TRANSPORTATION TOMORROW SURVEY
2001

DESIGN AND CONDUCT OF THE SURVEY

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A Telephone Interview Survey on
Household Travel Behaviour in
Greater Toronto and the Surrounding Areas
Conducted in the Fall of 2000, Fall of 2001 and Spring of 2002

DESIGN AND CONDUCT OF THE SURVEY

Prepared for the
Transportation Information
Steering Committee

by the

Data Management Group
University of Toronto
Joint Program in Transportation

January 2003

Participating Agencies:
Ministry of Transportation, Ontario • City of Barrie • City of Guelph
City of Hamilton • City of Kawartha Lakes • City of Orillia • City of Peterborough
City of Toronto • County of Peterborough • County of Simcoe • County of Wellington
GO Transit • Regional Municipality of Durham • Regional Municipality of Halton
Regional Municipality of Niagara • Regional Municipality of Peel
Regional Municipality of York • Toronto Transit Commission • Town of Orangeville

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Nineteen agencies were represented on the Technical Steering Committee that planned and directed the 2001 survey. The people who served on the technical committee were:

David Smith, Chair	Ministry of Transportation
Martin Rosen, Secretary	Ministry of Transportation
James Wong	Ministry of Transportation
Kelly McCleary	City of Barrie
Rajan Phillips	City of Guelph
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Tom AppaRao	Regional Municipality of York
John Barnes	Regional Municipality of York
Bernard Farrol	Toronto Transit Commission
Allen Reid	Town of Orangeville

The survey was managed by the Data Management Group at the University of Toronto. The management team consisted of:

Prof. Gerry Steuart	Director
Peter Dalton	Project Manager
Susanna Choy	Coding Manager
Sharon Kashino	Interview and Site Manager

The hiring and training of interview staff was supervised by Ian Fisher, assisted by Lucy Balaisis

Evan Sidoriak and Mike Rasmusson provided computer support services

Jim Bate supervised set up of the interview site facilities

Lorine Jung provided administrative assistance.

The interview team leaders for the 2001 component of the survey were

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The Data Management Group prepared this report for the Transportation Information Steering Committee at the University of Toronto. The principal authors are Peter Dalton and Susanna Choy. The authors would like to express their appreciation to the rest of the DMG staff and the members of the Survey Technical Committee for their review and comments. The views and opinions contained in the report are those of the authors and do not necessarily reflect the positions of either the participating agencies or the Data Management Group.

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Executive Summary

1. Introduction and Background

The 2001 Transportation Tomorrow Survey (TTS) is the fourth in a series of area-wide travel surveys conducted in Toronto and the surrounding regions. The previous surveys were in the fall of 1986, the fall of 1991and the fall of 1996. In the current survey, areas outside the Greater Toronto Area (GTA) and the City of Hamilton were surveyed in the fall (September to December) of 2000. The GTA and the City of Hamilton were surveyed in the fall of 2001. Additional interviews were conducted in May 2002 to correct for some under-representation of apartment buildings that occurred in the fall 2001 component of the survey. Over 134,000 households were successfully interviewed. Changes in the survey area relative to the 1996 TTS were the inclusion of the whole of Simcoe County, only partially surveyed in 1996, the addition of the City of Orillia and the exclusion of the Regional Municipality of Waterloo. The area surveyed in the fall of 2000 consisted of the Regional Municipality of Niagara, the Cities of Guelph, Barrie, Orillia, Kawartha Lakes (formerly the County of Victoria) and Peterborough, the Town of Orangeville and the Counties of Wellington (Part), Simcoe and Peterborough (Part). Parts of Dufferin County adjacent to Orangeville were also included although the County was not one of the participating agencies. The area surveyed in the fall of 2001 consisted of the Cities of Toronto and Hamilton and the 4 Regional Municipalities (Durham, Halton, Peel and York) that make up the rest of the GTA and which were all surveyed in the three previous surveys.

The survey was undertaken on behalf of the Transportation Information Steering Committee (TISC); a successor to a committee formed in 1977 to co-ordinate data collection activities between agencies. The membership of the committee consisted of representatives from the Ministry of Transportation of Ontario, the six Regional Municipalities in the GTA, the Toronto Transit Commission and GO Transit. A larger technical committee, that included representatives from the other agencies, was formed for conducting the 2001 survey. The survey was jointly funded by all the participating agencies.

The 1986 survey was the first comprehensive area-wide survey conducted in the Greater Toronto Area since 1964. The participating agencies have made extensive use of the 1986 TTS data. More than $7 billion was committed to future transportation projects, the need for which was indicated by the survey. The 1991 survey was a smaller scale update focusing primarily on those areas that had experienced above average population growth since the 1986 survey. However, comparison of the 1986 and 1991 survey results revealed that significant changes in travel behaviour were not restricted to the high growth areas. The 1996 and 2001 surveys were both full-scale repeats of the 1986 survey with expanded geographic coverage. All four surveys were timed to coincide with the Canada Census.

2. Planning and Design

The planning for the 2001 survey started early in 2000. An organisational structure was put in place that reflected the co-operative nature of the project. The Data Management Group at the University of Toronto was requested to prepare a proposal including budget estimates. The Data Management Group managed the 1991 and 1996 surveys, and is the principal custodian of the data from all four surveys. All of the agencies that participated in the 1996 survey accepted the invitation to participate in the 2001 survey with the exception of the Regional Municipality of Waterloo.

No changes were made to the survey questionnaire used in 1996. Minor changes were made to the way school and transit information were recorded in order to make additional information available in the final database.

Occupied dwelling unit counts from the 2001 Canada Census have been used as control totals in expanding the survey data to represent the total population of the survey area.

3. Survey Methods

The same methods were used in all four surveys. A random selection of households within the survey area was drawn from Bell Canada residential phone listings. Each of the selected households was sent an advance letter explaining the nature of the survey, why it was being done, which the sponsoring agencies were and advising the residents to expect a phone call from a trained interviewer. Interviews were conducted between 5:30 and 9:30 p.m. on weekdays and between 10 a.m. and 4 p.m. on Saturdays. Up to eight attempts were made to contact each household. In most interviews, a single member of the household, the respondent, was asked to provide the person and trip information for all members of the household. Other members of the household were contacted if necessary to get complete information. Travel information was collected for the weekday immediately prior to the day of the interview. Some interviews conducted on Saturdays were for trips made the previous Thursday in order to limit the over representation of Friday trips.

Significant advances have been made in the software and computer technology used to conduct travel surveys of this type. The 1986 TTS was the first large-scale survey in Ontario to use automated geocoding. Geocoding refers to the use of grid co-ordinates to identify geographic locations instead of coding to a pre-defined zone system. The major advantage of geocoding is the flexibility to subsequently assign the data to any zone system.

Direct Data Entry (DDE) computer software was introduced as part of the 1991 survey. The DDE software prompts the interviewer with the appropriate script and enables the interview data to be recorded in the computer as the interview is in progress. In 1986, the interviewers used pencil and paper to record the responses. The advantages of DDE include a flexible interview script based on the response to previous questions, better quality control through on-line logic and spelling checks, and elimination of data entry as a separate process.

The major advance in the 1996 survey was the in the use of a local area network to speed up the transfer of data to a central file server and to improve the control of the sample. The 1991 survey used “stand alone” personal computers.

For the conduct of the 2001 survey, no significant changes were made to the software or procedures used in the 1996 TTS.

4. Quality control

Good quality control over the data being collected was given a high priority throughout the conduct of the survey. The measures used to ensure accuracy and completeness included:

- Adequate training and testing of interviewers prior to the conduct of live interviews
- Visual and aural monitoring by supervisory staff of interviews in progress
- Spelling and logic checks built into the Data Entry software
- Visual review of printouts for all completed interviews
- Daily monitoring of interview performance statistics
- Callbacks to obtain missing information or to verify inconsistencies
- Logic checks built into the geocoding software
- Quality control audit of selected households

The results of the survey have been validated through comparisons made with the 1986, 1991 and 1996 survey data and with independent sources, including the Canada Census, Cordon Counts, transit ridership data and post secondary school enrolment. Basic demographic information is in close agreement with the census. Peak period trips by all modes appear to be

accurately reported, as are trips associated with work and school. There is strong evidence that off-peak discretionary trips, mainly made by automobile, have been under reported, possibly by as much as 30%. Transit trips appear to be accurately reported with the exception of off-peak use of streetcars in the downtown of Toronto. Total daily streetcar use is under reported by 20%. These results are consistent with the findings from the validation of the 1986,1991 and 1996 surveys. Other checks performed on the data for the four surveys revealed a high degree of consistency in trip length distribution, mode split as it relates to socio-demographic factors and many other travel behaviour characteristics.

5. Survey Statistics

	1986 TTS	1991 TTS	1996 TTS	2001 TTS
Number of households in the survey area	1.47 Million	1.71 Million	2.32 Million	2.51 Million
Target sample	5%	High growth 4.5% Low growth 0.5%	5%	5%
Completed sample	4.2%	1.4%	5.0%	5.5%
Sample used (approximate number of letters mailed)	102,606	34,167	158,753	215,000
Valid contacts	83,764	27,813	139,952	174,000
Refusal rate (of valid contacts)	25.9%	11.4%	21.8%	21.1%
Completion rate (of sample used)	60%	72%	70%	64%
Final Database				
Household records	61,453	24,507	115,193	136,379
Person records	171,086	72,496	312,781	374,182
Trip records	313,633	142,453	587,676	817,744
Transit records	56,615	14,896	70,295	85,095
Mean household size (expanded data)	2.77 persons	2.77 persons	2.71 persons	2.70 persons
Trips per person 11 or older	2.35	2.54	2.48	2.54
Interview stations	86	33	120	120
Interviewers & Supervisors recruited	390	75	300	275
Coding staff	N/A	6	17	13

The above interview station and staffing statistics are for the main components of the 1996 and 2001 surveys.

6. Survey Cost

The budget established for the survey, including development, report production and analysis was **$2.47** million. Adopting the 1996 TTS software and procedures with only minor modifications kept development costs to a minimum. The following table provides a breakdown of actual expenditures

Development and Testing	$	21,000
Conduct of the survey	$	1,614,000
Analysis and Reports (Estimate)	$	345,000
Management and Co-ordination	$	388,000
Total Expenses	**$**	**2,468,000**

The next table gives a breakdown of the direct costs associated with the conduct of the survey and compares them with the costs of the 1986, 1991 and 1996 surveys. Inflation factors of 60%, 25% and 12% have been used to adjust the 1986, 1991 and 1996 costs to 2001 values. The 1986 survey had a very different management organisation from the 1991, 1996 and 2001 surveys. It should be noted that the 1986 survey costs do not include any allowance for the substantial amount of time that staff from the participating agencies spent managing and directing the survey.

Interviewing costs per interview were slightly higher in 2001 than in 1996 due to the lower productivity that resulted from the high incidence of answering machines and voice mail encountered in making the phone calls. The other reason for the increase in the variable cost component was the cost of renting and furnishing commercial office space. In 1996 the Metropolitan Toronto (now the City of Toronto), as part of their contribution to the survey, provided office space. The net credit that Metropolitan Toronto received in payment is included in the 1996 TTS costs. However, maintaining the methods and procedures from previous surveys resulted in a saving in management costs for 2001. The 2001 survey benefited from the continuity of software development since 1986 and the ability to use the 1996 TTS software without significant modification. Unfortunately, the software is now obsolete.

Cost Comparison (2001 $)

	1986 TTS	1991 TTS	1996 TTS	2001 TTS
Number of completed interviews	61,453	24,507	115,241	136,424
Variable Costs (Per completed interview)				
Interviewing	$ 8.27	$ 10.61	$ 8.61	$ 8.85
Coding	$ 8.66	$ 2.55	$ 1.29	$ 1.05
Other Variable Costs	$ 2.94	$ 2.74	$ 1.72	$ 2.48
Total variable Cost	**$ 19.89**	**$ 15.91**	**$ 11.63**	**$ 12.37**
Fixed Costs (Not directly related to the number of interviews conducted)				
Pilot survey & Pretests	$ 59,000	$ 19,000	$ 96,000	$ -
Management	$ 141,000	$ 201,000	$ 467,000	$ 317,000
Other Costs	$ 104,000	$ 5,000	$ 246,000	$ 118,000
Total Fixed Cost	**$ 304,000**	**$ 225,000**	**$ 809,000**	**$ 435,000**
Total Cost (Excluding analysis and reports)	**$ 1,526,000**	**$ 615,000**	**$2,149,000**	**$ 2,123,000**
Total cost per interview	$ 24.83	$ 25.09	$ 18.65	$ 15.56

7. Conclusions and Recommendations

The desired target of a 5% sample was significantly exceeded within the approved budget. Despite problems that were experienced in sample selection and a lower than expected response rates in some areas, early indications are that the quality of the data is excellent for a wide range of applications. Those applications include the planning of transportation facilities to meet peak period demands, the analysis of home to work and home to school travel linkages, and the analysis of travel behaviour as it relates to household socio-economic and demographic characteristics. The most serious deficiency is a significant under reporting of off-peak discretionary travel by automobile. This under reporting is common to all four TTS and is likely a result of a survey method that relies on a single individual being able to recall and report on the travel movements of all members of a household without having kept a written diary.

The continuity of development since 1986 has resulted in survey procedures, which are highly effective and efficient at collecting large amounts of travel behaviour data for use in transportation planning. Unfortunately, the computer software used in both the 1996 and 2001 surveys must now be regarded as obsolete. A complete review and rewrite will be necessary before the next major survey. That process should start immediately in order to take full advantage of the experienced gained in the conduct of those two surveys.

It is recommended that the 2001 TTS methods be used as the model for the conduct of a travel survey in the year 2006. In the long term, it is likely that a ten-year cycle of a 5% sample is adequate with something smaller in the intervening quinquennial. Two options are available for 2006, begin the ten-year cycle in 2006 after a full 5% sample (recommended) or begin the cycle in 2001 with a smaller sample in 2006.

Problems experienced in sample selection place into question both the competence of the supplier of the lists as well as the currency and completeness of the sample frame that was used. Alternative sample selection sources and procedures should be investigated prior to the next survey.

Declining response rates resulting from the increased use of voice mail and cell phone technology is a major concern. Validation of the 2001 survey data does not show any obvious bias in the survey results that might be attributed to low response rates other than a slight increase (from 8% to 11%) in the under-representation of the 18-22 age cohort of respondents relative to the 1996 survey. Close monitoring, and subsequent evaluation, of response rates is needed in future surveys.

The staging of the 2001 TTS over two years was efficient and cost effective. Of particular importance was the ability to re-hire trained staff from the fall 2000 component to assist in the training and supervision of staff for the main component of the survey in 2001. It is recommended that any future survey of a similar scale also be done over 2 years from approximately the same site location. The GTA / non-GTA division was convenient and provided consistency with the previous surveys.

The proportion of survey respondents who acknowledged receipt of the advance letter was higher in the 2001 survey than it was in 1996. The use of envelopes bearing the official provincial government logo could well have contributed to the higher receipt rate and a slightly lower refusal rate. The use of official government envelopes is recommended for future TTS.

1 Introduction

The Transportation Tomorrow Survey (TTS) is a comprehensive travel survey conducted in the Greater Toronto Area (GTA) once every five years. The TTS is a joint undertaking by the agencies represented on the Transportation Information Steering Committee (TISC), formerly known as the Toronto Area Transportation Planning Data Collection Steering Committee (TATPDCSC). The Committee was established in 1977 for the purposes of setting common transportation data collection standards and for coordinating data collection and dissemination between the member agencies. Membership of the committee includes Cities of Toronto and Hamilton, the Regional Municipalities of Durham, York, Peel, Halton, the Toronto Transit Commission, GO Transit and the Ontario Ministry of Transportation.

The first TTS, conducted in 1986, obtained completed interviews for a 4.2% random sample of all households in the GTA. After completion of the 1986 survey, the Data Management Group was formed at the University of Toronto with one of its prime objectives being the management and distribution of the 1986 TTS data. The Data Management Group was also requested to manage the second TTS undertaken in 1991. The 1991 survey was a smaller update of the 1986 survey focusing primarily on those geographic areas that had experienced high growth since 1986. The survey area was expanded slightly to include a band approximately one municipality deep surrounding the outer boundary of the GTA for the purpose of obtaining more complete travel information in the fringe areas of the GTA.

The 1996 TTS was a new survey, not an update. Agencies outside of the GTA were invited to participate if they wished. The survey area was expanded to include the Regional Municipalities of Niagara and Waterloo, the counties of Wellington, Simcoe and Victoria and Peterborough, the Cities of Guelph, Barrie and Peterborough and the Town of Orangeville. Approximately 115,000 interviews were completed representing a 5% random selection of households throughout the survey area. A technical sub-committee of TATPDCSC was established that included representation from all the participating agencies. The Data Management Group was responsible for all aspects of the management of the survey.

The 2001 TTS is essentially a repeat of the 1996 survey with approximately 137,000 completed interviews. The survey area is the same as in 1996 except for the exclusion of the Regional Municipality of Waterloo and inclusion of City of Orillia and all of the County of Simcoe. The organizational structure and the role of the Data Management Group were also the same as for the 1996 survey.

The 1996 and 2001 surveys are two of the largest travel surveys ever undertaken anywhere. The 1986, 1991 and 1996 surveys each involved a major element of technology development. The use of automated geocoding was a key development in the 1986 survey. On-line Direct Data Entry (DDE) was introduced in the 1991 survey and networked computers in the 1996 survey. There was no comparable technological advance for the 2001 survey. The survey methods were essentially unchanged from 1996 with only minor revisions to some of the computer software. A telephone interview with on-line Direct Data Entry (DDE) and automated geocoding of all geographic information collected was adopted as the proven most cost effective and reliable means of collecting large quantities of travel data.

The interviews for the 2001 TTS were conducted in three stages. Areas external to the GTA and Hamilton were interviewed in the fall of 2000, the GTA and Hamilton in the fall of 2001. Additional interviews in the GTA and Hamilton were conducted in May 2002 to correct for problems identified in the original sample selection.

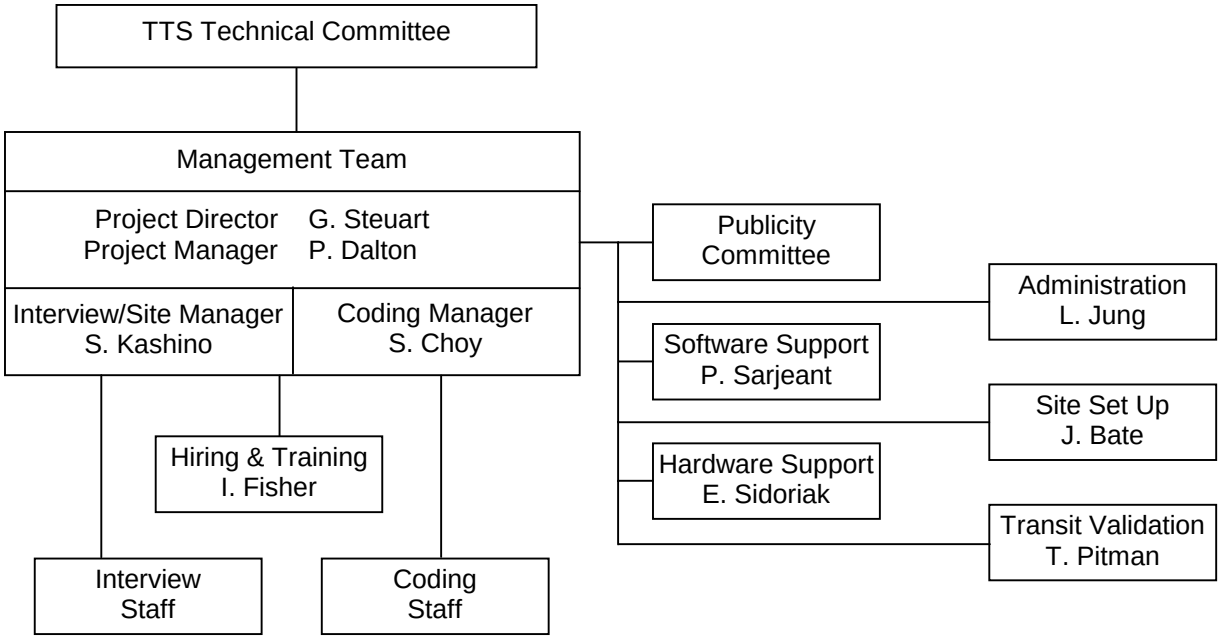
2 Planning and Organisation

The selection of the Data Management Group to manage the 2001 survey ensured continuity from the initial planning and design of the survey through to the dissemination of the final database and subsequent analysis of results. The selection also took advantage of the experience gained from the 1986, 1991 and 1996 surveys, ensuring consistency in survey methods and results.

2.1 Organisation

Exhibit 2.1.1 shows the reporting relationships adopted for the survey. The Technical Steering Committee consisted of a representative from each of the participating agencies. It met once every three to six months to receive progress reports from the Project Director, Gerald Steuart, and to make, or confirm, decisions on critical items.

Exhibit 2.1.1 2001 TTS Organisation Chart



The Management organisation was established based on the need to draw on the experiences gained in the conduct of the previous surveys at the same as broadening the base of experience that might be used in the conduct of future surveys. The Data Management Group appointed Peter Dalton as the Project Manager. Mr. Dalton was the General Manager of both the 1991 and 1996 surveys. Management responsibilities were shared between the Project Director and Project Manager, both part time positions. Primarily the Project Director handled management issues related to coding and computer support while issues related to sample management and interviewing were handled by the Project Manager. Sharon Kashino was appointed initially as Chief Supervisor and subsequently Site Manager. Ms. Kashino was a team leader for the 1996 survey and was extensively involved in the post survey processing of those data. Susanna Choy was appointed as Coding Manager. Ms. Choy was involved in the conduct of the 1991 survey and post survey processing of the 1996 survey data. A long time employee of the Data management

Group her responsibilities have included the ongoing maintenance and distribution of the TTS data. The Management Team met on an informal, as required, basis to discuss all aspects of the design and conduct of the survey.

An ad-hoc committee was established to advise the management team on the design and distribution of publicity material including press releases and the notification of local officials within the survey area. The members of the committee were John Barnes form the Region of York, who assumed a similar role on previous surveys, Martin Rosen, the secretary of the TTS Technical Committee, and Ruth Ann Sutton, Communications Co-ordinator with the Ministry of Transportation, Ontario

Ian Fisher, an independent consultant, was retained to hire and train the interview staff. Mr. Fisher was the chief supervisor for the 1986 and 1991 surveys, hired and trained the staff for the 1996 survey.

Paul Sarjeant, of BA Consulting Group, was retained to make any necessary revisions to either the Direct Data Entry or Sample Control Software. Mr. Sarjeant developed the software used in the 1996 survey.

Jim Bate, an independent consultant, was retained to supervise the acquisition of office space, furniture and equipment. While a staff member at the Region of Durham, Mr. Bate was a member of the TTS Technical Committee for the 1986, 1991 and 1996 surveys.

Trevor Pitman of the Toronto Transit Commission was seconded to the project to review and edit all transit routes in all jurisdictions recorded by the interviewers. Mr. Pitman was an active member in the conduct of the 1996 TTS.

2.2 Survey Design

The success and cost effectiveness of the 1986, 1991 and 1996 surveys, together with the need for a consistent time series, resulted in the same survey methods being adopted for the 2001 survey. The basic survey methods consisted of an advance letter mailed to each of the selected households followed, about a week later, by a telephone interview to collect demographic data and travel information for the previous weekday for each member of the household. A universal co-ordinate system was used to record geographic information to allow assignment to any zone system.

The computer software developed for the 1996 survey was used with minor revisions.

An early decision was made to conduct the 2001 TTS in two stages, the first in the fall of 2000 and the second in the fall of 2001. This decision was based on the experience in the 1996 TTS that benefited significantly from having the Regional Municipality of Waterloo surveyed in the in the fall of 1995. The Waterloo component provided a valuable opportunity to test and refine the computer software in an environment where software performance was not critical due to the smaller scale of the survey. It also provided an added level of experience and continuity in the hiring and training of staff for the main part of the survey in 1996. Similar benefits also accrued from the conduct of 1995 TRANS survey in Ottawa and Hull using essentially the same survey methods and software. The fall 2000 component of the 2001 TTS was significantly larger than the 1995 Waterloo component of the 1996 TTS in that it included all of the survey area external to the GTA and Hamilton. Increasing the number of interviews in the first of the two stages, relative to 1995/6 provided for a better transition between the two stages and reduced the total number of interviews that had to be completed in the more critical second stage.

Unlike the 1995 Waterloo survey that was conducted from the Regional Office in Kitchener, it was decided that both components of the 2001 TTS should be conducted from the same, preferably somewhere in central area of Toronto. Having the same site location for the second stage of the

survey proved to be very beneficially in terms of being able to re-hire many of the same interviewers. The availability of a pool of trained interviewers permitted the hiring and training of new interviewers to progress at a faster rate than in 1996 as well as making more resources available for ongoing quality control.

Exhibit 2.2.1 provides a summary of key events leading up to the completion of the 2001 TTS.

Exhibit 2.2.1 Schedule of Key Events

1977	Formation of the Toronto Area Transportation Planning Data Collection Steering Committee (TATPDCSC)
Fall 1986	Conduct of the 1986 TTS (61,708 households interviewed)
August 1988	Release of the 1986 TTS database (Version 2.0)
August 1988	Data Management Group formed at the University of Toronto
December 1989	Data Management Group appointed to manage the 1991 TTS
Fall 1991	Conduct of the 1991 TTS (24,507 households interviewed)
June 1992	Release of the 1991 TTS database (Version 2.1)
January 1995	Data Management Group appointed to manage the 1996 TTS
Sept-Dec 1995	TRANS survey in Ottawa (21,707 households interviewed)
Oct./Nov. 1995	Conduct of the Waterloo component of the 1996 TTS (7,556 interviews completed)
Sep-Dec 1996	Conduct of the main portion of the 1996 TTS (108,850 households interviewed)
August 1997	Release of the 1996 TTS database (Version 2.1)
May 1999	Data Management Group appointed to manage the 2001 TTS
January 2000	First meeting of the Technical Steering Committee
June 2000	500 University Ave. Selected as survey site for stage 1 of the 2001 TTS
Sep-Nov 2000	Conduct of external portion of the 2001 TTS (22,000 household interviews)
May 2001	National census (Statistics Canada)
June 2001	500 University Ave. Selected as survey site for stage 2 of the 2001 TTS
July 2001	Installation and testing of phones, computer systems and software
August 2001	Initial recruitment and training of interview staff
Sep-Dec 2001	Conduct of the main portion of the 2001 TTS (101,000 households interviewed)
May 2002	14,000 additional interviews conducted
September 2002	Release of preliminary 2001 TTS database

2.3 Survey Content

No changes were made in survey content relative to the 1996 survey other than to collect the boarding and alighting station names for all trips that use either the subway or GO Rail. In the 1996 survey, the boarding and alighting station information was only collected if the access, or egress, mode was a private vehicle.

The survey consists of the following questions:

2.3.1 Household Data

- Home Location
- Type of dwelling unit
- Number of persons
- Number of vehicles available for personal use

2.3.2 Person Data

- Gender
- Age
- Possession of a driver's licence
- Possession of a transit pass
- Employment status
- Occupation
- Usual work location
- Availability of free parking at place of work
- Status as a student
- Usual school location (Name of school)
- Origin of first trip

2.3.3 Trip Data (Only collected for persons 11 and older)

- Location of destination
- Trip purpose
- Start time
- Method of travel

2.3.4 For Trips made by Public Transit

- Method of access
- Sequence of transit routes and/or boarding & alighting stations (maximum of 6)*
- Method of egress

* The transit route is recorded for each segment of a transit trip made by bus or streetcar. The boarding and alighting stations are recorded as two separate trip segments for transit trips that involve the use of the subway, Scarborough RT or GO Rail.

Details of all the response categories and definitions are contained in both the Interview Manual (Joint Program in Transportation Working Paper #7, 2001 Transportation Tomorrow Survey Working Paper Series: Interview Manual, December 2002) and the Data Guide (Joint Program in Transportation Report 92, Transportation Tomorrow Survey: Data Guide, January 2003)

2.4 Fall 2000 Survey (Areas External to the GTA and Hamilton)

The search for an appropriate interview site commenced in May 2000. Unlike the 1996 survey, none of the funding agencies was able to provide appropriate office space. It was therefore necessary to rent commercial space. Basic requirements were identified as 2,400 sq. ft open floor space in downtown Toronto with good access to the subway. Appropriate space available from August 1st to the end of December was found at 500 University Avenue.

The site was equipped with 30 interview and 2 monitoring stations. Each interview station was equipped with a computer and a telephone with a headset. A variety of disused Pentium I (60, 75 and 90 MHz) computers were obtained from the City of Toronto. As part of a large computer system upgrade, these computers were judged to be of little resale value. Where necessary,

these computers were refurbished and the necessary software installed. Six of the interview stations were also designated for use as coding stations and for the training of newly hired interviews. These stations were provided with high speed Internet access for use in the coding process. Each of the two monitoring stations was able to mirror the screen of any of the 30 workstations, while at the same time listening to the interview in progress on a silent telephone monitoring system. A new file server was purchased to act as a file server. The phone lines were connected into the Provincial Government's Centrex phone system to facilitate long distance calling at very competitive rates. The file server, computers and telephone headsets were retained for use in the main part of the survey in 2001.

The 5% sample requirement translated into a target of 22,000 completed interviews. A randomly distributed sample of residential phone listings was purchased from Cornerstone List Management, a private company specialising in the maintenance and distribution of phone and mailing lists. An initial list of 16,000 residential phone listings (name, address and phone number) was obtained in early July for use in training and the initial start up of the survey. A second list of 24,000 was obtained in mid October. The purchase of the 2nd list was delayed until October in order that students moving into University and College residences in September would be included.

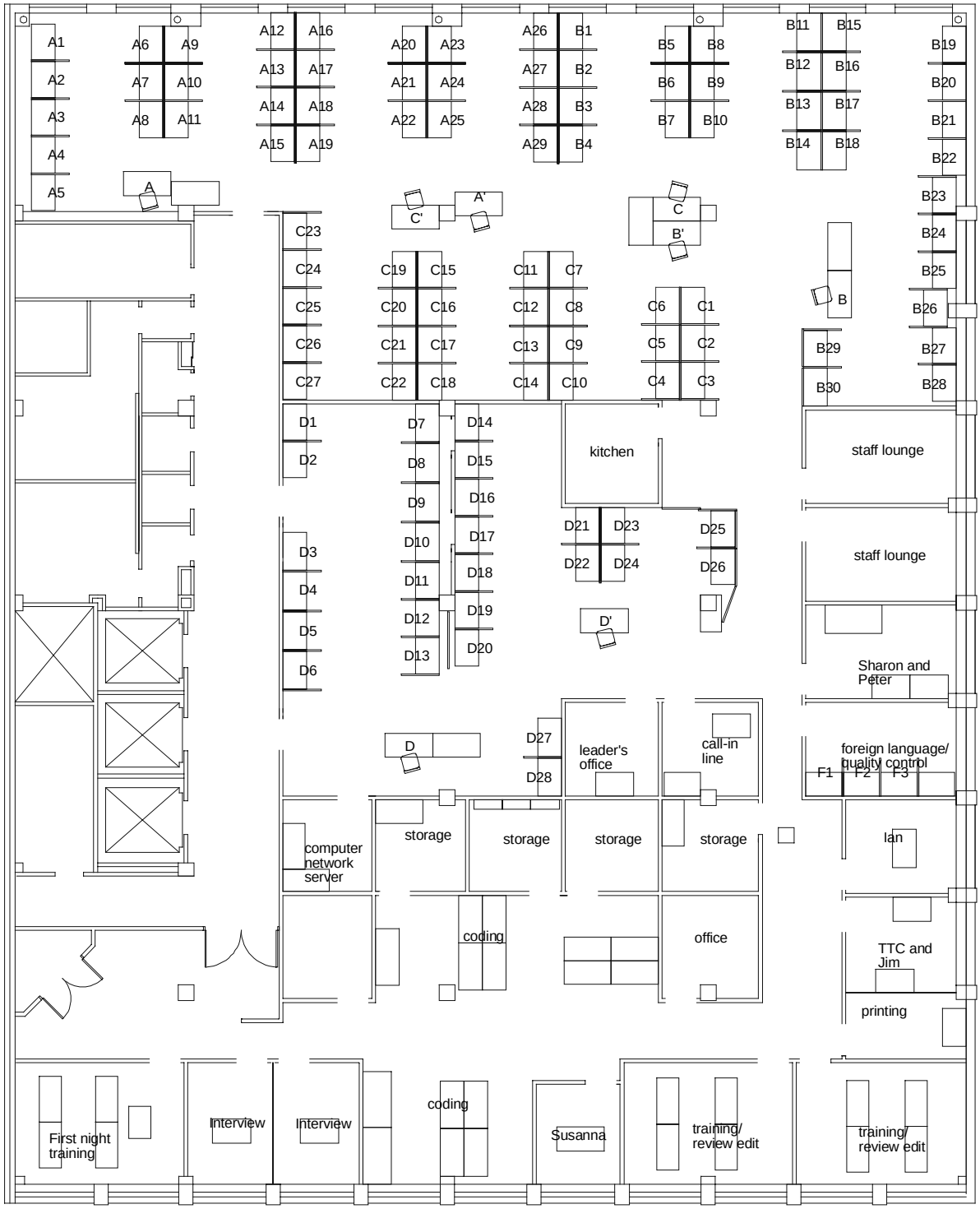
The survey commenced on Wednesday, September 7, 2000 and ended on Friday, December 1, 2000. Some callbacks were made the following week. A total of 57 interviewers and 5 geocoders were recruited and trained. 22,678 interviews were completed successfully. A small number of records were subsequently discarded as being incomplete or outside the survey area.

2.5 Fall 2001 Survey (GTA and Hamilton)

The only real difference between the 2000 and 2001 components of the survey was in the scale of operation. The minimum space requirement was identified as 10,000 sq. ft of open floor space. The appropriate amount of space was found to be available in the same building as was used in the fall of 2000 but on a different floor. The space was rented for 5 months from August 1st to the December 31st. Free access was granted in the last week of July for installing wiring, computers, telephones and furniture.

In order to equip the additional interview and coding stations needed, 100 used computers were purchased from the undergraduate student laboratories of University of Toronto's Engineering Computing Facilities. The availability of a large number of identical computers was an important factor in the set up of the local area network and the configuration of the survey software. The site was set up to accommodate up to 116 regular interviewers in four semiautonomous teams of approximately the same size, 6 non-English interview stations, 8 monitoring/supervisor stations, 16 geocoders plus individual computers for use by the members of the management team. Most of the computers were re-sold on completion of the survey. All of the interview stations (English and non-English) were separated from each other by 5-foot high screens for the purpose of sound attenuation. The monitoring/supervisor stations were located in open areas with a good view of the interview stations they were set up to monitor. Each of the semiautonomous teams was set up in a similar manner to the fall 2000 site with just under 30 interview stations and two visual and telephone monitoring station. The geocoding staff were located in a separate open plan area (no screens). Separate rooms were set up for nights 1, 2 and 3 training of new interviewers prior to their going live on the telephone. The site facilities included a small kitchen equipped with a fridge, microwave oven and coffee maker. Two small rooms were designated as lunch areas in which interviewers could take their breaks without leaving the premises. A layout of the survey site is shown on Exhibit 2.5.1

Exhibit 2.5.1 Layout of the Survey Site



LAYOUT

The 5% sample translated into a target of 98,000 completed interviews. As in the fall of 2000, the sample was purchased in two stages. The 1st list contained 75,000 phone listings was obtained and a 2nd list of 112,000 in early October after completion of the September updates to the residential phone lists. Subsequent to the acquisition of the 2nd list significant discrepancies were found between the geographic distribution of that list relative to both the first list and the distribution of households in previous surveys. At a macro level, the City of Toronto was under represented by about 30%. The suppliers of the list (Cornerstone List Managers) were unable to identify the source of the apparent discrepancies. A 3rd list of 19,000 phone listings, selectively stratified by forward sortation area, was purchased at the end of October to supplement the sample in those areas identified as being under-represented in the 2nd list. The problem in sample distribution was subsequently identified as relating specifically to apartment buildings, which first manifested itself as geographic bias. Additional interviews were conducted in May 2002 to correct for the under-representation of apartment buildings.

Live interviewing commenced on Wednesday, September 5, 2001 and finished on Tuesday, December 11, 2001 with a continuation of callbacks for the remainder of that last week. A total of 279 interview staff and 11 geocoders were recruited. 3 staff members originally recruited, as interviewers subsequently became geocoders increasing the total coding staff complement to a maximum of 14. A total of 101,568 interviews were successfully completed.

2.6 May 2002 Survey (Apartment Unit Supplement)

The apparent sample bias with respect to type of dwelling unit was not discovered until April 2002 when the survey data was first expanded to represent the universe of households in the survey area. At that time, the source of what appeared to be a geographic bias in the sample list obtained in October 2001 was identified as being caused by an approximate 70% under representation of apartment units in that list. The list suppliers were not able to identify the cause of the problem but it was decided that a supplemental survey of exclusively apartment units needed to be done in order to obtain adequate representation in the survey. A computer laboratory, already equipped with 54 computers, at the University of Toronto was used as the survey site.

A list of 28,000 apartment phone listings randomly distributed across the GTA and Hamilton was obtained from the supplier of the original list. The apartment unit designation that was used was not from the original phone list information supplied by Bell Canada but was imputed by the list managers based on the number of times the same address is repeated in their total listings. 10% to 15% of the listing were identified houses in the subsequent interviews. A 2nd list of 7,000 phone listings, selectively stratified by forward sortation area was obtained to supplement the sample in those areas identified as still having an under-representation of apartment units.

62 interview staff and 2 geocoders from the fall 2001 survey were re-hired. 13,761 interviews were successfully completed between May 6th and June 11th 2002.

2.7 Sample Design

The original survey target was to collect completed interview information from a 5% random selection of households throughout the survey area. In 1996, the listing of households included in the survey was obtained from Infodirect, a subsidiary of Bell Canada. The services provided by Infodirect have since been taken over by Cornerstone List Managers, a private company specialising in the management and distribution of phone and mailing lists primarily for the telemarketing and direct marketing industries. Cornerstone obtains the white page phone listings from Bell Canada with regular monthly updates. The information supplied by Cornerstone for each household in the sample list consisted of:

- Name
- Street Address

- Municipality
- Postal code
- Phone number

CRTC regulations, introduced in 1991, do not allow Bell Canada to release information that is not contained in the telephone directory. Apartment numbers are generally not included in directory listings for Toronto and surrounding areas and were therefore not included in the listings obtained from Cornerstone.

The sample frame used for the survey consists of listed residential phone numbers within the boundaries of the survey area defined as accurately as possible by postal codes. Households without phones, or with unlisted phone numbers, were excluded from the sample frame while households with multiple listed phone numbers were represented more than once. The extent to which these differences in the sample frame affect the results of the survey is not known. The previous surveys have shown no evidence of significant bias that could be attributed to this factor. The sample frame for the 2001 TTS also excludes households whose members have specifically requested that they be excluded from any telephone or mailing lists given out for marketing or market research purposes.

One concern was to obtain a proper representation of post secondary students in the sample. According to the staff at Cornerstone, their computer files are updated with new phone listings once a month with the updated sample frame being available early in the first week of the following month. Phone listings for students moving into college residences were not likely to become part of the sample frame until October. The sample lists for both the year 2000 and 2001 components of the survey were purchased in two stages. An initial order was obtained in July/August for use in staff training and initial start up. Second, much larger, lists were obtained in early October after the September updates. Supplementary orders were subsequently placed in order to correct for under reporting and sample bias as discussed in the previous sections.

2.8 Sample Selection

The 2001 TTS area is divided into the two components surveyed in the years 2000 and 2001 respectively, based on postal codes. In urban areas, the first three characters known as the Forward Sortation Area (FSA) are used. In rural areas, the full 6-character code known as the Local Delivery Unit (LDU) is used. In most cases, each LDU is a rural post office. FSAs and LDUs are not always mutually exclusive to each other in terms of the geographic area they serve. The exact location of a house cannot be determined from the postal code even in urban centres, particularly where box numbers and general delivery codes are used. The boundary of the two areas surveyed is approximate such that some households inside the GTA were included in the fall 2000 and others, outside the GTA in the fall 2001 survey.

2.8.1 Area #1 (External to the GTA)

All postal codes beginning with the characters

L2

Forward Sortation Areas

K9H	K9J	K9K	K9L	K9V	
LOK	L0L	L0M	L0S		
L3B	L3C	L3K	L3M	L3V	L3Z
L4M	L4N	L4R			

L9M	L9R	L9V	L9W	L9Y			
N1C	N1E	N1G	N1H	N1J	N1K	N1L	N1M

Local Delivery Units

K0L 1B0	BAILIEBORO
K0L 1H0	BRIDGENORTH
K0L 1J0	BUCKHORN
K0L 1K0	BURLEIGH FALLS
K0L 1R0	CURVE LAKE
K0L 1S0	DOURO
K0L 1T0	ENNISMORE
K0L 1V0	FRAZERVILLE
K0L 2B0	INDIAN RIVER
K0L 2C0	JUNIPER ISLAND
K0L 2E0	KAWARTHA PARK
K0L 2G0	KEENE
K0L 2H0	LAKEFIELD
K0L 2V0	NORWOOD
K0L 2W0	OMEMEE
K0L 2X0	REABORO
K0L 3A0	WARSAW
K0L 3B0	WESTWOOD
K0L 3G0	YOUNGS POINT
K0L 3H0	CENTURY VILLAGE
K0M 1A0	BOBCAYGEON
K0M 1B0	BOLSOVER
K0M 1C0	BURNT RIVER
K0M 1E0	CAMBRAY
K0M 1G0	CAMERON
K0M 1K0	COBOCONK
K0M 1L0	DUNSFORD
K0M 1N0	FENELON FALLS
K0M 2A0	KINMOUNT
K0M 2B0	KIRKFIELD
K0M 2C0	LITTLE BRITAIN
K0M 2J0	MANILLA
K0M 2L0	NORLAND
K0M 2M0	OAKWOOD
K0M 2T0	WOODVILLE
L0A 1A0	BETHANY
L0A 1C0	CAVAN
L0A 1G0	MILLBROOK
L0A 1K0	PONTYPOOL
L0B 1K0	JANETVILLE
L0G 1A0	BEETON
L0G 1B0	BOND HEAD
L0G 1L0	LORETTO
L0G 1W0	TOTTENHAM
L0N 1R0	ROSEMOUNT
L0R 1B0	BEAMSVILLE
L0R 1B1	BEAMSVILLE
L0R 1B2	BEAMSVILLE
L0R 1B3	BEAMSVILLE
L0R 1B4	BEAMSVILLE
L0R 1B5	BEAMSVILLE
L0R 1B6	BEAMSVILLE
L0R 1B7	BEAMSVILLE
L0R 1B8	BEAMSVILLE
L0R 1E0	CAISTOR CENTRE
L0R 1M0	GRASSIE
L0R 1Y0	ST ANNS
L0R 2A0	SMITHVILLE
L0R 2J0	WELLANDPORT
L0R 1G0	CAMPDEN
L0R 1S0	JORDAN STATION
L0R 2C0	VINELAND
L0R 2E0	VINELAND STATION
L0R 2N0	BEAMSVILLE
N0B 1B0	ARISS
N0B 1C0	ARKELL
N0B 1H0	BALLINAFAD
N0B 1J0	BELWOOD
N0B 1P0	EDEN MILLS
N0B 1S0	ELORA
N0B 1T0	ERIN
N0B 1Z0	HILLSBURGH
N0B 2C0	MORRISTON
N0B 2J0	PUSLINCH
N0B 2K0	ROCKWOOD
N0C 1M0	SINGHAMPTON

2.8.2 Area #2 (GTA & Hamilton)

All postal codes beginning with the characters

M (Metro Toronto) L1 L5 L6 L7 L8

Forward Sortation Areas

L0A	L0B	L0C	L0E	L0G	L0H	L0J	L0P			
L3P	L3R	L3S	L3T	L3Y						
L4A	L4B	L4C	L4E	L4G	L4H	L4J	L4K	L4L	L4P	L4S
L4T	L4V	L4W	L4X	L4Y	L4Z					
L9A	L9B	L9C	L9G	L9H	L9J	L9K	L9L	L9N	L9P	L9T

Local Delivery Units

L0N 1A0	ALTON	L0R 1V0	MILLGROVE
L0N 1C0	CALEDON VILLAGE	L0R 1W0	MOUNT HOPE
L0N 1E0	CALEDON EAST	L0R 1X0	ROCKTON
L0N 1K0	INGLEWOOD	L0R 1Z0	SHEFFIELD
L0N 1P0	PALGRAVE	L0R 2B0	TROY
L0R 1A0	ALBERTON	L0R 2H0	WATERDOWN
L0R 1C0	BINBROOK	L0R 2H1	WATERDOWN
L0R 1H0	CARLISLE	L0R 2H2	WATERDOWN
L0R 1H1	CARLISLE	L0R 2H3	WATERDOWN
L0R 1H2	CARLISLE	L0R 2H4	WATERDOWN
L0R 1H3	CARLISLE	L0R 2H5	WATERDOWN
L0R 1J0	COPETOWN	L0R 2H6	WATERDOWN
L0R 1K0	FREELTON	L0R 2H7	WATERDOWN
L0R 1P0	HANNON	L0R 2K0	WEST FLAMBOROUGH
L0R 1R0	JERSEYVILLE	L0R 2M0	WATERDOWN
L0R 1T0	LYNDEN		

2.8.3 Sample Lists

The following is a complete summary of the lists obtained from Cornerstone. The requests except as noted, were for a random selection of all listed residential phone number within the defined area with duplicate phone numbers from previous lists removed.

1. August 2000 — 16,000 households in Area 1
2. October 2000 — 24,000 households in Area 1
3. July 2001 — 75,000 households in Area 2
4. October 2001 — 112,000 households in Area 2
5. October 2001 — 6,500 households in Area 2
6. November 2001 — 19,000 households in selected FSAs from Area 2
7. May 2002 — 28,000 apartment units in Area 2
8. May 2002 — 7,000 apartment units in selected FSAs from Area 2

Sample list 4 was found to contain households from outside the defined survey area. List 5 was supplied as a supplement to bring the number of households within the defined area up to the required total.

Sample list 6 was obtained for two purposes

a) To supplement the original list in areas that experienced a below average response rate, and
b) To correct for the apparent geographic bias in list 4 as noted in section 2.6.

The request was for a specific number of households in each of the identified FSAs.

Sample list 8 was obtained to supplement the sample in those FSAs where apartment units were expected to be under-represented even after completion of interviews from list 7. The FSA were divided into 4 groups each group representing a different level of under-reporting. The request was for a specific number of households in each of the four groups. The subsequent interviews revealed that majority of the households in list 8 were in fact houses and not apartments. This determination was too late for further corrective action to be taken in regard to sample selection.

2.9 Mailing Plan

On receipt of each sample selection, a random number was assigned to each household record. The records were then sorted on the random number and assigned to mailing blocks. An electronic copy of the address information was provided to a commercial mailing house (Anvon Direct Mail Services in the fall of 2000, Corporate Mailing and Printing in the fall of 2001 and May 2002) who were contracted to mail the advance letter to each household. The files for each mailing were sent to the mailing house by email at least 3 days before each mailing.

On receipt of sample list 2 in 2000 and sample list 4 in 2001 the remaining sample from lists 1 and 3 respectively that had not already been included in a previous mailing were moved to the end of the combined sample queue in order to maximise the use of the more current listing. The number of households included in the final mailing for each phase of the survey was based on the estimated number of additional records needed to achieve the sample target set for each individual FSA. The remaining households not yet included in a previous mailing were combined into a single list. A priority rating was then assigned to each record equal to (The estimate additional sample required to achieve the completion target for that FSA - The number of households already assigned a priority rating for that FSA) / (The estimate additional sample required to achieve the completion target for that FSA). The households were then assigned to the remaining mailing blocks in priority sequence.

Exhibit 2.9.1 Mailing Plan

Numbers and dates are approximate.

Fall 2000

Mailing	No. of letters	Mailing Date	
1	1000	August 22	Training sample
2	2000	September 14	
3	2000	September 19	
4	3000	September 22	
5	4000	September 29	
6	3850	October 5	
7	6000	October 12	Start of list 2
8	4000	October 19	
9	4000	October 30	
10	4000	November 6	
11	4200	November 13	

Fall 2001

Mailing	No. of letters	Mailing Date	
1	3000	July 31	Training sample
2	5000	August 16	Training sample
3	5000	August 30	
4	8000	September 5	
5	10000	September 10	
6	10000	September 18	
7	12000	September 25	
8	12000	October 2	
9	2870	October 5	
10	15000	October 10	Start of list 4
11	15000	October 17	
12	15000	October 24	
14	15000	October 30	
15	15000	November 7	
16	10500	November 14	
17	16000	November 20	

May 2002

Mailing	No. of letters	Mailing Date	
1	1000	May 2	Sent 1st class
2	3500	May 2	
3	4500	May 7	
4	5000	May 10	
5	5000	May 17	
6	3000	May 24	

2.10 Sample Control

Prior to each mailing block being sent out, each record was assigned a permanent 6-digit identification number and a code to determine which of 40 geographic areas it would be assigned to for geocoding subsequent to completion of the interview. The coding areas are defined based on postal code and had approximately equal population. The records were then added to the sample queue on the central file-server. The sample control software allocated records in the sample queue to individual interview stations. The software always allocates the first unused record in the sample queue that meets the following criteria:

- the mailing block containing the record has been activated,
- the Forward Sortation Area containing the household is active, and
- the coding area number lies within a range specified for the interview station that requires additional sample.

Management control features designed into the sample control software permit the following functions to be performed as needed:

- activation of a new mailing block
- setting the queue length for each interview station
- activation/de-activation of unused sample for any specific FSA
- setting the range of coding area numbers that can be assigned to each interview station
- transfer of interviews requiring a non-English call-back to a specific interview station that has been designated for conducting interviews in the language in question

Changing the workstation allocation or FSA activation does not affect records that have already been assigned to a workstation, regardless of whether or not an interview has been attempted.

Sample control consisted of daily monitoring of completion statistics to determine:

- changes required in the mailing schedule
- the appropriate time to activate a new mailing block
- the appropriate allocation of coding areas to each interview station
- the appropriate allocation of interview staff to interview stations
- de-activation of FSAs that have achieved their completion targets

In previous surveys, each interview team was assigned to a different geographic area. For the GTA/Hamilton component of the 2001 survey, the interview computers assigned to each of the four interview teams were divided into two sub-groups, one of which assigned samples from within Toronto and the other from outside Toronto. The primary reason for this division was to keep separate the household records most likely to have transit information that needed to be reviewed by staff from the Toronto Transit Commission (TTC). The number of computers assigned to each of the two sub-groups was modified as required to keep the completion of interviews in the two areas in step.

2.11 Publicity

Previous surveys indicate three constituents need to be informed about the objectives of the survey and, in varying degrees, about the methods used to conduct the survey. The constituents are the local government and public service officials (particularly the police), the press and households scheduled to be interviewed

2.11.1 Letter to Local Officials

Appendix A contains a copy of the letter sent by the Project Director advising local officials of the conduct of the survey. Two weeks prior to the start of the telephone interviews, this notification letter was sent to a list of people supplied by each of the funding agencies. The lists were generally made up of the following officials:

- Federal and Provincial Members of Parliament
- Regional Chairpersons
- Mayors, Reeves and County Wardens
- Local Councillors
- Police Departments
- Chambers of Commerce

2.11.2 Press Release

A press release package in both French and English was sent to all newspapers, television and radio stations in the survey area. Press release packages to the media outside the GTA were sent out in early October prior to the start of interviewing in those areas. Packages for the news media within the GTA were planned to go out in mid August but was not sent out until the first week of September due to delays in production. A copy of the press release package is contained in the Appendix B.

2.11.3 Advance Letter

The advance letter sent to all selected households was regarded as a critical item in the conduct of the survey to encourage a high response rate and minimise the time interviewers needed to spend explaining reasons for the survey. A copy of the advance letter used for the GTA-Hamilton component of the survey is contained in the Appendix C. The original letter was signed by the Minister of Transportation, the mayors of the City of Toronto and City of Hamilton and the four

Regional Chairs from the GTA. A similar letter was used for the fall 2000 component of the survey bearing the signatures of the Regional Chair (Niagara), Mayors, Reeves and County Wardens of the participating agencies outside the GTA and Hamilton.

Standard Ministry of Transportation envelopes were used for the mailing of the advance letters for all 3 components of the survey. The use of an official government envelope was regarded as important in giving legitimacy to the survey and ensuring that the advance letter not be treated as junk mail.

3 Software Development

3.1 System Design

No significant changes were made to the software used for the 1996 TTS. The overall data flow design was to move household sample through the system from one stage to another without duplication, other than for backup purposes. This allowed management personnel to use the sample control system to trace a household from the original sample file down to the final completion table. Household sample could be added to the sample queue of a particular interview station anytime. Vice versa, household sample could also be deleted at any stage upon request.

There were four stages in the data flow system, namely, the sample queue stage, the interview stage, the review and edit stage and the geocode stage.

- At the sample queue stage, all the selected sample were stored in one file which was sorted by the randomly assigned household numbers and grouped into mailing blocks. Once a mailing block was activated, all the sample records belonging to that block were then moved into a master sample queue ready for assignment onto one of 120 interview station sample queues. Interview station sample queues were in fact separate files managed by different sub-directories on the file server. The assignment was controlled by the Sample Control System (SCS) program.
- At the interview stage, the Direct Data Entry (DDE) program drew new sample from a designated sample queue on the file server and downloaded the records onto the local computers for interviewing. Completed surveys from individual interview stations were passed back onto the file server into one of 8 review and edit files, two files for each of the 4 interview teams. Incomplete sample (i.e., not yet contacted, call back required, etc.) remained on the local interview stations for follow up work.
- At the review stage, edit teams and supervisors did review and edits. The editors reviewed the completed interviews on paper printouts and made corrections directly on the computer files through the DDE program. When reviews were finished, the survey records from the 8 review and edit files were then grouped into 2 files, one file for successful interviews and one file for all rejected interviews (i.e., refusals, invalid contacts, etc.).
- The geocode stage started by taking the successful interviews and extracting out the location information by household to create a set of temporary files. A batch geocode program processed the temporary files and appended the batch records to 40 geocode area files for interactive geocoding. The geocode area files were downloaded onto the local coding stations on demand and backed up onto the file server upon completion.

For more information on the design specifications of the survey, please refer to “Joint Program in Transportation Working Paper #3, 1996 Transportation Tomorrow Survey Working Paper Series: Design Specifications”.

3.2 Operating System

The computers used for the survey were set up to operate in a local area network using Windows Networking with files remotely mounted using SAMBA on a LINUX file server. The computers used for the fall 2000 and fall 2001 components of the survey used Windows 95 as their operating system. The computers used for the May 2002 component used Windows 2000 as their operating system.

3.3 Direct Data Entry

The general operation of the DDE software did not change significantly since it was first developed for the 1991 TTS. Changes prior to the 1996 survey were made primarily to allow the computers to operate in a local area network instead of as stand alone personal computers.

The software has an internal sample control module which controls when and which household to contact from the pool of samples allotted to the interview station. There are four working screens in which data are entered, namely, the household, person, trip and a dedicated transit data screen. Information collected over the telephone was entered directly into the prescribed fields. To assist the interviewer, pop-up listings of municipalities, streets, schools and transit routes were available to record information quickly and accurately. Furthermore, there were logic and consistency checks as the information was recorded. At the end of an interview, an overall check was performed to ensure data completeness.

All instructions on the use of the program, valid data codes, survey questions and read-out messages are built into the DDE. Although the program has a prescribed sequence in which data are expected to be collected, the interviewer could override the sequence in response to the situation. The DDE has two operating options; a normal interviewing mode and a supervisor edit mode. In other words, the DDE can be used by interviewers to collect survey information, as well as by supervisors to review and make corrections to the data.

The most significant difference between the 1991 and 1996 versions of the DDE is that the later version takes advantage of the network environment. Besides backing up local files after every completed interview onto the network server, new sample can be added to the interview station anytime without interrupting the interview session. In the event of a computer hardware malfunction, all station files including sample and recorded information can be replicated on another computer quite quickly. Furthermore, even though the DDE was designed to work with a file server, it can operate as a stand-alone unit, provided that there are sufficient samples stored on the local interview station.

For more information on the design and operation of the DDE, please refer to the Software Documentation (Joint Program in Transportation Working Paper #4, 1996 Transportation Tomorrow Survey Working Paper Series: Software Documentation, March 1997) and the Interview Manual (Joint Program in Transportation Working Paper #7, 2001 Transportation Tomorrow Survey Working Paper Series: Interview Manual, December 2002).

3.4 Sample Control System

The Sample Control System (SCS) was completely redeveloped prior to the 1996 survey.

Some components of the sample control are built into the Direct Data Entry software. Whenever an interviewer logs on to start an interview session, the DDE picks up any new samples that have been allocated to that workstation. After each completed interview, the DDE makes a backup copy of the local files on the fileserver. On completion of an interview session, newly completed or rejected interviews are copied to the fileserver and deleted from the local files.

A batch process is usually run once a day on completion of interviewing. It performs other components of the sample control process, which includes the following functions:

- retrieving new interview records from the completion files for each work station
- performing validation checks on the new records
- compiling of completion statistics for each work station and each interviewer
- producing a print out of each completed interview
- updating the sample queue for each work station with the required number of new records from the active sample queue
- re-allocating interview records identified as requiring a non-English call back to the appropriate work station queue for the identified language.

In addition to the batch process, the SCS has a number of management functions that can be executed at any time. These functions include:

- updating the current list of interviewer names and login ID codes
- setting the queue length for each work station
- setting the allocation of work stations to teams
- setting the allocation of which geographic areas can be assigned to which interview stations
- activating new mailing blocks
- turning individual forward sortation areas on or off
- generating reports

The reports that can be generated include:

- a daily performance report giving completion and performance statistics for each interviewer
- a work station report summarising the status of the active sample on each interview station
- a survey status report summarising the completion statistics by forward sortation area relative to the calculated completion target
- a listing of the households identified as needing a daytime call back

For more information on the sample control software, please refer to the Joint Program in Transportation Working Papers #3 and #4: 1996 TTS Working Paper Series: Design Specifications, and 1996 TTS Working Paper Series: Software Documentation.

3.5 Geocoding Program

There were no significant changes to the geocoding software since the 1996 TTS. Geocoding is a two-stage process. In the first stage, a batch module is used to pre-process the coding files generated by the Sample Control System. The batch module attempts an automated look-up of street addresses, intersections and monument names. These files are then appended to the set of coding files used by the coders. The second stage is an inter-active process where the coders resolve problems in the records that are not coded during the automated process. Look-ups are done by specifying a street address, street intersection, monument name or place name. A full-text search is a built-in function in the look-up routine and is useful in browsing through a huge reference file. The inter-active process is carried out one household at a time. This allows the coder to access all of the information collected for that household as an aid to resolving problems. This also permits callbacks to a household be more organised.

For a detail description of the coding software, refer to the report “Joint Program in Transportation Working Paper #8, 2001 TTS Working Paper Series: Coding Manual”.

3.5.1 Coding Reference Database

The coding reference database consisted of a parcel dot file, an address range file, a traffic zone equivalency file, an intersection file, a monument or landmark file and two place name files. These files were compiled using the information obtained from the participating agencies and other various sources. Exhibit 3.5.1 summarizes the various data types provided by the agencies as the basis for geocoding. Exhibit 3.5.2 illustrates the coding standards used in the survey area.

Exhibit 3.5.1 Files from Participating Agencies

Agency	Data Type	File Format	Datum
City of Barrie	Address ranges	Arc View	NAD 83
City of Guelph	Parcel dots	MapInfo	NAD 83
City of Hamilton	Address ranges	Arc View	NAD 83
City of Kawartha Lakes	Traffic zones	Excel	-
City of Orillia	Address ranges	AutoCAD	
City of Peterborough	Address ranges	Arc View	NAD 83
City of Toronto	Address ranges	Arc View	NAD 83
County of Peterborough	Traffic Zones	Excel	-
County of Simcoe	Address ranges	Arc View	NAD 27
County of Wellington	Parcel dots	Excel	-
Region of Durham	Address ranges	Arc View	NAD 83
Region of Niagara	Address ranges	MapInfo	NAD 83
Region of Peel	Address ranges	Arc View	NAD 83
Region of Halton	Address ranges	Arc View	NAD 83
Region of York	Address ranges	Arc View	NAD 83
Town of Orangeville	Traffic zones	-	-

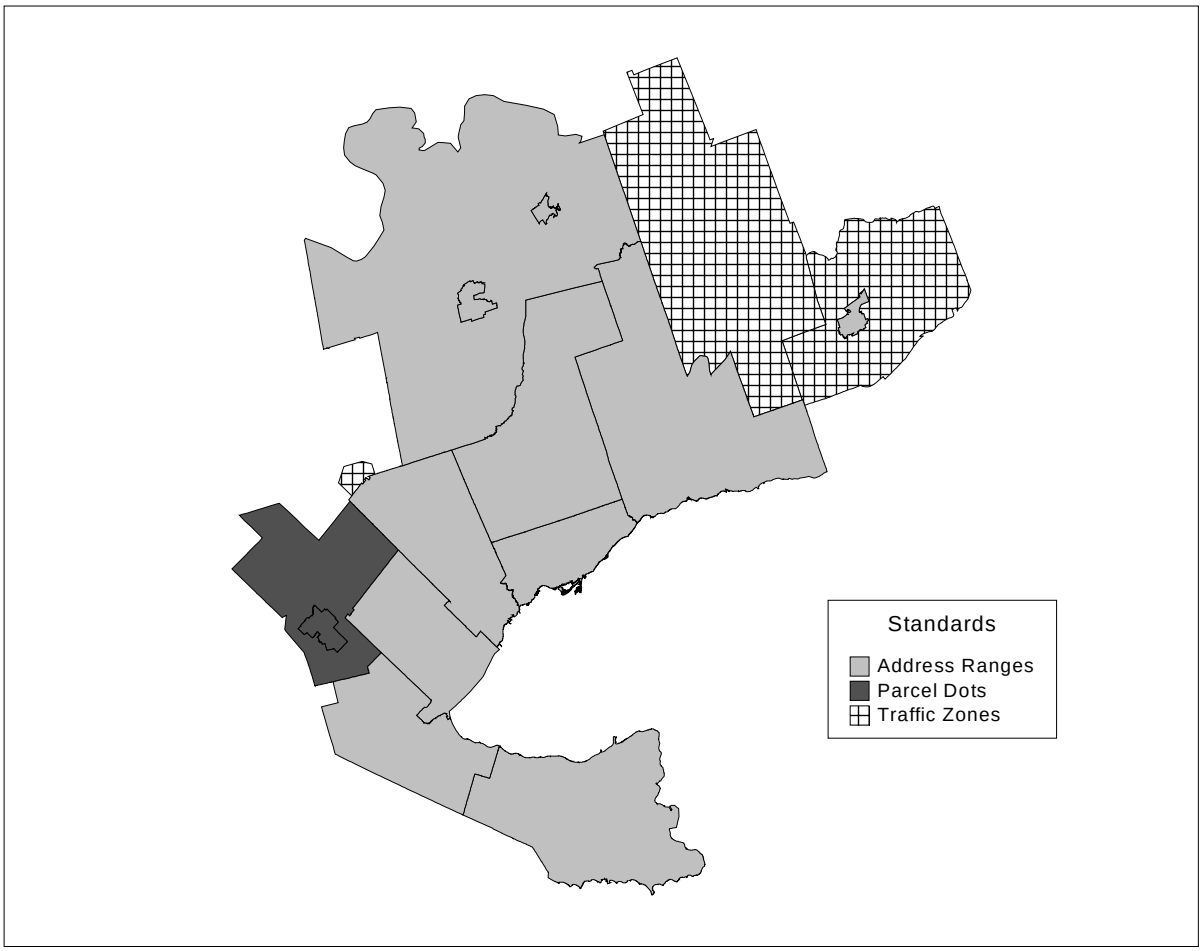
a. Street Address Files

Street addresses were geocoded either to an exact parcel dot coordinate or to a street block centroid coordinate depending on the availability of data. Eleven participants in the 2001 survey supplied street network files, while the City of Guelph provided a parcel dot file with street reference and the Wellington County provided a parcel dot file approximated to 100 metres. To create the address-coding file, the most up-to-date street network files were obtained from participating agencies. However, without a standard file format, such as the SNF, for the entire survey area, the combined street address reference file required immense effort to generate. In addition to converting the different file formats (i.e., AutoCAD, MapInfo, Excel Spreadsheet and Arc Info) to FoxPro (format for the geocoding software) the combined database also had two compatibility problems:

- Most of the GIS files obtained were based on either the NAD 83 datum, with the exception of Simcoe County, which was based on NAD 27 datum with 76 adjustment. Therefore, the geocoded coordinates for the street addresses were not compatible. The offsets were approximately 200 metres.
- Since agencies maintained their own street networks, incompatibilities were noted at jurisdictional borders even when they were using the same datum for digitisation. Offsets were generally less than 50 metres.

In order to have a reliable geocoding base file, conversion to the NAD 83 datum was first applied to all GIS files. After the conversion, streets along jurisdictional borders were aligned to ensure consistency across the entire survey area. In addition, extra efforts were made to correct only those geocoded coordinates along the borders and to align the traffic zone boundaries, since the survey data are usually used at the traffic zone level.

Exhibit 3.5.2 Coding Standards



b. Traffic Zone Equivalency File

For areas that did not have GIS files, street addresses were coded to traffic zones. The City of Kawartha Lakes, Peterborough County and the Town of Orangeville provided street name to traffic zone equivalency files. All streets within one traffic zone will be coded to the centroid of that traffic zone.

c. Intersection File

An intersection is defined as the centre point where two or more streets meet. Intersections are identified by locating all the common nodes in a street network. Since most participating agencies maintain GIS files, creating the intersection file was a relatively simple task.

d. Monument File

To identify a particular location, it is common to use a monument name instead of a street address. A monument may be a building or landmark, such as the CN Tower or the Eaton Centre. The monument file from 1996 survey was first updated by re-geocoding the existing records using the addresses included in the original file. It was then combined with information from various sources, such as listings from the school boards in the survey area, and major supermarkets. A new attribute, unique school code, was introduced in 2001 TTS. Therefore,

usual school locations were first geocoded and stored in the monument file in order to have unique geocoded coordinates.

During the survey, more records were added by the coding team by locating major shopping malls, language schools, tourist attraction areas, etc. through street maps, internet directories and telephone books. The monument file did not make use of assessment records. This was because the registered owner's name in the assessment may not be the common name of the property and the file was too large for practical use.

e. Place Name Files

The level of geocoding accuracy varied throughout the survey area. The goal was to geocode information to as much detail as possible. Street address and monument location were preferred over street intersection and traffic zones. However, in rural areas where the survey data are to be used at an aggregated level and when GIS data were not available, geocoding was performed at the place name level.

There are two geocoded place name files. The first listing included places within the survey area in which exact geocoded coordinates were required. The second listing included places outside the survey area where place name coding was acceptable.

4 Equipment

The effectiveness of the computer system in the 1996 TTS operation lead to the adoption of a similar system for the 2001 TTS. The major differences were related to availability of newer equipment and the use of a LINUX based mapping of remote drives with SAMBA rather than using Novell Networks. The objective of these incremental improvements was to reduce the total cost of supplying personal computers to the interviewers.

4.1 Computer Network

Because the same software was to be used in the 2001 TTS as was used in the 1996 TTS, the only issue was the local operating system. In 1996, the interviewer work stations operated in DOS mode with remote file sharing controlled by Windows 3.1. The problem at that time was reliable visual monitoring of the interviewer's computer screen. Testing of the DDE software under various configurations of the operating system started in May of 2000. It was determined that the interviewer stations could operate with any configuration of a Pentium computer with a small hard drive and 16 MB of memory using Windows 95. The configuration of choice was to operate in a DOS window using VNC software to visually monitor the interviewers screens. VNC had the added feature that a supervisor's station could take control of an interviewer station. A feature that was used for correcting faults and trouble shooting. Geocoding was also written in the DOS version of FoxPro. Given the experience geocoding in 1996, similar computers to the interviewer stations were judged sufficient.

With the decision to use a LINUX operating system on the file server rather than the previous use of Novell, it was necessary to purchase and test the computer to be used for this purpose. A Dell Power Edge 2400 server with a Pentium III 600 MHz processor, 768 MB of memory, 2 GB boot disk, 20 GB data disk, 4 mm DAT tape backup, UPS and 3 Ethernet network cards was purchased. The computer was fully configured and tested during the summer of 2000.

At the time the survey was contemplating computer purchases for the interviewer stations, the City of Toronto was in the process of disposing of their entire inventory of old computers, which had been replaced by a program in response to the potential dangers of Y2K. The City offered, free of

charge, those computers in their inventory that were judged to have very little resale value. These were a set of low-end Pentium 1 computers with, very importantly, an Ethernet card for network connection. Approximately 50 computers were taken in the spring of 2000 without being able to test whether they were still in operating condition. During the summer, a small group worked at the offices of the Data Management Group to configure these computers with Windows 95 and the necessary software. At the time of the 2000 interviewing stage, 35 operating computers were available and another 8-10 had potential when needed. Some of the better systems were used for supervisor stations and management computers. The effort to configure and repair these computers was judged cost effective, even though the product would continue to have little resale value, because they would be used a second time in the 2001 interviewing phase.

All computer systems including the server interview stations, supervisor (monitoring and review edit) stations and a networked printer (Lexmark 612) were fully tested in the Fall interviewing stage and found to have all the necessary features as well as being reliable. The decision was taken to replicate the approximately 30 interviewing station configuration 4 times to get the necessary number for the larger stage in the Fall of 2001.

Another fortuitous situation occurred for the acquisition of the additional computers needed for the Fall 2001 stage. The Engineering Computing Facility (ECF) of the University of Toronto's Faculty of Applied Science and Engineering operates an extensive network of personal computers for student use. The lease was due to expire on 100 identical Pentium II 266 MHz Dell computers with network cards. The survey purchased all of these computers and installed CD drives and sound cards on all of them. This was done to enhance the resale value at the end of the interviewing phase. In addition, the Data Management Group was phasing out 5 of their staff machines with a similar configuration. A complete image was developed for the 100 identical computers, which made changing their use from computers for interviewer training, to interviewer stations, to coding stations simple and rapid. As the need for training was phased out, the training machines became interviewer stations. Coding stations during the day could be used for interviewer training in the evening. Although the configuration kept changing during the course of the Fall stage, there were at one stage 96 interviewer stations, 6 foreign language stations, 8 supervisor/monitoring stations, 10 coding stations, one station serving call-in identification, 5 management computers, and one file server.

At the conclusion of the Fall 2001 interviewing stage, 95 of the Dell PII 266 computers were sold at approximately market value. Ten computers and the file server returned to the Data Management Group for post-interview processing and the remainder were donated to "Computers for Schools", a non-profit organisation providing computers to public schools.

When it became apparent in April of 2002 that a supplementary stage would be necessary, another fortuitous situation arose. Starting in May 2002 after the end of examinations, the computing laboratories operated by ECF would be under-utilised. They rented us a fully functional PC laboratory with 48 identical Dell PIII 900 MHz networked computers using Windows 2000. In addition, the file server had never been reconfigured and was immediately available for the supplementary stage. Some problems were encountered with the use of DOS software operating in the Windows 2000, but these problems were less than trying to reconfigure the system to operate Windows 95. A computer was brought in from the office of the Data Management Group for use as a monitor and administration. The entire room was operational in approximately two weeks. The problem was simplified somewhat by the fact that training was not needed and coding was undertaken off-site.

4.2 Telephones

The Fall 2000 stage was used as a test for telephone monitoring. Two Guytel CM-30 observation units were installed and wired to the 27 analogue telephone lines used by the interviewers. The configuration allowed two supervisors to monitor any of the interviewer lines. The lines were connected through the Province of Ontario's Centrex system, which had the very distinct advantage of showing the Province of Ontario on call display when an interviewer called a potential respondent. Use of the Province's phone system resulted in significant cost savings in both installation costs and long distance charges. Headsets remaining from the 1996 survey were used for hands free operation of the telephones.

The success of the telephone setup in 2000 led to the decision to duplicate the same telephone setup four times. The interviewer lines totalled, excluding foreign language and supervisors, totalled 114 with 8 CM-30 observations units operating in four banks. Software was installed on the monitoring station computers to allow the supervisor to visually monitor an interviewer's computer screen at the same time as listening to the interview over the phone. Cordless phones were used for monitoring enabling the supervisor to move around the room while still performing the monitoring function. There were 130 phone lines in total installed for the interview and coding operations. These lines were connected to the Government of Ontario Centrex phone system at Queen's Park. No conflict arose with the existing use of the Centrex phone system since nearly all of the interviewing was done outside of normal office hours.

Headsets are an important component for interviewers using computers for direct entry of data. The cost of commercial headsets was considered high given the low resale value after only 4 months of operation. It was decided to try a Plantronics T100 headset and keypad combination designed for domestic use but costing significantly less. The low cost of additional headsets, without the keypad meant that each interviewer was issued their own personal headset. The failure rate during the course of the survey was less than 10%.

Separate phone lines were installed for management functions and to receive call-ins from potential respondents who had been left a voice mail message. These call-in phones were equipped with automatic transfer to another line if the first line is busy or un-answered. With the number of households now using voice mail or answering machines, these call-in responses to messages left at the household were considered very important. Every attempt was made to have these lines answered by a trained interviewer during the day and early evening. Otherwise, an answering machine was used to describe the hours of operation and record any message the respondent may care to leave (see Section 5.6)

5 Conduct of the Survey

5.1 Interview Staffing

The number of interview staff required, together with the need to recruit and train them in a short time, is unquestionably the most challenging aspect of conducting a survey the size of TTS. The challenge was less demanding than in 1996 for two reasons. Firstly, a larger number of interviews (more than 22,000) were done in the fall of 2000 than in the fall of 1995 (7,500) thus reducing the target for the main part of the survey from 110,000 in 1996 to 98,000 in 2001. Secondly, the fall 2001 survey was done from the same location (Downtown Toronto) as the fall 2000 component enabling a significant number (18) of staff hired and trained for the 2000 survey component to be re-hired for the main component of the survey in 2001. The 4-team leaders for the main survey

were selected from the returning staff, as was the chief assistant to the hiring and training manager.

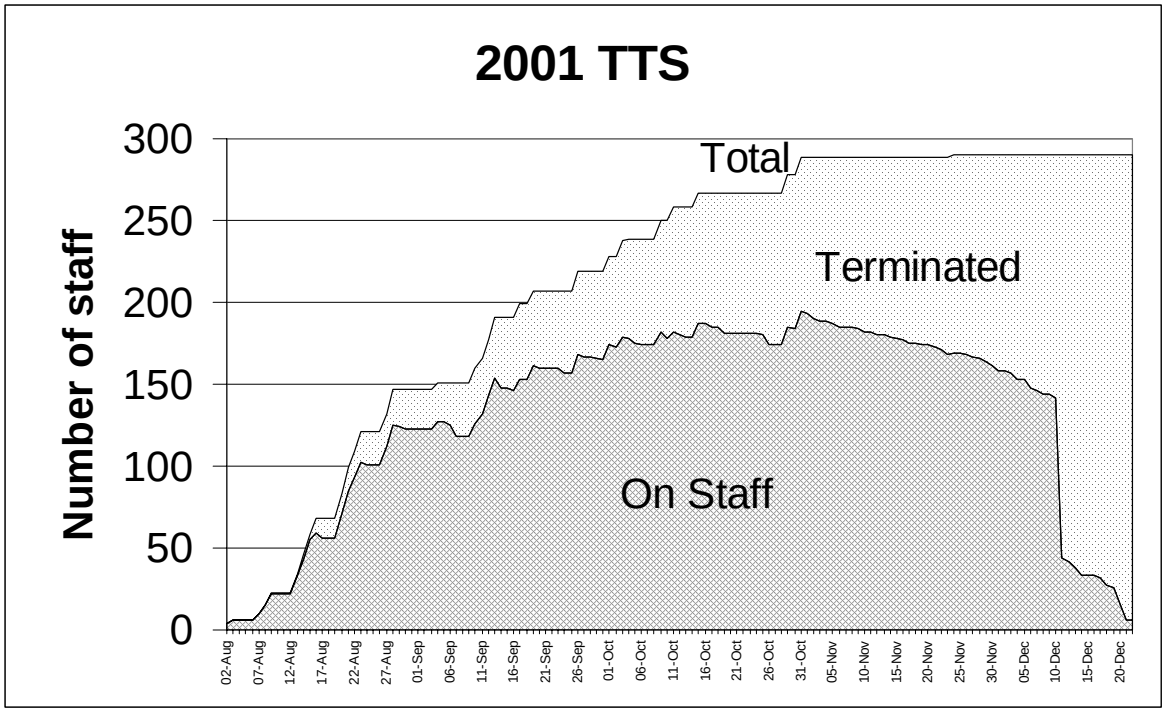
The primary method for recruiting staff was help-wanted advertisements placed in the Toronto Star newspaper. Hiring and training of staff for the fall 2000 component of the survey commenced September 5th, 2000 - the day after the Labour Day holiday. A total of 56 interviewers and 5 coders were hired and trained. The maximum number of interviewers on staff at any one time was 38.

Hiring and training of staff for the main component of the survey commenced August 2, 2001. The availability of the returning staff from the previous year made it possible to have approximately 130 interviewers trained by the time the survey started on September 5, 2001. In total 276 interview staff and 14 coders were recruited over the course of the survey. The maximum number of people on payroll at any one time was 195 at the end of October. Exhibit 5.1.1 shows how the number of interview staff varied over the course of the survey.

The interview staff were organised into four teams each with a team manager responsible for scheduling and supervision. A daytime supervisors was appointed with responsibility for ensuring that enough staff were available during the day to carry out functions such as answering the phone and making scheduled callbacks. The scheduling of staff to review the interviews conducted the previous day was initially the responsibility of the daytime supervisor but was later shifted to the individual team leaders

Staff for the May 2002 supplement were recruited by selectively contacting the better interviewers from the fall of 2001. 62 interviewers and 2 coders accepted the offer of re-employment. The interviewers attended a one evening refresher course in groups of about 20 prior to resuming live interviewing. The interviewers operated as a single team supervised by the site manager.

Exhibit 5.1.1 Interview Staff



5.2 Training

The initial training program consisted of three evening sessions for each new group of 12 to 15 interviewers. A maximum of three groups a week were trained usually starting on Monday, Tuesday and Thursday evenings. The Thursday group would complete their training on Saturday so that there would never be more than two groups being trained at the same time on any single day.

The first evening of training consisted of a detailed demonstration of the software by the Hiring Manager. The demonstration, with appropriate time for questions and answers took 2 to 3 hours. The trainees spent the remainder of the evening, working in pairs, familiarising themselves with the software.

On the second evening, the candidates practised interviewing each other. Supervisors were available to answer questions and provide guidance. A review meeting was held towards the end of the evening to provide a recap about certain aspects of the software and to allow questions.

On the third evening, the recruits continued to practice interviewing while the supervisors went around testing each person in turn. Once the training supervisor was satisfied that a trainee was ready to start live interviewing, that person would be moved to the main interview floor. Having the new interviewers come on to the floor one at a time enabled the team leaders and their monitoring staff pay special attention to each person during the conduct of their first few live interviews.

5.3 Rates of Pay

Interviewers were paid $10 per hour during training and $11.50 per hour as soon as they started to conduct live interviews. Rates of pay were reviewed every week with merit increases awarded on the base of performance. Daily and weekly performance statistics were calculated for each interviewer taking into account 3 measures:

1. Productivity. Both the number of phone calls placed and the number of interviews completed per paid hour of interviewing time.

2. Trip Rate. The average number of trips recorded per person in the households for which interviews were completed.

3. Refusals. The proportion of households contacted where the respondent refused to participate in the survey.

Although performance statistics were used as the primary factor in setting rates of pay, other factors were also taken into consideration. These factors included the number of post interview callbacks required, the general accuracy of their work, their willingness and co-operation.

Saturday to Friday was chosen as the pay period permitting the performance reviews to take place on Saturday in time for the payroll to be processed over the weekend. The merit increases were applied to the pay period that justified them so that interviewers received immediate reward for good work and improvements in performance. Pay cheques were dated for the following Friday and were generally distributed during or after the Friday night shift.

Staff were given a different rate of pay for non-interviewing time including supervisory duty and visual editing of interviews. The non-interview rates of pay were generally kept lower than the rate paid for interviewing in order to maintain the incentive for putting in as many hours as possible on the phone. The average rates of pay per hour, including incentive bonuses and vacation pay, are shown in the following table. The corresponding 1996 TTS averages are shown in brackets.

Trainee	$10.00	($9.00)
Interviewer	$13.23	($11.25)
Supervisor	N/A	($11.99)
Team leader	$16.63	($16.04)
Coder	$12.83	($11.15)

5.4 Hours of Work

Evening interview shifts ran from 5:30 to 9:30 p.m. Staff were instructed not to start any new interviews after 9:30 p.m. but were allowed to complete any interviews in progress. They were usually credited with an extra 15 minutes of interview time if an interview in progress took more than half that amount of time to complete. On Saturdays, the basic interview shift was from 10:00 a.m to 2:00 p.m. but staff were allowed to continue until 4:00 p.m. if they so wished.

5.5 Incentive Bonuses

Initially a bonus of $2 was paid for each hour of interviewing in excess of 14 hours in one pay period. The purpose of the bonus was to encourage regular turn out thereby reducing the total number of interviewers that need to be recruited. The bonus rate was later changed to a sliding scale such that the better interviewers received a bigger bonus. The sliding scale was set equal to the base rate of pay minus $10 with a minimum of $2 and a maximum of $5 per hour.

Supervisory and other non-interview time did not qualify for the bonus. No bonuses were paid during the initial training period in August. The number of qualifying hours was reduced to 10 for short workweeks resulting from public holidays.

Interviewers assigned to make non-English callbacks were paid the bonus rate regardless of whether they had reached the 14-hour minimum threshold.

5.6 Quality Control

Quality control of the information being collected was assured by the following procedures.

1. Logic checks performed by the DDE software.
2. Monitoring of interviews while in progress.
3. Daily monitoring of interview performance statistics
4. Visual review of all completed interviews
5. Callbacks
6. Feedback from the coding process
7. Rotation of interviewers between work stations
8. Random quality control audits

5.6.1 Logic Checks

The DDE software controls the flow of the interview, preventing the interviewer from moving on until a valid response has been entered for each question. At the completion of an interview, the software performs a second series of checks on the consistency and completeness of the information. A list of errors and warning messages appears on the screen prompting the interviewer to go back and make corrections immediately while the respondent is still on the phone. Any errors that are not corrected will appear on the print out of the interview for visual review by a supervisor. Details of the error checks are contained in the report "Joint Program in Transportation Working Paper #4, 1996 TTS Working Paper: Software Documentation".

5.6.2 Monitoring

All interview stations were equipped for monitoring, both aurally and visually, by a supervisor. Newly trained interviewers were monitored more frequently than seasoned interviewers. The team leaders and their most experienced staff carried out monitoring. Any comments were recorded in writing. Minor problems were brought to the attention of the interviewer immediately, particularly if corrections to a just completed interview were required. Serious problems were reported to the team leader for appropriate corrective action. Items of particular concern were the interviewers' telephone manner and their ability to question respondents to ensure completeness and accuracy of information. Interviewers were warned not to lead respondents in their answers, not to make assumptions, and not to readily accept refusals.

5.6.3 Performance Statistics

The sample control software was used to print comprehensive statistics on interviews conducted by each interviewer, both daily and weekly. Team leaders, and management staff, could also display or print a historical record of any interviewer's weekly performance statistics. In addition to setting rates of pay, the performance reports served to identify other problems, such as below average trip rates and higher than average refusal rates, so that corrective measures could be taken. A sample report is shown in Exhibit 5.6.1.

Exhibit 5.6.1 Performance Report

Team 3 Cumulative Statistics for the Week 20-Dec

ID	Total Pers	Total Trips	Total Time	B Cal Bak	C Ans Mch	D Lin Bsy	E No Ans	F Frn Lng	G Int Int	V Inv Num	W 8x Uns	X Out Srv	Y Int Ref	R Cmp Rev	Z Suc Cmp	Total Cntct	Cntct Rate	Comp Rate	Trip Rate	Hhld Size	Refl Rate	Perf Score
118GW	206	440	21	48	76	8	124	29		34	9	6	49		82	465	22.1	3.9	2.1	2.5	0.37	7.04
240SG	147	234	13.5	12	5	1	43	1		11		3	15		59	150	11.1	4.4	1.6	2.5	0.20	6.27
265HB	209	522	20	44	68	8	199	2		16	17	2	35		80	471	23.6	4.0	2.5	2.6	0.30	8.08
270SG	107	188	14.5	23	78	9	55	3		20	5	6	41		44	284	19.6	3.0	1.8	2.4	0.48	4.78
299YX	87	149	7.25	7	17	6	38	2		4	5	1	16		33	129	17.8	4.6	1.7	2.6	0.33	6.91
306SK	92	230	11.25	29	46	4	77	1		18	20	2	20		43	260	23.1	3.8	2.5	2.1	0.32	7.77
307CC	149	370	23	26	41	6	116	2		4	11	1	8		70	285	12.4	3.0	2.5	2.1	0.10	6.49
316SM	115	188	15	4	70	2	39	14		3	5	7	22	1	53	220	14.7	3.6	1.6	2.2	0.30	5.44
318DG	20	59	2.75	7	11		9		1		1		4		8	41	14.9	2.9	3.0	2.5	0.33	6.28
325BD	128	348	15	31	10	2	40	4		3			8		57	155	10.3	3.8	2.7	2.2	0.12	7.34
332MB	199	476	20.25	42	115	3	64	1		15	3	4	25		83	355	17.5	4.1	2.4	2.4	0.23	7.65
335SG	126	234	12	11	28	5	93	2		13	2		3		54	211	17.6	4.5	1.9	2.3	0.05	8.15
342MB	55	110	6	10	40		57	2		3	7		7		26	152	25.3	4.3	2.0	2.1	0.21	8.40
345TH	104	219	19	38	38	1	154			17	10		12		47	317	16.7	2.5	2.1	2.2	0.20	5.42
352SM	75	140	10.5	23	12	2	68	5				4	32		24	170	16.2	2.3	1.9	3.1	0.57	3.30
354SR	31	63	4.75	10	7		60	1			7		5		17	107	22.5	3.6	2.0	1.8	0.23	7.18
356AB	65	156	8	18	15	1	46	2		9	9		15		27	142	17.8	3.4	2.4	2.4	0.36	6.33
357LS	39	92	4	7	13		5			1		2	5		18	51	12.8	4.5	2.4	2.2	0.22	7.56
359CR	191	299	16.25	24	45	1	38	11		9		6	42		72	248	15.3	4.4	1.6	2.7	0.37	6.10
369MP	38	74	5.25	11	19	3	10	3		1	1	1	7		14	70	13.3	2.7	1.9	2.7	0.33	4.50
370SH	30	70	6.75	20	21	3	61	2		4			7		15	133	19.7	2.2	2.3	2.0	0.32	5.31
Team1	3527	7051	424.5	898	1590	85	1820	145	4	169	221	79	445	1	1417	6874	16.2	3.34	2.00	2.49	0.24	6.07
Team2	3748	8103	322	819	1110	79	1300	78	2	339	131	74	389	1	1296	5618	17.4	4.03	2.16	2.89	0.23	7.26
Team3	**2249**	**4736**	**262.5**	**464**	**805**	**70**	**1444**	**90**	**1**	**188**	**115**	**45**	**390**	**1**	**941**	**4554**	**17.3**	**3.59**	**2.11**	**2.39**	**0.29**	**6.41**
Team4	3358	7266	351.75	734	1120	73	1608	45	2	152	215	60	529	4	1307	5849	16.6	3.73	2.16	2.56	0.29	6.58
TOTAL	14572	30064	1424	3081	4790	320	6711	365	17	879	716	265	1958	7	5558	24667	17.3	3.91	2.06	2.62	0.26	6.85

5.6.4 Visual Review

After each interview session, all of the completed interviews were printed out. The software used to print the interviews performed the same logic checks as the DDE software, flagging errors with appropriate messages. A supervisor visually reviewed every interview by looking at the error messages, the consistency and logic behind the information collected, and the manner in which descriptive information, such as trip destinations, was recorded. The printouts were sorted by interviewer within each team and the printing was done overnight so that the visual review could be completed before the next interview session. Problems and corrective actions were noted on the printouts.

A separate visual review was done for transit related errors. A staff person from the TTC reviewed the printouts. Most problems resulted from missing route descriptions in the look-up database or routes that did not connect. The sample control software was designed to prevent a household to be passed on for geocoding until a valid code had been assigned to every transit route used. Most problems were fixed by using the DDE software to amend the route description. In other cases, new route descriptions were added to the look-up database. Problems requiring callbacks were noted on the printout. The review of transit problems was generally done prior to printouts being reviewed by a supervisor.

5.6.5 Callbacks

Printouts requiring callbacks were given back to the interviewer who did the interview before the next interview session. Interviewers were notified, either by the notes on the printout or verbally by the team leader, of areas where improvements to their work could be made. The interviewers were required to make the callbacks prior to starting new interviews. Corrected information was written on the printouts, which were then given back to a supervisor. Supervisory staff then made the corrections to the database using the DDE software.

If the original interviewer was not available to work the next session, the printouts were held until the following day. If the callbacks had not been made within two days then a supervisor would make the call back. Callbacks made by the supervisor provided an opportunity for the supervisor to check on the quality of the interviewer's work by speaking directly with the interview respondent.

5.6.6 Feedback from the Coding Process

Once all the visual edits, callbacks and corrections had been made for a given interview date, the data for those households were moved to the coding database for geocoding. A series of computerised logic checks was performed on each household to ensure that the information being passed on was complete. Incomplete interviews, and those containing identifiable errors such as missing transit route codes, were kept in the review database and reprinted for further checking.

If the geographic information in the coding database proved to be insufficient or ambiguous, the coders would flag the record for a new printout to be generated. These printouts were given to a group of interviewers assigned the task of making geocoding callbacks. The corrected printouts were given back to the geocoders for entry into the geocoding database. Software was also developed to enable the interviewer to make the changes on-line while making the call back.

Problems encountered in the geocoding process were monitored continuously and reported to the team leaders so that corrective action could be taken with respect to future interviews. The survey procedures were set up with the expectation that the geocoding would take place within 3 days of the interview. Delays in the review and edit process, together with the sheer volume of information being processed, resulted in a time delay of one week to 10 days.

5.6.7 Rotation of Interviewers

A point was made not to allow any one interviewer to use the same interview station all the time. Rotating the interviewers around meant that scheduled callbacks would be made by a different interviewer. Interviewers were instructed to report to their supervisors any problems in the way that previously collected information had been recorded. A particular concern was interviewers scheduling callbacks for households instead of accepting a refusal.

5.7 Answering Machines (Voice mail)

References to answering machines in this section, and elsewhere in this report, refer to either answering machines or voice mail.

The procedure for handling incoming phone calls, in response to the answering machine message, was to manually record the callers name, their home phone number and the phone number they were calling from if different. The person taking the phone call would determine which work station the household record had been assigned to and call the respondent back from that station in order to complete the interview. If the required workstation was already in use, a written message was handed to the interviewer at the workstation instructing him or her to make the call back as soon as possible.

The call-in phones were staffed from 12 p.m. to 9:30 p.m. each day. At other times a voice mail message was provided asking the respondent to either call back between those hours or, if the call was in response to a request for a specific piece of information, to leave that information on the voice mail. The volume of calls required two phone lines to be used during evening interview hours. Cordless telephones were used so that the staff person could take another call while delivering the previous message to the appropriate workstation.

In the early stages of the main survey (fall 2001), it was found that more than 1 in 3 phone calls resulted in contact being made with answering machines. The proportion was also increasing due to the length of time taken to remove a phone number permanently connected to an answering machine from the active sample. With the initial DDE settings up to 8 answering machine messages would be left at 2 or 3-day intervals before the sample was removed from the active queue. There were two concerns, one being the loss in interview productivity and the other that some respondents might regard the number of voice mail messages being left as an unwarranted invasion of their privacy.

The procedure for handling answering machines and voice mail was modified about 3 weeks into the main survey. Interviewers were instructed that if an answering machine was encountered on two consecutive calls to the same number then the 2nd call was to be recorded as a no answer without any message left on the answering machine. The total number of messages left on any one answering machine was limited to 3. Modifications were made to the DDE so that, after the three messages had been left, the household would not come up again in the normal course of interviewing. The household remained in the active sample queue so that it could still be accessed if a response was received to the answering message. The changes meant that a maximum of 3 answering messages would be left over a 9 or 10 day period instead of 8 messages spread over a 3 week period.

The modified procedure did not allow precise statistics to be kept on the number of no answers relative to the number of answering machines actually encountered. Over the entire course of the fall 2001 component of the survey, 22% of the calls placed were recorded as answering machines, and 25% as no answers. Prior to the change in procedure the proportion of no answers was recorded as between 10% and 15%. The actual proportion of answering machines was therefore more likely to have been around 40%. The proportion was noticeably higher in central Toronto and significantly lower in the more rural areas of the GTA. The number of

answering machines encountered in the external areas, surveyed in the fall of 2000, was not any more of a serious problem than it was in 1996.

5.8 Survey Interruptions

Unlike the 1986, 1991 and 1996 surveys there were no major strikes or labour disputes that would have affected travel patterns to the extent that interview plan had to be modified. The only disruption to normal interviewing was a result of the September 11, 2001 terrorist attacks in New York City, which led to the evacuation of a number of buildings in Downtown Toronto. The regular interview shifts were cancelled on September 11th and 12th. Due to the short notice, it was not possible to notify all staff that the September 11th shift had been cancelled. Those that turned up for work were allowed to make callbacks and were given other administrative work, to the extent possible, and were paid for a full shift.

5.9 Non-English Callbacks

The data entry software allowed the interviewers to schedule a call back to be made in a language other than English. The languages that could be specified were initially selected based on the frequency with which they were used in the 1986, 1991 and 1996 surveys. Those languages were Cantonese, Mandarin, Italian, Portuguese, Spanish, Greek and French. The category "Other" could be selected for other languages or if the appropriate language could not be identified. The list of languages was subsequently expanded to include other languages (Hindi, Russian and Urdu) in which the interview staff had indicated they were willing to attempt to do interviews. The interviewers conducting non-English interviews did their own on-line translation to and from the Standard English script. Households in the other category, where the required language was not identified, were contacted by an experienced interviewer who would attempt to conduct the survey in English, preferably with another member of the household from the one which was originally contacted. There was no monitoring of non-English interviews.

Initially, 4 interview stations were allocated for non-English interviewing. This number was later increased to 6. In previous surveys, no special efforts were required to recruit a sufficient number of interviewers with non-English language skills. In the 2001 survey, there was some problem in finding an interviewer competent enough to do interviewers in Portuguese and in recruiting a sufficient number on interviewers fluent in Cantonese. Towards the end of the survey it would have been desirable to have 3 interview stations devoted to Cantonese but it was rarely possible to staff more than two. As a result, a number of households identified as requiring callbacks in Cantonese were not contacted again.

6 Completion Statistics

Exhibit 6.0.1 shows the number of completed interviews in the final database for the areas represented by each of the funding agencies. The table also includes dwelling unit and population counts from the 2001 Canada Census. The Census dwelling unit counts include seasonal residences and vacant buildings and are therefore not directly comparable with the TTS data. The mean expansion factors shown are based on preliminary expansion of the survey data to represent the universe of households in the survey area. These factors may change slightly in the final database. The expansion factors have been calculated by postal areas, which do not necessarily match municipal boundaries hence, neither the expanded dwelling unit nor household totals match the census data exactly. The expanded survey population is generally slightly less than the census number due to the exclusion of nursing homes, hospitals, prisons and other collective homes from the survey. The 5% sample target was exceeded, primarily in Toronto, due

to the additional interviews conducted to correct for the under-representation of apartment buildings in the initial sample selection.

Preliminary comparisons made between the survey and Canada Census data suggest that the survey under-represents people in the age range of 18 to 22 years by about 11%. The same age group was under-represented by 8% in the 1996 TTS. The under-representation of one age group creates the potential for bias in the survey results to the extent that the travel patterns and behaviour of that age group differ from that population as a whole. The reason for the under-representation is not know. Possible explanations include:

1. It is not known to what extent the phone listings from which the sample was drawn are completely up to date with respect to students moving into new homes or residences at the start of the school year.
2. The increasingly widespread use of cell phones. Most cell phone numbers are not listed and are therefore excluded in the sample selection. There exclusion is not a problem for those cell phones, which are used as an addition to a household's regular land line but if they are used as a personal substitute for land lines it could result in under-representation of some segments of the population in the survey results.
3. People who are frequently out in the evenings are harder to contact and are therefore less likely to be surveyed than those who remain at home.

Exhibit 6.0.2 gives a summary of the combined completion statistics for all 3 components of the 2001 TTS. The numbers shown for the 1996 TTS are not exactly comparable because of the change in procedure with respect to answering machines. The 3 message category (3 a/m messages), which was added in the 2001 survey, is shown separately whereas in 1996 they would have been included either in the incomplete category unless 8 attempts had been made. The inclusion of most answering machines in the "sample used" sub-total for 2001 is done to give a better measure of contact and completion rates but leads to an over-statement of the difference in those rates relative to the 1996 rates. There was no significant change in the refusal rate between the two surveys.

Exhibit 6.0.3 provides a summary by geographic area. The numbers given for GTA urban and rural include Hamilton but exclude Toronto. The urban rural split is based on postal code with rural defined as any postal code with a zero "0" as the second character. The non-GTA total is for the postal codes surveyed in the year 2000. The number of answering machines appears to be the primary reason for the lower completion rate in Toronto relative to both the other areas and previous surveys. Of the 224 forward sortation areas included in the survey, 30 had completion rates of less than 60%. All of those 30 were in the City of Toronto. 10 (M5H, M5J, M5G, M4V, M4P, M5E, M5V, M5A, M5B, and M4T) had completion rates of less than 55%. The location of these postal areas is shown in Exhibit 6.0.4.

Exhibit 6.0.5 shows the outcome of all the phone calls that were made during the fall 2001 component of the survey. The most significant change from 1996 was in the number of calls that resulted in no answer or contact with an answering machine. The combined total of these categories increased from 42% of the calls placed in 1996 to 49% in 2001. The number of callbacks, both English and non-English, also increased with the net result that the average number of calls that had to be placed to obtain each completed interview was 28% more in 2001 than in 1996.

Exhibit 6.0.6 shows the number of completed interviews by trip day of the week. Trip data for Fridays were collected on both Saturday and Monday except for two Saturdays when Thursday trip data were collected to limit the over representation of Friday trips. Trips for Mondays were slightly under represented due to public holidays and the starting of the survey on a Wednesday. The uneven distribution of completed interviews by day of week results in an overall trip rate, that is 0.3% higher than if all 5-week days were weighted equally.

Exhibit 6.0.7 shows the number of interviews completed by day and compares it with the corresponding day in the 1996 survey. Measured over the entire fall 2001 component of the survey, interview productivity, at 3.42 completed interviews per paid hour of interview staff time, was lower than the 3.7 interviews per paid hour achieved in 1996. That difference can be attributed to the 28% increase in the average number of calls required to achieve each completed interview.

Exhibit 6.0.1 Completed Interviews by Funding Agency

	2001 Census		TTS Records		Expanded Totals		Mean	Sample
	Dwelling Units	Population	House	Person	House	Person	Expansion Factor	Rate
City of Toronto	963746	2476177	56525	146442	962872	2414100	17.03	5.9%
Region of Durham	175738	506901	9357	26929	176994	502797	18.92	5.3%
Region of York	229239	729254	12474	39766	232270	735309	18.62	5.4%
Region of Peel	313650	988948	17624	55182	312345	966145	17.72	5.6%
Region of Halton	136668	375229	7436	20377	136826	372828	18.40	5.4%
City Of Hamilton	194154	490268	10194	26512	194547	499565	19.08	5.2%
GTA+Hamilton	2013195	5566777	113610	315208	2015854	5490744	17.74	5.6%
Region of Niagara	170876	410574	8620	21868	168645	427001	19.56	5.1%
Wellington County	19060	52391	800	2306	17758	50964	22.20	4.5%
City of Guelph	42479	106170	2272	5888	42294	107672	18.62	5.4%
Town of Orangeville	8746	25248	534	1513	11003	30729	20.55	4.9%
Simcoe County	111716	243075	4217	11301	90074	239784	21.36	4.7%
City of Barrie	38191	103710	1969	5359	38439	104379	19.52	5.1%
City of Orillia	12172	29121	629	1510	12592	30238	20.02	5.0%
City of Kawartha Lakes	34637	69179	1312	3254	26848	66191	20.46	4.9%
Peterborough County	18149	42765	753	1989	15303	40263	20.32	4.9%
City of Peterborough	30804	71446	1663	3986	32155	76592	19.34	5.2%
Total exc. GTA & Ham.	486830	1153679	22769	58974	455115	1173815	19.99	5.0%
Total survey area	2500025	6720456	136379	374182	2470967	6664561	18.12	5.5%

Exhibit 6.0.2 Completion Statistics

Total sample	252,007			
Not attempted	23,022			
Incomplete	14,666			
Sample used	214,319			
Out of service	7,952			
Invalid	11,829			
8 attempts	7,224			
3 A/M messages	13,276		(1996 TTS)	
Valid Contacts	174,038	81.2%	(88%)	of sample used
Refusals	36,757	21.1%	(21.8%)	of valid contacts
Completed interviews	137,281	64.1%	(68.9%)	of sample used
Rejected in review	857			
Final database		Mean		
Households	136,379			
Persons	374,182	2.74	(2.72)	
Trips	817,744	2.19	(2.13)	
Transit records	85,095			

Exhibit 6.0.3 Completed interviews by Geographic Area

	Complete	Rejected	Refused	3 A/M messages	Comp. Rate	Refusal Rate	ans. mach
	A	B	C	D	A/(A+B)	C/(A+C)	D/(A+B)
Toronto	57,000	35,681	15,163	8018	62%	21%	7%
GTA Urban	54,423	27,718	13,854	5022	66%	20%	5%
GTA Rural	3,658	2,028	958	236	64%	21%	3%
Total GTA	115,081	65,427	29,975	13276	64%	21%	6%
Non GTA	22,470	11,611	6,782	N/A	66%	23%	N/A

Reject total (B) includes refusals (C) and answering machines (D)

Exhibit 6.0.4 Postal Areas with Low Completion Rates

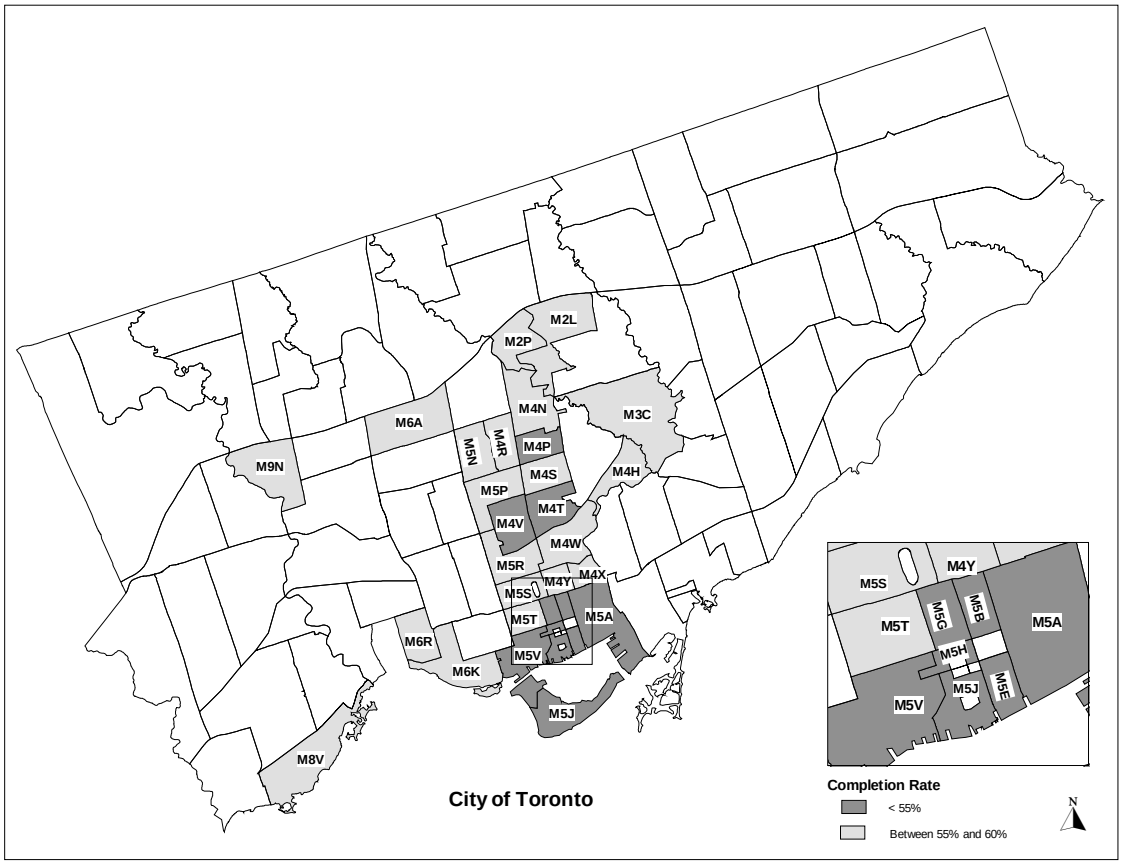


Exhibit 6.0.5 Disposition of Phone Calls

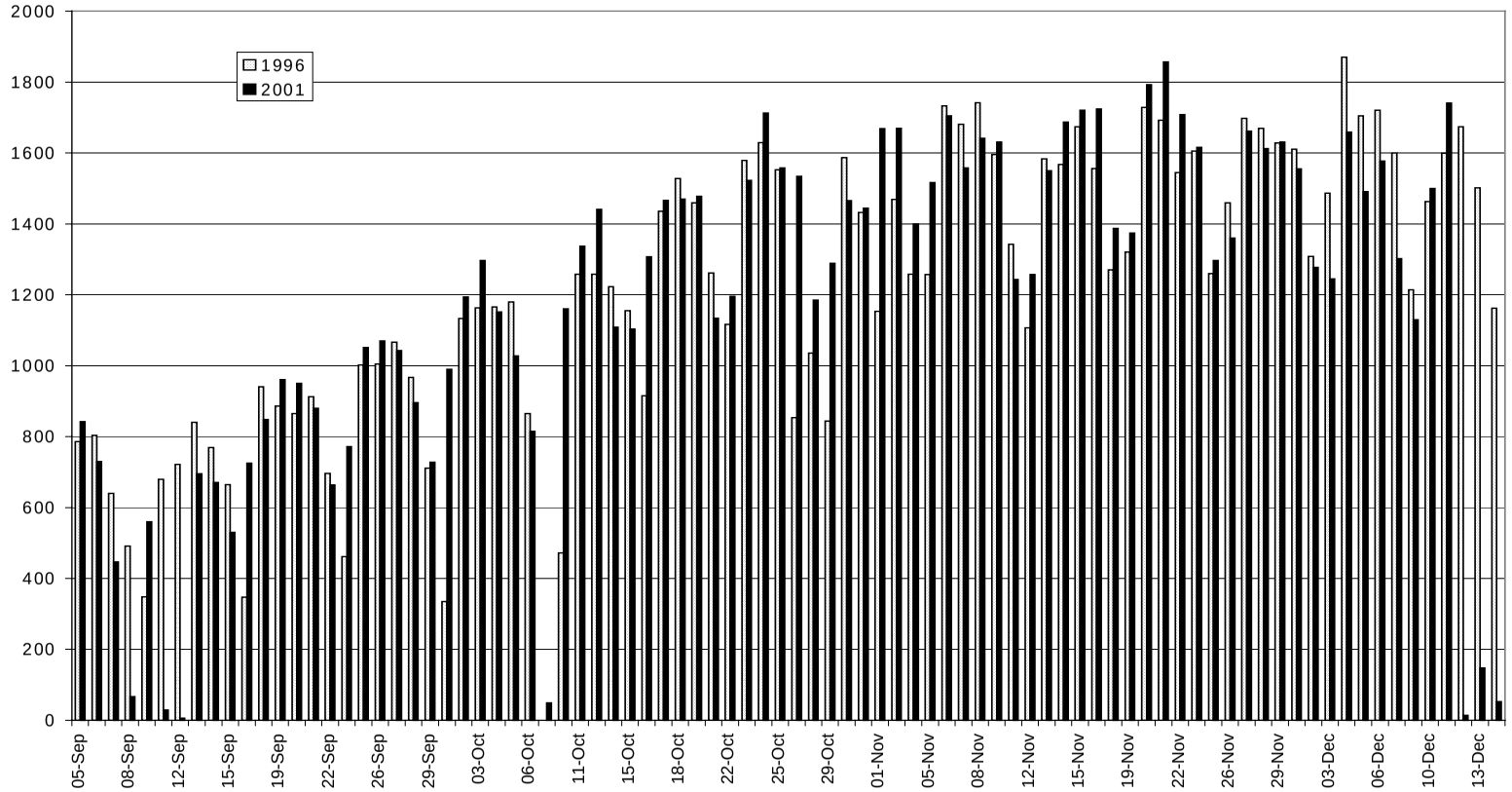
Phone calls	2001 TTS		1996 TTS	
Out of service	5,543	1%	4,527	1%
Invalid	8,877	2%	9,279	2%
Line Busy	7,080	1%	5,487	1%
No answer *	128,529	27%	80,271	20%
Ans. Machine *	104,025	22%	90,315	22%
Call back				
English	89,680	19%	68,270	17%
Non-English	10,716	2%	6,742	2%
Interrupted	184	0%	464	0%
Refused	25,231	5%	31,260	8%
Complete	101,568	21%	109,204	27%
Total	481,433		405,819	
Calls per completion	4.74		3.71	

* The 2001 No answer count includes an estimated 50,000 to 65,000 answering machines that were recorded as no answer and are not included in the answering machine count.

Exhibit 6.0.6 Completed Interviews by Trip Day

Trip Day		**Trip rate**
Monday	17.3%	2.15
Tuesday	18.4%	2.15
Wednesday	19.4%	2.17
Thursday	19.6%	2.17
Friday	25.2%	2.26

Exhibit 6.0.7 Completed Interviews by Day



7 Coding

7.1 Staffing and Training

Gaining from previous experience, recruiting and training of geocoders started as early as a month before the survey began. Coding positions were advertised through University of Toronto's employment placement centre and Campus WorkLink service with emphasis on computer and geography knowledge. Approximately 40 applicants were interviewed for the three survey periods by the coding supervisor of which 16 were retained. Nearly all of the coding staff had university education and most of them had GIS background. Three additional interviewers joined the geocoding team during the survey. Training sessions were held at the beginning of the surveys in 2000 and 2001, while the experienced coders who were retained for the 2002 survey went through a refresh session. Training took 2 to 3 full days and coders were trained to use the geocoding program and various reference materials such as telephone books, internet search engines, maps, etc. Some of the coders were also trained to perform visual review and edit corrections in the early stage of the survey in order to reduce the load of the non-interviewing component on the data collection process. Because coding was the last part of the survey process, extra effort was placed in stressing accuracy of information. The pay rate started at $10.50 per hour and increased regularly according to individual performance and length of time with the survey. The highest paid coders who also assisted in setting up the geocode reference database and some administrative work received up to $13 per hour. The turnover rate for coders was relative low. Most of the staff stayed throughout the survey, which minimized the trouble of hiring and training.

7.2 Coding Activity

Geocoding started one week after interviewing began. The coding plan was to geocode survey records within 3 days of the interview. The shorter the turn-around time the better it is for callbacks if households had to be contacted again to clarify information. However, the review and edit stage at times took longer than anticipated because many of the interviewers did not work consecutive days, thus delaying the review process. This problem was solved later in the survey when there was sufficient number of experienced staff to perform all tasks. Completed interviews were divided into 40 geocode area files, which had approximately the same number of sample records. Coders were assigned to specific geocode areas, which allowed them to develop better knowledge of their section of the survey area.

Although the interviews were only conducted in the survey areas external to GTA and City of Hamilton in 2000, geocoding process extended to the entire survey area. All geocoding reference data was acquired in 2000. In 2001, the survey focused on the GTA and Hamilton. Geocoding was normally a daytime activity. This allowed sharing of computers for geocoding, interviewing and training. Interview completions did not reach full strength until the middle of the survey. The number of completions that needed coding came in large volumes at that point. Although coding was short staffed, hiring new coders halfway of the survey was impractical. Hence, most coders contributed extra hours in the evenings and on Saturdays to speed up the process. Sharing computers in the evenings was more difficult in 2000 because priority had to be given to interviewing. However, the situation was improved in 2001. There was a separate floor space used only for coding and training of new interviewers. In addition, after all the interviews were completed, some interviewers were retained to perform geocoding for about a week at the survey site.

The most significant problem encountered in coding was the lack of up-to-date geocode reference material. For newly developed areas, which were not included in the original reference files obtained from the participating agencies, MapInfo was used to pin point geocode coordinates. This process was done on a weekly basis by two selected geocoders. These new data were used

to update the reference files to avoid any additional effort required at the end of the survey. Coding finished within two working weeks after the completion of interviews. The delay was primarily due to the post-interviewing validation, which involved callbacks for data clarification.

7.3 Clean-up and Recoding

The major clean-up work was to check for miscoded locations. Look-up lists used in the DDE and geocode programs made it easy for interviewers and coders to select wrong entries. Given the large survey area, there were many duplicate names for streets, monuments and even local districts. Validation checks which revealed extremely long school and work trips, lengthy access or egress distance from transit transfer points, batch geocoded place names, etc. were individually reviewed and recoded as necessary.

7.4 Statistics

A location was geocoded by one of three methods:

1. cross referenced to another location field (i.e., trips to home, usual place of work or usual place of school),
2. batch processing, or
3. interactive geocoding.

The cross-reference feature processed more than half (55%) of the location data, mainly home-based trips. Of the remaining locations, which required geocoding, the batch process had a success rate of 48%. This is as high as the rate achieved in 1991 because of a better geocode reference database.

Exhibit 7.4.1 is a breakdown of coding method (i.e. address type) for different surveyed information (i.e. location type). Exhibit 7.4.2 gives a summary of coding statistics for each coding method. This excludes records with cross-referenced location. The number of records in the final TTS database is less than that in the exhibit because a number of invalid household samples (e.g., those outside of the survey area) were included.

Exhibit 7.4.1 Location Types verses Address Types

	Address Type					
Location Type	Street Address	Intersection	Monument	Place Name	Traffic Zone	Row Total
Home	133,010	328	21	708	2,357	136,424
	97.49%	0.24%	0.02%	0.52%	1.73%	
School	3,225	6	57,355	443	636	61,665
	5.23%	0.01%	93.01%	0.72%	1.03%	
Work	83,990	72,931	20,547	2,198	1,583	181,249
	46.34%	40.24%	11.34%	1.21%	0.87%	
1st Origin	253,321	2,120	1,269	2,249	4,196	263,155
	96.26%	0.81%	0.48%	0.85%	1.59%	
Destination	469,541	199,635	127,807	9,974	10,837	817,794
	57.42%	24.41%	15.63%	1.23%	1.33%	
Column Total	943,087	275,020	206,999	15,572	19,609	1,460,287
	19.71%	13.89%	9.73%	1.11%	0.58%	

Exhibit 7.4.2 Address Types verses Coding Method

Address Type	Coding Method Batch Geocode	Interactive Geocode	Uncodable	Row Total
Street Address	137,106	147,809	103	285,018
	48.10%	51.86%	0.04%	42.68%
Intersection	113,989	100,896	92	214,977
	53.02%	46.93%	0.04%	32.20%
Monument	65,821	81,603	176	147,600
	44.59%	55.29%	0.12%	22.10%
Place Name	1,927	9,847	29	11,803
	16.33%	83.43%	0.25%	1.77%
Traffic Zone	18	8308	1	8327
	0.22%	99.77%	0.01%	1.25%
Column Total	318,861	348,463	401	667,725
	47.75%	52.19%	0.06%	

8 Survey Budget and Costs

The total budget for the survey was **$2.47 million** including development, conduct of the survey, and preparation of the final database and the production of five reports:

- Conduct of the survey
- Data Guide
- Validation
- 2001 and 1996 Summary of results for the entire survey area
- 2001, 1996 and 1986 Summary of results for the GTA

Significant cost savings were realized from using the 1996 TTS software without modification. The direct marginal cost of conducting the survey, excluding development, management co-ordination and post survey analysis and reports, is estimated to have been **$12.37** per completed interview.

8.1 University Overhead and Taxes

The overhead charged by the University of Toronto was 40% of University staff staffing costs and 2% of other expenditures. These overhead charges helped cover the cost of providing the Data Management Group office facilities, general supplies and secretarial services. University staffing costs includes the fees charged by the Project Manager but excludes the interviewers, coders and supervisors hired specifically for the survey. The survey qualified as a University research project. Most equipment purchases were therefore exempt from Provincial Sales Tax. The University also qualifies for a refund of 2/3 of the net amount paid in Federal Goods and Services Tax (GST). University staff costs, excluding the Project and Site Managers, were exempt from GST. The appropriate amount of University overhead and net taxes has been included in the individual itemised costs in the following sections.

8.2 Cost Summary

Exhibit 8.2.1 provides a summary of actual expenditures for each of the 3 components of the survey. . The 1996 TTS costs, shown for comparison, include the Waterloo component of the survey, conducted in the fall of 1995. Not included in the expenses are the cost of post survey

bulletins, reports, analysis and applications. $309,000 was spent on these items subsequent to the 1996 TTS. Relative to the 1996 survey higher staff and office costs were offset by substantial savings in development, computer and management costs.

The costs shown for interview and coding staff are the net of payroll expenditures including fringe benefits and payroll taxes. The staff were hired and paid by the Project Manager, who invoiced the Data Management Group for the net amount of the payroll cost plus 3% to cover the cost of administration and interim financing.

Most of the computers were purchased second hand from one of the University of Toronto computer laboratories and were resold at the end of the survey. Exceptions were the main fileserver, purchased new, and a small number of personal computers retained for post survey processing. Software costs were significantly lower than for the 1996 TTS as a result of using LINUX based software for network communications obviating the need for a LAN software license.

The telephone costs include the installation of phone lines, the purchase of phones and headsets and long distance charges. The cost of telephones for the 1996 survey does not include any charges for the use of the Government of Ontario Centrex phone system at Queen's Park or the use of the Ontario Communications Network (OCN) for toll free long distance calling. These services were provided by the Government of Ontario free of charge representing a net saving of about $75,000 in the 1996 survey budget.

The cost of Office space and furniture reflect the cost of renting commercial office space. In 1996, the Metropolitan Toronto Planning Department provided office space and furniture as part of their contribution to the cost of the survey. The amount shown is the net amount of the credit they received under the cost sharing agreement with the other agencies. The Regional Municipality of Waterloo provided office space and furniture for the Waterloo component of the 1996 survey at no cost to the survey budget.

8.3 Unit Cost Comparison With Previous Surveys

Exhibit 8.3.1 gives a comparison of the per interview 2001 survey costs with the comparable unit costs of the 1996 survey as reported in the 1996 TTS Design and Conduct of the Survey report. Exhibit 8.3.2 compares the unit cost per completed interview with the 1986, 1991 and 1996 surveys after the previous survey costs have been adjusted for inflation. Inflation factors of 60%, 25% and 12% have been added to the 1986, 1991 and 1996 survey costs, respectively, to make them comparable to the 2001 values.

The unit cost of conducting the interviews has not changed significantly since 1986. The biggest change has been in the cost of coding the data once the interview has been completed. The use of automated geocoding for the 1986 survey likely reduced coding costs by 50% relative to the manual coding methods used in surveys prior to the 1986 TTS. Improved software design, more comprehensive and up to date reference databases, the use of direct data entry and the networking of computers have, together, resulted in a further reduction of more than 85% in the unit cost of coding survey records since 1986. The total savings due to automation and the use of electronic media is therefore in excess of 90% relative to the cost of manual coding procedures used prior to 1986 leading to a net reduction of about 60% in total survey cost. Other benefits include the flexibility of zonal aggregation afforded by geocoding, improved quality control and a dramatic reduction in the total time required for post interview processing from 18 months down to a few weeks. The continuity of effort between surveys has likely been a significant factor in achieving these benefits and cost savings.

The relatively high unit cost of the 1991 TTS can be attributed to the development costs associated with the writing and testing of the DDE software being spread over the relatively small number of interviews that were conducted in 1991. The absence of any significant development

cost associated with the 2001 TTS contributed to the low unit cost of that survey. The low fixed cost, primarily management and co-ordination, associated with the 2001 survey resulted, to a large extent, from the use of tried and tested procedures, continuity of staffing from previous surveys and the effective staging of the survey over 2 years. Some of those cost savings are unique to the situation in 2001 and may not, therefore be entirely indicative of the cost of conducting future surveys in the same area or of conducting similar surveys elsewhere. Total costs, depending on the size and scope of the survey, are more likely to be in the $20 to $30 range per completed interview.

Exhibit 8.2.1 Summary of Expenses

	Fall 2000	Fall 2001	May 2002	**Total**	1996 TTS
Development and Testing					
Software Development	10,000	11,000		21,000	45,000
Pretests and Pilot Projects					86,000
Development Support & Management					102,000
Subtotal				**$ 21,000**	$ 233,000
Interviewing					
Interview Staff & Training	193,000	804,000	79,000	**$ 1,076,000**	$ 714,000
Coding					
Coding Staff	27,000	95,000	21,000	**$ 143,000**	$ 132,000
Equipment					
Computer Hardware & Software	1,000	40,000	1,000	42,000	198,000
Telephone	26,000	58,000	10,000	94,000	24,000
Sale of Equipment		(31,000)		(31,000)	(75,000)
Subtotal				**$ 105,000**	$ 147,000
Other Direct Expenses					
Printing & Mailing	23,000	84,000	13,000	120,000	73,000
Office Space & Furniture	27,000	142,000	18,000	187,000	72,000
Sample	6,000	25,000		31,000	19,000
Office Expenses & Supplies	8,000	17,000	1,000	26,000	25,000
Security					14,000
Subtotal				**$ 364,000**	$ 203,000
Management and Coordination					
Management	97,000	186,000	34,000	317,000	417,000
Support Staff	56,000	39,000	2,000	97,000	219,000
Subtotal				**$ 388,000**	$ 636,000
Total Expenses	474,000	1,470,000	179,000	**$ 2,123,000**	$ 2,065,000
Post Survey Processing					
Reports & Analysis				$ 300,000 (Estimate)	$ 309,000
Total Cost				**$ 2,423,000**	$ 2,374,000

The above costs have been rounded to the nearest $1,000.

Exhibit 8.3.1 Cost Comparison with the 1996 TTS

	2001 TTS Costs		1996 TTS Costs	
	Total	Per Completed Interview	Total	Per Completed Interview
Variable Costs (Directly related to the number of interviews)				
Interviewing				
Interviewers	$ 1,076,000	$ 7.89	$ 714,400	$ 6.20
Equipment & Supplies	$ 131,000	$ 0.96	$ 172,300	$ 1.50
Subtotal	$ 229,000	$ 8.85	$ 886,700	$ 7.70
Coding				
Geocoding	$ 143,000	$ 1.05	$ 132,200	$ 1.15
Other Variable Costs				
Printing & Mailing	$ 120,000	$ 0.88	$ 70,000	$ 0.61
Other Direct Costs	$ 218,000	$ 1.60	$ 107,300	$ 0.93
Subtotal	$ 338,000	$ 2.48	$ 177,300	$ 1.54
Total variable Cost	**$1,688,000**	**$ 12.37**	**$1,196,200**	**$ 10.38**
Per Person Record		$ 4.51		$ 3.82
Per Trip Record		$ 2.06		$ 1.82
Fixed Costs (Not directly related to the number of interviews)				
Pilot Survey & Pre-tests			$ 85,600	$ 0.74
Management	$ 317,000	$ 2.32	$ 416,800	$ 3.62
Other Costs	$ 97,000	$ 0.71	$ 219,500	$ 1.91
Total Fixed Costs	$ 414,000	$ 3.03	$ 721,900	$ 6.27
Development Costs	$ 21,000	$ 0.15	$ 146,500	$ 1.27
Total Cost (Excluding analysis and reports)	**$ 2,123,000**	**$ 15.56**	**$2,064,600**	**$ 17.92**
Per Person Record		**$ 5.67**		**$ 6.60**
Per Trip Record		**$ 2.60**		**$ 3.14**

Exhibit 8.3.2 Cost per Completed Interview Adjusted for Inflation

	1986 TTS	1991 TTS	1996 TTS	2001 TTS
Assumed Inflation factor included	60%	25%	12%	0%
Number of completed Interviews	61,453	24,507	115,241	136,379
Interviewing	$ 8.27	$ 10.61	$ 8.61	$ 8.85
Coding	$ 8.66	$ 2.55	$ 1.29	$ 1.05
Other Variable Costs	$ 2.94	$ 2.74	$ 1.72	$ 2.48
Total variable Cost	**$ 19.89**	**$ 15.91**	**$ 11.63**	**$ 12.37**
Fixed Costs	$ 4.95	$ 9.18	$ 7.01	$ 3.03
Development	$ 0.98	$ 8.81	$ 1.42	$ 0.15
Total Cost	**$ 25.82**	**$ 33.90**	**$ 20.07**	**$ 15.56**

9 Conclusions and Recommendations

Despite the problems with sample selection and the low response rate early validation results indicate that the over all quality of the 2001 TTS database is likely to be at least as good as, if not better than, the data collected in previous surveys.

9.1 Data Quality

Non-respondents are a potential source of bias in any survey. A high response rate minimises the potential magnitude of that bias, should any exist. The 3 previous TTS have had total non-response rates of 30% to 35% of which about 10% have been due to invalid or out of service phone numbers. Refusal rates have been less than 22%. There has been no evidence to suggest that there is significant non-response bias in any of those three surveys. The fact that the non-response rate was significantly higher in some geographic areas, notably central Toronto, in the 2001 TTS is cause for some concern. The data collected for the areas shown in Exhibit 6.0.4 are inherently less reliable than the data for other parts of the survey area where the non-response rate was similar to previous surveys.

After correcting for differences in the survey area and sample stratification the overall reported trip rate per person in the 2001 survey was 3% higher than in the 1996 survey but 2% lower than in the 1991 survey. Analysis by trip purpose indicates that the differences are primarily in the amount of discretionary travel recorded. Comparisons with 2001 Cordon Count and transit ridership data from several sources reveal no evidence of any under reporting of morning peak period, work trip or school trip data. The apparent level of under reporting of discretionary travel is much greater than the differences in total reported trip rate between the four years. Care should therefore be exercised in drawing any conclusions as to trends in trip rates. Comparisons with the 1986, 1991, 1996 and 2001 survey data reveal a high degree of consistency in the distribution of trip rates, modal splits, trip lengths and many other factors.

9.2 Software

The 2001 TTS was the largest travel survey conducted to date and utilised the technological developments that were implemented in previous surveys. The 1986 TTS was a pioneer in the use of automated geocoding. The 1991 TTS was the first to use Direct Data Entry. The most significant new development for the 1996 survey was the on-line networking of the interview computers. No significant changes were made to the 1996 TTS software for the conduct of the 2001 TTS. While significant cost savings were realised it is important to recognise that the software has become obsolete in both design and implementation. Specific problem areas are:

- The DDE, SCS and Geocoding software is all written in Foxpro; a computer language that is no longer supported and which has compatibility problems with more recent computer operating systems. The problems associated with getting that software to even run are going to increase over time. The ability to make changes or enhancements is also problematic.
- The sample control process was designed when the networking of personal computers was in its infancy. Key elements in the design were the ability to continue to operate in the event of a network failure and the creation of multiple backup copies of all files at each stage in the process. Many of these features are redundant, given the proven speed and reliability of current LAN systems. The control process is therefore more cumbersome and complex than it needs to be. A basic redesign is needed to take advantage of the speed and other performance advantages of current state of the art computer networks.
- The DDE, and most of the other software components, are MSDOS based with all the limitations on screen layout and sequential data entry that that implies. The use of a

generic "browser" would greatly enhance the data entry and editing process as well as providing flexibility in the use of different computer platforms.

Other, more specific, problems that were identified in the 1996 TTS still exist. These include:

- The process for reviewing and editing completed interviews required all the completed interviews for each interview team to be placed in a single review database for that team. Access to that review database is restricted to a single user at any one time.
- The frequency with which street intersections were used to record geographic locations, particularly the usual place of work, was higher than desired despite frequent instructions to interviewers that they should only accept intersections as a last resort. The use of intersections presents a problem if the intersection lies on a boundary of two or more traffic zones, as is often the case.
- Providing the ability to retrieve incomplete or not started interview records from the workstation to which they have been assigned to increase sample control. Having that option would improve the sample management capabilities in several respects including the ability to more readily adjust the geographic area being covered at any one time in response to strikes, or other labour disruptions. Appropriate safeguards are essential, however, to ensure that there is no possibility of an interview record being duplicated or lost in the process.

It is recommended that the entire data entry, sample control and geocoding process is reviewed and a complete re-write of the software is carried out prior to the next TTS. The current software is the result of a development process that was spread over approximately 12 years (1984 to 1996). A complete rewrite is expected to take up to 2 years to complete with adequate testing. It is therefore essential that the development process start immediately if the next TTS is to be conducted in 2005/2006.

9.3 Hardware

Very few computer hardware problems were experienced during the conduct of the survey. The purchase, and subsequent resale, of used name brand equipment is recommended as the most cost effective and efficient way to equip a survey of this magnitude. The fileserver is central to most operations. “Over” purchasing, in terms of its performance, reliability and back up capabilities, is recommended.

9.4 Supervisory Staff

The single most difficult problem encountered in the conduct of the 1996 TTS was finding an adequate number of staff with the experience and background necessary to act in a supervisory role. Inevitable conflicts arose between the level of supervisory quality control being provided and the production needed to meet the completion targets.

Supervisory responsibilities include:

- the training of new interviewers
- basic supervision and assistance to interviewers
- selective monitoring of interviews in progress
- visual review of completed interviews
- review of call back information and editing corrections

The quality of first level supervision is probably the single most important aspect in overall quality control. It was anticipated that many of the supervisory positions would be filled from the early ranks of the interview staff. Unfortunately, it was found that while there was no shortage of good

candidates as interviewers the resulting pool of supervisory talent was smaller than desired. It was also necessary to appoint some staff to supervisory positions before they were fully trained or had a complete understanding of the survey and the unique situations that can arise during the conduct of a typical interview.

The availability of mature staff with supervisory experience was still a problem in 2001, but not to the same extent as in 1996 due to the availability of a pool of trained staff from the first phase of the survey in the fall of 2000. A similar staging is recommended as an essential component of any future survey to be done on the same scale as the 2001 TTS.

9.5 Interview Site

The central site location in Toronto with convenient subway access proved to be extremely good. There was no shortage of applications for interview and coding staff positions. The use of space in the same building for both the 2000 and 2001 components of the survey was an added convenience although not as important as the downtown location and subway access. As mentioned previously, there were relatively few people with the maturity and experience needed for supervisory positions.

Site costs were significantly higher than in 1996 due to the need to rent commercial office space. The benefits of having one of the funding agencies provide the site facility, as was done in 1995 in Waterloo and 1996 in Toronto, are more than just the direct cost saving on space. Access to an in house office management section and purchasing department can significantly reduce the time and effort spent in sit preparation allowing management staff to concentrate on the conduct of the survey at the same time as reducing management costs.

9.6 Advance Letter

The advance letter has always been regarded as a critical item in achieving a low refusal rate. The reported refusal rate was approximately the same as in the 1996 TTS but higher than in the 1991 survey.

Approximately 40% of respondents claimed not to have received the advance letter, a 10% reduction compared to the 1996 TTS. It is not possible to make a definitive statement as to the reason for this improvement but the use Government of Ontario envelopes could have been a factor. Non-government envelopes were used for the 1996 TTS. The use of official Government envelopes is recommended for all future surveys.

Incomplete address information is also likely a contributing factor to the non-receipt of the advance letter. Due to CRTC regulations, the address information used to mail the advance letters does not include apartment numbers unless they are included in the address information listed in the telephone directory. Relatively few apartment numbers are included. People who live in apartments, particularly large buildings, are therefore less likely to receive the letter than those who live in single family dwelling units contributing to a potential source of bias in survey response. In the 1991 TTS, when complete address information was available for all households and Government envelopes were used, only 35% respondents reported that they did not receive the letter.

A third factor affecting the receipt of the letter is the timing of the mailings. Control letters to survey staff members were included in each mailing as a check on the timing. A few of the mailings at the start of both the 2000 and 2001 components of the survey took longer than expected to arrive. These letters were sent by bulk mail for which Canada Post offers no guarantee as to how long delivery will take. The delays should not have had any significant affect on the survey results but the use of third class mail is recommended for future surveys. The cost

of postage is slightly higher but there are savings in mail preparation costs since the letters do not have to be pre-sorted.

The commercial mailing house was cost effective and efficient in preparing the mailings, as was the case in 1996.

9.7 Answering Machines / Voice Mail

The increasingly widespread use of answering machines and voice mail has become a serious problem in the conduct of telephone surveys. The resulting loss in interview staff productivity resulted in an estimated increase of 4% to 5% in total survey cost relative to what it would have been if the proportion of answering machines had remained at 1996 levels. A more serious concern is the potential for hidden bias in the survey results if the over all response rate is adversely affected. At this time the problem is mostly confined to the central area in the City of Toronto, but could become more widespread in future surveys.

9.8 Student Population

Student travel is an important component of total daily travel patterns with distinct characteristics. Two problems exist in capturing information on that component. The first problem is in obtaining a representative sample that includes the student population. The second is the method of expansion given that the Canada Census is not done during the post secondary school year. It is not known to what extent on campus residences are represented in the sample. In the 1996 TTS, separate expansion factors were calculated for two residences, the main campus at Trent and the Queenston campus at Brock, using control totals obtained from the Universities. There were no survey records collected for either of these two residences in the 2001 TTS. The most likely explanation for that is that they were not included in the sample frame.

9.9 Sample Selection and Management

The problems in sample selection that were experienced in the 2001 component of the survey indicate the need for a review of the alternative sources of sample lists prior to the next survey and the need for rigorous checking of sample lists to the extent that that is possible prior to having the results of the interviews.

- Verify that there is no readily available and more comprehensive alternative to residential phone listings as the sample frame for the entire survey or for specific segments, such as students in residence.
- Contact Bell Canada to determine if it is possible to obtain phone listings without going through a third party.
- Assess the feasibility of obtaining complete phone listings so that survey staff can carry out the sample selection process instead of relying on a third party. Phone directories for the whole of Canada are available on CD-ROM but it is not known how current the listings are or how adequate the address information is for mailing purposes.
- Re-evaluate the desirability of acquiring the sample in two stages. The primary reason for doing that has been to ensure that the sample universe is current particularly with respect to post secondary students starting or returning to school at the start of the school year in September. It is not clear that that objective was actually achieved in the 2001 TTS. For example, no students in on campus residences at Trent University were included in the 2nd sample list obtained in the fall of 2000. Problems associated with drawing the sample in two stages include the greater scope for error in dealing with two sample selections instead of one. The ability either to detect errors or to make corrections is further compromised by the tight time schedule required to process the 2nd list.

- If the sample is purchased in two stages, the suppliers of the list should be asked not to remove duplicate numbers contained in the first list. The removal of duplicate numbers is a trivial task for the survey team. Having them in allows survey staff to verify that both lists were in fact drawn from a similar sample frame. The number of duplicates that there should be can be estimated and the geographic distribution of the duplicates should match the distribution of the non-duplicates within normal statistical limits.
- The geographic distribution of all sample lists should be verified prior to their use. Postal code information from the 2001 TTS is being retained as part of the final database in order that it may be used to check the sample distribution for future survey. Postal code information from the 1996 TTS was not readily available for that purpose in 2000 and 2001. Canada Post is also able to supply dwelling unit counts for urban and some rural postal code. These counts are available on the Internet but take time to extract.
- Any re-design of the TTS software should include more information in the daily monitoring reports in order to facilitate the early detection of problems such as the under-representation of apartment units that occurred in the 2001 component of the TTS. The information on dwelling unit type, collected as part of the interview process, was not readily available in one location until after the coding of the 2001 data was complete.

9.10 Geocoding

Duplication of street and municipal names within the vast survey area made coding especially difficult. For example, there are 52 Church Streets in the survey area without accounting for variations such as Church Road, Church Lane and Church Street East and West. Coding small towns and hamlets in rural areas were more difficult because of the lack of commercial street maps and reference materials.

Overall, coding productivity improved since the 1996 TTS. The improvement is attributed to several factors:

- The quality of the reference materials received from the participating agencies was more detailed. Street addresses were used widely in the survey area, with a few exceptions.
- Coding by households instead of by record types (i.e., home, work, etc.) enabled the coder to understand household travel patterns. This proved to be invaluable in solving coding problems. For example, locating schools in proximity to the home location can solve an incomplete school description. In addition, this also allows on-line validations such as speed and distance checks.
- The full-text search routine in the geocode program permitted the coder to browse through the massive reference database in a robust and organised fashion. Search results were more complete and less dependent on the coder's own geographic knowledge.
- The advancement of technology allowed coders to search for any information through the internet. This saved both time and effort in looking up addresses for uncommon monuments recorded in the interviews.
- Grouping the coders into units by large geographic areas enabled the coders to gain experience in particular areas while allowing them to assist one another in solving problem records. It is worth noting that there were no partitions between coding stations as there were with interview stations. This was to allow coders to freely communicate with one another and share reference materials.

9.11 Coding Reference Databases

The most strenuous coding issue encountered was the development of the geocode reference database. The problem was two-fold. There was a lack of up-to-date GIS information and a lack of a common GIS standard.

- Although two-thirds of the participating agencies in the survey area had GIS data available prior to the start of the survey, additional information from various sources was added to

the geocode reference database regularly as the survey progressed. Furthermore, some records had to be re-coded after the survey when additional information became available.

- GIS data are maintained independently by agencies. Aside from using different GIS packages, the kinds of information being maintained also vary. For example, some agencies maintain address ranges while others code to parcel dot detail. The major problem is the different naming conventions used for numbered streets and abbreviations for street types and direction. Furthermore, inconsistencies were noted at boundary locations even between adjacent areas that were using the same geographic datum.

For future surveys, it is strongly recommended that development work on the geocode reference database start well in advance of the survey, preferably 7 to 8 months ahead. This allows the time to understand and combine data from various sources. In addition, a last minute update of the database prior to the start of the survey should also be done based on new materials provided by the agencies in order to include the streets in new development areas. A geographic reference standard, in terms of datum, naming conventions, etc., should be promoted for not just the GTA, but also for the external area. Although it is not necessary to adopt the same GIS package, a periodic check on street and boundary alignments is definitely beneficial.

10 Recommendations for 2006

The conduct of a fifth TTS in the year 2006 is recommended for three reasons:

1. To provide consistent time series information on global demographic, socio-economic trends and their influence on travel behaviour.

2. To provide reliable before and after travel behaviour information specific to major new transportation initiatives such as the Sheppard subway line and ongoing improvements to the road system throughout the survey area.

3. To maintain the continuity of effort, and the expertise, for the efficient and consistent conduct of large-scale travel surveys.

Two options are presented for a TTS survey in 2006. The first option (recommended) is for a full survey as was done in 1986, 1996 and 2001. The second option is for a scaled down version of the 2001 TTS. In the long run, it would be difficult to justify a repeat of a survey on the scale of the 2001 TTS every 5 years. The justification for a 5% sample is to obtain reliable origin-destination trip information. Detailed O-D information is used primarily for demand modelling and forecasting, in addition to important detailed information on transit properties. Travel patterns change slowly over time. A 10-year interval between major updates to the trip distribution components of these models is appropriate given the rate of change and level of effort involved. Transit properties use detailed trip information for service planning and are therefore a major beneficiary of a repeat survey on the same scale as 1996. Increased interest in the future role of transit in the GTA should be considered when choosing an option for 2006. One last consideration is the possibility that cell phone use will require a change in survey methods. A full 5% sample in 2006 would test the impact of expanding use of cell phones and should occur in a time frame where the existing procedures continue to be reliable.

10.1 Option 1 – Full TTS in 2006

If a full scale TTS is to be conducted in 2006, then advance planning needs to begin immediately (before the end of 2002). The total number of interviews that would need to be conducted assuming 5% coverage of the same area as was covered by the 2001 TTS plus the Regional Municipality of Waterloo would be approximately 145,000. All of the survey software needs to be redesigned, rewritten and thoroughly tested. The recommended development schedule is:

2003	Design and writing of software
Early 2004	Refinement and pilot testing
Fall 2004	Large scale pilot survey or application to a medium size city outside the survey area (e.g. London or Windsor)
Fall 2005	Survey of participating areas excluding the GTA & Hamilton
Fall 2006	Survey of GTA & Hamilton

10.2 Option 2 – Scaled down TTS in 2006

It is recommended that scaled down TTS should focus primarily on the socio-economic and demographic influences on trip rates and mode choice. These relationships can be volatile, can be influenced by government policy, and can have long-term implications, which take time to measure and fully understand. A complete sample of 2,000 households is about the minimum that will permit a reasonable degree of stratification within a single geographic area. A 1.5% sample would be sufficient to achieve that minimum target in each of the regional municipalities. A 0.5% sample rate would likely be sufficient within Metropolitan Toronto for a comparable level of detail. The use of a stratified sample or differential sampling rates by geographic area, other than the Metro/non-Metro division, is not recommended due to the difficulties associated with sample selection.

The Regional Municipalities of Niagara and Waterloo are similar in size and population densities to several of the Regional Municipalities in the GTA; therefore, their data requirements are likely to be similar. The Region of Niagara participated in both the 1996 and 2001 surveys and might, therefore wish to participate in a 2006 survey on the same basis as the regions in the GTA. The Region of Waterloo did not participate in the 2001 TTS and therefore want to consider a full 5% sample if they were to participate in a 2006 survey. Exhibit 10.1.1 provides a summary of the projected number of completed interviews that would be required in each region.

It is recommended that the survey instrument be very similar to the 1996 and 2001 TTS in order to obtain consistent time series information. Some geographic detail could be sacrificed; for example nearest major intersection would be sufficient for origins and destinations. Additional questions or refinement of the existing questions pertaining to household structure, occupation and auto occupancy could be considered.

Exhibit 10.1.1 Proposed Sample for 2001 by Regional Municipality

City/ Regional Municipality	Estimated Households	Sample Rate	Target Sample
Toronto	1,000,000	0.5%	5,000
Durham	200,000	1.5%	3,000
York	290,000	1.5%	4,350
Peel	360,000	1.5%	5,400
Halton	160,000	1.5%	2,400
Hamilton	210,000	1.5%	3,150
Niagara	180,000	1.5%	2,400
Waterloo	170,000	5.0%	8,500
Total	2,570,000		34,200

A major concern in the TTS has always been the under reporting of off-peak and discretionary travel. This concern may be even greater in the future, if discretionary travel continues to increase at a faster rate than travel related to work and school. A smaller scale TTS could provide an appropriate opportunity to obtain a better understanding of the magnitude and characteristics of discretionary travel. Such an investigation might involve a follow up trip diary type of survey along with the basic survey. The unit cost would likely be much higher than for the TTS but a relatively small sample, 1,000 to 2,000 households, would likely be sufficient to quantify the extent of the under-reporting in the TTS in a number of different categories.

Due to the smaller population of the areas represented by the other agencies that participated in the 1996 survey, a 5% sample is about the minimum that is likely to produce useful information. It would not make sense for those agencies to participate in a survey with a lower sample rate. Should those agencies wish to expand on the 1996 experience to create a time series database, they should consider a larger sample that will provide better information than was obtained in the 1996 TTS. A sample rate of between 10% and 20% is recommended. Differential sampling rates, by geographic area, are not recommended due to the problems inherent in pre-defining the sample area boundaries. The survey could be quite separate from the one that is done for the GTA, and could use a different survey instrument. Exhibit 10.2.1 provides a summary of the required number of interviews. The numbers for the Counties of Wellington and Peterborough assume that the geographic coverage is limited to the same area as was surveyed in 1996 and 2001.

Exhibit 10.2.1 Proposed Non-GTA Sample for 2006

Area	Estimated Households	10% Sample	20% Sample
City of Guelph	48,000	4,800	9,600
City of Barrie	48,000	4,800	9,600
City of Orillia	12,000	1,200	2,400
City of Kawartha Lakes	27,000	2,700	5,400
City of Peterborough	34,000	3,400	6,800
Town of Orangeville	16,000	1,600	3,200
County of Wellington	20,000	2,000	4,000
County of Simcoe	100,000	10,000	20,000
County of Peterborough	16,000	1,600	3,200
Total	321,000	32,100	64,200

The timing of the interviews for areas outside the GTA and Hamilton should be based on the needs of the participating agencies and the total number of interviews that need to be completed. It is recommended that not more than 50,000 interviews be attempted without staging the survey over 2 years. In addition, if new software is to be developed, the first application should be on a relatively small scale. If part of the 2006 survey is not done in 2005 a reasonably large-scale pilot survey (5,000 plus interviews) should be included as part of the development process.

10.3 GTA in 2011

The recommendations for a TTS in 2011 depend on the decisions made with respect to 2006 and the outcome of any survey conducted in 2006. Technological developments (Voice mail and cell phones) are having a negative effect on both survey response rate and our ability to identify a representative sample of households. In 2001, the most serious problems were restricted to a relatively small area in Central Toronto. If those problems become more widespread, or become more severe, they may ultimately call into question the validity and cost effectiveness of doing telephone surveys such as the TTS. A new approach, or alternative means of data collection, may be required. Although that point has not been reached yet, it is important that the situation continues to be monitored and that a new assessment be made after each survey.

10.4 Expansion of Survey Area

There are economies of scale to be realised if other agencies, in addition to the ones that participated in the 1996 survey, wish to be included in future surveys. Information on travel and growth trends in surrounding areas would also benefit the GTA agencies. To fully rationalise the area covered by the 1996 survey, consideration should be given to including the Regional Municipality of Haldimand-Norfolk and the Counties of Brant, Dufferin and Northumberland. It is suggested that the agencies representing these areas be contacted well before the next large-scale survey to determine whether they would be interested in participating.

Appendix A Letter to Local Officials

This letter is being sent to municipal councils, members of Legislature and Parliament, police and senior government officials to inform you that another phase of a major travel survey is about to be conducted in your community. We would appreciate your assistance in ensuring that all members of your organization that deal with the public are aware that this survey is underway.

This phase of the survey consists of telephone interviews of a randomly selected sample of households in the Greater Toronto Area and will be conducted from May until early June 2002. The financial partners in this phase are the Cities of Hamilton and Toronto, the Regional Municipalities of Durham, Halton, Peel and York, GO Transit, the Toronto Transit Commission and the Ministry of Transportation Ontario. Earlier phases were conducted in the fall of 2000 and 2001.

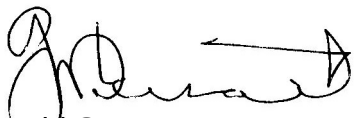
The purpose of the survey is to collect information on the travel habits of residents and provide a data base for long-range planning and improvement of transportation facilities. Similar surveys were conducted in 1986, 1991 and 1996. In addition to trip information of each household member (i.e. trip origin, destination, time, purpose, method of travel) survey participants will be asked about age, gender, employment status, size of household and number of motor vehicles.

All information collected will be kept in the strictest confidence and cannot be traced to an individual household.

Enclosed is a sample of the notification letter that will be sent to each household chosen for telephone interviews. Separate press kits have been prepared to notify the general public through regular television and cable channels as well as local and regional newspapers.

If you have any questions about the survey please contact me at (416) 978-5979, or visit our website at www.TransportationTomorrow.on.ca

Sincerely,



Gerald Steuart
Professor Emeritus
University of Toronto
Project Director

TRANSPORTATION TOMORROW SURVEY

We are conducting an important travel survey on behalf of your municipality, other municipalities in southern Ontario, and the Province of Ontario. Every five years for the past 15 years, we have conducted this survey so that we may keep up with your ever-changing transportation requirements. The purpose of this survey is to collect information on the travel choices and preferences of people in the area. We need your help to provide this information so we may continue to plan transportation services to meet your future needs.

Here is how it works. You will be telephoned at home by a professional interviewer and asked to spend about 10 minutes answering questions. A sample list of the questions to be asked is shown on the back of this letter. The interviewer will call sometime in the next two weeks. On weeknights, the calls will be made between 5:30 p.m. and 9:30 p.m. If the interviewer calls on a Saturday, it will be between 10:00 a.m. and 5:00 p.m.

Please inform other members of your household that you have received this letter and to expect our telephone call.

Most of the questions will focus on travel the weekday before the call, for those members of your household who are 11 years of age or older. We would like to know specific information about where and when trips were taken by each member of your household. This information will allow us to develop an accurate picture to plan improved transportation services and facilities in your area.

All information will be kept strictly confidential. No information will be released in such a way that it could be traced to your household. Your answers will be combined with other responses in your area. This information will be used for travel forecasts and recommendations for future transportation plans.

If you have any questions, please call the City of Toronto's public information service 'Access Toronto' at (416) 338-0338 or visit our web site at www.TransportationTomorrow.on.ca

We would like to extend our personal thanks for your assistance in this project. Your help will mean better transportation services in the future.

Regards,

Mel Lastman, Mayor
City of Toronto

Robert E. Wade, Mayor
City of Hamilton

Emil Kolb, Chair
Regional Municipality of Peel

Roger Anderson, Chair
Regional Municipality of Durham

Joyce Savoline, Chair
Regional Municipality of Halton

Bill Fisch, Chair
Regional Municipality of York

Survey Questions

A. About your household

- Type of building (house or apartment)
- Number of people
- Number of vehicles available for personal use

B. About each person

- Their age
- Do they have a driver's licence?
- Where do they work or go to school (street address please)

C. About each trip made by each person the previous day

- From where, to where (street address preferred, building name would help)
- Reason for making the trip (e.g. shopping)
- Start time of the trip
- Mode of transportation (bus, car, bicycle, etc.)

We will only be collecting trip data for persons 11 years of age or older. A trip is a one-way journey from one location to another by any form of motorized transportation or bicycle. We will request some information on walking, but only for trips to and from work or school.

Authority for collection of this information has been obtained from each of the Regional and Local governments participating in this survey. Confidentiality of this information is protected under the Freedom of information and Protection of Privacy Act.

Appendix B Press Release

NEWS RELEASE **For Immediate Release**

Future Planning Focus of Transportation Survey

TORONTO—Phase two of a survey looking at the travel habits and preferences of residents of the Greater Toronto Area and surrounding communities begins today, Transportation Minister Brad Clark announced. The survey will help in the long-term planning of future road and transit improvements.

The Ontario government, 15 municipal governments, the Toronto Transit Commission and GO Transit have joined forces to conduct a comprehensive phone survey of travel patterns called the Transportation Tomorrow Survey. The first phase, which took place in fall 2000, contacted more than 30,000 households in communities surrounding the GTA. The second phase will contact more than 130,000 households in the regions of Durham, Halton, Peel and York, and the cities of Hamilton and Toronto.

"This survey will help us better respond to each community's needs," said Clark. "We are looking at today's travel patterns to help us plan responsibly for the future—ensuring our growth is Smart Growth."

The Transportation Tomorrow Survey will provide input into highway improvements, development proposals, improving transit services, and determining needs for GO transit improvements.

Information will be gathered through telephone interviews of randomly selected households. Questions will focus on trip information for each household member, including origin, destination, time, reason for travel and mode of transportation. The survey will also inquire about the number of vehicles available for personal use and where each family member works or attends school. All personal information will be kept confidential and used for statistical purposes only.

The survey is being conducted by the University of Toronto's Data Management Group. When the study is complete, the results will be collated and released early in 2002.

This is the fourth Transportation Tomorrow Survey to be carried out. Other surveys took place in 1986, 1991 and 1996.

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Disponible en français

For more information visit www.TransportationTomorrow.on.ca

TRANSPORTATION TOMORROW SURVEY

MAJOR STUDY FOCUSES ON PEOPLE ON THE MOVE

The future of transportation in the Greater Toronto Area (GTA) and surrounding regions will be the focus of a major new study of how people get around in this rapidly growing area.

The Ontario government, 15 municipal governments, the Toronto Transit Commission and GO Transit have joined forces to conduct a comprehensive survey of travel patterns called the Transportation Tomorrow Survey.

The Transportation Tomorrow Survey will give politicians and planners a comprehensive snap-shot of current patterns of travel and transit use in south-central Ontario. This information will be used by transportation planners to understand where, when, and how residents travel, and to estimate future transportation requirements (how many trips are likely to be made from a given area, to where, and by what mode).

The Transportation Tomorrow Survey is designed to collect data on the travel patterns of all members of a selected sample of households. Information such as the origins, destination, and purpose of the trip, and car or transit use will be obtained. Although very specific travel information will be collected, the results will be combined in order to build a picture of the overall travel patterns from area to area.

The survey requires confidential telephone interviews with more than 160,000 randomly selected families. Participants will be asked to make note of their trips on a particular day, as well as to provide statistical information about the various members of the household.

With the dramatic growth in traffic throughout the GTA and beyond over the last two decades, and declining public funding, planners are taking a hard look at travel trends so they can respond to future growth and ensure the most effective public investments.

Similar surveys were carried out in 1986, 1991 and 1996 in the Greater Toronto Area. The 1996 survey incorporated travel information from many of the areas surrounding the GTA to give transportation planners throughout the Toronto region a similar database for planning.

The 2001 survey will allow planners to combine the travel information with the wealth of information on household characteristics available from the 2001 Census of Canada.

The Transportation Tomorrow Survey will include households in:

- City of Toronto
- Regional Municipality of Niagara
- County of Wellington
- City of Guelph
- Town of Orangeville
- County of Simcoe
- City of Barrie
- City of Orillia
- County of Peterborough
- City of Peterborough
- County of Victoria
- Regional Municipality of Durham
- Regional Municipality of Halton
- Regional Municipality of Peel
- Regional Municipality of York
- City of Hamilton

Approximately 168,000 households will be contacted by the survey's team of telephone interviewers. Letters explaining the purpose of the survey and requesting household participation will be mailed about a week in advance of the telephone interview. (Samples of letters are included with this package.)

CONTACT:

Gerald Steuart
Project Director
Transportation Tomorrow Survey
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BENEFITS OF A COMPREHENSIVE TRANSPORTATION SURVEY

1. Helps Identify Transportation Needs and Impacts

- Estimation of transportation implications of short and medium term land use changes, particularly in high growth areas;
- Identification of cross boundary needs;
- Monitoring effectiveness of existing transportation systems;
- Travel behaviour change; and
- Assessment of local transportation impacts.

2. Provides Much-Needed Data

- Capture changing travel patterns in a rapidly changing urban environment;
- Build on existing time series data (particularly important in high growth areas);
- A reliable means of capturing cross-boundary data;
- Important data on changing transit use;

3. Provides Valuable Information For Many Agencies

- Planning and Development Departments;
- Engineering Departments;
- Finance Departments;
- Transit Departments;
- Federal Government (Airport access);
- School Boards;
- Social Agencies;
- Emergency Service Planning Coordinators;
- Housing Industry;
- Ministry of Transportation;
- Ministries of Energy, Science and Technology, Municipal Affairs and Housing, and Finance;
- GO Transit;
- Consultants;
- Developers.

4. Enables Cost-Effective Transportation Improvements

- Design of transit services;
- Identification of low ridership areas and strategies to improve ridership;
- Structuring of routes to serve non-central destinations;
- Monitoring cross-boundary travel;
- Phasing of highway improvements;
- Monitoring of transportation for both official plans and individual developments;
- Input to development proposals;
- Determining need for GO Transit improvements;
- Development and calibration of travel forecast models;
- Determining need for road improvements.

TRANSPORTATION TOMORROW SURVEY

FACT SHEET

Survey Details

Dates: September 7 to approximately December 8, 2001.

Hours: 5:30 p.m. to 9:30 p.m. during weekdays
10:00 a.m. to 5:00 p.m. Saturdays
Some call backs may be arranged during other hours.

Languages: English, French, Italian, Cantonese, Portuguese, Mandarin.

Households To Be Contacted:

City of Toronto	67,000
Peel Region	21,000
Durham Region	13,000
Halton Region	9,000
York Region	14,000
City of Hamilton	14,000
Other counties, cities and towns (Completed Fall 2000)	30,000
	168,000

Allowing for missed calls and refusals this will represent about one in every 20 households in the Greater Toronto Area and surrounding districts.

Survey Questions

All questions are about trips that people in each household have made, as well as about the characteristics of those people. Details of the questions are outlined in the letter sent to the participating households (sample enclosed). All information is confidential and will be used only in combination with other households to determine general travel trends. No individuals or households will be identified.

Spokesman

Gerald Steuart of the Data Management Group, University of Toronto, is the Project Director. He can be reached at (416) 978-5979.

Travel Trivia from 1996 Survey

Total Households in Greater Toronto Area (including Hamilton)	1,805,000
Average Household Size	2.7 persons per household
Lowest Vehicle Ownership	City of Toronto 1.1 per household
Highest Vehicle Ownership	York Region 1.8 per household
Average Vehicle Ownership	1.4 per household
Total Trips	10.1 million daily in the GTA

17% of all households did not have a vehicle
34% of all trips were to or from work and home
61% of the total population of 4,926,400 was licensed to drive
13% of all trips were made by transit
78% of all trips were made by automobile
7% of all trips were made by walking or riding a bicycle
2% of all trips were made by other means, such as by motorcycle

Appendix C Advance Letter

TRANSPORTATION TOMORROW SURVEY

We are conducting an important travel survey on behalf of your municipality, other municipalities in southern Ontario, and the Province of Ontario. Every five years for the past 15 years, we have conducted this survey so that we may keep up with your ever-changing transportation requirements. The purpose of this survey is to collect information on the travel choices and preferences of people in the area. We need your help to provide this information so we may continue to plan transportation services to meet your future needs.

Here is how it works. You will be telephoned at home by a professional interviewer and asked to spend about 10 minutes answering questions. A sample list of the questions to be asked is shown on the back of this letter. The interviewer will call sometime in the next two weeks. On weeknights, the calls will be made between 6:00 p.m. and 9:30 p.m. If the interviewer calls on a Saturday, it will be between 10:00 a.m. and 5:00 p.m.

Please inform other members of your household that you have received this letter and to expect our telephone call.

Most of the questions will focus on travel the weekday before the call, for those members of your household who are over 11 years old. We would like to know specific information about where and when trips were taken by each member of your household. This information will allow us to develop an accurate picture to plan improved transportation services and facilities in your area.

All information will be kept strictly confidential. No information will be released in such a way that it could be traced to your household. Your answers will be combined with other responses in your area. This information will be used for travel forecasts and recommendations for future transportation plans.

If you have any questions, please call the Ministry of Transportation at 1-800-268-4686 or visit our web site at www.TransportationTomorrow.on.ca

We would like to extend our personal thanks for your assistance in this project. Your help will mean better transportation services in the future.

Regards,

Brad Clark, Minister
Ministry of Transportation

Robert E. Wade, Mayor
City of Hamilton

Mel Lastman, Mayor
City of Toronto

Emil Kolb, Chair
Regional Municipality of Peel

Bill Fisch, Chair
Regional Municipality of York

Roger Anderson, Chair
Regional Municipality of Durham

Joyce Savoline, Chair
Regional Municipality of Halton

Survey Questions

A. About your household

- Type of building (house or apartment)
- Number of people
- Number of vehicles available for personal use

B. About each person

- Their age
- Do they have a driver's licence?
- Where do they work or go to school (street address please)

C. About each trip made by each person the previous day

- From where, to where (street address preferred, building name would help)
- Reason for making the trip (e.g. shopping)
- Start time of the trip
- Mode of transportation (bus, car, bicycle, etc.)

We will only be collecting trip data for persons 11 years of age or older. A trip is a one-way journey from one location to another by any form of motorized transportation or bicycle. We will request some information on walking, but only for trips to and from work or school.

Authority for collection of this information has been obtained from each of the Regional and Local governments participating in this survey. Confidentiality of this information is protected under the Freedom of information and Protection of Privacy Act.