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City of Kitchener Waste Audit:
An Attempt

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Table of Contents

1.0 SUMMARY	1
2.0 INTRODUCTION	1
2.1 Sustainability	3
2.2 Information	4
2.3 WATgreen	4
3.0 PURPOSE OF STUDY.....	4
3.1 Key Concepts.....	5
4.0 RESEARCH OBJECTIVES.....	6
5.0 CONCEPTUAL FRAMEWORK.....	7
5.1 Systems Diagram.....	7
5.1.1 Actor System	7
6.0 BOUNDARIES.....	10
6.1 Definition of Key Terms.....	10
6.2 Scope and Focus of This Study	11
6.3 Limitations.....	12
6.4 Significance	12
7.0 METHODS.....	13
7.1 Procedural Method Information for research question #1	14
7.2 Procedural Method Information for research question #2	15
8.0 DATA ANALYSIS PROCEDURE.....	16
8.1 Procedural Data Analysis Methods	16
9.0 RESULTS.....	17
9.1 Literature Review	17
9.2 Interview Results	20
9.3 Interview Conclusions	23
9.4 Data from Surveys	23
9.5 Analysis of Surveys	24
9.6 Audit of Community Services dumpster proposed procedure:.....	29
9.7 Audit Approval Requirements.....	29
10.0 CONCLUSION.....	30
11.0 ACKNOWLEDGEMENTS	30
12.0 LITERATURE CITED	31
APPENDICES.....	32
Appendix 1 - Schedule	32
Appendix 2 - Audit Data Worksheet	34
Appendix 3- City of Kitchener Waiver	35
Appendix 4- Questionnaire.....	37

1.0 Summary

For our project, our research team intended to assess the waste disposal procedures of the Community Services department of the City of Kitchener. In addition, we had hoped to perform a waste audit on the refuse stored at the Community Services transfer station. Unfortunately, we did not receive approval from The City of Kitchener to conduct a waste audit or to administer our questionnaire to the Community Services workers. However, we were able to ascertain the steps that a future “Greening the Campus and Community” group would have to follow in order to be allowed execute an audit, if such a group were so inclined. Because we were unable to follow through with our original intentions, our research team decided instead to assess the procedures of Community Services departments in the cities of Cambridge, Guelph, Bramton and Waterloo. The following paper outlines the purpose, framework, boundaries and methods we followed in carrying out our research, as well as some suggestions which a future group might consider following in order to complete the original research that we initiated. We have included an appendix, which contains an audit worksheet, questionnaire, and other forms related to our study.

2.0 Introduction

Waste diversion may be one of the most widely accepted forms of conservation in our society. Our group defines waste diversion as the diversion of discarded items from landfill sites. The 'blue box' program provides a simple means by which the average citizen can recycle, and many regional governments also have adopted compost pick-up or backyard composter programs. In addition, many businesses have large recycling bins and compost piles so that they too can take part in this phenomenon. There is always more that can be done. One way to discern if a particular citizen or business is re-directing as much of its waste as is possible is to

perform a waste audit. We intended to perform such an audit on the refuse collected by the Community Services Department of the Corporation of the City of Kitchener. The purpose of the audit would have been to answer the question: *'How can the Community Services department of the City of Kitchener divert as much waste as possible from landfill sites?'*. Regrettably, we were unable to determine an answer to our question because we had an insufficient amount of time to both fulfill the requirements of the City of Kitchener to be permitted to complete an audit, and to actually perform an audit that would be representative of the composition of waste that is typical for the Community Services transfer station. In addition, our research team sought to conduct a survey of the Community Services workers and an interview with a Community Services decision-maker, in order to get a sense of their ideas and attitudes toward waste diversion. Unfortunately, our contact at Kitchener's Community Services Department informed us that, because the City of Kitchener officials believed that the workers themselves were not responsible for making decisions regarding waste disposal, we would not be permitted to administer our Questionnaire to them. Our team does not agree that the workers do not make disposal decisions; every time the waste the workers collect is being disposed of, the decision of whether it gets recycled, composted or trashed is ultimately the worker's because her hands are likely the last hands that will touch the waste. Fortunately, the administration of the City of Cambridge agreed with us that the front-line workers' waste disposal decisions are important in regard to assessing waste diversion possibilities, and we were allowed to administer our questionnaire to the Cambridge Community Services Department employees. Furthermore, we were able to establish exactly what some other Community Services Departments are doing to divert some of the waste that they collect. Our research question, then, has changed from *'How can the Community Services department of the City of Kitchener divert as much waste as*

possible from landfill sites?’ to ‘What requirements would need to be fulfilled in order for a future group to answer our original research question?’ and ‘What have some other Community Services Departments done to divert waste from the landfill sites?’.

2.1 Sustainability

Any waste that increases the volume of landfill sites has many sustainability implications. Although there is no definite meaning of the word ‘sustainability’, there seems to be a general consensus that sustainability involves environmental, social and economic factors with an emphasis on ‘intergenerational equity’ and ‘intragenerational equity’. Farrell and Hart (1998) assert, “intergenerational equity, of course, entails leaving future generations an ecologically viable planet with abundant resources, while intragenerational equity entails distributing the environmental costs and benefits among people living now”(7). Our research team defines sustainability as ensuring that the quality of environmental, social and economic systems does not decrease now, or in the future. It is an ambitious goal, which requires that many small steps be taken by many people. We aimed to take the small step of assisting Kitchener’s Community Services department in diverting as much of the waste they collect as possible from the landfills. Instead, we have taken the even smaller step of outlining what a future team would have to do in order to be allowed to complete the necessary waste audit so as to make a statement regarding the amount of waste that could be diverted. If a future group is successful in answering our original question, this will increase our community’s sustainability because landfill space has become very limited and expensive, and the problem of finding new places to put our garbage has yet to be solved. Therefore, diversion of any waste from landfill sites will save our community money, slow the encroachment of landfill sites onto or near urban and rural areas, and reduce the amount of new space needed for garbage. Furthermore, recycling and

composting have benefits in and of themselves as they reduce the amount of glass, plastics, paper, metals, and fertilizers that are produced. Waste diversion, then, will increase our community's sustainability by reducing the space, therefore the cost and environmental and social impacts of the garbage system now and for future generations.

2.2 Information

One member of our research group is a former employee of the Community Services Department of the Corporation of the City of Kitchener who, as a result of his previous position, has learned much about the waste diversion measures taken by the city. Although City of Kitchener workers are typically very thorough in their conservation attempts, our goal is to help them ascertain where improvement strategies are warranted. It is our hope that a future group will continue on from where we left off in reaching our goal.

2.3 WATgreen

There are several WATgreen projects that include waste audits. Unfortunately for our group, most of the projects deal primarily with food wastes generated within the University of Waterloo campus. We were unable to find a project that is available on-line that pertains to a general waste audit performed on a system that is not on campus. Furthermore, we have discovered a very comprehensive waste audit guide provided by the federal government (see literature review section), which we will use for our audit design. Therefore, we will not be building on a past WATgreen projects, or using them as a primary information source.

3.0 Purpose of Study

Employees of the Corporation of the City of Kitchener consider themselves to be role models for the community. Because of this perceived responsibility, they try to display a

positive attitude toward the environment for the public. The workers accomplish this in many ways, which include: cleaning up garbage in the street that is not necessarily their responsibility; turning off their vehicle's engines when they are not in use to limit greenhouse gas emissions; composting the organic material that they pick up when it is appropriate; and further reducing their greenhouse gas emissions by limiting use of two-stroke engines (a high greenhouse gas producing engine found in small machinery like lawnmowers and weed-eaters) on 'smog days'. Additionally, the City of Kitchener has recently purchased a number of small machines that run on more efficient four-stroke engines. However, as with any system, there seems to be room for improvement. As a former employee, one member of our research team has witnessed several large, easily recyclable items being discarded with the regular refuse. It is precisely because the city workers are perceived to be role models, who consider the image of environmental consciousness to be important, that we want to help them achieve maximum environmental responsibility. Hopefully, a future research group will pick-up where we left off and complete an audit and offer suggestions to the City of Kitchener for waste diversion. Our assessment of other Community Services Department's efforts for waste diversion will assist a future group in offering alternatives to the City of Kitchener.

3.1 Key Concepts

Our research team took an integrated approach for our study. Quantitative aspects of our study include:

1. Questionnaire responses are quantified and graphed
2. Interview results are charted

Qualitative aspects of our study include:

1. A literature search

2. Interviews with decision makers
3. Some of the open-ended questionnaire queries
4. A list of requirements for a future research team

These methods will be discussed further in our “Methods” section.

Although waste audits have obviously been conducted in the past, it is our understanding that no such audit has been performed on the Community Services Department of the City of Kitchener, subsequently we believe that our research will be exploratory, as well as relational. For instance, we aim to explore the waste disposal habits of the city workers so that we can determine whether the variable, ‘volume of waste’, can be affected by the introduction of new waste diversion options.

4.0 Research Objectives

Our research team attempted to determine the quantity of waste the Community Services Department of the Corporation of the City of Kitchener can divert from the regional landfill, and the feasibility of implementing a waste diversion program. In order to achieve this goal, we attempted to complete the following objectives:

1. Identify the composition of waste
2. Determine the social, economic and environmental impacts associated with current waste management practices
3. Recommend sustainable alternatives (technologies or awareness programs)

Due to circumstances beyond our control, we were forced to create a new objective while still maintaining the core theme of our previous research question. Our new research objective is to determine what some other local municipalities are currently doing to divert waste collected

by their respective Community Services Departments (also known as Parks & Recreation Department). In order to achieve this new goal, we completed the following objectives:

1. Interview the person in charge of the Community Services department
2. Attempt to administer surveys to workers
3. Compare and contrast various municipalities diversion tactics

5.0 Conceptual Framework

Social, economic and environmental factors play a crucial role in the actor system, as well as the biophysical system. Since they are interconnected, we have chosen to integrate the two systems in order to establish how various social, economic and environmental impacts affect the two systems, and their ultimate impact upon local sustainability via waste reduction.

5.1 Systems Diagram

As illustrated in the systems diagram (Figure 5.1), we investigated how social factors (such as worker's attitudes) impact the actor system through waste collection and diversion. Economics play the primary role in the method of disposal and decision making, which ultimately affects the sustainability of the local environment. The culmination of social and economic factors and their interaction with the biophysical system will ultimately determine the outcome of any environmental impacts. Although government regulatory bodies also play an important role in waste management issues, we will not place this factor inside our system boundaries because it is beyond the scope of our study.

5.1.1 Actor System

Core Actors

- Group Members — perform waste audit on the Corporation of the City of Kitchener; provide information to Patti Cook and UWSP
- Regional Decision Makers -- inform workers how to proceed, make important decisions pertaining to waste management
- City Workers — complete surveys
- Community — generate waste

Supporting Actors

- Community Services Administration— provide resources for city workers and community

Shadow Actors

- Corporation of the City of Kitchener — must provide Community Services with funds for implementation of recommendations

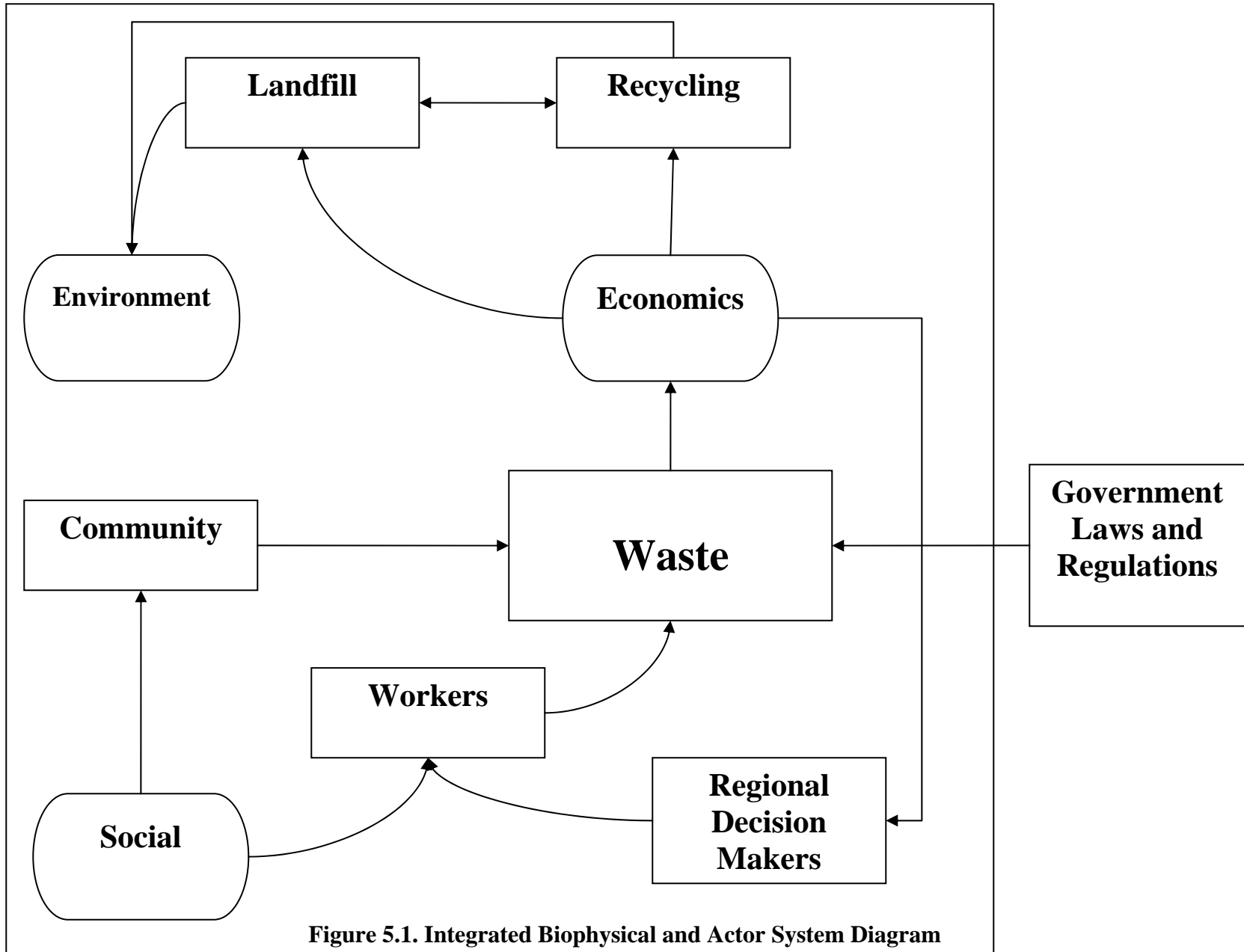


Figure 5.1. Integrated Biophysical and Actor System Diagram

6.0 Boundaries

6.1 Definition of Key Terms

Waste – Waste is generally referred to by a few names, such as garbage, refuse, and trash. For the purpose of this study, waste is defined as solid trash collected by city employees in garbage bins, on park grounds, and in the street. It does not include household, industrial, or business trash or non-solid waste. Waste can be comprised of many materials, including recyclables and organics. True Waste is garbage that is not recyclable or reusable, and can only be landfilled.

Waste Diversion – Waste diversion is mainly accomplished through what most people refer to as “the 4 R’s,” Reduction, Recycling, Reuse, and Recovery, as well as composting. We focus mainly on the recycling and composting aspects of waste diversion. The goal of waste diversion, and the origin of its name, is the diversion of trash from landfill sites to locations in which the waste may be utilized in a more productive manner, such as creating toaster parts from aluminum cans.

Waste Audit – An audit is a common accounting procedure. Increasingly, accounting terms are being used in other fields to describe similar processes. A waste audit consists of determining the quantity of waste collected, usually by mass, and categorizing it according to type. This gives people a much better picture of what can be done to divert waste from landfills.

Landfill – A landfill is a prepared waste disposal site. A landfill is different from the dumps of twenty years ago in that building a landfill involves planning for leachate and methane gas collection and disposal. Waste from businesses, industries, and homes typically goes to a landfill site or is recycled or composted. Many issues currently surround the construction and use of landfills. These range from soluble chemicals from garbage leaching into the surrounding soil and groundwater, to finding new sites for landfills. Understandably, few people will accept the

construction of a new landfill in their backyard. Any diversion of waste from landfills can only increase the sustainability of a community.

Material Recovery Facility (MRF) – An MRF is a facility where waste is sorted into recyclables and non-recyclables, usually through electromagnetic and mechanical sorters. This is useful for large-scale waste management. A problem associated with MRFs is that they depend on large quantities of garbage to be profitable. This has implications for the viability of MRFs if less waste is produced. Both Brampton and Guelph use MRFs for waste management.

Incineration – In some communities, waste is burned to produce heat. The heat can be used in district heating programs or more commonly, to produce electricity. Unfortunately, leftover debris is hazardous and must be disposed of appropriately. In addition, the incineration of garbage emits greenhouse gases and toxic chemicals into the atmosphere. However, incineration does divert large quantities of waste from landfills.

Molok – A molok, basically, is a huge garbage bin. Two thirds of its total height is below the ground, while one third is above ground. Situating most of the molok below ground keeps waste cool, and reduces microbial action and smell. Because of the size of the molok, trash becomes more compact. Moloks also reduce air pollution, since they only need to be emptied once or twice a year, and the vehicles used to transport waste are associated with greenhouse gas and smog emissions.

6.2 Scope and Focus of This Study

As previously mentioned, the focus of this study was originally waste collected throughout the City of Kitchener from trash bins in the downtown core, and parks. Due to a combination of time constraints and the requirements imposed by the City of Kitchener, which need to be fulfilled in order to receive permission to execute an audit, our focus has changed to the assessment of information garnered from interviews of key decision makers in various

municipalities. In addition, we have assessed questionnaires responses from those responsible for collecting trash from parks and various other locations in Cambridge. Our change in focus also led to a change in scope. The scope of our study now includes information about the behaviour, attitudes, and ideas of people operating in a decision-making capacity and those collecting the trash in Cambridge, Guelph, Brampton and Waterloo. The changes in focus and scope have led to a general indication of common problems and solutions faced by most municipalities.

6.3 Limitations

Limitations include:

- Time constraints, in that the study must be completed in one semester (approximately three months). We did not have a sufficient amount of time to arrange field work, such as off campus waste audits, in light of the unforeseen requirements from the City of Kitchener.
- Researcher bias was also a limiting factor in our study. We, as Environment and Resource Studies students, are committed to waste diversion and expect to see some ways in which waste may be diverted.
- Accuracy of data collection was also limited. Interviews and questionnaires, by their very nature, are subject to the individual opinions and biases of those answering the questions posed, as well as by how the questions themselves are worded. In addition, the rapport between the interviewer and interviewee can influence the depth of some answers. In our study, interviewees were often subject to time constraints from their own jobs, and they had little time to take out from their busy schedules.

6.4 Significance

Our study explores what is probably one of the last frontiers of municipal waste management. Much work has been done in residential and industrial waste management, but

there is currently a very small knowledge base concerning waste management in Community Services facilities. None of the municipalities scrutinized in our study have ever conducted a waste audit, and few have attempted large scale recycling programs. Perhaps this is because there is little information on common problems, such as contamination of recyclables by other waste, or the tendency of some people to litter instead of placing materials in appropriate containers. While our study is modest in decision and execution, it has a disproportionately large significance in an area of research that definitely needs more attention. The collection of data from various municipalities has allowed us to identify problems common to most municipalities, as well as what some municipalities have already done to divert park and community waste.

7.0 Methods

Table 7.1 Summary of Data Collection Methods for research question #1:
 “What have local municipalities done to divert waste from the landfill sites?”

Area to be investigated	Information Needed	Collection Procedure
1. Waste diversion programs currently in place	Past, current and future recycling and diversion programs used and the success or failure of each	<ul style="list-style-type: none"> • interview with Community Services management • “grey literature” addressing policies collected on site
2. Community Services worker’s attitudes regarding waste diversion policies	Employee education of the present diversion programs in place	<ul style="list-style-type: none"> • questionnaire for Community Services workers
3. Diversion Technologies	Diversion technologies that have been implemented in other cities that could be implemented here	<ul style="list-style-type: none"> • secondary research of current programs in other cities

***Note: for bold text see additional method information**

Table 7.2 Summary of Data Collection Methods for research question #2:

“What requirements would need to be fulfilled in order to answer our original research question?”

Area to be investigated	Information Needed	Collection Procedure
1. Requirements of the city of Kitchener	What needs to be fulfilled in order to complete a waste audit of Kitchener’s community services dumpster	<ul style="list-style-type: none"> • correspondence with Kitchener’s Director of Operations

7.1 Procedural Method Information for research question #1

Interview with Community Services management:

Our research team interviewed decision-makers in the Community Services department of four local municipalities. We questioned officials from Brampton, Cambridge, Guelph and Waterloo. Our group used this purposive method of sampling because we sought the information that decision-makers would have as a result of their position and expertise. Our research team pre-tested the interview questions on the city of Cambridge decision-maker, and then proceeded to interview the other participants. See our ‘Interview Conclusions’ section for the results of our interviews.

Grey Literature regarding policies and procedures:

On our interview visits to the city sites, we collected grey literature in the form of memos, staff letters, policy booklets/brochures, etc. that helped us investigate diversion policies currently in place. The information gathered from these sources is incorporated into the results recorded from the interviews.

Questionnaire administered to Cambridge Community Services workers:

We aimed to sample the entire population of Cambridge Community Services workers in order to achieve the most representative results. Our team conducted the questionnaire in a 'mail out questionnaire' fashion; we distributed the questionnaires to every employee, and collected them from the information desk (drop box) at Cambridge City Hall. The drop box method ensured anonymity for those who so desired. We received 11 out of the distributed 35 questionnaires, an impressive 32% response rate. According to Palys (1997), this is a typical response rate for a mail-out survey, which is usually between 10-40% (146). The method we used is perhaps not the most representative, but because of time constraints it was the most efficient method available to us. We pre-tested the questionnaire on several roommates prior to distribution. See attached 'Questionnaire' for the questions asked.

Secondary Research:

Through our literature review we have explored diversion practices already in use by other cities that provide useful information in regard to how current programs could be improved, as well as additional programs that could be implemented in Kitchener to reduce landfill-bound waste. Our literature review consists of journal articles, web resources, and periodicals.

7.2 Procedural Method Information for research question #2

Correspondence with the City of Kitchener:

In the process of our attempt to obtain authorization from the city of Kitchener to perform the waste audit, much correspondence was exchanged. Through this informal interview process, we collected information from the Director of Operations for Community Services for the City of Kitchener, while attempting to fulfill her ever-increasing requirements. From our exchange, we now have a list of requirements that, upon fulfillment, will allow for the execution of a waste

audit on the Community Services Department of the City of Kitchener. See ‘City of Kitchener audit requirements’ in the ‘Results’ section of this paper for our findings.

8.0 Data Analysis Procedure

Table8.1: Methods of Analysis

Source of Data Collected	Analysis Procedure
Interview with Community Services management	<ul style="list-style-type: none"> • compare and contrast programs of different municipalities under themes • discuss ‘best’ methods being used to divert waste
Questionnaire of Community Services workers	<ul style="list-style-type: none"> • open-ended questions grouped for themes • quantify rating scale questions
Correspondence with the City of Kitchener	<ul style="list-style-type: none"> • discuss and summarize major requirements to be fulfilled

***Note: for bold text see additional method information**

8.1 Procedural Data Analysis Methods

Compare and contrast programs:

In order to analyze the information we garnered from our interviews with Community Services management, we grouped responses into three main headings: Recycling Methods, Composting Methods, and Waste Disposal Methods. Grouping enabled us to include the responses typical of exploratory research. Our team then discussed our findings and came to some conclusions regarding the methods used by municipalities to divert the maximum amount of waste from the landfills. See section 9.2 for interview results.

Open-ended and rating scale questions:

We used two main methods to analyze the questionnaires given to Community Services workers. Responses to the open-ended questions were coded for themes, and data from the rating scale questions were quantified. Our data was then compiled into graphs and charts that illustrate the composition of responses in each area. See section 9.4 for questionnaire results.

Discussion and Summary of requirements:

The requirements received from the Director of Operations were discussed by group members and then outlined in the ‘Results’ section of our study. See section 9.6 for correspondence results.

9.0 Results

9.1 Literature Review

Several sources of literature are available on waste production, collection, and diversion. These primarily deal with municipal waste collection and large-scale diversion of waste from landfills, such as citywide recycling programs. Conversely, there is very little literature available on waste in parks and recreational areas. A search of available journal articles has led to only a handful of studies that pertain directly to waste diversion in parks. One study, by Carol Werner, Mark Rhodes, and Kimberly Partain (1998), indicates that clear and well-designed signs are very important in reducing contamination of recyclable materials, as well as the quantity recycled. Although the article focuses mainly on polystyrene recycling in a cafeteria, some of their concepts, like what they call “schema” (plan sensitive signs), could also be applied to parks. In their study, recyclable materials collected increased 87 percent by weight, and contamination

was reduced to almost zero, due to the use of proper signs. We also examined a litter control handbook, by Charles Rombold. Although this book is somewhat out of date, it does contain some excellent information on the design of signs and public relations campaigns geared towards the reduction of litter. Some of the ideas in Rombold's handbook could also be applied to recycling in parks and recreational facilities.

Although there is not much information concerning park and community waste diversion specifically, there is a large amount of literature regarding waste diversion in general, available both online and in print. Since Brampton, Guelph, and Waterloo Region all have unique waste management ideas, secondary sources on these subjects is of importance to our study.

Brampton's waste is separated at a MRF, and true waste is incinerated. Other waste is recycled and composted, and heat from incineration is utilized to produce electricity. Advantages and disadvantages of incineration are addressed in Ellison's Municipal Solid Waste Management (1991). An article in Ellison's book illustrates that incineration is a major contributor to dioxin emissions. The article suggests that the emissions from waste incineration are equivalent to that of steel production. In countries that use incineration technology extensively, it has also been found to contribute to carbon monoxide and nitrogen oxide emissions, which are both greenhouse gases.

The Guelph waste system involves the collection of two waste streams, wet and dry. A journal article in *Biocycle*, by Megan McGarrity (2000), illustrates how the system works. Compostable material is placed in a blue bag, while dry or non-compostable material is placed in a green bag. The blue bag waste is then sent to a composting facility that is part of the Wet Dry Recycling Centre (WDRC). The green bag waste also goes to the WDRC, and is then sent through an MRF to separate recyclables. Although low participation rates are recognized as a

problem, the 'Wet Dry' method of waste management has greatly reduced collection costs because separate fleets of garbage and recycling trucks are not needed. According to the article, the city's diversion rate is about 50 percent, and annual revenues are just under 1.5 million dollars. Brampton also utilizes a MRF facility. There are some problems associated with MRF technology though. As Tyler Miller (1998) explains, "[MRF] plants are expensive to build and maintain, and once trash is mixed it takes a lot of money and energy to separate it"(575). Miller goes on to say that the traditional source-separation approach "provides more jobs for unskilled workers than centralized MRF's"(576). However, since the most common hindrance to Parks and Community Services recycling programs is contamination, we believe that MRF's significantly reduce the amount of recyclable waste that would otherwise end up in a landfill.

Waterloo Region utilizes a unique garbage bin called a molok. The company that makes Moloks, The Molok company (2002), produces both a Compact Disc, and a website [www.molok.com]. Although moloks do not divert or reduce waste specifically, the sheer mass of the waste causes compaction, which results in fewer trips to landfill sites. Moloks are available in four sizes, from 300 litres to 5,000 litres. They are comprised of a support well and a reusable lifting bag, which can be emptied in 5 minutes by one person. They rarely, if ever, overflow. The size of the moloks reduces the time city employees spend emptying scattered small bins and reduces pollution from waste transportation. Moloks could be used in conjunction with MRFs for efficient waste management in large parks.

In addition, the Canadian Council of Ministers of the Environment has produced guidelines for a waste audit for the federal government. The pamphlet is subtitled as a "Comprehensive guide to the Waste Audit Process". The guide offers general guidelines concerning all aspects of conducting any scale of waste audit and it was our original intention to

follow these guidelines. The Guide would be extremely useful in any further research done in park and community waste. The Region of Waterloo is under contract to dispose of municipal waste from Kitchener, Cambridge and Waterloo, and it maintains a waste management plan for the entire region. The Region’s plan indicates the amount of money typically spent on waste disposal. Such information is important in determining the feasibility of waste diversion policies. The Region has also published A Survey of Provincial and Federal Environmental Statutes, Regulations, Policy Statements, and Guidelines, and Regional Environmental Bylaws, which outlines laws that pertain to waste collection, diversion, and disposal. The City of Kitchener has A Strategic Plan for the Environment, as well as a planning guide for the Community Services Department that lists initiatives that have been adopted to divert and reduce waste, such as the composting of wood chips, lawn clippings, and garden waste.

9.2 Interview Results

Table 9.1: Recycling Methods of local municipalities

City of Brampton	<ul style="list-style-type: none"> • Mixed waste sorted at Material Recycling Facility (MRF) • Recycle metals, glass and paper products
City of Cambridge	<ul style="list-style-type: none"> • Recycling bins in parks unsuccessful due to contamination • Steel bin for recycling of large scraps
City of Guelph	<ul style="list-style-type: none"> • Currently running a pilot project in parks with one recycling barrel for glass, plastic, cans and newspaper • Mixed waste sorted at Material Recycling Facility (MRF)
City of Waterloo	<ul style="list-style-type: none"> • Recyclables collected at major parks only • Molok recycling bin on trial in Waterloo Park • Steel bin for recycling of large scraps

The cities of Guelph, Cambridge and Waterloo all cited contamination as the main reason for discontinuing recycling programs in their parks. The City of Cambridge has completely discontinued all recycling collection in parks (except on special events), but currently recycles steel scraps picked up by workers, which is collected in a steel bin. The city of Guelph notes dog feces as a major contaminate of their recycling bins, and discontinued their previous recycling program in all parks. Currently, Guelph is using one blue-painted barrel as a pilot project for collecting recyclables in major parks once again. Waterloo has discontinued all recycling collection in parks due to contamination, except for one recycling program currently running in Waterloo Park for household recyclables. As well, Waterloo is trying to implement a new recycling collection program with Molok deep collection bins, which will only be accepted by the Region if it contains less than 20% contamination. The City of Waterloo’s Parks, Works and Service departments also recycle scraps of steel they collect through the use of a steel bin. The City’s of Brampton and Guelph are unique in their recycling facilities, as contamination is not a problem. In Brampton and Guelph, waste is not source separated but is sorted at a Materials Recycling Facility (MRF). MRF recycling entails that metals and glass are sorted out of the waste by electric current, and large paper products are sorted out by hand.

Table 9.2: Composting Methods of local municipalities

City of Brampton	<ul style="list-style-type: none"> • Compost branches, leaves and garden waste at Regional composting facility
City of Cambridge	<ul style="list-style-type: none"> • Compost picked up, processed and redistributed by the Region
City of Guelph	<ul style="list-style-type: none"> • Composts branches, clippings, and garden waste at the City composting centre, part of the wet-dry facility.
City of Waterloo	<ul style="list-style-type: none"> • Tree cuttings and branches chipped for reuse on paths

	<ul style="list-style-type: none"> and flowerbeds Leaves composted by municipality or soil company
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All four cities are comprehensively composting branches, clippings and garden waste through either regional or municipal programs. In both Brampton and Cambridge, the compost is collected by city workers, but processed and distributed by the Region. Guelph workers compost the waste they collect through the city wet-dry facility. In addition, Guelph has a unique distribution program in which non-profit organizations sell compost to the public for profit. Waterloo uses a chip pile at the service yard to collect branches and trimmings, which are then used for mulch on flowerbeds and walkways. The leaves collected in Waterloo are either composted by the Region or sold to soil companies as compost.

Table 9.3: Waste Disposal Methods of local municipalities

City of Brampton	<ul style="list-style-type: none"> Incineration of Parks’ waste to produce energy Land--filling of non-incineration able waste.
City of Cambridge	<ul style="list-style-type: none"> Land-filling of non-recyclable and non-compostable waste
City of Guelph	<ul style="list-style-type: none"> Land-filling of all non-compostable waste (including recyclables)
City of Waterloo	<ul style="list-style-type: none"> Land-filling of non-recyclable and non-compostable waste (flare methane to produce energy)

Waterloo, Guelph and Cambridge Community Services Departments use the similar waste disposal method of landfilling, although the content of landfilled waste depends on the materials removed from the waste stream via the previously discussed recycling and composting techniques. In Cambridge non-diverted waste includes all waste (and recyclables) picked up, except large pieces of steel. In Guelph, non-diverted waste includes all recyclables except those

collected from the single barrel recycling pilot project. Waterloo also landfills all of their waste excluding the recyclables collected in Waterloo Park and the large pieces of steel that are collected by workers. Waterloo's landfilling method does recover some of the energy going into the landfill though, by the capture of some of the methane gas emitted, to produce electricity. Brampton is unique in that their main waste disposal method is incineration. After the recyclables are sorted out at the MRF, Brampton's 'true waste' is incinerated, and the remaining waste is landfilled.

9.3 Interview Conclusions

After comparing and contrasting the waste diversion methods of the four cities we investigated, we feel that Brampton is diverting the most waste from the landfills, although the method that they use may not be the most sustainable. By not having to deal with the problem of contamination in public parks, Brampton can recycle more of their waste stream through their MRF. As well, by incinerating their waste, they are diverting more garbage than any of the other cities we looked at, although we do not believe it is the most environmentally sound way of diverting waste. See discussion of the harmful environmental affects of incineration in our 'Literature Review' section. We feel that both Guelph and Waterloo should be commended for continually working towards new solutions that in the end will be most sustainable. The new pilot project of recycling collection in Guelph after the failure of their initial recycling program in public parks is a prime example of striving for new solutions that work for each community. The City of Waterloo's Molok collection initiative shows motivation in working towards more sustainable waste collection initiatives as well.

9.4 Data from Surveys

Question 5. Are there any environmental issues facing society today that are of particular concern to you?

Yes: 10 No: 1

Question 8 . How easy is it for you to use the available facilities?

Easy: 4 Medium: 5 Difficult: 3 (note: two answers were given on one questionnaire for different facilities)

Question 10. How important is waste diversion to you personally?

Important: 10 Medium: 1 Not Important: 0

Question 11. How supportive would you be of new waste diversion policies in your workplace?

Supportive: 8 Medium: 3 Not Supportive: 0

9.5 Analysis of Surveys

Question 5 was asked to determine the frame of mind of the workers, since the workers are ultimately responsible for the separation of the waste into recycling and composting components. As seen in figure 9.4, 91% of the workers stated that there are various environmental issues facing society that are of concern to them. These typically include: global warming, pesticide use, hazardous waste disposal etc.

Question 5

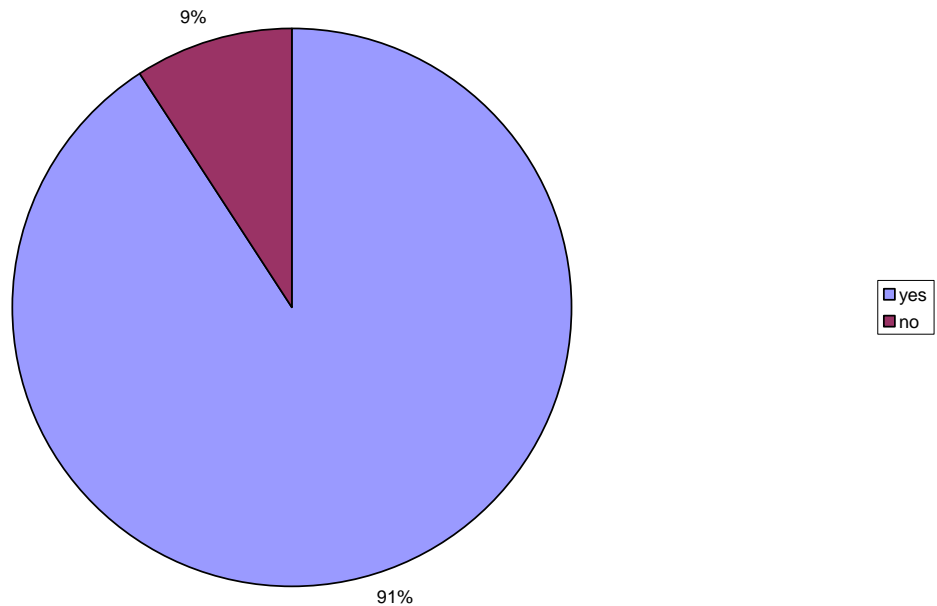


Figure 9.4: Question 5 Results

Question 8 assessed how easy the current facilities for composting and recycling are to use. There was a wide range of responses. Figure 9.5 shows that 42% of the workers feel that the facilities are easy to use; conversely 25% of the workers feel the facilities available are difficult to use. The remaining workers feel that the facilities are typically semi-easy to use. One worker noted that the recycling facility is very easy to use while the composting facility is not. Since the workers are the ones who separate the waste, easy-use facilities are crucial in diverting waste from the landfills. Question 8 is related to question 10 because, although a worker may be motivated to recycle and compost, if the facilities are too hard to use they may ultimately be less willing to do so.

Question 8

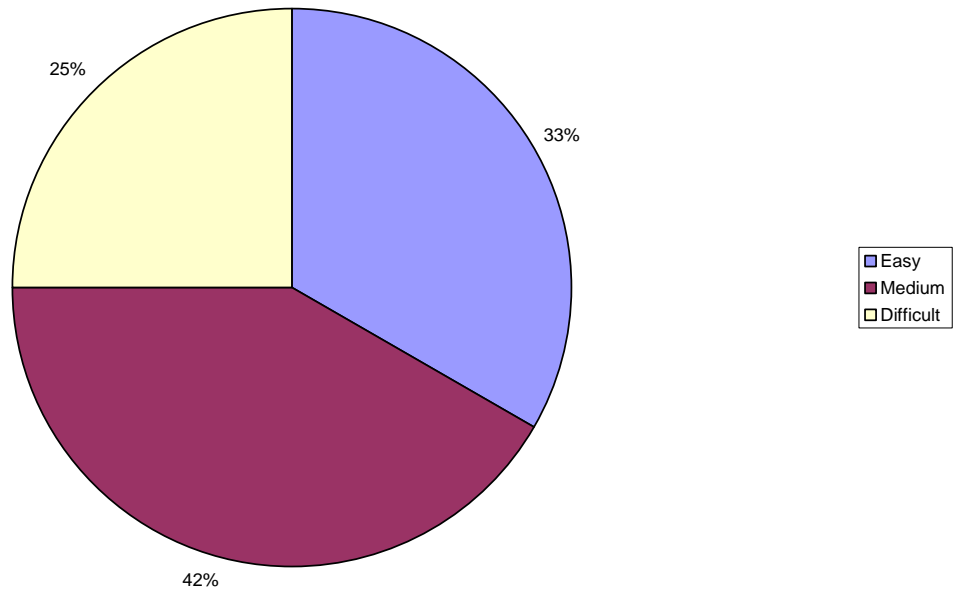


Figure 9.5: Question 8 Results

Question 10 indicates the worker's willingness to separate waste into recyclable and compostable components. Figure 9.6 shows that 91% of the polled workers stated that waste diversion is important to them while the remaining 9% stated that waste diversion is somewhat important to them. These results illustrate the social aspects of our system, in that a self-motivated worker who believes that waste diversion is important will be more willing to spend the time and effort to separate waste. It is important to note that no worker stated that waste diversion is not important.

Question 10

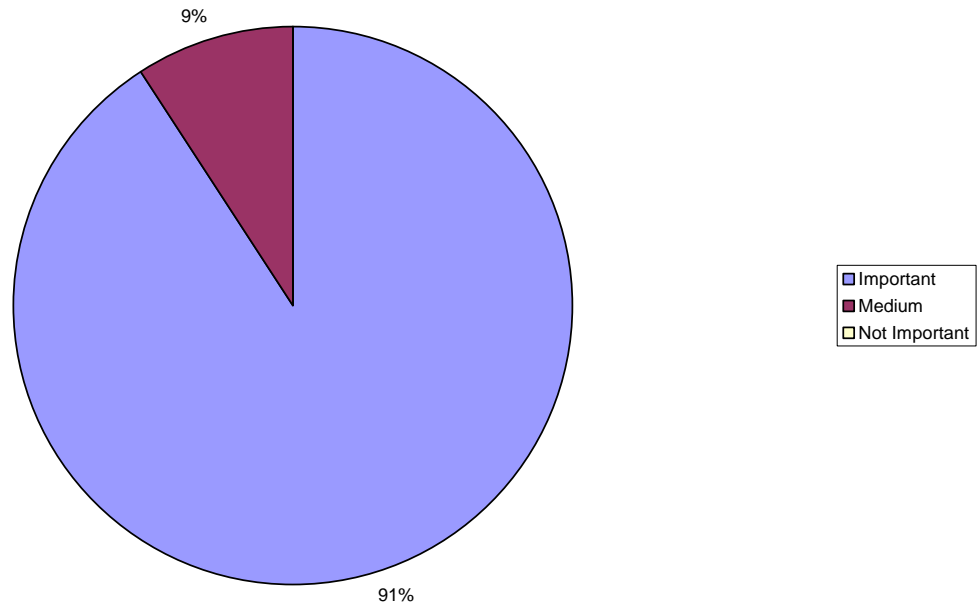


Figure 9.6: Question 10 Results

Question 11 indicates that, in general, the workers would be supportive of new policies for waste reduction in the workplace. Figure 9.7 illustrates that almost three quarters of all workers support new policies and would welcome them. The remaining quarter stated that they would be supportive as long as the policies were not so strict that their jobs would be affected. This is similar to the 'Not In My Back Yard' (NIMBY) syndrome; although people want a change and would be supportive of new policies, they don't want these changes and policies to affect their required behaviour.

Question 11

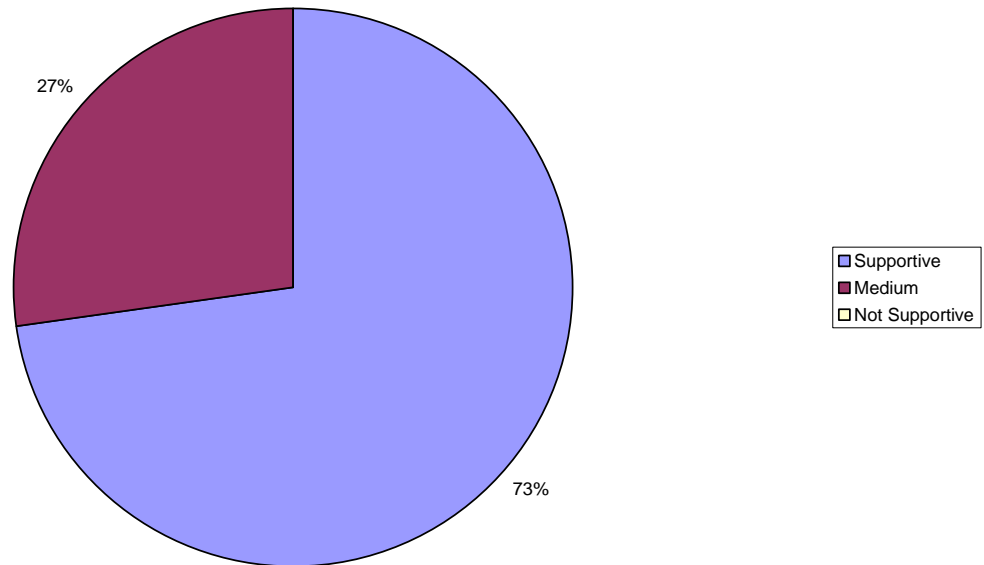


Figure 9.7: Question 11 Results

In general, the results from the survey were very helpful in determining how social aspects may impact waste diversion. Since the workers of the Community Services Departments are directly responsible for recycling and composting, it is up to them to actually divert the waste. The attitudes of the workers typically seem positive in regard to waste diversion and most seem willing to participate. The ease of use of the facilities is also an important factor in waste diversion, as complicated facilities will result in lower use. Thus, it is in the interest of decision makers to keep new waste diversion facilities simple.

9.6 Audit of Community Services dumpster proposed procedure:

The following is a procedural method we wanted to follow, and would now like to offer to a future group as a reference.

In order to audit the main dumpster for Community Services of the City of Kitchener, we intended to go to the yard shortly after 3:00pm, when the worker's shifts typically end, on the afternoon following a garbage pickup. We asked to be contacted on the day the dumpster is emptied, in order for us to prepare to come the following afternoon. That way, we could easily climb into the dumpster and remove the items to be recorded and weighed. Items that are too large to be removed and weighed would have been recorded and the weight estimated through secondary data. We would have recorded our observations on the attached "Audit Data" worksheet. We would have estimated the volume of the container that is presently used, and multiplied this in order to get an estimate of what might be in a full container (for example, if the container was one quarter full we would multiply our findings by 4). We aimed to repeat this process at least three times. We realize that this estimation method would have significantly limited the accuracy of our results and this would have been reflected in the 'Limitations' section of our paper.

9.7 Audit Approval Requirements

According to the Director of Operations for the City of Kitchener, in order for a research group to gain approval to perform an audit on the City of Kitchener Community Services Department dumpster they would be required to fulfill the following requirements.

1. Specify exactly which bin is to be audited.
2. Provide a Ministry of Labour approved and confirmed means of accessing/egressing the bin.
3. Provide a schedule of days and times access of the bin will be requested.

4. Access to the bin will be limited to between 3:15pm and 3:45pm.
5. Dates and times would have to be confirmed immediately prior to performing an audit.
6. Provide a guarantee that results will not be publicized with the media
7. All group members would be required to sign the attached waiver (see appendix) which would absolve the City of Kitchener of any accidents or health problems that might arise from the performance of an audit on their dumpster.

Any research team interested in fulfilling these requirements should contact Christine Legault, City of Kitchener Director of Operations at 519- 741- 2657 or christine.legault@city.kitchener.on.ca.

10.0 Conclusion

The goal of our study was to help increase the sustainability, as we have defined it, of our community. We hoped to gather enough reliable data to make suggestions to the City of Kitchener, pertaining to waste diversion possibilities. Unfortunately we were unable reach our goal. Instead, we have provided a means by which a future ‘Greening the Campus and Community’ research group can achieve our initial goal and thereby enhance the sustainability our community.

11.0 Acknowledgements

We would like to thank Stan Jaworski, Director of Operations Waterloo Park, Karen Richter, Director of Operations for Parks & Recreation for the City of Waterloo, Steve Wilson, Director of Operations for Parks & Recreation for the City of Brampton, Alan Brubeck, Director of Waste Management for Parks & Recreation for the City of Guelph, John Hannah, Director of

Parks and Outside Services for the City of Cambridge, Christine Legault, Director of Operations for Community Services for the City of Kitchener and everyone at the City of Kitchener who helped us try to get approval for a waste audit, all the Cambridge Community Services workers who filled out our questionnaire, Patti Cook and Dr. Susan Wismer for understanding and guidance.

12.0 Literature Cited

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Appendices

Schedule

Thursday, Sept. 12

- first group meeting
- chose research topic
- plan to meet every Monday 10:30, Thursday 10:00

Thursday, Sept. 19

- define research question
- talked to Patti, re: other waste audits completed on campus
- other City of Kitchener projects
 - talk to city officials, re: permission to conduct audit

Thursday, Sept. 26

- fill out checklist 1
- group weaknesses / strengths
- begin literature review

Wednesday, Oct. 2

- workshop at library regarding periodical research

Thursday, Oct. 3

- major literature review completed
- develop conceptual framework

Thursday, Oct. 10

- begin working on design proposal
- assign sections of design proposal to individuals

Thursday, Oct. 17

- meeting to discuss design proposal
- contact city re: approval

Monday, Oct. 21

- meet to combine individual sections of design proposal
- table of contents, appendices, bibliography

Tuesday, Oct. 22

- design proposal due
- submit ORE 101 Form, online and in hard-copy
- contact City of Kitchener for permission to conduct audit again.

Monday, Oct. 28

- pretest interview and questionnaire
- complete more questions regarding the audit, and send to the city of Kitchener

Thursday, Oct. 31

- have changes made to interview and questionnaire

Tuesday, Nov.5

- follow-up on ORE 101 Form – approved
- waiting for permission from the city of Kitchener...

Thursday, Nov.7

- received email from city of Kitchener with requirements to perform audit
- discussed, and realized it was not enough time to complete the audit
- change our focus of the study and figure out where to go from here

Tuesday, Nov.12

- talked to Susan Wismer
- divided up municipalities each group member would talk to
- new research question
- rework the interview questions to be relevant for new research question
- set up meetings with contacts from each municipality

Thursday, Nov. 21

- analyze initial findings of interviews
- divide up parts of presentation to prepare

Tuesday, Nov. 26

- drop off questionnaires to Cambridge

Thursday, Nov. 28

- made contact for second time with decision-maker (if more questions to ask)
- finalize findings of the interviews

Monday Dec. 2

- put all parts of the presentation together
- hand in by 12noon to get 2 bonus marks

Tuesday Dec. 3

- meet 1/2 hr. early to review presentation
- final presentation

Friday, Dec. 6

- questionnaires collected
- analyze questionnaires
- divide up parts of final paper to prepare

Wednesday, Dec. 11

- have outline ready for each part of the final report
- discuss overlap or omissions and amend those parts of the paper

Monday, Dec. 16

- bring together individual parts of final paper
- have to Ralph for final proof-reading

Wednesday, Dec. 18

- Part A and Part B of final report due

Audit Data Worksheet

Date:

Recorder:

Divertible Waste		Weight	Volume
Organic Material			
	grass cuttings, leaves		
	branches, wood debris		
	other plant material		
Metal			
	household recyclables		
	scrap metal		
Plastics			
	household recyclables		
	plastic bags		
	industrial containers		
Non-divertible Waste			
Household Waste			
	household waste		
Appliances			
	a.		
	b.		
	c.		
	d.		

How full was the bin:

Additional Comments:

City of Kitchener Waiver

City of Kitchener Activity

AGREEMENT AND RELEASE

WARNING:

BY SIGNING THIS FORM YOU GIVE UP YOUR RIGHT TO BRING A COURT ACTION TO RECOVER COMPENSATION FOR ANY INJURY OR LOSS TO YOURSELF OR YOUR PROPERTY AND THE RIGHT OF YOUR PERSONAL REPRESENTATIVE TO BRING AN ACTION TO RECOVER COMPENSATION FOR YOUR DEATH ARISING OUT OF YOUR PARTICIPATION IN THE _____ (*insert activity- hereinafter referred to as the "Activity"*).

DISCLAIMER CLAUSE:

The Corporation of the City of Kitchener, their agents, officials, officers, directors, employees, servants or representatives (hereinafter referred to as "The City") are not responsible for any death, injury, loss or risk of damage of any kind suffered by any person caused in any manner whatsoever, including but not limited to the negligence of the City or the breach of duty of care prescribed by the Occupiers Liability Act, R.S.O. 1990, by the City arising out of, associated with or related to participation in the Activity.

AGREEMENT AND RELEASE:

In consideration of my being permitted to participate in the Activity, I, (the "Participant" below) guardian/parent on the Participant's behalf hereby acknowledge that I am aware of all of the risks associated with or related to the Activity **(INCLUDING THE POSSIBLE RISK OF SEVERE OR FATAL INJURY)** to others or myself

I agree:

- a) To assume all risks arising out of, associated with or related to my participating in Activity, notwithstanding that the same may have been caused or contributed to by the negligence of the City or its breach of the duty of care prescribed by the Occupiers' Liability Act, R.S.O., 1990;
- b) To be solely responsible for any loss or damage I sustain, including loss or damage caused by the injury to my person or property or by my death howsoever caused and notwithstanding that the same may have been caused or contributed to by the negligence of the City or its breach of duty of care prescribed by the Occupiers Liability Act, R.S.O., 1990; and
- c) Not to make any claim or take any proceeding against any other person, firm, company, entity or the Crown which may have the effect of, or where there might arise any claims against the City for contribution or indemnity under the provisions of the Ontario Negligence Act or otherwise.

BY SIGNING THIS FORM, I ACKNOWLEDGE HAVING READ, UNDERSTOOD AND
AGREED TO THE ABOVE.

NOTE: For PARTICIPANTS UNDER **THE AGE OF 18** require parent/guardian signature

Date: _____

PARTICIPANT'S NAME AND PARENT OR GUARDIAN (if applicable) (print)	SIGNATURE PARTICIPANT (+18); OR PARENT OR GUARDIAN	OF ADDRESS TELEPHONE (optional) AND NUMBER

Questionnaire

Please take a few minutes to answer the following questions. The entire survey should not take more than 10 minutes to complete. A summary of our findings will be available by January 2003 on the WATgreen Student Library web page located on-line at <http://www.adm.uwaterloo.ca/infowast/projects/library/>.

1. How long have you worked for the City of Cambridge? _____

2. How long have you worked for Community Services specifically? _____

3. What is your job title? _____

4. Do your duties include collecting garbage and/or picking up litter?

YES NO (Please circle one.)

5. Are there any environmental issues facing society today that are of particular concern to you?

YES NO (Please circle one.)

If 'yes', please describe: _____

6. List any activities that you engage in on a regular basis that you would consider to be 'environmentally friendly'. (for example, do you cycle to work or use public transportation? Do you recycle or compost?)

7. Are you aware of any waste diversion policies (i.e. recycling, compost) currently in place in the Community Services Department?

YES NO (Please circle one)

If 'yes', please describe: _____

8. How easy is it for you to use these facilities?

Very Difficult ____/____/____/____/____ Very easy

9. Does using these facilities make your job easier or more difficult to complete?

Please explain: _____

10. How important is waste diversion to you personally?

Not Important ____/____/____/____/____ Very Important

11. How supportive would you be of new waste diversion policies in your workplace?

Very Supportive ____/____/____/____/____ Not Supportive

12. Are there any new waste diversion policies you would like to see implemented at your workplace?

YES NO (Please circle one.)

If 'Yes', please describe: _____

Your name: _____

Please note: You may provide your name if you wish to be contacted with the results of our survey once it is completed. If you choose to remain anonymous, we will ensure that your responses remain confidential.

Thank you so much for taking the time to answer our questions.

Your input is valuable and very much appreciated. Please feel free to provide us with any additional comments you might have
