

# University of British Columbia Commuting Greenhouse Gas Emission Reduction between 2002 and 2003

Prepared for UBC TREK Program Centre

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## **Purpose**

The purpose of this report is to compare the greenhouse gas emissions (GHG) from the UBC commuting fleet between the year 2002 and 2003 at the University of British Columbia. In September of 2003 UBC implemented a campus with U-Pass that increases the transportation options for students and provides a discounted bus pass. This work is conducted as a follow-up to a prior report prepared for TREK titled Greenhouse Gas Emission Baseline: Students, Faculty And Staff Commuting To The University Of British Columbia, which may be found on the TREK web site. I speculated in that report that the U-Pass could significantly reduce the GHG emissions from the UBC commuting fleet. This report proves that speculation to be true and indicates that the U-Pass has reduced the GHG emissions by approximately 16 thousand tons.

## **Methods**

The methods used to calculate the level of GHG reductions is fairly basic and should therefore be considered as a rough approximation and not a precise value. As this is an update to a prior report I do not discuss the methodology in great detail; for more information refer to the prior report. Two calculations are used to determine the total GHG emissions for both years. First, I used existing transportation mode data to determine the approximate vehicle and bus kilometres traveled by UBC commuters in one calendar year. Second, those values are multiplied by emission factors to determine the overall GHG emissions.

The calculation begins with the transportation mode data. UBC uses different methods, survey and counts, to estimate the transportation mode. For the year 2002 the mode data that is available is from counts and for 2003 the data is available from the survey results. It is not ideal to use different methods for each year, but that is the only available option at this point in time. Only modes that emit GHG are of concern for this calculation, which are vehicle and bus and it is assumed that 2.5 people per carpool vehicle. The number of trips per day by student, faculty and staff are multiplied by the assumed number of commuting days, which are 164 for students and 240 for faculty and staff. The result of that calculation is the number of vehicle and bus trips per year, which is then multiplied by the average trip distance of 17.3 km to give the total km traveled by vehicle and bus for commuting purposes.

After the total kilometres traveled are determined various emission factors are used to determine the GHG emission totals. The emission factors are based on the aged and type of the commuting vehicle or bus. Updated fleet information was not available therefore the fleet is assumed to be the same for 2002 and 2003. The emissions being calculated are carbon dioxide, nitrous oxide and methane all of which are converted to a carbon dioxide equivalent (CO<sub>2</sub>e).

With the results of the calculation show the total GHG emissions in both 2002 and 2003 for students, faculty and staff commuting to UBC.

## **Findings**

The findings indicate that a significant reduction in GHG emissions has been achieved as a result of the U-Pass. The 2002 GHG emission total was 54,109 tons of CO<sub>2</sub>e and in 2003 it was reduced to 37,872, for a decrease of 16,237 tons of CO<sub>2</sub>e. This represents a decrease of 30%.

The primary source of the GHG emission reduction is a dramatic change from single occupant vehicle (SOV) trips to bus trips. Vehicle trips decreased by approximately 35% while transit trips increased by 31% between 2002 and 2003. Commuting to UBC via the bus results in approximately one tenth of the GHG emissions of an SOV commute. In 2002 the total vehicle trips, both SOV and carpool, was 10,736,987 and in 2003 that number dropped to 7,112,109. The reduction of over three and a half million vehicle trips per year at an average trip distance of 17.3 km result in over 62 million less vehicle km traveled. Those vehicle trips were replaced with an increase of approximately 110,00 bus trips or 1.9 million km traveled.

## **Considerations**

It is important to remember that this is an approximation and not a precise calculation. A number of variables used in the calculation have been extrapolated and assumptions have been made where data has been unavailable. Among the key variables that should be quantified are: yearly commuting totals, vehicle fleet information and commuting distance. For details of the assumptions and extrapolations see the previous GHG Baseline Report. In that report I also discuss alternative calculation methods that will provide more accurate results.