
**A FEASIBILITY STUDY ON THE
IMPLEMENTATION OF A VEHICLE SCRAPPAGE
PROGRAM IN
WINNIPEG, MANITOBA**

Submitted to

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EXECUTIVE SUMMARY

An assessment has been conducted to determine the feasibility of implementing a voluntary vehicle scrappage program in the Winnipeg area. The goal of a vehicle scrappage program is to reduce the amount of greenhouse gas emissions and improve air quality. Vehicle scrappage programs accelerate the attrition rate of older, higher polluting vehicles, by offering incentives to vehicle owners to retire their vehicle earlier. Programs target older vehicles since they contribute a significantly higher amount of GHG emissions into the environment than newer vehicles.

A complete literature review has been conducted of scrappage programs operating in other regions of Canada, as well as the United States. While each program is unique to the region it is operating in, there are still many similarities among the programs. Most scrappage programs require the following criteria to qualify to participate:

- 1987 or older car/light duty truck,
- Vehicle insured in the area for the last 12 consecutive months,
- Legally registered to the person scrapping the vehicle.

The basic incentive package options typically include:

- Money towards the purchase of a new or used vehicle (on average \$500 to \$750), or
- Transit passes for a year, or
- Charitable tax receipt.

A pilot voluntary vehicle scrappage program should be implemented in the City of Winnipeg. It is recommended that the program run for the period of one year, or 400 vehicles retired through the program – whichever comes first. The scrappage program should commence operations by the spring of 2003. To be successful, a scrappage program will need the support of a large number of stakeholders involved in the industry.

There are approximately 335,000 vehicles currently registered in the City of Winnipeg, of which over 50,000 vehicles are between the model years of 1975 and 1987. This constitutes about 16% of all vehicles. A vehicle scrappage program would target this segment of the market. Also, nearly 50% of these vehicle owners are between the ages of 36 and 55. This is extremely helpful in creating a marketing campaign targeted at the proper demographic.

Implementing a vehicle scrappage program, targeting the aforementioned demographic will prove beneficial in reducing greenhouse gas emissions in the Winnipeg area.

1.0 INTRODUCTION

The objective of this report is to evaluate the feasibility of developing a voluntary vehicle scrappage program in the City of Winnipeg. A scrappage program encourages owners to retire their older vehicles through incentives, in order to reduce tailpipe and greenhouse gas emissions. Research has shown that a relatively small number of older, higher polluting vehicles contribute greatly to overall vehicle emissions. Programs in other jurisdictions have been evaluated for their relevance to Manitoba, and data on the Manitoba vehicle fleet has been reviewed in order to develop the most effective vehicle scrappage program for Winnipeg.

In 1997, transportation accounted for 25% of all greenhouse gases emitted in Canada¹, and the forecast states that these gases will increase substantially if aggressive measures are not taken to get it under control. In Manitoba, vehicle emissions account for approximately 20% of all greenhouse gas emissions produced. These concentrations are highest in urban areas where the majority of vehicles are operated.

Poor air quality is recognized as being hazardous to the environment, and to the health of all Canadians. Vehicle emissions are recognized as a major contributing factor to poor air quality through the formation of ground level ozone and smog. Pollution from vehicle emissions has been linked with premature deaths, increased rates of hospitalization, in addition to a number of other health related issues.

In December 1997, Canada and other developed countries signed the Kyoto Protocol, an agreement to reduce global greenhouse gas emissions within specified timeframes. Under the Kyoto Protocol, Canada must reduce GHG emissions to 6% below 1990 levels, during the 5-year period from 2008 to 2012. On average this converts to a 20-30% reduction in Canada's GHG emissions from 2002 levels. If Canada is to achieve these reductions, measures must be put in place today to reduce the GHG emissions from the transportation sector, since it is the major source of emissions.

The National Climate Change Transportation Issue Table, one of over 20 sector issue tables set up to develop strategies and work plans to assist in implementing Canada's commitments under the Kyoto Protocol, found that Canada's largest metropolitan areas account for almost 75% of the GHG emissions from urban transportation and 10% of all greenhouse gas emissions in Canada. Clearly, if Canada is to make significant progress towards meeting the Kyoto commitment, reducing urban transportation emissions must become a priority.

The Transportation Issue Table recognized the dual role that vehicle scrappage programs can have in the overall GHG emission reduction plan. Effective vehicle

scrappage programs can have a measurable impact on reducing vehicle emissions by convincing owners of older cars to retire them sooner than they might have if no incentives were in place. The scrappage programs can also serve in a communications/awareness role by promoting further action on improving air quality and reducing GHG emissions.

In a vehicle scrappage program, the registered owner of a vehicle receives an incentive to scrap their older, higher emitting vehicle. Vehicles 1987 and older emit GHG emissions at substantially greater rate than newer models. Due to the fact that prior to 1987 vehicles manufactured for the Canadian market were subject to less stringent emissions standards. As a result, most incentive programs target 1987 and earlier model year vehicles. There are a variety of different incentives that can be offered, with most packages uniquely tailored to match the needs and vehicle demographics of the province where the program is to be implemented.

The key objective of a scrappage program is to accelerate the attrition rate of older vehicles and collect verifiable data on the emission reductions that have been achieved. By removing these older, higher polluting vehicles from the road, there will be a corresponding increase in the number of newer vehicles or in other forms of environmentally appropriate transportation, such as mass transit, car pooling, teleworking, or walking. Another objective is to increase public awareness through education and marketing campaigns.

2.0 ANALYSIS OF OTHER PROGRAMS

Currently there are two vehicle scrappage programs operating in Canada, located in British Columbia and Ontario. Alberta's program will commence in late-March. Similar programs are also operating throughout the United States and in other parts of the world.

2.1 BRITISH COLUMBIA – SCRAP-IT PROGRAM

In April 1996 British Columbia launched a pilot vehicle scrappage program called the "Scrap-It Program" in the Lower Fraser Valley area and Victoria. The primary objective was reducing tailpipe emissions by removing older, higher polluting vehicles. The program had a goal of removing 1,000 vehicles from the Lower Mainland area and 100 vehicles from Victoria during a period of one year.

The pilot program took almost two and a half years to reach the objective of scrapping 1,000 vehicles. Despite the extended period, the program was considered a success in the Lower Fraser Valley area and operations were continued. However, Scrap-It was not as successful in the Victoria region and the program was cancelled in that area.

The Scrap-It pilot program produced the results shown in Table 1.

Table 1: Scrap-It Pilot Results²

	Lower Fraser Valley	Victoria
Cars approved for scrapping	1149	85
Cars scrapped	900	55
Incentive chosen:		
New Car	243	21
Used Car	147	10
Transit Pass	431	19

To participate in the program vehicles must meet a certain set of criteria. To increase participation levels the set of criteria has been altered slightly since the program was first implemented in 1996. Current criteria are:

- Must be a 1987 or older car/light duty truck,
- Vehicle insured in the area for the last 12 consecutive months,
- Failed an AirCare³ test at some point in its history,
- If the vehicle is registered as “pleasure” insurance, proof must be provided that it was driven more than 5,000 kilometers in the past year.

When the program was first implemented the incentives consisted of: \$750 toward a new vehicle, \$500 toward a used vehicle (1988 or newer), or a B.C. Transit pass for one year. Over time the incentives have been modified to increase participation and better meet the needs of the public. The current incentives include a choice of one of the following:

- \$1000 toward a new natural gas vehicle
- \$750 toward a new vehicle
- \$500 toward a 1988 or newer vehicle
- 8 months of a 3-zone transit pass (\$824 value)
- 10 months of a 2-zone transit pass (\$780 value)
- 14 months of a 1-zone transit pass (\$756 value)
- 20 months of a concession transit pass
- West Coast Express 28-day pass
- \$500 toward a bicycle (50% of purchase price to maximum)
- \$750 toward van pooling.³

Figure 1 shows the distribution of incentives selected over the past three years of operation.

Figure 1 Incentive selected in Lower Fraser Valley



In B.C. the most popular incentive has been the transit pass. The high demand for this incentive can partially be attributed to the fact that it is the best value among the incentives. On average 40% of participants choose the transit option, 30% new car, 12% used car, and 10% bicycle options. In a survey conducted of transit pass recipients 77% expected to continue using transit when their passes ran out, and 70% had not purchased a vehicle after participating in the program.⁴ The natural gas vehicle and van pooling options have not proven to be popular so far.

Scrap-it does not put a lot of money into its advertising budget.⁵ Since they have the AirCare standard, in which vehicle emissions are required to be tested yearly, vehicles that fail must be repaired before they can be re-insured. This encourages individuals to take the incentive when it becomes too cost-prohibitive to continue fixing the vehicle. One of the main recommendations coming from the Evaluation of the Scrap-It Pilot Program was to market the program more aggressively to increase participation rates.⁴

The Canadian Petroleum Products Institute (CPPI) is a major funding sponsor of the program. Also, the BC Automobile Dealers Association (BCADA) subsidizes a third of the new or used car options, with CPPI and BC Hydro making up the remaining amount. The Vancouver Regional Transit Commission contributes transit passes, and AirCare supplies Federal Test Procedure (FTP) tests and technical assistance. Scrap-It also has partnerships with Environment Canada, Translink, West Coast Express, the Jack Bell Foundation, Envirotec Canada, BC

Ministry of Environment, Lands and Parks, the Greater Vancouver Regional District, the BC Lung Association, and participating bicycle retailers.

Scrap-It tows approximately 10% of vehicles to an AirCare site where they are extensively tested to calculate emission reductions from the program. Scrap-It calculates its emissions reduction as the average measured scrapped vehicle emission minus the baseline emission estimated for the replacement option (new car, used car, transit). Table 2 illustrates the reduction of hydrocarbon (HC), carbon monoxide (CO), and nitrogen oxides (NO_x) per vehicle scrapped.

Table 2: Scrap-It Emission Reductions⁴

	HC	CO	NO _x
	<i>Emission Baseline Factors – g/km</i>		
Average Scrapped Vehicle	4.98	33.37	1.54
New Vehicle	0.15	2.00	0.20
Used Vehicle	0.60	5.50	0.60
Transit Pass	0.05	0.50	0.24
Bicycle	0.00	0.00	0.00
	<i>Emission Reductions – g/km (per vehicle scrapped)</i>		
New Vehicle	4.83	31.37	1.34
Used Vehicle	4.38	27.87	0.94
Transit Pass	4.93	32.87	1.30
Bicycle	4.98	33.37	1.54

Thus far the Scrap-it Program has been deemed a success in the Vancouver area, and one of the most successful scrappage programs in North America. It has effectively reduced vehicle emissions while accelerating the retirement of older vehicles.

2.2 ONTARIO – CAR HEAVEN

On July 13, 2000 the Clean Air Foundation launched “Car Heaven” in the Greater Toronto Area (GTA), Hamilton, and Wentworth. It plans to operate for three years, upon which the success of the program will be evaluated.⁶ Air pollution is a major problem in Southern Ontario. This is due to the fact that of the 17 million vehicles on the road in Canada, approximately 7 million are located in Ontario.

In the first five months of operation, Car Heaven took 1,500 to 2,000 vehicles off the road. To date over 5,000 vehicles have been retired. The removal of these older, high polluting vehicles has produced a significant reduction in emissions. As of November 1, 2001 Car Heaven has removed 41 tons of nitrogen oxide

(NO_x), 27 tones of volatile organic compounds (VOCs) and 540 tons of carbon monoxide (CO) from the environment.⁷

Car Heaven accepts all cars, and light and medium duty trucks and vans. They will take vehicles that do not pass the Drive Clean⁸ emissions standards, as well as vehicles that are old, no longer wanted, or not economical to fix.

The incentives currently offered by Car Heaven are:

- Vehicle is towed at no cost,
- Receive a minimum \$60 charitable tax receipt,
- Eligible to win a brand new 2001 Toyota Prius (on Oct.1/2001),
- Also entered into a draw for various other prizes, such as: bicycles, transit passes, hiking boots, etc.⁹

Car Heaven differs from other programs in that it resells non-emission related parts once the vehicle has been dismantled. The proceeds support charitable organizations such as the Kidney Foundation of Ontario and the Recycling Council of Ontario.

The main sponsors of the program are the Canadian Petroleum Producers Institute (CPPI), Environment Canada, Protect Air, and Toyota Canada. They also have partnerships with the Ontario Automotive Recyclers Association, Ontario Ministry of the Environment (OMOE), Imperial Oil Ltd., Autotrader, and Ontario Power Generation Inc. (OPG). Various other organizations such as the Recycling Council of Ontario, Ontario and Toronto Auto Dealers Associations, Canadian Hearing Society, and Kidney Foundation of Canada support the program too.

2.3 CALGARY – SCRAPPAGE PROJECT

The Calgary Scrappage Project has been in development for approximately three years. On March 21, 2002, Calgary launched their pilot vehicle scrappage program. This program has been modeled after the highly successful B.C. “Scrap-it Program.” It will operate for a period of 1 year, or up to 600 cars scrapped – whichever comes first. The program will then be evaluated and a final report produced with recommendations for the future.

The program will be targeted at the 100,000 vehicles that are between the model years of 1975 and 1987. Everything that is older than 1975 is considered a collector car and is not included in the calculations. The target segment of vehicles comprises close to 20% of the 550,000 vehicles registered in Calgary.¹⁰

This program has three main objectives that it hopes to achieve in its first year of operation. It plans to reduce vehicle emissions by removing older, high polluting

vehicles, educate the public on the effect of emissions on the environment, and assess the public response and acceptance of a permanent vehicle scrappage program.¹¹

To be eligible for the Calgary program vehicles must meet these criteria:

- Model year 1987 or older,
- Car or light duty truck not exceeding 2721 kg (6000 lbs),
- Registered in Calgary for the past 12 months,
- Legally registered to the person scrapping the vehicle.

Owners of any vehicles that do not qualify for the program are encouraged to phone the Kidney Car Line and donate their vehicles through that program.

Calgary has started with a very basic incentive package. Participants have two options: \$500 credit toward a 1994 or newer vehicle plus a \$50 tax receipt, or 12 months of transit passes plus a \$50 tax receipt.¹⁰ The Kidney Foundation is the organization in charge of administering the charitable receipt through the Kidney Car Line. Having only two incentives will simplify the administration of this pilot program. There are only 300 of each incentive available, so they are offered on a first-come, first-serve basis.

The transit pass has the highest value of the incentives (\$660). The City of Calgary Transit is supplying the passes as a contribution in-kind. All motor dealers in Calgary are expected to participate in the program. Their contribution is \$165 toward each new or used vehicle purchased from an authorized dealer. To follow the process, an applicant makes their best deal possible with the car dealer, and then presents their certificate for \$500 to the dealer. The dealer will reduce the price of the car accordingly, and bill the scrappage program for a \$335 reimbursement.

Calgary has prepared a budget of \$541,290 for the life of the project. Climate Change Central of Alberta and Environment Canada are contributing the majority of the financial support. With Canadian Petroleum Products Institute (CPPI), Transport Canada, Calgary Community Lottery Board, and CASA making up the remainder of the \$239,000 in cash funding. The rest of the budget is comprised of in-kind contributions totaling \$302,290. The program has received in-kind contributions of transit passes and advertising from the City of Calgary Transit, \$165 per vehicle from the Calgary Motor Dealers Association, emissions testing and vehicle recycling from Calgary Pick-Your-Part, Kidney Car Line advertising, and CASA contributing a Web site, human resources, and leadership on the program.¹²

A large media event was planned for the program launch on March 21, 2002. A press conference was held to acquire as much television, radio and newspaper coverage as possible. From there radio advertisements, newspaper ads,

brochures, information on their Web site, and a telephone hotline are available for additional information.

To quantify emissions the Calgary program plans to have the vehicle recycler, Pick-Your-Part, test emission levels using a gas analyzer on each vehicle. They will be testing the levels of HC, CO, CO₂, and O₂. From this about 60 vehicles will be taken to the Southern Alberta Institute for Technology for more extensive testing. All emissions information will be recorded, and then be presented to the public at the conclusion of the program, demonstrating the successful reduction of greenhouse gases that has been achieved.

They also plan to complete a pre-program survey to measure people's awareness of the issues surrounding vehicle scrappage. Then another survey will be used once the program is concluded, to gauge the effectiveness of the program and measure the change in awareness levels. The final report will analyze and evaluate the pilot program and summarize all results. Opportunities will be assessed to see if the program should be run on an on-going basis, or periodic programs run in various locations of Alberta.

2.4 THE KIDNEY FOUNDATION OF CANADA – CARS FOR KIDNEY

The Kidney Foundation of Canada also operates a vehicle scrappage program in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, and Quebec. The program has been in operation in Manitoba since 1994. They accept all light or medium duty vehicles that are towable with four inflated tires. Participants receive a charitable tax receipt for the value of the vehicle, as determined by the Manitoba Motor Dealers Association.

Cars for Kidney receives approximately 60 to 70 cars a month in Manitoba, and normally resells as many as 10 per month. They will accept any vehicles, including functioning vehicles, as well as non-operating, non-registered vehicles. Kidney Manitoba normally has approximately 800 vehicles go through the program each year.

The program differs from conventional scrappage programs in that the Kidney Foundation does not scrap all vehicles it receives. Vehicles that can be resold are advertised at vehicle auctions, and some vehicles are not fully recycled, parts are still sold.

2.5 OTHER PROGRAMS

There are many similar programs operating around the world. In June 2000, the State of Illinois implemented an "Accelerated Vehicles Scrappage Program." To be eligible it must be a light duty vehicle or truck, not from a model year 25 years

or older, has been continuously registered in the State for 12 months prior, legally drivable and able to drive to the site on its own, and also pass an operability check. If all these conditions are met, the individual will receive money from the vehicle scrappage sponsor.¹³

Texas implemented their program, called “Cash for Clunkers” in December 1999. Each individual is allowed to scrap a maximum of 2 vehicles under current regulation. Eligibility consists of cars and light duty trucks from 1986 or earlier, driven to the site on their own power and in working order. The incentive to scrap the vehicle is an average of \$500, with additional premium incentives of \$700 for vehicles rated as high emitters, such as vehicles older than 1975.¹³

California instituted a similar program in July 2000, in conjunction with their “Smogcheck Program.” To qualify it must be a passenger vehicle, or light or medium duty truck, have failed a Smogcheck within the last 90 days, currently registered and continuously operated for the last 2 years, and pass a visual and operational inspection. If a vehicle meets these criteria, the owner will receive \$1,000 from the State to retire the vehicle. Recommendations from this program indicate that a substantial incentive is needed for participation, a good public relations campaign to increase awareness is required, good infrastructure, and clear and simple qualifying rules must be in place.¹³

3.0 VEHICLE EMISSIONS

Reducing vehicle emissions is the primary focus of a vehicle scrappage program. The main three targeted pollutants from a vehicle scrappage program are hydrocarbon (HC), carbon monoxide (CO), and nitrogen oxides (NO_x).

3.1 HC, CO, NO_x

Hydrocarbons (HC) are produced mainly from unburned fuel that evaporates. Sunlight breaks these down to form oxidants, which react with oxides of nitrogen to cause ground level ozone, a major component of smog.

Carbon monoxide (CO) is a poisonous gas that is colourless and odorless. It is formed by the combustion of gasoline.

Nitrogen oxides (NO_x) are created when the heat in the engine of a vehicle forces nitrogen in the air to combine with oxygen. NO_x contributes to smog and acid rain.

3.2 VEHICLE EMISSION COMPONENTS

The catalytic converter is the most important part of the emissions control system of a vehicle. Its purpose is to reduce harmful emissions released from the engine by treating exhaust before it leaves the vehicle, which removes a great proportion of the pollution. The catalytic converter converts the harmful emissions of hydrocarbons (HC), carbon monoxide (CO), and nitrogen oxides (NO_x) into less harmful emissions.

The catalytic converter is situated before the muffler and designed to treat exhaust gases by reaction after they exit the exhaust manifold. After being heated to over 700°C by exhaust gas, precious metals create a reaction site for CO and HC to be oxidized to CO₂ and water.¹⁴

Catalytic converters take carbon monoxide and hydrocarbons given off as waste from the combustion of gasoline in a car's engine, and convert them into water and carbon dioxide gas. It also converts nitrous oxide into nitrogen gas. Water and carbon dioxide are much safer for the environment than carbon monoxide and hydrocarbons.

All vehicles produced for the United States market after 1980 were legally required to have catalytic converters. However, in Canada they were not legally required until the 1988 model year. Hence, the vehicles 1987 and older produce significantly higher emission levels. Removal or tampering with the catalytic converter can increase CO and HC emissions up to ten times that of a properly functioning vehicle with a catalytic converter.

3.3 QUANTIFICATION METHODS

There is currently no one standard method to measure the expected reduction in vehicle emissions. Emissions must be quantified for the scrapped vehicle, as well as the new means of transportation. Environment Canada has modified the US EPA computer model, MOBILE5C for Canada. It is used for estimating vehicle emissions of HC, CO, and NO_x. "The computer model estimates the emission produced by vehicle model year based on U.S. driving cycles, with modification by Environment Canada to calibrate the models to Canadian cities."¹⁵

3.4 INSPECTION AND MAINTENANCE (I/M) PROGRAMS

Vehicle certification standards apply only to new vehicles; once they are sold maintenance is the owner's responsibility. As time goes by the vehicle deteriorates due to lack of maintenance and deliberate tampering. This leads to considerably higher tailpipe emissions.

As a result of this, many jurisdictions are beginning to implement a mandatory vehicle emission inspection and maintenance program, otherwise known as an I/M program. Most programs require a test of exhaust gas emissions every year or every two years. If the vehicle fails the test, the vehicle must be repaired and then retested before it can be insured.

Vehicles are subjected to an I/M 240 test, which involves driving the vehicle onto a dynamometer. Then the vehicle is put through a four minute standardized simulated city and highway driving cycle. Tailpipe emissions of NO_x, HC, CO, and CO₂ are measured every second. The computer then calculates the emission levels in grams of pollutant per kilometer, and these values are compared against the “acceptable” emission level for that type of vehicle.¹⁶

I/M programs work as a nice compliment to vehicle scrappage programs. In the case that the vehicle that failed the emissions test has a market value lower than the repairs required, many individuals would rather participate in a scrappage program where they are receiving more than the value of their vehicle.

The City of Winnipeg and Province of Manitoba can actively take measures to help decrease emissions. Mandatory emissions testing can be included in the vehicle safety inspection that is conducted when a vehicle changes owners. Also, having mandatory odometer readings every year for emissions monitoring and buyer protection, and certification of the safety and emission testing personnel.

3.5 VEHICLE EMISSIONS DATA FROM INSPECTION CLINICS

In 1986 Environment Canada’s Transportation Systems Branch began holding nationwide emissions inspection clinics across Canada. The objective was to build a database on Canada’s light duty vehicle fleet, educate the public on the importance of proper vehicle maintenance, and generate environmental awareness.

A tailpipe emissions test was conducted on all vehicles using a 4-gas analyzer to measure the HC and CO concentrations in the exhaust gas. Then a high idle and low idle test are performed, they are performed in this order to ensure that both the engine and catalyst have reached operating temperature and conditions. The test procedure starts with inserting a test probe into the tail pipe, and then holding the engine speed between 2,000 and 2,500 rpm for approximately 30 seconds until the emission level has stabilized, and the HC, CO, CO₂, and oxygen levels are recorded. Then the engine returns to idle speed of approximately 750 rpm and another set of stabilized readings are taken. Only the low idle test results are currently used for analysis. Finally the level of HC and CO emissions for each vehicle is compared to the British Columbia Idle Test Limits.¹⁴

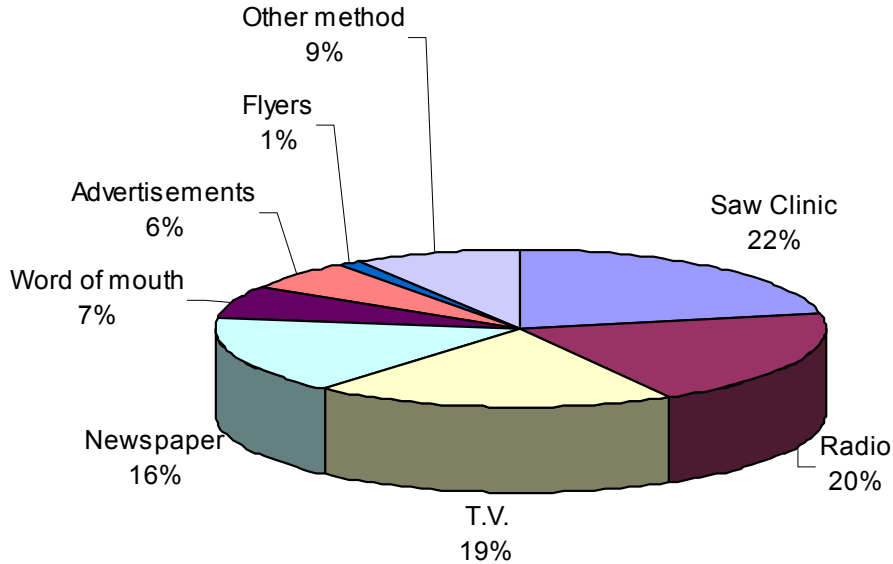
The most recent clinics were held between May 3rd and September 19th, 2001 at 14 locations across Canada. During this time over 3,600 vehicles were tested, of which 15.6% of vehicles failed because they exceeded HC or CO limits based on BC AirCare idle emission standards. Of the 376 vehicles tested in Winnipeg, 19.5% failed the idle emissions test.

Data analysis from all clinics found that the failure rate increased with vehicle age, with vehicles 13 years and older failing 35 to 40% of the time. 42.3% of the vehicles that failed were called “gross emitters”, because they doubled or more than doubled the allowable emission limits of HC or CO.¹⁴

Data from the Winnipeg clinic of May 2000 shows 364 vehicles tested with 13.3% failing the emissions test, and a national fail rate of 16.8%. The vehicles tested show approximately 15% of all vehicles exceeds HC or CO limits.¹⁷

A voluntary survey was also conducted of all participants at the clinic. General questions were asked about vehicle use, vehicle maintenance, and environmental concerns. Figure 2 shows how the motorist found out about the clinic.

Figure 2 How motorists found out about the clinic¹⁴



The most successful advertising mechanism was people seeing the clinic the

weekend it was run; it was identified by bright signs and a large clinic tent. Radio and television advertising both accounted for approximately 20% of the participants, while newspaper accounted for 16% and word of mouth 7%. The rest of the participants learned of the clinic from advertisements (6%), flyers (1%), and other methods (9%). This information will prove valuable when designing a marketing strategy for a Winnipeg vehicle scrappage program.

Another interesting question on the survey was, "Would you support the implementation of a mandatory vehicle emissions inspection and maintenance program?" The national response from 2001 was 83% saying yes, further supporting this is the results of the survey from the Winnipeg region from 2000 with 82% of participants supporting the creation of such a program. In both cases only 15% replied no to the question.¹⁴

4.0 BENEFITS

There are numerous benefits that come from implementing an accelerated vehicle scrappage program. There are benefits towards the environment, individual's health, safety factors and many other benefits.

4.1 ENVIRONMENTAL BENEFITS

The main environmental benefit of implementing a vehicle scrappage program is the improved air quality by means of reduced vehicle emissions. The transportation sector is the largest producer of greenhouse gas emissions in Canada. In the Lower Fraser Valley of B.C. light duty vehicle emissions are responsible for approximately 58% of air pollution.³ Scrapping older vehicles will result in measurable reductions in the amount of HC, CO, and NO_x emitted into the atmosphere. Replacing these vehicles with more efficient models or with more environmentally sound choices of transportation will also assist Canada in achieving the necessary reductions in GHG emissions that will soon be required under Canada's Kyoto Protocol commitments.

The program will ensure that scrapped vehicles are recycled according to the appropriate environmental guidelines for the industry, with each component fully removed and recycled. There will also be further benefit to the environment with decreased leaking fluids, which affects the vegetation and ground water.

The program will promote the use of sustainable and environmentally friendly means of transportation, such as increased transit ridership, or increased bicycle usage. At least some of the individuals choosing to scrap their vehicle may decide not to purchase another vehicle, and instead use alternate means of transportation. This will directly benefit the environment as fewer emissions are being released, thus dramatically reducing vehicle emissions. Even if a newer

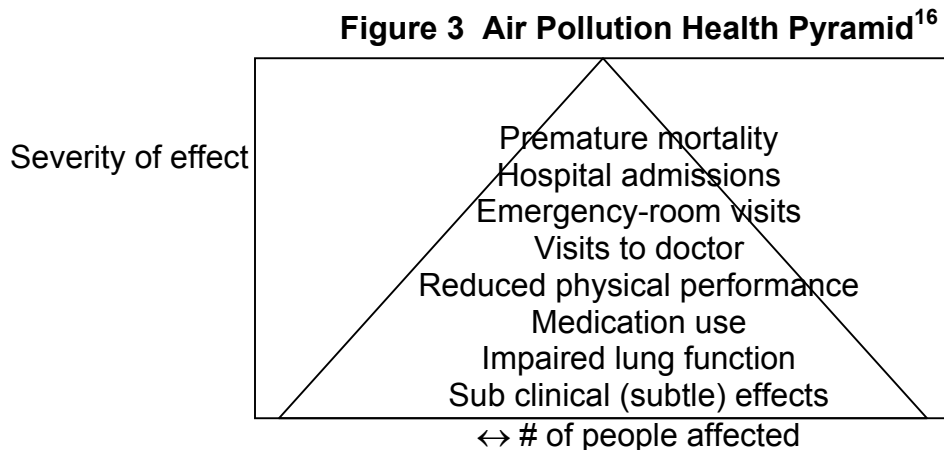
vehicle is purchased, it will result in considerably less emissions being produced than the older vehicle it is replacing.

4.2 HEALTH

Air pollution is the greatest contributing factor to respiratory disease. It can lead to lost productivity in the workplace, lost wages, and a lower quality of life, which can also lead to increased doctor and hospital visits. This all contributes to increasing the costs of health care.

There is a proven correlation between air levels of ozone and respiratory related emergency room visits and hospital admissions. The visit to emergency room typically occurs one or two days after outdoor exposure. Children, seniors, and people with a pre-existing respiratory condition are most at risk.

The Air Pollution Health Pyramid, in Figure 3, shows the increasing severity of effect that air pollution can cause. Respiratory effects begin with shortness of breath and painful breathing, and as it moves up the human health pyramid, effects become more serious.



4.3 SAFETY

There are also numerous safety benefits of establishing a vehicle scrappage program. There would be less mechanical deficiencies of vehicles currently on the road, since it is expected that older, less-maintained vehicles would be removed. It would create safer driving conditions by having fewer vehicles with braking or steering problems on the road. As a result there may also be less vehicles on the road, as some people choose different incentives, which do not include purchasing a new vehicle. Also, newer vehicles are required to have air bags and anti-lock brakes, which increases the safety factor of driving newer vehicles.

4.4 OTHER BENEFITS

There are other benefits that will result from the implementation of a vehicle scrappage program. There would be decreased emissions of fuel toxins, such as benzene. Also it will encourage the development of more fuel-efficient replacements. The public will have an increased awareness of pollution due to vehicle emissions. Finally, the provincial economy will benefit from a vehicle scrappage program, by stimulating sales in the vehicle market.

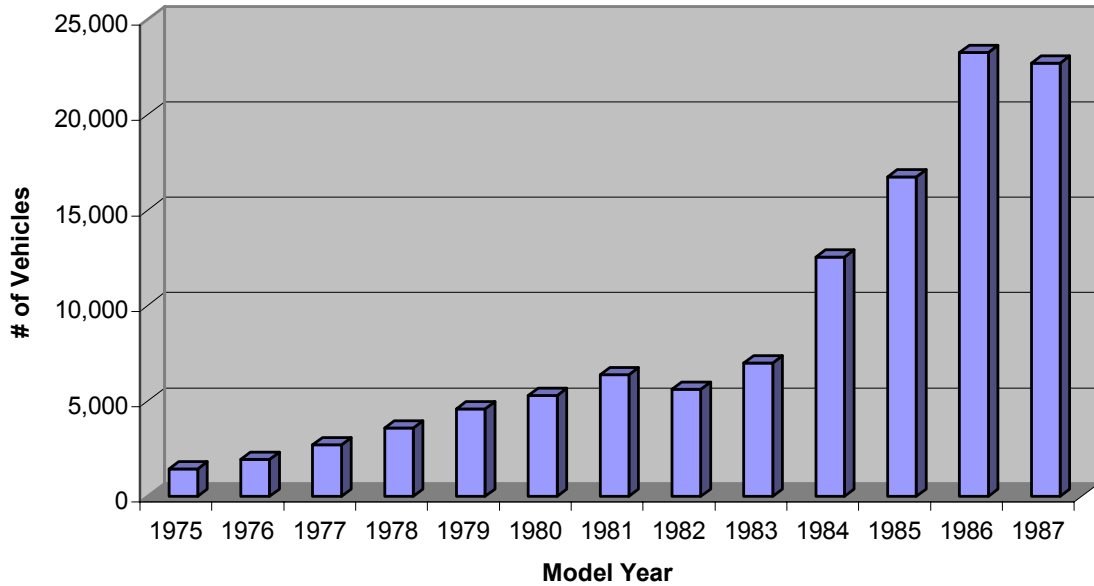
5.0 MARKET ANALYSIS

Manitoba Public Insurance (MPI) Corporation has provided data sets on the number of vehicles registered in Manitoba and Winnipeg, average ages of drivers, and other valuable information. All of this information has been combined to develop a strategy to influence the normal attrition rate of the pre-1988 vehicles through the implementation of a vehicle scrappage program in Winnipeg. It also creates a profile of individuals currently driving these older, higher polluting vehicles.

5.1 EVALUATION OF THE MANITOBA REGION VEHICLE DATA

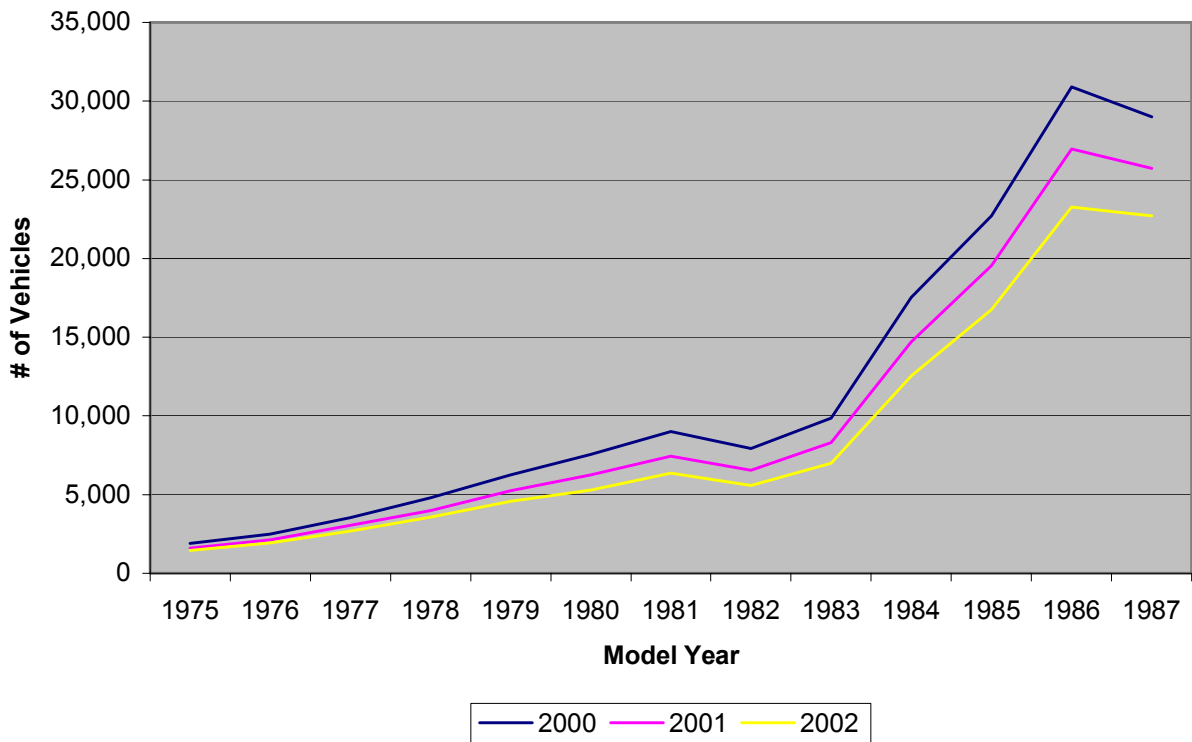
Information provided by Manitoba Public Insurance (MPI) Corporation shows that there are approximately 630,000 vehicles currently registered in the province of Manitoba. Of this total approximately 20%, or 125,000 vehicles are from the 1987 model year or older. The 10,000 vehicles older than 1975 are considered collector cars and would not be targeted in a typical vehicle scrappage program. Therefore, the number of vehicles eligible for the program is approximately 115,000. Figure 4 shows the distribution of registered vehicles in Manitoba between the model years of 1975 and 1987, as of January 1, 2002.

Figure 4 Number of vehicles registered in Manitoba, January 2002



Based on an analysis of the data, the number of vehicles registered in the province has been increasing at a rate of approximately one and a half percent per year over each of the past three years. The corresponding attrition rate of these vehicles between the model years of 1975 and 1987 was 14.36% between 2000 and 2001, and 13.45% between 2001 and 2002. This led to reductions of respectively 22,000 and 18,000 vehicles in each of the last two years. Figure 5 illustrates the reduction in vehicle registrations across the last three years between the model years of 1975 and 1987.

Figure 5 Number of vehicles registered in Manitoba from January 2000 - 2002



5.2 EVALUATION OF THE WINNIPEG REGION VEHICLE DATA

Winnipeg is the largest urban centre in the province of Manitoba, with a population of just over 670,000 people. As of January 1, 2002 there were almost 335,000 vehicles registered in Winnipeg and surrounding areas. Table 3 shows the breakdown of vehicle ages insured in Winnipeg over January 1st of 2000, 2001, and 2002.

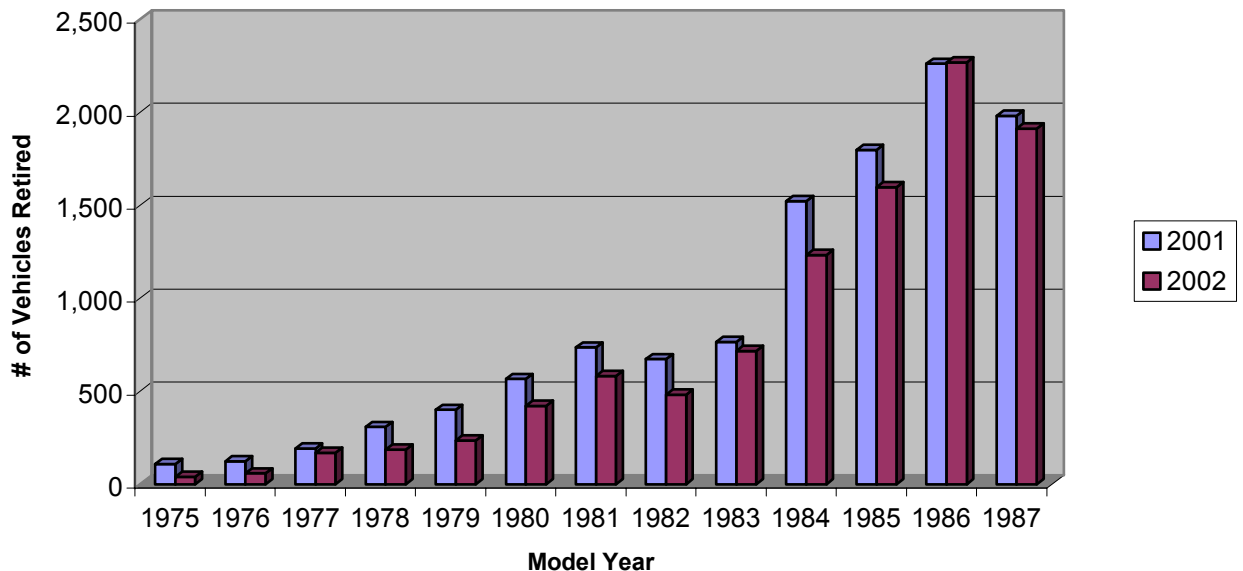
Table 3: Vehicle registrations in Winnipeg as of January 2000/01/02

	2000	2001	2002
Old-1974	4,787	4,652	4,736
1975-1987	73,134	61,703	51,808
1988-2002	244,415	261,449	278,336
TOTAL	322,336	327,804	334,880

Table 3 shows that the proportion of vehicles between the model years of 1975 and 1987 has been decreasing each year, with an attrition rate of approximately 16% per year. From 2000 to 2002 the 1975 to 1987 vehicle segment shrunk by 21,326 vehicles, while the 1988 and newer segment grew by 33,921 vehicles. This results in a 1.70% increase in vehicle registrations in 2001 and a 2.16% increase in 2002.

Figure 6 shows the number of vehicles that were not re-registered in January of 2001 and 2002. It can be assumed a great proportion of these vehicles were scrapped due to their age.

Figure 6 Number of vehicles retired (not re-registered) in January 2001/02



5.3 COLLECTOR VEHICLES

A vehicle scrappage program would not include the approximately 4,700 collector vehicles registered in the Winnipeg Region. Collector vehicles are considered any vehicle model year older than 1975. Scrappage programs will still accept vehicles older than the 1975 model year, but these vehicles are not included in the target market of the program. This is due to the fact the value of these vehicles is often much higher than any incentive offered through a scrappage program, and they are rare, which also increases their value.

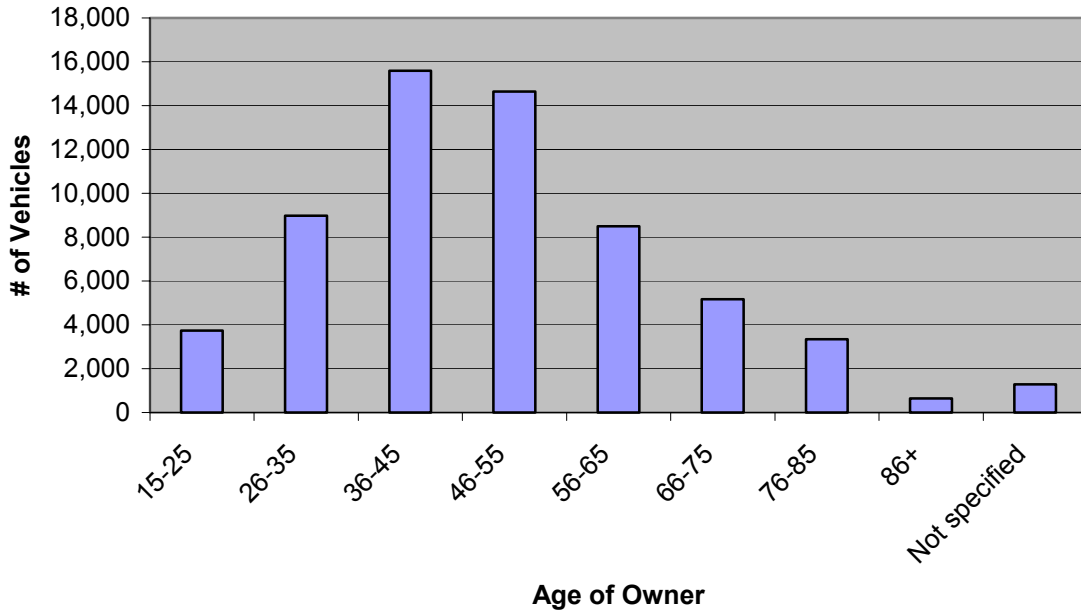
In addition, many of these vehicles are kept in storage all winter and are only driven for the few months of good weather during the summer. Hence, these vehicles do not produce year round emissions and therefore do not pose a major problem to the environment. The environmental effect is much diminished, since

the vehicle is only driven one or two thousand kilometers a year, as opposed to being driven and polluting the environment all year.

5.4 PROFILE OF DRIVER

In order to ensure the scrappage program is as effective as possible, it is necessary to determine a profile of the typical vehicle owner in the target 1975-1987 vehicle category. Figure 7 provides information on the age of the driver insured related to the model year of vehicle insured. This information will assist in narrowing the focus of the program.

Figure 7 Driver age related to 1975 to 1987 vehicles



The data reveals that almost 50% of 1975 to 1987 model year vehicle owners are between the ages of 36 and 55. Out of nine separate categories, two categories, 36-45 and 46-55 comprise close to 50% of vehicles. As a result, marketing efforts can be focused on this major target age segment.

A possible explanation for these results is families who have a newer first car, and keep an older vehicle as a second car, or for use by their children. Another proportion of this segment will be comprised of low-income families who cannot afford to purchase a newer vehicle.

6.0 PROPOSED PROGRAM DESIGN

Various vehicle scrappage programs have been researched, from across Canada to across the United States. Since each location is unique, it is difficult to predict what will dictate success in the Winnipeg market. However, from the market analysis, and having other similar Canadian cities operating programs, an effective program can be created for the Winnipeg region.

6.1 PROGRAM OVERVIEW

A vehicle scrappage program operating in Winnipeg would be tailored after the successful program operating in British Columbia, and the program just commencing in Calgary. BC's Scrap-It Program has been considered to be one of the most successful scrappage programs in North America. Appropriate adjustments would be made in consideration of the Winnipeg market. Also, since scrappage programs have had success in other regions of Canada and the world, we can assume that the program would be met with success in Winnipeg as well.

Initially, a pilot vehicle scrappage program would be run for the period of one year, or 400 vehicles retired, whichever comes first. At that point the pilot program's success would be evaluated and a decision would be made regarding the creation of a longer-term operational program.

In order to provide meaningful data on the emission reductions approximately every tenth vehicle accepted into the program will be extensively tested at Red River College. Emission levels from each of the test vehicles will be measured and recorded in order to provide a quantifiable reduction of vehicle emissions. Each vehicle owner participant will also be encouraged to fill out a program evaluation questionnaire, for feedback on the program and general information about the participant.

6.2 PROGRAM ELIGIBILITY CRITERIA

The proposed set of criteria to qualify for a vehicle scrappage program is very similar to the set of criteria used for the Calgary program. The first criterion is the vehicle must be from the model year 1987 or older. Vehicles 1987 and older emit CO, HC, and NO_x at substantially greater rates than newer models. This is due to the fact that prior to 1987 vehicles manufactured for the Canadian market were subject to less stringent emissions standards. The program will be focused only on cars and light duty trucks and vans.

Also, it is recommended that the vehicle must have been registered in Manitoba for at least five of the past twelve months. Other programs have insisted on the vehicle being registered for a minimum of the past twelve months, but Winnipeg is a unique case. With the harsh winters many people buy 'beater vehicles' to

drive for the winter months in order to save their newer vehicle for driving the rest of the year. Hence, these winter beaters will not normally be registered for the full year. They are driven for the winter, and then sold off or parked in the spring. Having the criteria of the vehicle only being registered for five of the past twelve months will help target and remove this segment of vehicles currently on the road.

The vehicle must also be in working condition and drivable to the program site. This is because the scrappage program is targeting vehicles currently in use, because they are the vehicles currently contributing to greenhouse gas emissions. Older vehicles sitting in a field and not being driven are not the target of a vehicle scrappage program.

6.3 INCENTIVES

Various incentive programs have been examined as to which would prove to be most successful in the Winnipeg area. The current recommendations are to provide an applicant with:

- \$500 toward the purchase of a 1990 or newer vehicle, or
- Transit passes for a year, or
- Autopac vehicle insurance reduction (50% off, up to \$500 maximum).

These incentives will be subject to change as further program details are developed. The first phase of the implementation of the vehicle scrappage program will include a survey on the types of incentives that are the most attractive to Winnipeggers. The results of this survey will be used to tailor the incentive package to better suit the needs of the target market.

Other possible incentives that may be considered include:

- a discount on the purchase of a new bicycle, or
- a charitable tax receipt, or
- entry into a draw for a new vehicle.

6.4 PROJECTED DECREASE IN EMISSIONS

The most difficult part of a vehicle scrappage program is quantifying the emission reductions as a result of the program. Since the types, year and condition of the vehicles that will be scrapped are not known in advance, the emission reductions will vary significantly. Therefore, only very basic estimates of emissions reductions can be computed.

The Manitoba Lung Association and the University of Manitoba Transportation Information Group (UMTIG) from the Faculty of Civil Engineering are currently in discussion for UMTIG to develop an appropriate model to measure vehicle emissions. UMTIG has previously developed a model to measure emissions of heavy-duty trucks, so with some modification it can be adapted to the light-duty vehicle fleet.

Red River College has assisted with the vehicle emission testing for the Winnipeg Emissions Inspection Clinics held in Winnipeg the past few years. They are very interested in continuing this partnership in conjunction with their Automotive Technician Diploma. They would conduct tests on approximately 10% of vehicles accepted to the scrappage program.

Based on the fleet data provided by MPI it is estimated that implementing a pilot vehicle scrappage project in Winnipeg will accelerate the reduction of the older vehicle fleet by half a percent for the life of the project. An additional half percent reduction will be realized due to increased awareness and education of vehicle scrappage, as a result of the marketing campaign. Hence, a scrappage program would increase the attrition rate of older vehicles by one percent.

By generalizing the results of emissions reductions from the British Columbia Evaluation of the Scrap-It Program⁴ to the Winnipeg region, a basic indication of the amount of decreased vehicle emissions can be calculated. Table 4 illustrates the projected decrease in emissions, assuming 100 new vehicles are purchased, 150 used vehicles, and 150 transit passes.

Table 4: Projected Decrease in Vehicle Emissions¹⁸

	HC	CO	NO_x
	<i>Emission Reductions – g/km (per vehicle scrapped)</i>		
New Vehicle	4.83	31.37	1.34
Used Vehicle	4.38	27.87	0.94
Transit Pass	4.93	32.87	1.30
Bicycle	4.98	33.37	1.54
	<i>Emission Reductions – g/km (per 400 vehicles scrapped)</i>		
New Vehicle (100)	483	3137	134
Used Vehicle (150)	657	4,180.5	141
Transit Pass (150)	739.5	4,930.5	195
TOTAL REDUCTIONS	1,879.5	12,248	470

From a pilot vehicle scrappage program we can estimate that HC will be reduced by almost 2,000 g/km, CO by approximately 12,200 g/km, and NO_x by 470 g/km.

These numbers are only estimates, and more precise numbers will be developed once an appropriate model is created.

6.5 POSSIBLE PARTNERS

As a preliminary step in assessing the feasibility of implementing a vehicle scrappage program in the Winnipeg area, meetings have been held with various sectors of the community to gauge their response and accept any suggestions. These meetings were simply to make stakeholders aware of this initiative and gauge their interest in the subject. The plan was to only establish a sign-on to the general concept; details of the exact involvement will be discussed at a later date.

To this point meetings have been held with:

- Manitoba Used Car Dealers Association (MUCDA),
- Manitoba Transportation and Government Services,
- Manitoba Conversation,
- Automotive Recyclers of Manitoba,
- Red River College,
- Manitoba Kidney Foundation.

In the future, meetings will be planned with the following organizations:

- City of Winnipeg, Environmental Division,
- Winnipeg Transit,
- Manitoba Motor Dealers Association (MMDA),
- Manitoba Public Insurance Corporation (MPI),
- CAA.

6.6 MARKETING PLAN

As with the other programs, a significant media launch would be key to the vehicle scrappage program success. A large kick-off event would draw local newspaper, television, and radio stations, which would help to increase awareness of the program, and generate free publicity. Advertisements will also be placed on billboards, along with radio ads and flyers distributed. Also, Manitoba Public Insurance (MPI) Corporation outlets would be invited to carry brochures about the program.

The majority of the advertising would be focused on the target market, as determined by the data MPI supplied. The target market focuses on drivers between the ages of 36 and 55, since they comprise almost 50% of the owners

of later model vehicles. Advertising efforts would be focused on radio stations and newspapers that cater to this group of people.

The communications strategy will also incorporate the use of a model similar to the AIDA Model.¹⁹ The AIDA Model has four main steps: attention, interest, desire, and action. The first step is to create attention to the subject of vehicle scrappage, by making the public aware of the concept. Then create interest in such a program. Next, generate a desire to participate in a scrappage program, and finally take action to implement the program. By this time individuals are aware and knowledgeable of the program, and are more willing to participate.

6.7 TIMELINE

A proposed timeline, beginning April 1st, 2002 has been developed for the implementation of a vehicle scrappage program in Winnipeg. It includes three main steps as benchmarks for success.

The first step is securing agreements and funding. This step commences immediately, and includes waiting approximately ten weeks for Environment Canada to approve the pilot program and secure their portion of funding. It also involves meeting with program participants to determine their level of participation and sponsorship, and applying for federal and provincial grant application programs.

The second step starts simultaneously with the first step, in which the program design is completed. During this time a survey will be conducted to determine which incentives are most appealing to the Winnipeg target demographic market. A basic questionnaire will be distributed by means of placing it on the windshield of vehicles older than 1988 at various shopping malls across the city at various points of time. A return envelope will be enclosed, and the participant will be encouraged to fill out the survey and mail or fax it back. From this survey a better understanding will be had as to which incentives are most appealing to the general public, and what would make the scrappage program a success. This survey method will yield the most accurate data, as only the target vehicle owners are being surveyed. Also during this time a project coordinator will be hired to begin coordinating the program, and promotional materials will begin to be developed.

The third step is comprised of two parts. The first part will start around November 2002; it is an awareness strategy, to promote the concept of vehicle scrappage to the general public. Its purpose is to inform the public of the significantly higher amount of emissions older vehicles emit, and begin to create initial awareness of the scrappage concept. The second part will include the launch of the actual vehicle scrappage program. Hypothetically, a vehicle scrappage program could begin operation in Winnipeg by the spring of 2003 at

the earliest. This timing would coincide perfectly with the end of winter, and individuals wanting to be rid of their 'winter beater' vehicles.

7.0 PROPOSED PROGRAM FUNDING

As a part of the feasibility study, research has been done into how a vehicle scrappage program would be funded. No funding has been secured as of yet, so the proposed budget will certainly be subject to change.

7.1 FUNDING SOURCES

Environment Canada has shown considerable interest in establishing vehicle scrappage programs in all regions across Canada. They are willing to make a substantial financial contribution to the origination of such a program. Other programs have been funded up to \$120,000, so the same amount can be assumed for a Winnipeg program.

Transport Canada offers a program called Moving on Sustainable Transportation (MOST). As of January 23, 2002 a fourth round of funding has been announced, with a 5 year \$2.5 Million extension.²⁰ They fund projects that promote sustainable transportation and that achieve quantifiable environmental benefits. Funding is provided up to 50% of eligible costs, to a maximum of \$100,000 over a 2-year period. The next application deadline is June 1, 2002, with the decision on funding pending on August 30, 2002. The Calgary scrappage program received funding from this program in December 2000 in the amount of \$25,000. A similar amount can be assumed to be received for a Winnipeg project.

Manitoba Climate Change Action Fund is a similar program, but on a provincial level. They have a four year \$1 million commitment to support issues pertaining to climate change. Each project generally has a \$50,000 maximum cap. An application must be completed and submitted to Manitoba Conservation, after which, applications received are reviewed at a few times during the year.

The Urban Transportation Showcase Program (UTSP) provides funding for proposals that aim at reducing GHG emissions from urban transportation. Up to one-third of eligible costs will be covered by the program.

7.2 BUDGET

The expected amount of funding required to start a one-year pilot vehicle scrappage program in the Winnipeg area is presented in Table 5.

Table 5: Proposed Scrappage Budget

Revenues / Grants		Expenses	
Environment Canada	\$120,000	Personnel	\$40,000
M.O.S.T.	\$25,000	200 vehicles @ \$500	\$100,000
MB Climate Change Fund	\$30,000	200 Transit Passes @ \$63.55/month	\$152,520
Potential Gifts in Kind		Marketing	\$70,000
*Transportation showcase (bus passes)	\$75,000	Overhead costs (8%)	\$29,000
*Winnipeg Transit	\$25,000		
*Auto dealers or MPIC	\$33,200		
TOTAL	\$308,200	TOTAL	\$391,520

* To be negotiated

The remainder of the expenses will be comprised of partnerships and gifts in-kind with organizations like the car dealers association and Winnipeg Transit. This is only a preliminary budget, and will be subject to change as partnerships are developed.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 CONCLUSIONS

1. Vehicle scrappage programs have been successful in other locations of Canada and the U.S.
2. A pilot voluntary vehicle scrappage program in Winnipeg has the potential to retire 400 1975-1987 vehicles.
3. The program will be successful if it involves a large number of stakeholders currently engaged in this area. Including: automotive dealers, government departments, MPI, automotive recyclers, and others.
4. An appropriate model is needed to be able to quantify and measure vehicle emissions.
5. A key factor to success is creating awareness to the public of vehicle scrappage programs, and marketing the program appropriately.

8.2 RECOMMENDATIONS

Based on the preceding conclusions, the following action is recommended:

1. A pilot vehicle scrappage program should be implemented in the City of Winnipeg.
2. The pilot program should run for the period of one year, or 400 vehicles retired – whichever comes first.
3. The program should be launched by the spring of 2003.

REFERENCES

- ¹ Transport Canada. *“Transportation in Canada 1999 Annual Report,”* Canada, 2000.
- ² Scrap-It Program. *“Scrap-It Program Results,”* February 2002.
- ³ *“Air Care – Making a clear difference in the air we breathe.”* (10 Jan 2002). <<http://www.aircare.ca>>.
- ⁴ Innovatech Energy Systems Ltd. and Constable Associates Consulting Inc. and Alchemy Consulting Inc.. *“Evaluation of the Scrap-It Pilot Program (Final Report),”* Report for Scrap-It Program Steering Committee, August 1997.
- ⁵ Hopkyns, Dan, Scrap-it Program. Telephone Interview. 12 January 2002.
- ⁶ The Clean Air Foundation. *“An important new force takes to the air The Clean Air Foundation aims to make a measurable difference to Ontario’s air quality,”* July 13, 2000.
- ⁷ Alden, James. *“Car Heaven,”* Presentation, Environment Canada Vehicle Scrappage Meeting. Ottawa, 11 February 2002.
- ⁸ *“Ontario’s Drive Clean.”* (10 Jan 2002). <<http://www.driveclean.com>>.
- ⁹ *“Car Heaven: Where Old Cars Come to a Good End.”* (18 Jan 2002). <<http://www.carheavenhelps.com>>.
- ¹⁰ Ertel, Gerry. *“Calgary Scrappage Project,”* Presentation, Environment Canada Vehicle Scrappage Meeting. Ottawa, 11 February 2002.
- ¹¹ CASA. *“Calgary Scrappage Pilot Project Manual – A Voluntary Project to Remove High-Polluting Vehicles from our Roads,”* 31 December 2001.
- ¹² Chomlak, Kerra. *“CASA and the Vehicle Scrappage Project,”* Presentation, Environment Canada Vehicle Scrappage Meeting. Ottawa, 11 February 2002.
- ¹³ Friends of the Earth. *“Scrappage Programs Report,”* Report for Transportation System Division of Environment Canada, October 2000.
- ¹⁴ Environment Canada, Transportation Systems Branch, Air Pollution Prevention Directorate. *“Summary of the 2001 Vehicle Emissions Inspection Clinics,”* 19 December 2001.
- ¹⁵ BOVAR-CONCORD Environmental and Constable Associates Consulting.

“Voluntary Scrappage Program for Older High Polluting Vehicles for the British Columbia Lower Fraser Valley Area,” Report for the British Columbia Lung Association, 1 May 1995.

¹⁶ Walker, Bruce. *“STOP’s Guide to I/M,”* prepared for STOP, Winter 1998.

¹⁷ Environment Canada, Transportation Systems Branch, Air Pollution Prevention Directorate. *“Summary of the 2000 Winnipeg Vehicle Emissions Inspection Clinic,”* March 2000.

¹⁸ *Note: Adapted from Evaluation of the BC Scrap-It Pilot Program (Final Report)

¹⁹ Shapiro, Stanley J. *“Basic Marketing: A Global-Managerial Approach,”* Toronto: Times Mirror Books, 1996.

²⁰ Transport Canada. *“Moving on Sustainable Transportation (MOST).”* (6 Feb 2002). <<http://www.tc.gc.ca/EnvAffairs/most/>>.