) from commuting to and from the airport. Emissions from aircrafts were not included in this inventory.

Table 1: Prince George Airport's greenhouse gas emissions, fiscal year 2007

Ownership/Control	Emissions (tonnes CO ₂ e)	Percent of Total	Sources
Prince George Airport Authority	1,239.0	19.6 %	Terminal buildings, vehicle fuel usage, fire training, business travel, staff commuting, paper usage, garbage haulage
Tenants/Air Carriers	1,091.9	17.3 %	Tenant buildings, ground support vehicle fuel usage, tenant commuting
Public	3,982.5	63.1 %	Passenger commuting
Total at Airport	6,313.3	100%	

The majority of emissions were generated from passenger commuting to and from the airport (63.1%), followed by building natural gas and electricity usage (22.1%), employee commuting to and from the airport (7.3%), airport vehicle fleet fuel usage (3.4%), ground support fuel usage (2.7%), fire training (0.6%), PGAA business travel (0.6%) and other activities (0.2%).

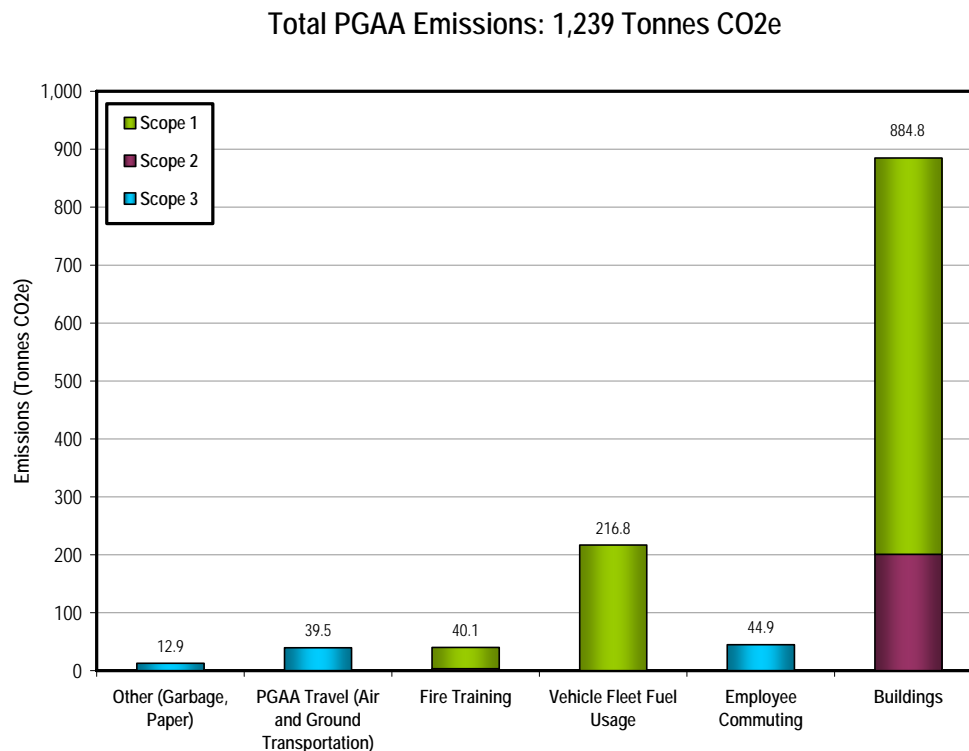
Figure 1: Prince George Airport's greenhouse gas emissions by source, fiscal year 2007



As defined by the GHG Protocol, greenhouse gases from sources under the control or ownership of PGAA are categorized into the following "scopes":

- **Scope 1** – direct emissions from sources that are controlled by PGAA. These include emissions from natural gas heating of buildings, fuel burned in its vehicle fleet and fire training. In 2007, Scope 1 emissions were 937.5 metric tonnes of carbon dioxide equivalent.
- **Scope 2** – indirect emissions from PGAA's use of purchased electricity. These include emissions from electricity onsite in its buildings and in lighting its airfield and aprons. In 2007, Scope 2 emissions were 204.2 metric tonnes of carbon dioxide equivalent.
- **Scope 3** – all other indirect emissions. These include emissions from: business travel (air and ground transportation), staff commuting, paper usage and garbage haulage. In 2007, Scope 3 emissions were 97.2 metric tonnes of carbon dioxide equivalent.

Figure 2: PGAA's greenhouse gas emissions by source, fiscal year 2007



Prince George Airport Authority has initiated new greenhouse gas targets for three key performance indicators: absolute emissions, emissions per passenger and emissions per aircraft movement (see Table 2). To achieve its targets, PGAA has identified a range of emissions reduction strategies to be pursued over the short and long term.

Table 2: Greenhouse gas targets

	Target	2007 Metric
Absolute Emissions	33% reduction by 2020, in line with the new BC Government's greenhouse gas targets	1,239.0 tonnes CO ₂ e
GHG Emissions / Passenger	5% reduction per year	3.0 kg CO ₂ e / passenger
GHG Emissions / Aircraft Movement	5% reduction per year	43.3 kg CO ₂ e / movement

Mike Davis, Manager, Communications & Business Development, Prince George Airport Authority has volunteered to act as the internal GHG champion. Mr. Davis, in conjunction with the Environmental Committee, will see to it that the GHG inventory process and system is implemented and maintained on an ongoing basis. The GHG Inventory Quality Management System (QMS) will ensure that inventory methods are the best possible, data is of the highest quality, and that the process and system developed by the company are fully implemented.

This report is available online on the Prince George Airport website, www.pgairport.com. For more information about the PGAA greenhouse gas reduction commitment, please contact Mike Davis, Manager, Communications & Business Development at 250-963-2413 or mdavis@pgairport.ca.

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1. Introduction

This Greenhouse Gas Report has been conducted on behalf of the Prince George Airport Authority (PGAA). The report presents information collected from a detailed accounting of the Prince George Airport's emissions in fiscal year 2007, January 1 to December 31, 2007. This is the first year a greenhouse gas report has been prepared by PGAA. Prince George Airport Authority intends to publish annual greenhouse gas reports in order to track its performance.

This report is organized as follows:

- Section 2 describes the accounting and reporting procedures used;
- Section 3 presents the greenhouse gas emission inventory for fiscal year 2007;
- Section 4 summarizes greenhouse gas management actions for reducing emissions;
- Section 5 outlines targets for future emissions reductions; and
- Section 6 discusses carbon credit purchases for fiscal year 2008.



2. Accounting and Reporting Procedures

The report follows the accounting and reporting guidelines of *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard, Revised Edition* published by World Resources Institute and the World Business Council for Sustainable Development. A copy of these documents can be downloaded from the GHG Protocol website, www.ghgprotocol.org.

2.1 Organizational and Operational Boundaries

Organizational boundary: This defines the companies, business units and operations that constitute an organization for the purposes of the greenhouse gas report and the criteria for how the emissions will be reported. For corporate reporting, two distinct methods are available for consolidating GHG emissions: the equity share approach and the control approach (financial or operational). For the purposes of reporting this inventory, PGAA applies the GHG Protocol's organizational boundary based on the operational control approach.

Prince George Airport Authority's organizational structure consists of one stand-alone company, with no parent or subsidiaries. Under this structure, there is no difference between the equity and control approach. PGAA has full ownership, financial control, and operational control of its organization.

This report also tracks emissions from airport tenants and the general public. These emissions sources are outside of PGAA's organizational boundary.

Operational boundary: This identifies and categorizes emissions sources associated with an organization as defined in the organizational boundary. PGAA's inventory includes emissions categorized into the following "scopes" as defined by the GHG Protocol:

- **Scope 1** (direct emissions from sources that are controlled by PGAA)

PGAA has Scope 1 emissions from natural gas heating of buildings, fuel burned in its vehicle fleet and fire training.

- **Scope 2** (indirect emissions from PGAA's use of purchased electricity)

PGAA has Scope 2 emissions from the use of electricity onsite in its buildings and in lighting its airfield and aprons.

- **Scope 3** (all other indirect emissions)

PGAA has Scope 3 emissions from the following sources: business travel (air and ground transportation), staff commuting, paper usage and garbage haulage.

The following emissions sources are included in this inventory, but outside of PGAA's operational boundary:

- **Tenants/Air Carriers** (emissions from airport tenants and air carriers operating at the airport)

Tenants have emissions from buildings (natural gas and electricity usage), ground support equipment (gasoline and diesel), and tenant (including air carrier) employee commuting.

- **Public** (emissions from public access to and from the airport)

Passengers generate emissions from commuting to and from the airport.

2.2 Inventory Exclusions

Of the emissions applicable to the operations at Prince George Airport, the following emissions sources are not included in this inventory:

- **Runway Expansion** – while planning for the runway expansion project took place in 2007, no activities that resulted in significant emissions occurred during the year.
- **Aircraft Landing and Takeoffs** – PGAA may utilize the Emissions and Dispersion Modeling System (EDMS) in future years to estimate emissions from aircraft at the airport (including start-up, taxi out, takeoff, climb out, approach, and taxi in).

2.3 Base Year

A base year is a reference year against which emissions performance can be measured over time. Following the guiding principals of the GHG Protocol, Prince George Airport Authority has selected 2007 as its base year due to the availability of accurate and complete data for that year.

2.4 Emissions Adjustments

As Prince George Airport Authority's knowledge and experience in inventory development grows, it may develop improved calculation methodologies and tools. When this happens, previous years' reported emissions will be adjusted according to the new methodology. Adjustments will also be made when new emission factors are published that more closely reflect actual emissions than those available at the time of the original calculations. These adjustments allow the emissions accounting to be as accurate and consistent from year to year as possible. However, in the case where adjustments are relatively insignificant or do not reflect a change in calculation methodology, recalculations will not be performed for previous years' emissions.

2.5 Inventory Quality

To ensure inventory quality, a PGAA staff person external to the Inventory Quality Team will review all calculation spreadsheets for accuracy. PGAA may choose to subject this inventory to a verification (audit) by a qualified third party.

3. Greenhouse Gas Emissions for Fiscal 2007

In fiscal year 2007, the total greenhouse gas emissions generated from operation of the Prince George Airport were 6,313.3 metric tonnes of carbon dioxide equivalent (CO_{2e})¹. PGAA's operations accounted for 1,239.0 metric tonnes, airport tenants' operations contributed 1,091.9 metric tonnes, and passengers commuting to and from the airport produced 3,982.5 metric tonnes. Emissions from aircrafts were not included in this inventory.

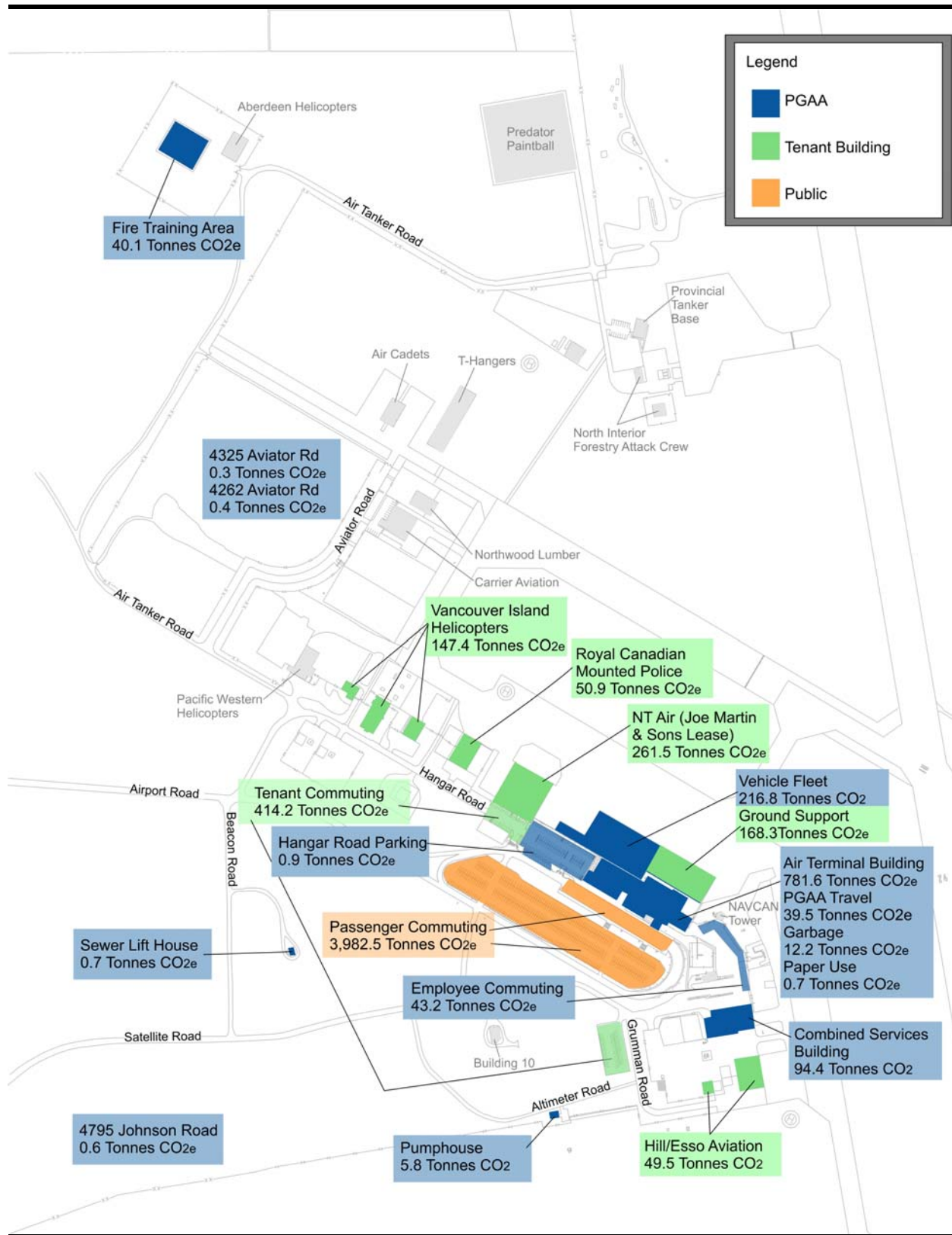
Table 3: Prince George Airport's greenhouse gas emissions, fiscal year 2007

Source	Details	Emissions (tonnes CO _{2e})	% of User's Total	% of Airport Total
Scope 1 (Direct)	Stationary	720.6	58.2%	11.4%
	Mobile	<u>216.8</u>	<u>17.5%</u>	<u>3.4%</u>
	Sub-total Scope 1	937.5	75.7%	14.8%
Scope 2 (Indirect - Consumption of Purchased Electricity)		204.2	16.5%	3.2%
Scope 3 (Other Indirect Emissions)	Business Air Travel	39.2	3.2%	0.6%
	Business Travel - Rental Car	0.2	0.0%	0.0%
	Business Travel - Taxi	0.1	0.0%	0.0%
	Staff Commuting	44.9	3.6%	0.7%
	Paper Usage	0.7	0.1%	0.0%
	Garbage Haulage	<u>12.2</u>	<u>1.0%</u>	<u>0.2%</u>
	Sub-total Scope 3	97.2	7.8%	1.5%
PGAA Total		1,239.0	100%	19.6%
Tenant/Air Carriers	Tenant Buildings	509.3	46.7%	8.1%
	Ground Support Gasoline	77.0	7.1%	1.2%
	Ground Support Diesel	91.3	8.4%	1.4%
	Tenant Employee Commuting	<u>414.2</u>	<u>37.9%</u>	<u>6.6%</u>
	Sub-total of Tenants	1,091.9	100.0%	17.3%
N Public	Passenger Commuting	3,982.5	100%	63.1%
T Airport Total		6,313.3		100%

Note: Figures may not add due to rounding

¹ GHG emissions are reported in terms of carbon dioxide equivalent (CO_{2e}). The metric CO_{2e} is used to calculate the impact of various gases involved in global warming using a single unit of measurement. In this report, CO_{2e} accounts for the global warming potential of CO₂, N₂O and CH₄.

Figure 3: Prince George Airport layout and emissions sources



3.1 Prince George Airport Authority

Of the greenhouse gases attributed to PGAA, direct emissions from stationary and mobile combustion sources (Scope 1) contributed 937.5 metric tonnes; indirect emissions from consumption of purchased electricity (Scope 2) generated 204.2 metric tonnes; and other indirect emissions (Scope 3) accounted for 97.2 metric tonnes of CO₂e. Further details on each scope are provided in the subsequent sections.

3.1.1 Scope 1

In fiscal year 2007, PGAA's direct emissions from stationary and mobile combustion sources (Scope 1) generated a total of 937.5 metric tonnes of carbon dioxide equivalent.

Stationary Combustion Sources

Building Natural Gas: PGAA occupies two buildings on the airport property (Air Terminal Building and Combined Services Building). Based on metered data, the natural gas used to heat these buildings produced 683.9 metric tonnes of carbon dioxide equivalent in 2007.

Table 4: Emissions from natural gas consumption in buildings, fiscal year 2007

	Emissions Source	Activity Data (GJ)	Emission Factor (kg CO ₂ e/GJ)	Emissions (tonnes CO ₂ e)
Air Terminal Building	Natural Gas	10,497.7	56,152	589.5
Combined Services Building	Natural Gas	1,681.7	56,152	94.4
TOTAL				683.9

Emissions factor source: Natural Gas Stationary Combustion (EF# 117642), Intergovernmental Panel on Climate Change (IPCC) (reference: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Tables 1.4 and 2.2), www.ipcc-nggip.iges.or.jp/EFDB/

Note: Figures may not add due to rounding

Fire Training: First Responders at Prince George Airport require mandatory fire training. As a result, fuel is periodically burned at a dedicated fire training area on airport property. Also known as "dyed gasoline," the Type E36 fuel used for fire training is selected for its more favourable environmental impact. In 2007, the fuel combustion from fire training generated 36.7 metric tonnes of carbon dioxide equivalent.

Table 5: Emissions from fire training fuel combustion, fiscal year 2007

	Emissions Source	Activity Data (L)	Emission Factor (kg CO ₂ e/L)	Emissions (tonnes CO ₂ e)
Fire Training	Gasoline	14,287.8	2.5713	36.7
TOTAL				36.7

*Emissions factor source: The emissions factor for gasoline was used because one could not be found for Type E36 fuel. Environment Canada - http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/a12_eng.cfm#a12_1_4 Environment Canada Table A12-7 Emission Factors for Energy Mobile Combustion Sources
Note: Figures may not add due to rounding*

Mobile Combustion Sources

Vehicle Fleet: PGAA maintains a fleet of 26 vehicles and heavy equipment. The vehicle fleet includes emergency response vehicles, pickup trucks, dump trucks, tractors, snow blowers, front-end loaders, tractors, sweepers, mowers and brush cutters. Based on fuel supplier summaries for gasoline and diesel, the fuel consumed by this fleet generated 216.8 metric tonnes of carbon dioxide equivalent in 2007. Fuel purchased from the fuel supplier and sold to ground support service companies is attributed to airport tenants and air carriers (see Section 3.2.2).

Table 6: Emissions from vehicle fleet fuel consumption, fiscal year 2007

	Emissions Source	Activity Data (L)	Emission Factor (kg CO ₂ e/L)	Emissions (tonnes CO ₂ e)
Gasoline Purchases	Gasoline	13,351.5	2.5713	34.3
Diesel Purchases	Diesel	65,265.6	2.7965	182.5
TOTAL				216.8

*Emissions factor source: Environment Canada
http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/a12_eng.cfm#a12_1_4
Environment Canada Table A12-7 Emission Factors for Energy Mobile Combustion Sources
Note: Figures may not add due to rounding*

3.1.2 Scope 2

While PGAA occupies two buildings, it provides power to eight different areas on airport property. These properties are metered separately by BC Hydro. In fiscal 2007, PGAA's indirect emissions from consumption of purchased electricity (Scope 2) contributed 204.2 metric tonnes of carbon dioxide equivalent.

Table 7: Emissions from electricity consumption, fiscal year 2007

	Emissions Source	Activity Data (kWh)	Emission Factor (kg/kWh)	Emissions (tonnes CO ₂ e)
Air Terminal Building	Electricity	2,287,285	0.084	192.1
4325 Aviator Road	Electricity	4,155	0.084	0.3
4262 Airport Road	Electricity	4,583	0.084	0.4
Fire Training Area	Electricity	40,032	0.084	3.4
Pumphouse	Electricity	68,940	0.084	5.8
Sewer Lift	Electricity	33,887	0.084	0.7
Hangar Road Parking	Electricity	11,002	0.084	0.9
4795 Johnson Rd (2 mos)	Electricity	6,884	0.084	0.6
TOTAL		2,456,768		204.2

Emission factor source: BC Hydro Emissions factor of 0.084 kg/kWh British Columbia, National Energy Board (2005 data) as referenced by Dowlatabadi et al Paper "Ground Source Heat Pumps in Canada: Economics and GHG Reductions Potential" Page 10, Table 4, Published May 2007.

Note: Figures may not add due to rounding

3.1.3 Scope 3

In fiscal year 2007, PGAA's other indirect emissions (Scope 3) accounted for a total of 97.2 metric tonnes of carbon dioxide equivalent.

Air Travel for Business

Some air travel is required by PGAA staff for business purposes. In fiscal 2007, employees flew a total of 52 flight segments, which generated 39.2 metric tonnes of carbon dioxide equivalent.

Table 8: Emissions from air travel, fiscal year 2007

	Emissions Source	Activity Data	Emission Factor	Emissions (tonnes CO ₂ e)
Stieg Hoeg, Todd Doherty	Aircraft Fuel	Air travel to a variety of destinations - 52 flight segments	Refer to Offsetters.ca	39.2
TOTAL				39.2

Emissions factor source: the formula used to calculate the greenhouse gases is sourced from the Offsetters.ca calculator (www.offsetters.ca).

Note: Figures may not add due to rounding

Ground Transportation for Business

Rental cars and taxis are also used for business travel. In fiscal 2007, the fuel consumption from these vehicles generated 0.3 metric tonnes of carbon dioxide equivalent.

Table 9: Emissions from business travel ground transportation, fiscal year 2007

	Emissions Source	Activity Data (km driven)	Emission Factor (kg CO ₂ e/km)	Emissions (tonnes CO ₂ e)
Rental Cars	Gasoline	900.0 km*	0.2297	0.2
Taxis	Gasoline	300.0 km*	0.2297	0.1
TOTAL				0.3

**Number of kilometres estimate based on accounting estimates.*

Emissions factor source: Table 4 default fuel economy factors for different types of mobile sources and activity data, GHG Protocol – Mobile Guide (03/21/05) v1.3 Medium Gas Auto, averaged for city and highway and Climate Registry's General Reporting Protocol (page 69 Table 11.3) for CH₄ and N₂O emissions.

Note: Figures may not add due to rounding

Staff Commuting

PGAA employed a total of 28 full-time equivalent employees in fiscal 2007. Based on an employee survey (14 responses), employee commuting accounted for 44.9 metric tonnes of carbon dioxide equivalent in 2007.

Table 10: Emissions from PGAA employee commuting, fiscal year 2007

	Emissions Source	Activity Data (km)	Emission Factor (kg CO ₂ e/km)	Emissions (metric tonnes CO ₂ e)
All Staff	Automobile	193,390.7	0.2297 *	44.4
	Transit	-	0.0024 **	-
	Car Pool	8,659.3	0.05742 ***	0.5
	Other (walk, bike, etc.)	-	0	-
TOTAL		202,050		44.9

Emissions factor sources: *GHG Protocol – Mobile Guide (03/21/05) v1.3 Table 4 Medium Gas Auto, averaged for city and highway and Climate Registry's General Reporting Protocol (page 69 Table 11.3) for CH₄ and N₂O emissions.

**Poudenx, Pascal and Walter Merida, 2007, Energy Demand and greenhouse gas emissions from urban passenger transportation versus availability of renewable energy: The example of the Canadian Lower Fraser Valley, Energy, 32(1), 1-9.

*** Medium Gas Auto as above, assuming four passengers in car pool.

Note: Figures may not add due to rounding

Paper Usage

All of PGAA's paper usage represents copy paper used in the photocopiers, printers and fax machines. 54,000 sheets of copy paper with 10% recycled content, equal to a total of 108 packages (reams) of paper were consumed in 2007. In fiscal year 2007, paper usage accounted for 0.7 tonnes of carbon dioxide equivalent.

Table 11: Emissions from paper usage, fiscal year 2007

	Emissions Source	Activity Data (# of sheets)	Activity Data (# of 20 lb packages)	Emission Factor (lbs CO ₂ e/20lb package)	Emissions (metric tonnes CO ₂ e)
PGAA	Copy Paper (10% Recycled)	54,000	108	13.7	0.7
TOTAL					0.7

Emissions factor source: Environmental Defence Paper Task Force Website www.papercalculator.org

Note: Figures may not add due to rounding

Garbage Haulage

Garbage is hauled regularly from three bins at the Prince George Airport. Two bins are picked up once per week and one is picked up three times per week by Waste Management, an outside contractor. Recycling is picked up once per year and has a negligible greenhouse gas footprint.

Although Waste Management does not track its own GHG emissions, they were able to provide data on the number of trips, the number of stops per trip, the total trip distance and the fuel efficiency of their garbage truck. Based on this data, the greenhouse gas impact from garbage haulage was approximately 12.2 metric tonnes CO₂e in 2007.

Table 12: Emissions from garbage haulage, fiscal year 2007

	Emissions Source	Activity Data	Emission Factor	Emissions (tonnes CO ₂ e)
Garbage hauled	Landfill	82.1 tonnes	Clean Air Cool Planet Campus Carbon Calculator – Solid Waste*	12.0
Transport of waste	Diesel Fuel	208.8 km	0.871 kg CO ₂ e/km**	0.2
Transport of recycling	Diesel Fuel	1.5 km	0.871 kg CO ₂ e/km**	0.0
TOTAL				12.2

Emissions Factor Source: *Clean Air Cool Planet Campus Carbon Calculator – Solid Waste section, <http://www.cleanair-coolplanet.org/toolkit/content/view/43/124/>

**WRI GHG Protocol Mobile Guide, Mar.21/05 V1.3 Diesel Heavy Truck and Climate Registry's General Reporting Protocol (page 69 Table 11.3) for CH₄ and N₂O emissions.

Note: Figures may not add due to rounding



3.2 Tenants/Air Carriers

Though outside of PGAA's operational boundary, airport tenants' operations contributed 1,091.9 metric tonnes of carbon dioxide equivalent in 2007. Further details on these emissions are provided in the sections below.

3.2.1 Buildings

Four tenant organizations – Joe Martin & Sons, Hill Aviation, the RCMP and Vancouver Island Helicopter – occupy six buildings on the airport property. While there are other tenants, these four account for the overwhelming majority of natural gas and electricity usage from airport buildings. In fiscal 2007, the emissions generated from these buildings contributed 509.3 metric tonnes of carbon dioxide equivalent.

Table 13: Emissions from natural gas and electricity consumption in tenant buildings, fiscal year 2007

	Emissions Source	Activity Data	Emission Factor	Emissions (tonnes CO ₂ e)
4245 Hangar Road (Joe Martin & Sons)	Natural Gas*	4,325.5 GJ	56.152 kg CO ₂ e/GJ	242.9
	Electricity**	221,911 kWh	0.084 kg CO ₂ e/kWh	18.6
3900 Grumman Road (Hill Aviation)	Natural Gas*	878.2 GJ	56.152 kg CO ₂ e/GJ	49.3
	Electricity**	2,311 kWh	0.084 kg CO ₂ e/kWh	0.2
4255 Hangar Road (RCMP)	Natural Gas*	837.2 GJ	56.152 kg CO ₂ e/GJ	47.0
	Electricity**	46,060 kWh	0.084 kg CO ₂ e/kWh	3.9
4265 Hangar Road (Vancouver Island Helicopters - VIH)	Natural Gas*	725.8 GJ	56.152 kg CO ₂ e/GJ	40.76
	Electricity**	52,373 kWh	0.084 kg CO ₂ e/kWh	4.4
4275 Hangar Road (VIH)	Natural Gas*	1,143.3 GJ	56.152 kg CO ₂ e/GJ	64.2
	Electricity**	148,980 kWh	0.084 kg CO ₂ e/kWh	12.5
4285 Hangar Road (VIH)	Natural Gas*	401.1 GJ	56.152 kg CO ₂ e/GJ	22.5
	Electricity**	35,940 kWh	0.084 kg CO ₂ e/kWh	3.0
TOTAL				509.3

Emissions factor source: * Natural Gas Stationary Combustion (EF# 117642), Intergovernmental Panel on Climate Change (IPCC) (reference: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Tables 1.4 and 2.2), www.ipcc-nggip.iges.or.jp/EFDB/

**BC Hydro Emissions factor of 0.084 kg/kWh British Columbia, National Energy Board (2005 data) as referenced by Dowlatabadi et al Paper "Ground Source Heat Pumps in Canada: Economics and GHG Reductions Potential" Page 10, Table 4, Published May 2007.

Note: Figures may not add due to rounding

3.2.2 Ground Service Vehicles

The ground services contracted by air carriers use a number of vehicles to service aircraft at the airport. Based on gasoline and diesel sales from PGAA to the ground service provider, the fuel consumed by ground service vehicles generated 168.3 metric tonnes of carbon dioxide equivalent in 2007.

Table 14: Emissions from ground service vehicles fuel consumption, fiscal year 2007

	Emissions Source	Activity Data (GJ)	Emission Factor (kg CO ₂ e/L)	Emissions (tonnes CO ₂ e)
Gasoline Sold	Gasoline	13,351.5	2.5713	77.0
Diesel Sold	Diesel	65,265.6	2.7965	91.3
TOTAL				168.3

Emissions factor source: Environment Canada

http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/a12_eng.cfm#a12_1_4

Environment Canada Table A12-7 Emission Factors for Energy Mobile Combustion Sources

Note: Figures may not add due to rounding

3.2.3 Tenant Staff Commuting

Airport tenants employed a total of 293 full-time equivalent employees in fiscal 2007. Based on an employee survey (18 responses), tenant commuting accounted for approximately 398.2 metric tonnes of carbon dioxide equivalent. This figure should be treated with some caution, however, due to the low survey response rate.

Table 15: Emissions from tenant employee commuting, fiscal year 2007

	Emissions Source	Activity Data (km)	Emission Factor (kg CO ₂ e/km)	Emissions(metric tonnes CO ₂ e)
3.2.4 All Tenants	Automobile	1,704,527.5	0.2297 *	391.5
	Transit	78,670.5	0.0024 **	0.2
	Car Pool	393,352.5	0.05742 ***	22.6
	Other (bike, etc.)	183,564.5	0	0.0
<i>E</i> <i>m</i> <i>i</i>	TOTAL	2,360,115.0		414.2

*ssions factor sources: *GHG Protocol – Mobile Guide (03/21/05) v1.3 Table 4 Medium Gas Auto, averaged for city and highway and Climate Registry's General Reporting Protocol (page 69 Table 11.3) for CH₄ and N₂O emissions.*

***Poudenx, Pascal and Walter Merida, 2007, Energy Demand and greenhouse gas emissions from urban passenger transportation versus availability of renewable energy: The example of the Canadian Lower Fraser Valley, Energy, 32(1), 1-9. *** Medium Gas Auto as above, assuming four passengers in car pool.*

Note: Figures may not add due to rounding

3.3 Public

As the gateway airport to Northern British Columbia, Prince George Airport's passenger catchment area is large. As a result, public ground access to and from the airport is a significant source of greenhouse gas emissions.

3.3.1 Passenger Commuting

Based on data from the airport's 2007 Customer Satisfaction Survey, departing passengers traveled an average distance of 78.5 km to reach the airport, with 71% coming from Prince George and the remaining 29% traveling from outside the city. The vast majority of passengers (90.4%) accessed the airport by automobile (private or rental car, or taxi), while only 7.7% traveled by scheduled or shuttle bus. Based on an estimated 376,033 origin-destination passengers in 2007, total passenger commuting contributed approximately 3,982.5 metric tonnes of carbon dioxide equivalent.

Table 16: Emissions from passenger commuting, fiscal year 2007

	Emissions Source	Activity Data (km)	Emission Factor (kg CO ₂ e/km)	Emissions(metric tonnes CO ₂ e)
Passenger Commute	Privately owned car	22,696,595.4	0.2297*	3,384.8
	Rental car	1,702,244.7	0.2297*	253.9
	Taxi	2,269,659.5	0.2297*	338.5
	Schedule Bus/Shuttle	2,269,659.5	0.0024**	5.4
	Other / Not Stated	567,414.9	0.000***	0.0
TOTAL		2,360,115.0		3,982.5

Emissions factor sources: *GHG Protocol – Mobile Guide (03/21/05) v1.3 Table 4 Medium Gas Auto, averaged for city and highway and Climate Registry's General Reporting Protocol (page 69 Table 11.3) for CH₄ and N₂O emissions.

**Poudenx, Pascal and Walter Merida, 2007, Energy Demand and greenhouse gas emissions from urban passenger transportation versus availability of renewable energy: The example of the Canadian Lower Fraser Valley, Energy, 32(1), 1-9.

***Other / Not Stated include bicycling, walking, motorcycle, or some other alternative means of transportation that are assumed to have little to no emissions.

4. Management Actions to Reduce Emissions

The Prince George Airport Authority is implementing a five-part GHG management action plan, including: 1) a GHG Inventory Quality Management System, 2) an internal reductions plan for its building space and vehicle fleet, 3) target setting and 4) investment in GHG offsets for 2008.

4.1 GHG Inventory Quality Management System

Mike Davis, Manager of Communications & Business Development, has volunteered to act as the internal GHG champion. Mr. Davis will see to it that the GHG inventory process and system co-developed between PGAA and its consultants is implemented and maintained on an ongoing basis. The PGAA GHG Inventory Quality Management System (QMS) will ensure that inventory methods are the best possible, data is of the highest quality, and that the process and system developed by the company are fully implemented.

Through this inventory process PGAA has:

- Established an Inventory Quality Team made up of Cuyler Green and Todd Doherty.
- Developed a Quality Management Plan including steps to be taken in collecting the data, inputting it into a tracking spreadsheet, and reporting the results annually.

As recommended by the GHG Protocol, in future fiscal years the Inventory Quality Team will ensure that PGAA:

- Performs generic quality checks to ensure that the tracking system continues to remain accurate, and that data is being archived for future verification.
- Reviews final inventory estimates and reports – as a normal part of monthly, quarterly or annual management decision making, management should review and support the greenhouse gas inventory estimates and reports.
- Performs source-specific quality checks from time to time to ensure the continued quality of the data.
- Institutionalizes formal feedback loops so that errors, operational changes or inconsistencies are reflected in the ongoing inventory tracking system.
- Documents activities in its Annual Report and archives all data.

4.2 GHG Reductions Plan

During the inventory process the consultant team reviewed PGAA's environmental policies and documentation and recommended a range of greenhouse gas reduction strategies and other environmental policies. These recommendations are provided in the tables below.²

Table 17: Strategies to reduce heating, ventilation and air conditioning utility consumption

	Existing Condition 2007	Recommendations
Main Terminal Building Space	<ul style="list-style-type: none"> ▪ Cobalt Design & Management Energy Ltd. (Cobalt) - Options Study was completed in May 2008. ▪ There is no full-time facility operations manager dedicated to monitoring and optimizing facility operation. Systems have not been optimized. ▪ There is no use of space temperature setbacks, to lower thermostats in non-use areas during off-hours. ▪ The air handling units on the roof are in use 24 hours a day. ▪ The local exhaust fans serving the washrooms, restaurant, canteen and cocktail bar operate continuously. ▪ Airport employees report that temperatures are computer controlled in some areas, but manually controlled in others. ▪ The building boilers are 20 years-old and have low efficiency. ▪ The building envelope was upgraded in 2004 and does not require additional improvements at this time. ▪ PGAA is currently undertaking a redesign of the Main Terminal Building's departures area. ▪ Airport employees are not familiar with the amount of energy being used at the airport. 	<p><i>Action:</i></p> <ul style="list-style-type: none"> ▪ Engage an Energy Management System (EMS) contractor to provide and operate an EMS system to optimize the existing HVAC (and lighting) system. Estimated savings are 28 tonnes CO2 per year. ▪ Optimize temperature setbacks by reprogramming thermostats to lower after regular hours in areas that are unoccupied at night. Estimated savings are 13 tonnes CO2 per year. ▪ Shut down air handling units incrementally by zone, in conjunction with occupancy levels and ventilation air change requirements. Estimated savings are 20 tonnes CO2 per year. ▪ Install timer switches or motion sensor controls on local exhaust fans serving the washrooms, restaurant, canteen and cocktail bar. Estimated savings are 1 tonne CO2 per year. ▪ As part of the Main Terminal redesign, Cobalt recommends installing either: a new pellet boiler plant with rooftop units (RTUs) and low pressure hot water coils; a new high-efficiency condensing boiler plant with RTUs and low pressure hot water coils; or RTUs and fan coils serviced by variable refrigerant flow coupled with a geo-exchange field. ▪ Should the air terminal building be redesigned, Cobalt recommends completing a Building Recommissioning to ensure that all building energy systems are optimized per manufacturer standards. ▪ Share fuel and electricity data with employees and tenants to educate them on airport energy use and to encourage energy conservation.

² Many of these recommendations are sourced from the Options Study conducted by Cobalt Design & Management Energy Ltd. (Cobalt) in May 2008.

	Existing Condition 2007	Recommendations
Combined Services Building	<ul style="list-style-type: none"> Combined Services Building is poorly insulated. 	
Tenant Buildings	<ul style="list-style-type: none"> No environmental policies are in place for airport tenants. PGAA has established a tenant "Go Green" Committee. 	<p><i>Policy:</i></p> <ul style="list-style-type: none"> Initiate environmental policies for all tenant buildings to ensure that tenants are turning off heat at night, and closing external doors when heat or A/C is on.

Table 18: Strategies to reduce electricity consumption (non-HVAC)

	Existing Condition 2007	Recommendations
Office Lighting	<ul style="list-style-type: none"> High efficiency metal halide and linear fluorescent lighting dominates the Main Terminal, where architectural design has optimized the potential for daylighting. Some T12 lamps have been changed to more energy efficient T8 lamps. Lighting in public areas is computer controlled and is on for 19 hours per day during operating hours. Some washrooms have lighting motion sensors. 	<p><i>Policy:</i></p> <ul style="list-style-type: none"> Turn off all lights that are not in use. <p><i>Action:</i></p> <ul style="list-style-type: none"> Add lighting sensors to offices.
Runway Lighting	<ul style="list-style-type: none"> All runway lights are controlled by Air Traffic Control. All runway lights are on for aircraft movements regardless of runway used. 	<ul style="list-style-type: none"> Beginning October 31, 2008 FSS Williams Lake will control the lights remotely via the Internet.
Computers	<ul style="list-style-type: none"> No policies are in place. 	<p><i>Policy:</i></p> <ul style="list-style-type: none"> Replace all computer monitors with LCD monitors as monitors age or new computers purchased. Change power settings on all computers to power down if not used within a certain amount of time. Printers to be set to sleep when not in use and turn off at night. All computer or printing equipment purchases to be Energy Star rated. <p><i>Action:</i></p> <ul style="list-style-type: none"> Install stickers on monitors reminding staff to turn off monitors and computers or power bars when not in use.

Table 19: Miscellaneous strategies

	Existing Condition 2007	Recommendations
Heavy Equipment	<ul style="list-style-type: none"> PGAA has an anti-idling policy. Most recent truck purchase had EPA Tier-3 certified engine. Biodiesel has been tried, but airport needs a proper mixing system to use it consistently. 	<i>Policy:</i> <ul style="list-style-type: none"> Ensure all vehicle purchases meet environmental criteria established by PGAA. <i>Action:</i> <ul style="list-style-type: none"> Meet with Union to share environmental best practices.
Vehicle Travel		<i>Action:</i> <ul style="list-style-type: none"> Prior to making a vehicle trip, determine if it could be combined with other trips, or held when a larger trip can be planned.
Air Travel	<ul style="list-style-type: none"> Only essential flying is taking place by staff and management. 	
Staff Commuting	<ul style="list-style-type: none"> Some employee car-pooling and Airporter commuting taking place. 	<i>Action:</i> <ul style="list-style-type: none"> Initiate car-pool board or website to help facilitate alternatives to single occupancy vehicle commuting.
Passenger Commuting	<ul style="list-style-type: none"> PGAA is in discussions with City of Prince George to add a transit stop at the airport. The airport is on the Greyhound Bus network, with two stops from Quesnel per day. Airporter is serving the airport for local passenger pickup and drop off. Taxi service is available. 	
Paper Usage & Recycling	<ul style="list-style-type: none"> Printers are currently not defaulted to double-sided printing. Photocopy and printer paper is 10% recycled. There is currently no recycling program and tenants handle their own recycling. 	<i>Action:</i> <ul style="list-style-type: none"> Default all printers and photocopiers to double-sided printing. Increase the recycled content in paper purchases. Add blue-bins throughout airport and coordinate with all tenants. Coordinate collection of materials with the City of Prince George.
Ground Support	<ul style="list-style-type: none"> At times, ground support leaves hangar doors open. There is no anti-idling policy for ground support operators. Auxiliary Power Units (APUs) are needed to power up airplanes. There is no power station available to replace the APUs. During a four month period over the winter, the unit required to heat deicing fluid is plugged in and idling at all times. 	<i>Policy:</i> <ul style="list-style-type: none"> Extend anti-idling policy to all tenants. <i>Action:</i> <ul style="list-style-type: none"> Investigate replacing hangar doors with ones allowing easier in and out access without leaving doors open. Investigate ground power alternative to APUs. Investigate deicing practices with ground support operators.
Fire Training	<ul style="list-style-type: none"> The 12 First Responders are required to do three hot fires per year. Type E36 fuel is used, which has the same intensity as jet fuel but dissipates particulate matter immediately. 	

5. Greenhouse Gas Target Setting

After reviewing its greenhouse gas footprint for fiscal year 2007, PGAA initiated new greenhouse gas targets as follows:

1) **Absolute Emissions**

TARGET: The BC Provincial Government has set a target of 33% reductions of GHG emissions by 2020.

In 2007, PGAA's operations generated 1,239.0 metric tonnes of carbon dioxide equivalent (based on its operational boundary). To meet the BC Government reduction target, PGAA would need to reduce its emissions to 826.0 tonnes by 2020. To stay on track to meet this target, PGAA should aim to reduce its total emissions by approximately 3% per year. This equates to 1,201.8 tonnes in 2008; 1,165.7 tonnes in 2009; and 1,130.8 tonnes in 2010.

2) **GHG Emissions / Passenger**

TARGET: 5% reduction per year.

Based on a total of 407,300 enplaned-deplaned passengers in 2007, PGAA's operations produced 3.04 kilograms of carbon dioxide equivalent per passenger. To meet its target of a 5% reduction per year, PGAA would need to reduce its per-passenger emissions to 2.89 in 2008, 2.75 in 2009 and 2.61 in 2010.

3) **GHG Emissions / Aircraft Movement**

TARGET: 5% reduction per year.

Based on a total of 28,596* aircraft movements in 2007, PGAA's operations generated 43.33 kilograms of carbon dioxide equivalent per movement. To meet its target of a 5% reduction per year, PGAA would need to reduce its emissions to 41.16 in 2008, 39.10 in 2009 and 37.15 in 2010.

* Total aircraft movements from Transport Canada/Statcan TP141 Aircraft Movements data for YXS.



6. Purchases of Carbon Credits

This section will be included pending decision to purchase carbon credits.



Appendix 1: Greenhouse Gas Emissions by Scope

Figure 4: Scope 1 greenhouse gas emissions

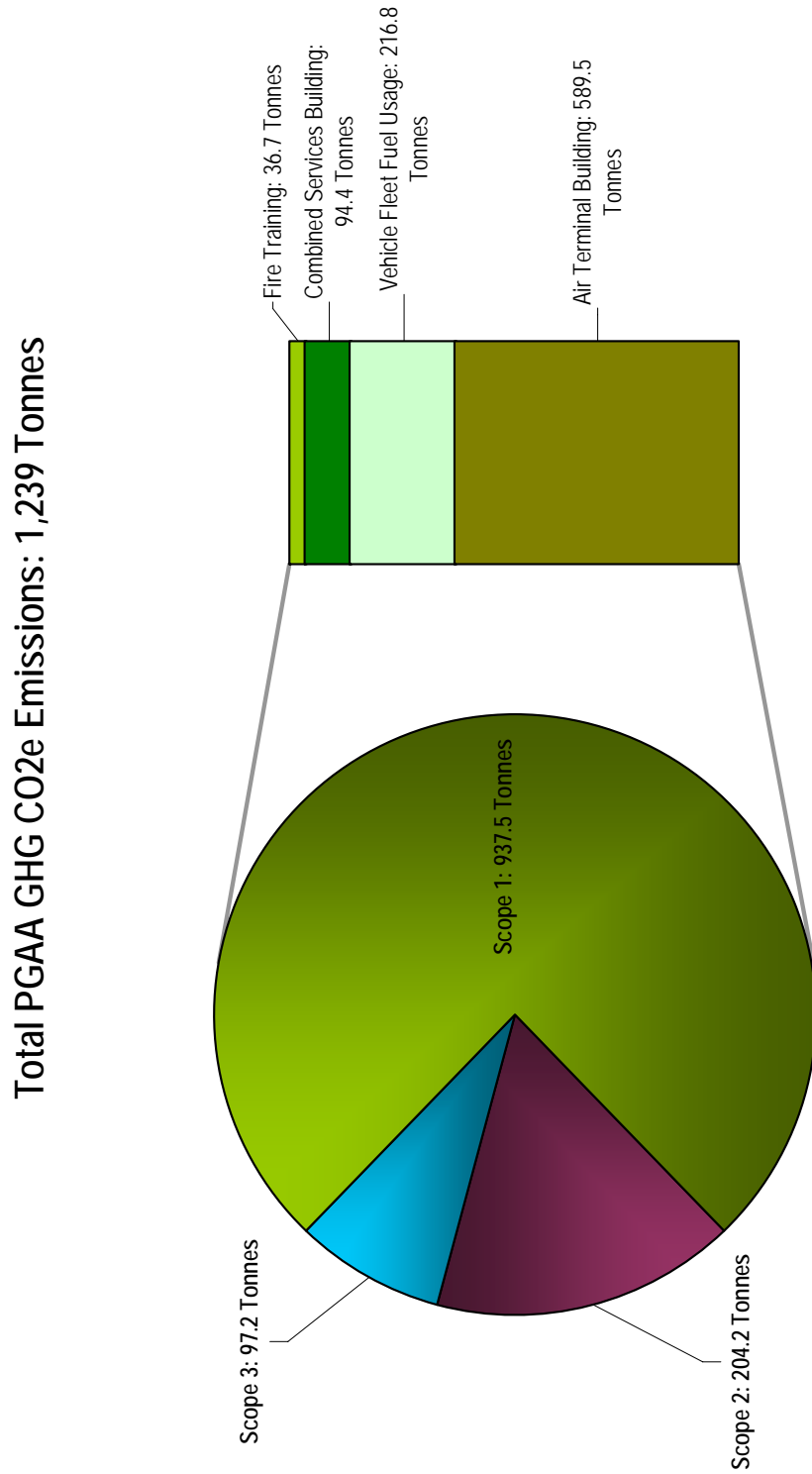


Figure 5: Scope 2 greenhouse gas emissions

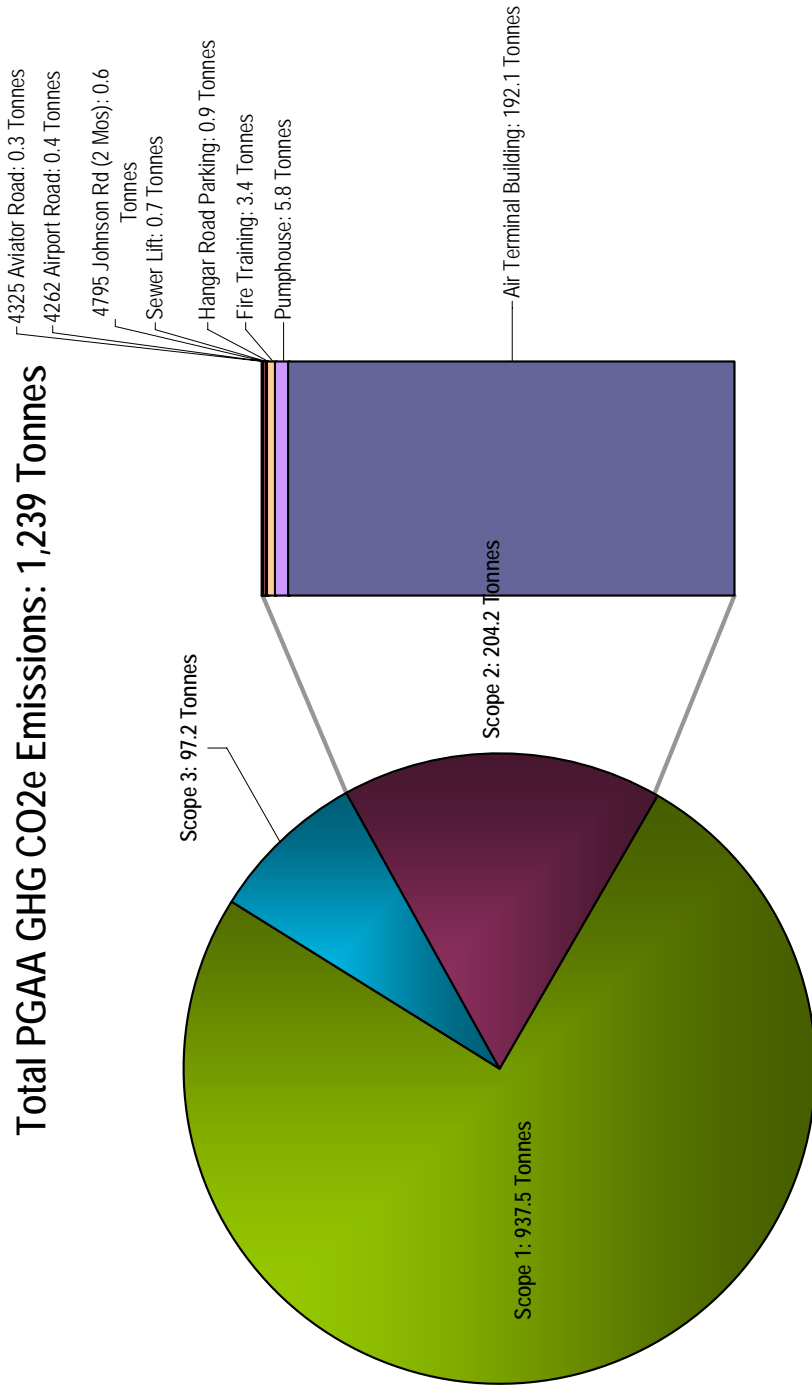
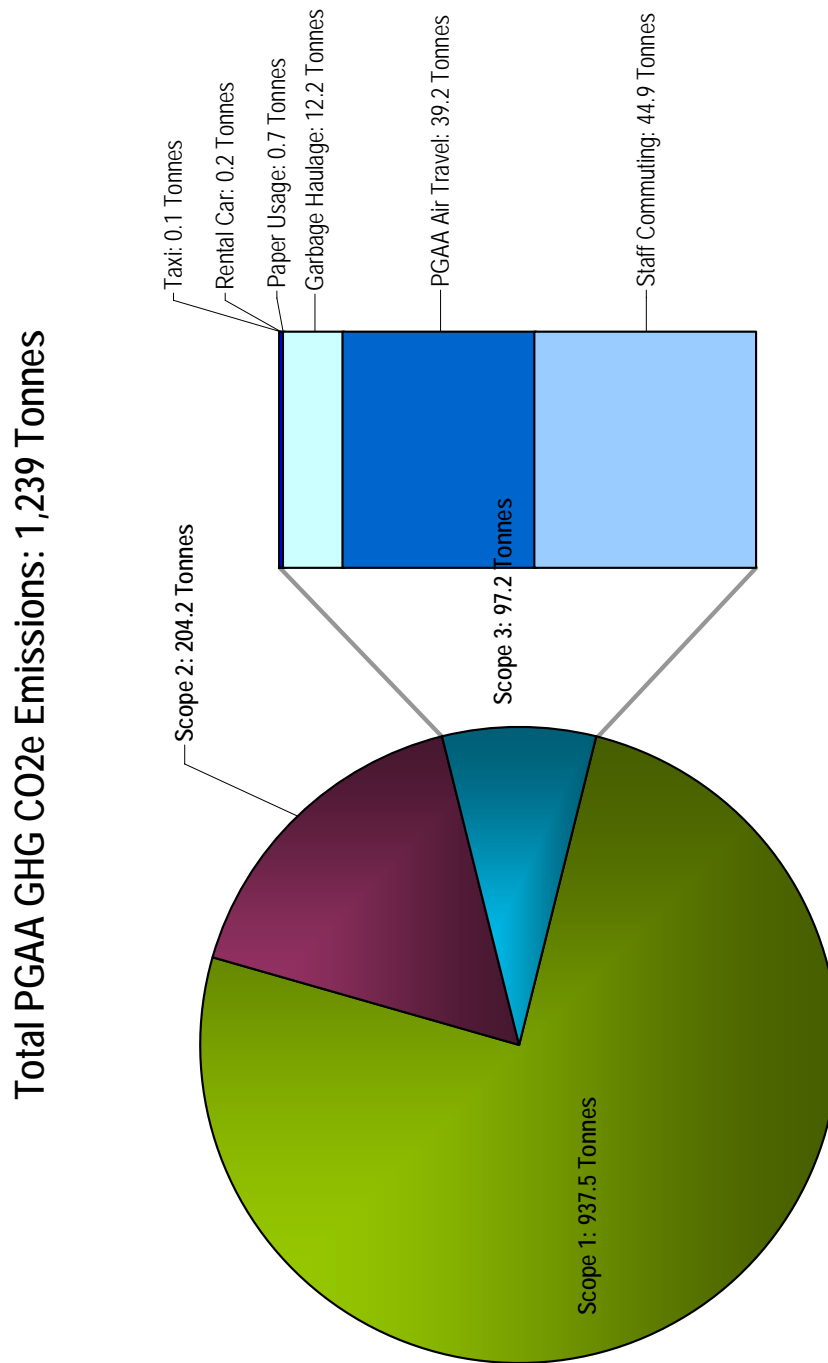


Figure 6: Scope 3 greenhouse gas emissions





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