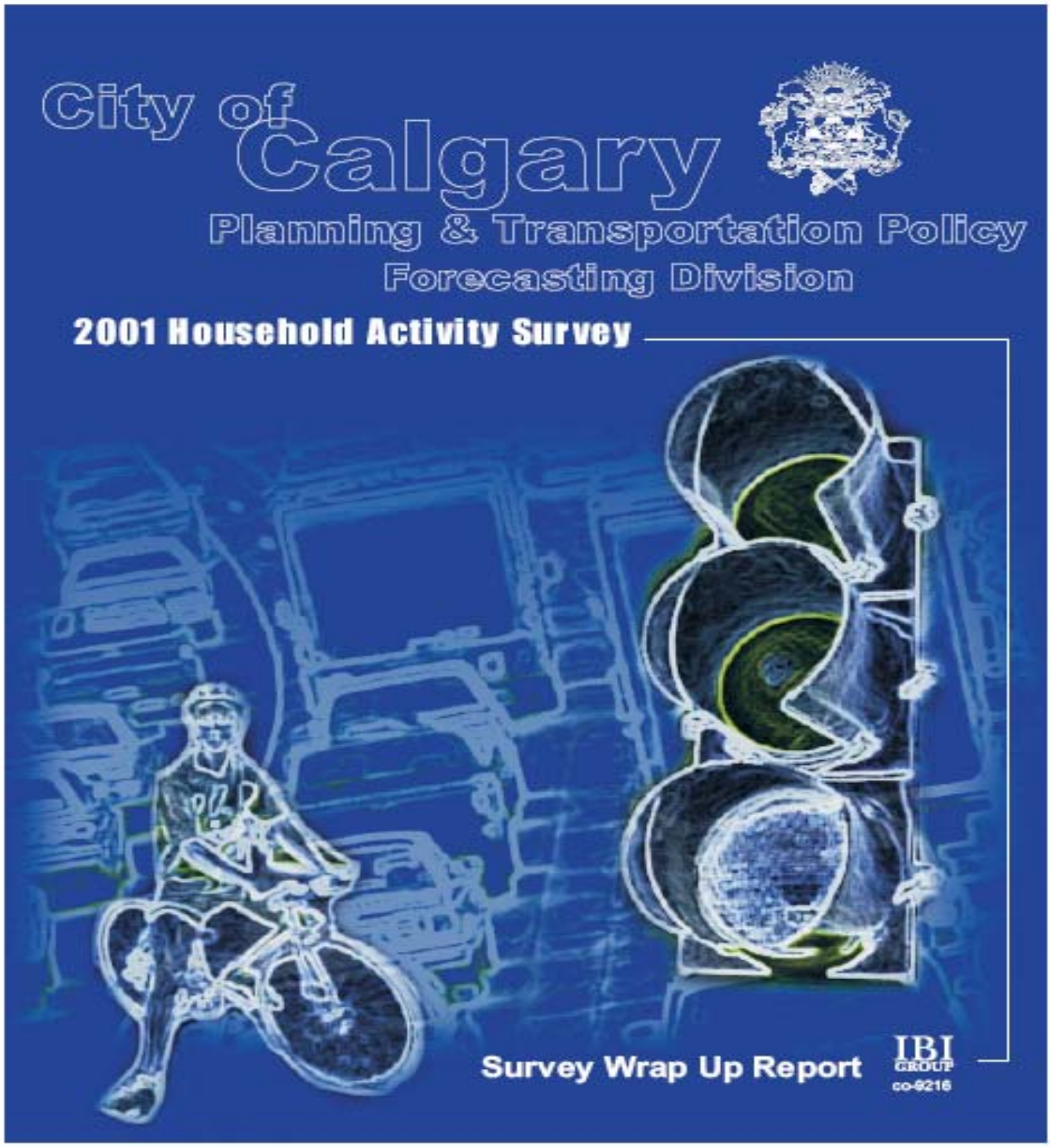

THIS DOCUMENT IS AN EDITED SUMMARY OF THE ORIGINAL IBI REPORT.

EXECUTIVE SUMMARY

INTRODUCTION

The City of Calgary, Planning and Transportation Policy Business Unit, Forecasting Division, and Alberta Transportation are undertaking an update of the Calgary Regional Transportation Model. To update the model and provide a dataset conducive to pioneering a new traffic demand model, Forecasting required the collection of new data to establish a 24-hour travel and activity profile for the city and its region and to account for the changes that have occurred over the last ten years. This collection was performed through the 2001 Household Activity Survey.

IBI Group was retained to conduct the 2001 Household Activity Survey (HAS) for the transportation model update. This report documents the methods employed and provides an overview of the survey fielding results.

STUDY OBJECTIVES

The general goal of this study was to collect data detailing both travel and non-travel activities of Calgary and Regional households, based on the survey developed through the pilot project. To accomplish this goal, a number of subsidiary objectives were identified and are as follows:

- *recruit from the greater Calgary region a representative sample to participate in the study;*
- *review data collection forms for content and consistency with the goals of the data output;*
- *review database structure and propose modifications if necessary;*
- *develop database framework, including input forms and lookup tables;*
- *develop an instruction manual to aid survey respondents in completing the forms;*
- *develop formal data checking and validation procedures;*
- *oversee and manage data collection process;*
- *enter data in database;*
- *verify data;*
- *code data to valid addresses and convert to City geocoded standards;*
- *prepare a report describing the work conducted and summary results; and*
- *deliver completed database.*

APPROACH

The overall approach to the study was focused on providing timely and accurate deliverables. The project was structured into a multiple stage work program in order to develop and refine the database, collect data, enter data into the database and ensure its accuracy. The following items detail the specific results of the Survey project.

PHASE 1: PROJECT INITIATION

In order to insure an effective project start-up, representatives of the City of Calgary Forecasting Division and senior IBI Group staff initiated the project by verifying the final survey objectives, finalizing the work plan and key milestones, and confirming all of the project's requirements and consultant deliverables.

The project schedule was developed based on anticipated survey results and response rates. From all households notified for possible recruitment, an overall retrieval response rate of 25 to 28% was determined through the pilot studies. A random sample generation was drawn from the population accordingly and provided the database footing for the project.

The database was carefully reviewed for errors and duplication. Inadequate data was filtered out of the system, re-assembled and parsed for the data management software. Stringent review of the data collection and quality control procedures were instituted, as the 2001 Household Activity Survey will represent a benchmark study for the City of Calgary.

PHASE 2: IBI GROUP SOFTWARE DEVELOPMENT

IBI Group developed a survey and data management tool specifically for this project to create greater efficiency and accuracy. The software offered a user-friendly interface for data entry in real-time and was completed based on the experience gained during the pilot tests. The resulting structure of the interface followed the survey forms that were developed and finalized through the same pilot studies.

The interface offered a greatly improved method for tracking and monitoring calls, ensured consistency and accuracy through a variety of error-trapping measures, and automated the bulk of the validation procedures and much of the critical geo-coding requirements. The compiled data is contained on the CD in the back of this report along with the user interface package, which illustrates all the features of the software as described.

PHASE 3: PRE-SURVEY LOGISTICS

IBI Group established a dedicated project office for the duration of the study. The office was located at 415, 301 14th Street in close proximity to IBI Group's main office. The space provided secure, centralized space for interview staff, data entry staff, and

supervisory staff. The logistics of the Call-centre (including power, telephone, furniture and computer hardware were operational by October 21st 2000.

Procedures and protocol for the data collection staff were established, and a detailed training program was developed. Procedures were summarized into a simple instruction sheet or manual provided to each interviewer and formed part of the training materials. The instructions addressed the importance of a high degree of accuracy in the data collection phase. This manual is included as an appendix to this document.

As detailed elsewhere, the pilot test produced several recommendations for improving the survey instrument. Until these changes were completed, the staffing levels required were difficult to assess. Initial estimates suggested a full-time complement of 30 data collection personnel and 5 data entry personnel would be required. This indicated a need for a pool of 40 to 50 data collection staff, and 5-10 data entry staff. IBI Group determined that the initial complement of forty-eight staff was insufficient given the average length of retrievals. A few additional workstations were added and, along with increased staff performance, 30 to 40 staff were simultaneously able to productively retrieve and enter on any given day. This level of production required a staff contingent of up to 75 during the full throws of the project.

All staff required a minimum six to eight hours of training and mock call tests before they were allowed to execute formal survey calls. New staff were required to job shadow after their training period until they were comfortable with the protocols of the process and demonstrated acceptable proficiency with the database management interface.

PHASE 4: DATA COLLECTION PROCESS

The data collection process was divided into manageable waves of 2000 to 3500 households per wave. Each wave constituted approximately one week of work. Each wave consisted of three steps, notification/recruitment, reminder, and retrieval.

Notification letters were sent to random households at least 7 to 10 days prior to their first recruitment call. Once recruited, there could be a delay of up to a week (while the remaining recruitments occurred for the wave) before the survey packages were sent to those recruited households. A random travel day was assigned to the recruited households and sent to them within their packages. These packages were sent 9 to 14 days prior to the assigned travel day in case there were any questions with the package that needed to be addressed. A sample of the survey package is attached in the appendix. Work undertaken to retrieve data from every household began a minimum of three to four weeks prior to the actual travel day and subsequent retrieval.

Calls were initially made Monday to Friday between 6:00 pm and 9:30 pm, and between 10:00am and 4:00 pm on Saturdays. For the latter half of the survey process, calls were also initiated during weekday daytime hours between 9:00 am and 5:00 pm, based on feedback from the respondents. Reminder calls were placed daily to all households that were designated to travel on the following day.

The Call Centre was purposefully staffed with non-English language skills and personnel were available to handle many households with a foreign language as their primary communication medium.

Random data checking and call back verifications were executed to monitor staff performance and accuracy during the daily retrieval process. These follow-ups were instituted as a quality control measure and were effective in identifying and addressing concerns in a timely manner.

The software allowed all travel destination information to be geo-coded immediately and effortlessly. However, the geo-coding database was not absolutely complete and nightly, any locations that did not have a geo-code on file were highlighted and earmarked for geo-coding by daytime staff the following morning. This process was effective and strategic as the information remained fresh for geo-coding and it also minimized the backlog of addresses without geo-codes at the end of the study.

DATA COLLECTION RESULTS

The 2001 Household Activity Survey was targeted to capture 9,500 household data completions. These 9500 completions were comprised of the following:

- *8400 City of Calgary Households*
- *850 Regional Households*
- *250 Banff and Canmore Households*

The final retrieval results at the close of data retrievals was as follows:

	Target	***Collected***	***Surplus***
City of Calgary Households	*8400*	*8545*	*145*
Regional Households	*850*	*943*	*93*
Banff and Canmore Households	*250*	*282*	*32*
Total:	***9500***	***9770***	***270***

There were several interruptions that were part of the 2001 HAS data retrieval process. As a result the data was collected in three segments. The breakdown of household data based on the period in which they were collected is as follows:

	Fall 2000	***Spring 2001***	***Fall 2001***
City of Calgary Households	*1234*	*685*	*6626*
Regional Households	*0*	*0*	*943*
Banff and Canmore Households	*0*	*0*	*282*
Total:	***1234***	***685***	***7851***

Recruitment

During the course of the study, over 106,300 recruitment calls were placed which led to 15,941 households agreeing to participate and having travel days assigned. On average, over 1030 recruitment calls were placed on each day the Call Centre was in operation.

Reminder Calls

Over 27,750 reminder calls were placed during the study. The average number of reminder calls placed per day was 270. Several attempts were made to reach households in person and failing that, a message would ultimately be left. On any given day, Monday through Sunday, there were, on average, 140 households assigned a travel day. If the transit strike had not occurred, the average would have been higher - in the range of 175 households per day.

Data Retrieval

Of the 15,941 households that were recruited 9770 households were successfully retrieved. The 9770 households represent complete data sets. Approximately 680 households had incomplete or missing data. This would result in a drop off rate of approximately 38.7% from those recruited. Another ±2200 households had to be expelled either due to the Transit strike or due to the quota being met at the conclusion of this study. Accounting for these expelled households, the drop off rate would drop to approximately 25 to 28%, which was what was originally anticipated. Over 64,650 data retrieval calls were placed during the study period for an approximate average of 628 retrieval calls placed per day. Overall, on any given day, an average of 1928 calls (recruitment, reminder and retrieval) were placed.

The final response rates for the City, the Region and Banff and Canmore combined are given below. The response rate for the City was as expected from the Pilot Studies. The rates for the regional area and Banff/Canmore were significantly lower.

	Notified	***Recruited***	***Retrieved***	***Retrieval Rate***
City	*35,596*	*13,706*	*8537*	*24.0%*
Region	*4,710*	*1,623*	*950*	*20.2%*
Banff/Canmore	*2,139*	*612*	*282*	*13.2%*

SURVEY RESULTS

Overall Summary

The table below highlights the overall results of the survey. Total persons, travel persons, activities, and trips have all been listed. The information provided in this report may not be consistent with previously reported data for earlier stages of the study. As the final leg of the study was completed, a thorough sweep of the entire data set was undertaken, which would have corrected any errors not previously detected. Any such errors have been updated and reflected in this final report.

Summary of Household Activity Survey Results
All Households: City and Region

	City Pilot I	City Pilot II	Winter 00	Spring 01	Fall 01	Complete
Number of Households	44	13	1234	685	7851	9770
Number of Persons	112	29	3289	1775	20145	25209
Number of Travel Persons			3181	1701	19576	24458
Number of Activities	1325	500	47294	25510	297155	369959
Number of Trips	371	135	13253	6949	79162	99364
Persons per Household	2.5	2.2	2.67	2.59	2.57	2.58
Travel Persons per HH			2.58	2.48	2.49	2.50
Activities per Household	30.1	38.5	38.33	37.24	37.85	37.87
Trips per Household	8.4	10.4	10.74	10.14	10.08	10.17
Vehicles per Household			1.84	1.73	1.77	1.77

The table below show the overall results for the City and the Regional area separately.

Summary of Household Activity Survey Results

	Calgary	Region	Calgary & Region
Number of Households	8545	1225	9770
Number of Persons	21802	3407	25209
Number of Travel Persons	21146	3312	24458
Number of Activities	322128	47831	369959
Number of Trips	87640	11724	99364
Persons per Household	2.55	2.78	2.58
Travel Persons per HH	2.47	2.70	2.50
Activities per Household	37.70	39.05	37.87
Trips per Household	10.26	9.57	10.17
Vehicles per Household	1.74	2.00	1.77

Spatial Distribution

In order to effectively monitor the level of representation achieved, a test of spatial distribution was conducted at various points during the data collection. The geographic distribution of all responding households was compared to the 2001 Municipal City census data.

As detailed in Exhibit 4.1, the 2001 HAS surveys show some minor discrepancies to established distributions of dwellings. The resulting data retrieval distribution is slightly off in some areas as identified on Exhibit 4.1. The red areas indicate districts where response rates are low. Overall, the distribution of household completions is fairly close to the dwelling distributions. A few exceptions include higher rates in the south, and lower rates in the central and northeast sectors.

By utilizing a digital map provided by the Forecasting Division, spatial representation checks have been conducted. These checks were updated bi-weekly and provided the basis for targeted recruitment efforts. As part of the ongoing process, we reviewed the response rate by transportation district and made adjustments to the selection method to increase the records from districts with significantly lower response rates.

Similar to Exhibit 4.1, Exhibit 4.2 illustrates the distribution of surveyed households based on the regional transportation districts.

Language Barriers

The following list contains the languages that were actually used to collect household data. 58 household activity data were collected using a non-English language.

- *Cantonese (33)*
- *Korean (4)*
- *Spanish (2)*
- *Vietnamese (8)*
- *Romanian (2)*
- *Italian (1)*
- *Hindi (2)*
- *French (2)*
- *Japanese (4)*

Household Size Distribution

Overall completions need to be representative of the known household size characteristics. To confirm that a representative sampling was collected, a test of the data was conducted on an on-going basis. The final set of responses was compared to accepted City standards (the 1999 Travel to Work *data). As detailed in the table below, household size comparisons are well representative of the city's characteristics.*

Comparision by Household Size

HH SIZE	Adjusted 1999 T/W %	Winter 2000 Collection	Winter 2000 %	Sping 2001 Collection	Spring 2001 %	Fall 2001 Collection	Fall 2001 %	Project Total Retrieved	Project Total %	Variation with Adj. 1999 T/W survey
1	22.9%	227	18.4%	148	21.6%	1605	20.4%	**1980**	**20.3%**	***-2.6%***
2	33.2%	448	36.3%	254	37.1%	2976	37.9%	**3678**	**37.6%**	***4.4%***
3	16.8%	210	17.0%	103	15.0%	1269	16.2%	**1582**	**16.2%**	***-0.6%***
4	17.4%	255	20.7%	115	16.8%	1425	18.2%	**1795**	**18.4%**	***1.0%***
5	6.7%	63	5.1%	45	6.6%	429	5.5%	**537**	**5.5%**	***-1.2%***
6	2.1%	22	1.8%	16	2.3%	115	1.5%	**153**	**1.6%**	***-0.5%***
7	0.6%	6	0.5%	3	0.4%	18	0.2%	**27**	**0.3%**	***-0.3%***
8	0.2%	1	0.1%	1	0.1%	10	0.1%	**12**	**0.1%**	***-0.1%***
9	0.1%	1	0.1%	null	null	2	0.0%	**3**	**0.0%**	***-0.1%***
10	null	1	0.1%	null	null	null	null	**1**	**0.0%**	***null***
11	null	null	null	null	null	2	0.0%	**2**	**0.0%**	***null***
Blank	null	null	null	null	null	null	null	**null**	**null**	***null***
	100.0%	1234	100.0%	685	100.0%	7851	100.0%	**9770**	**100.0%**	***0.0%***

Age Distribution

At the request of the City, the survey completions were also examined for age characteristics. Several attempts were made to address groups identified by the pilot studies as less likely to participate.

Age Distribution of all Surveyed Households (Calgary and Region)

Age Distribution	# of All Respondents	2001 Civic Census %	% of All Respondents	Variation
<14	4,847	19.10%	**19.82%**	0.72%
15 - 24	2,628	14.50%	**10.74%**	-3.76%
25 - 34	3,093	16.77%	**12.65%**	-4.12%
35 - 54	9,010	33.51%	**36.84%**	3.33%
55 - 64	2,632	7.12%	**10.76%**	3.64%
65+	2,248	9.00%	**9.19%**	0.19%
TOTAL	**24,458**	100%	**100%**	

Income

An important indicator of the survey process is often the response rate to income questions. This response is often used to gauge how successfully the survey is at extracting detailed personal information.

The winter fielding delivered an impressive 52.6% response rate. The spring fielding offered a 70% response rate to income information. The total fielding yielded 68.77% response rate. The table below highlights the distribution of household income ranges for households with completed surveys. More importantly, the income distribution of completed households, show an excellent sample across all income ranges.

Income Distribution for All Households and by Calgary & Region

Household Income	Total Responses (All)	%	Calgary Total Responses	%	Region Total Responses	%
<25,000	500	5.12%	455	5.32%	45	3.67%
25,000 - 35,000	688	7.04%	317	3.71%	78	6.37%
35,000 - 45,000	722	7.39%	570	6.67%	37	3.02%
45,000 - 55,000	801	8.20%	282	3.30%	91	7.43%
55,000 - 65,000	797	8.16%	597	6.99%	97	7.92%
65,000 - 75,000	734	7.51%	625	7.31%	120	9.80%
75,000 - 100,000	1165	11.92%	681	7.97%	105	8.57%
100,000 - 125,000	648	6.63%	692	8.10%	120	9.80%
125,000 - 150,000	319	3.27%	614	7.19%	150	12.24%
>150,000	345	3.53%	1015	11.88%	28	2.29%
Total Provided	**6719**	**68.77%**	**5848**	**68.44%**	**871**	**71.10%**
Refused to provide	3051	31.23%	2697	31.56%	354	28.90%
Grand Total	**9770**	**100.00%**	**8545**	**100.00%**	**1225**	**100.00%**

DATA DELIVERY

A series of delimited text files have been assembled that represent a summary of all the survey information collected. These files are included on the CD-ROM attached to this document. This CD contains extremely valuable information and should be carefully used and is a wealth of information. It should be a benefit to future transportation modeling and funding allocation in Calgary.

Also on the CD is a copy of the database management software that was developed by IBI Group. The interface program was developed using MS Access 2000 and will require the current version of MS Access to open the file. The program contained on the CD is the actual program that was used to collect the data and illustrates the interface and forms that were used.

This purpose of this study was to obtain household travel information as well as activity information, for updating the City's transportation forecasting model, as well as provide the ground data for pioneering transportation and land use modeling. Significant efforts

and protocols were executed to ensure that the dataset is accurate, concise and as representative as possible within the confines of the sample size that was prescribed by the client. While there are some limitations under which this data was collected, this data will nonetheless, offer a solid foundation upon which to model transportation and activity behaviour within the City of Calgary and immediate region.

1.0 INTRODUCTION

1.1 BACKGROUND

The City of Calgary, Planning and Transportation Policy Business Unit, Forecasting Division, and Alberta Transportation are undertaking an update of the Calgary Regional Transportation Model. In order to update the model and provide a dataset conducive to pioneering a new traffic demand model, Forecasting required the collection of new data to establish a 24-hour travel and activity profile for the city and its region to account for the changes that have occurred over the last ten years. This collection was performed through the 2001 Household Activity Survey.

IBI Group was retained to conduct the 2001 Household Activity Survey (HAS) for the transportation model update. This report documents the methods employed and provides an overview of the survey fielding results. A cursory analysis of the data is offered in this report for the purposes of communicating the data validity based on known municipal census information. Further data analysis is not within the scope of this project and will be undertaken by the Forecasting Division or agents designated by that division.

1.2 STUDY GOALS AND OBJECTIVES

The general goal of this study was to collect data detailing both travel and non-travel activities of Calgary and regional households, based on the survey developed through the pilot project.

To accomplish this goal, a number of subsidiary objectives were identified:

- recruit from the greater Calgary region a representative sample to participate in the study;
- review data collection forms for content and consistency with the goals of the data output;
- review database structure and propose modifications if necessary;
- develop database framework, including input forms and lookup tables;
- develop an instruction manual to aid survey respondents in completing the forms;
- develop formal data checking and validation procedures;
- oversee and manage data collection process;
- enter data in database;
- verify data;
- code data to valid addresses and convert to City geocoded standards;
- prepare a report describing the work conducted and summary results;
- deliver completed database.

In identifying these goals and objectives, and the level of complexity inherent in this project, it also became IBI Group's goal to develop a direct data entry and management system that would enable the most efficient, accurate and effective method in which to achieve the goals and objectives set out above.

1.3 REPORT FORMAT

This report is set out in five (5) sections, as follows:

1) Introduction
2) Methodology
3) Data Collection and Response Rates
4) Survey Data Results
5) Data Transfer and Summary

2.0 METHODOLOGY

2.1 STUDY APPROACH

The objective of the 2001 HAS is to provide data for use in the update of the existing regional transportation forecasting model. The 2001 HAS differed significantly from previous surveys in that data was collected in the form of a 24-hour household activity diary, which includes both travel and non-travel activities. This survey was not a general data collection exercise, nor was it a public opinion pool. This survey was targeted to collect the necessary demographic and behavioural data that is specifically required for future modelling purposes.

The defined population for the survey consisted of all dwelling units in the city of Calgary, the Calgary region and Banff and Canmore. The sampling frame consisted of the Telus residential listings database current to September 2000 for survey fielding prior to the 2001 transit strike and listings current to August 2001 for fielding after the 2001 transit strike.

Based on the requirements of the City of Calgary, and pilot studies conducted in late November 1999 and early December 1999, a mail-out activity/travel diary in combination with a telephone data retrieval interview technique was selected. Using this technique, households were mailed a survey packet containing necessary forms and instructional material necessary to complete a 24-hour activity/travel diary on a randomly assigned day. An example of the survey packet that was developed in consultation with City Forecasting staff is attached in Appendix A. Households were first officially introduced to the survey via a letter from City officials prior to soliciting their participation.

Due to the inherent data complexities and volume of data that needed to be accurately managed, a computer database system was also developed and provided an improved platform for tracking household notification and recruitment status, individual call tracking, data entry and management, and interactive/online error-trapping.

2.2 PROJECT INITIATION

2.2.1 Random Sample Generation

The target population for the activity profile survey was limited to Calgary and surrounding regional households at the study inception. However, since then Banff and Canmore households were added under a separate contract with the Province. The survey population was the residential telephone listings in the current (electronic) Telus database, as residential contact information was not provided by the City or the Province due to the measures under Freedom of Information and Protection of Privacy Act.

While it is recognized that these populations differ slightly due to multiple listings for some households, unpublished listings for others, households without telephone service,

and households excluded from the "current" directory due to time lag of processing, previous activity surveys in Montreal and Toronto have determined that these differences are not apparently significant. Several comparisons of the survey results with municipal census data indicated that our sample was representative and verified the experience in Montreal and Toronto. These comparisons will be discussed in more detail in Section 4.

All published residential listings constituted the total possible response units. A random sample draw of these response units was selected on a uniform non-stratified basis across the city. A separate generation was needed to secure the required regional samples. The regional area encompasses a significantly larger land mass and includes a number of directories versus a single one for the city of Calgary. All applicable directory areas and their associated listings were assembled and the required number randomly drawn. The random draw ensured that more heavily populated areas were represented accordingly. Prior to using the randomly drawn listings, the geographic distribution of the listings was compared to the overall listing distribution to verify its representation.

The list of response units included the name of the telephone subscriber, the service address and postal code, and the telephone number. The required number of listings was established based on the retrieval results during the pilot study which found an ultimate complete data retrieval rate of approximately 25% of the initial listings. This is a result of the following sequence:

- 63% of the all sampled households will be successfully contacted;
- 58% of those successfully contacted will be successfully recruited; and,
- 65 to 75% of recruited households will yield completed surveys.

For example, if 10,000 completed surveys were required, 40,000 listings would be required due to an overall completion rate of approximately 25%. A drop from the 25% in the ultimate retrieval rate required additional listings for the Regional households. The overall response rates and their impacts are discussed in more detail in Section 3.

2.2.2 Database Development

Once confirmed, and any duplicates eliminated, IBI Group took each household listing and assigned a random ID number and integrated the information into the database structure. The ID allowed all future data collected to be linked to that household as well as preserve their anonymity for privacy purposes (Freedom of Information and Protection of Privacy Act). Once collected, the personal contact information associated with the household can be eliminated with only the ID number remaining.

A relational database was developed based on the data structure presented in the Request for Proposal. The database software package developed had a number of benefits over manual methods and some of these advantages are indicated below:

- offered direct input of data and eliminated interpretation later during a separate data entry process;
- required users to enter all fields and reduced the possibility of missing information;
- relational integrity required during data entry which ensured that every location had established geo-codes, otherwise it is automatically highlighted for further attention;
- valid ranges set for each field as an error-trap - thereby minimizing errors at point source;
- data entry forms were a duplicate of the actual survey forms and were not static, i.e. could infinitely grow to accommodate any level of detail;
- allowed automated on-demand or time-stamped access to household listings which enabled multiple retrieval attempts by multiple interviewers without a wasteful and time consuming paper trail.

The software was designed to check each record for completeness and to perform certain range checks and logical checks on the data. Any errors identified by the software were reported for remedial action, which may have included immediate re-entry of data, a manual review of the survey form, or possibly a call back of the respondent.

IBI Group software was designed to accommodate the specific patterns related to the activity diary. These modifications insured consistency with the household contact person and the reliability and accuracy of the data. Examples of some of the software features that helped achieve higher levels of accuracy and productivity include the following:

- a pull down look up table of valid city of Calgary addresses provided by The City. The table structure was consistent with address coding in the base tables;
- a table of landmarks and their associated addresses. Landmarks included major buildings, transportation terminals and distribution centres. This table facilitated the capture of key data from incomplete forms;
- a table of valid city and town names and addresses outside of Calgary to permit error checks on data entry;
- a multi-user relational database system for processing the survey information and preventing overlap;
- correlation to the actual physical forms used to collect the data, focusing on making data entry efficient and error free, while automatically mapping to appropriate tables;
- all forms incorporated standard Windows features such as "check-boxes" and pre-coded selection menus to minimize actual typing where possible.
- IBI took steps to obtain all regional business addresses and residential addresses wherever possible. Although geo-codes for these locations were not available,

providing these addresses in the database helped prevent unnecessary and inaccurate duplication of the same location being a destination for multiple families. All regional "hit" locations, as well as those within the city not initially provided by The City, were manually geo-coded to the Calgary UTM by IBI Group.

2.3 IBI GROUP SOFTWARE DEVELOPMENT

The system that was developed offered the following automated benefits:

- Generateda defined list of households from the data supplied by Telus on a wave-by-wave basis. Unique identifiers were assigned to each record and tagged for the appropriate notification wave.

- Selected and printed batches of notification letters, envelopes and survey forms from the sample list. IBI Group was able to review the response rate by transportation districts and adjust the selection method to increase the selection of records from districts with significantly lower response rates. The goal was to maintain a representative City-wide sample during the survey process such that any timing or survey biases were not concentrated in particular areas. This review was also repeated for study areas outside of the city limits in order to insure a representative sample.

- Data entry screens were developed for processing the completed survey forms. Data entry included appropriate error checks and logic checks.

- Using the City Building Directory and other sources, secondary references or aliases for common destinations such as shopping centres, schools, and major places of employment were defined. The correct addresses for these locations were stored on the system as lookup tables and were assigned to the survey records on data entry. The list of location references was significantly expanded during the address validation process to include business listings within the city of Calgary.

- Validation rules were programmed into the forms to ensure that all appropriate fields were filled without permitting the next record to be reached, and that the data entered was appropriate for the field to which it relates.

- The database forms were implemented in a networked environment to speed the data entry process and to eliminate overlap and duplication.

- The forms were designed to cater to data entry preference that is usually keyboard-driven as opposed to mouse-driven, permitting users to "tab" through the fields on any form without having to use the mouse. Some logic checking was programmed at the form level to minimize instances of users entering information in incorrect fields, particularly in cases where an entry in a previous field determined the requirement for data entry in a subsequent field.

- Addresses, which were not matched (geo-codes unavailable from The City), were checked and flagged accordingly. After geo-coding, the data was scanned to identify potential duplicate household records. Since these locations had to be manually geo-coded and possibly by different personnel, two or more locations could actually be only one destination. These potential duplicates had to be corrected manually.

- The geo-coded address list was processed by the system and assigned a traffic sub-zone, traffic zone and transportation district. Over the period of the survey fielding, Forecasting updated its traffic zones and utilizing the new digital mapping from The City, an update to traffic zones occured. The new layer was re-integrated with the system and new traffic zones re-assigned to the database.

- Upon completion of the processing of the survey data, the system was used to prepare data sets for The City. The compiled data is contained on the CD attached in the sleeve at the back of this report.

2.4 PRE-SURVEY FIELDING LOGISTICS

2.4.1 Project Office

A dedicated Call Centre was established for the 2001 HAS. The Call Centre was located at Suite 415, 301 – 14 Street NW. The Call Centre contained the following critical infrastructure:

- 40 work stations equipped with telephone headsets for hands-free operation;
- 30 stations outfitted with computers networked to a main server;
- Installed on all the computers was the software developed by IBI Group for survey tracking, data collection and data management. They were networked and worked off of one main database residing on the server.
- Network Server that contained and protected the main database. Data back-up of the key database occurred on a daily basis and the entire server was backed up on a weekly basis. Remote network administration was also provided via a high-speed Internet connection to IBI Group's office over a Virtual Private Network (VPN) for security purposes and for off-site backup protection.

2.4.2 Procedures for Data Collection Assistance

As part of the overall project design, IBI Group developed procedures and protocols for the data collection staff. The procedures were summarized into a simple instruction sheet or manual provided to each interviewer, and formed part of the training materials. Samples of all manuals relating to training and Call Centre staff are attached in Appendix D.

Professional staff continued to work with the interviewers throughout the data collection phase to ensure the collection of complete and accurate data and that overall professionalism was maintained similar to conduct expected of City representatives.

2.4.3 Contract Staff Recruitment

The survey team was comprised of a project director, a senior advisor, a project manager, a quality control supervisor, two survey coordinators, and data collection, coding and entry staff. Together Project director, manager, and coordinators overlooked quality control, data processing and data collection.

Initially it was estimated that the Call Centre could manage a full-time complement of 30 data collection personnel and 5 data entry personnel. A pool of 40 to 50 data collection staff, and 5-10 data entry staff were projected to ensure that a number of shifts were available to accommodate long working days. However, as the Call Centre was further enhanced and fine-tuned, it eventually required a complement of 65 to 75 staff. This was due to the volume of work that was achievable, as well as to account for variations in schedules of the employees.

Based on our experience, a premium rate along with incentives, were offered to the staff to retain their services for the duration of the project, as turnover is costly. The following lists the pay grid for key Call Centre staff positions including incentives:

Phone Interviewers/data collection & entry (approx. 65 staff)	$12.00 to $14.00/hour
Team Leaders (7 staff)	$13.00 to $15.00/hour
Study Co-ordinators (2)	$18.00 to $20.50/hour

A variety of nominal weekly incentives were offered to staff members that achieved either pre-set goals or the best performance results for that given week. These techniques reduced the need to acquire and train new staff, increased productivity and improved the quality of the resulting data.

However, due to the transit strike in the spring of 2001, over 60% of the staff were lost and this had a tremendous impact on the productivity levels. It was resounding evidence that staff turnover is extremely costly. Significant re-investment had to be made to recreate the momentum and efficiencies the Call Centre had previously established. Nonetheless, during the last leg of the survey fielding, the Call Centre was able to reach and surpass its previous performance levels.

2.4.4 Staff Training

All interview staff participated in training sessions with respect to the survey's purpose, method and protocols. The staff were trained in small groups of 8 – 12 persons, together with their immediate supervisors and the project manager. Initially thirty staff were hired and trained by early November. As the time demands of the survey were greater than

estimated, an additional thirty staff were hired. All staff, regardless of their start date went through the same training procedures.

After the transit strike, this process had to be re-started. Staff were hired and trained from mid August 2001 to mid September 2001, in order to target the first travel date reset for the beginning of September 2001.

Data entry staff were also required to be trained in the procedures and protocol for data matching and address matching. IBI Group's professional staff including the project director, senior advisor, the project manager, and the survey coordinators carried out the training. As the project progressed, highly skilled contract staff were employed as "Team Leaders" to assist with ongoing training and data management.

Approximately eight hours of training was required for average interviewers to achieve proficiency in the administration of the questionnaire. The project director, project manager and coordinators contributed to the staff training routines and manuals. These materials were used to train supervisors and interviewers for the project.

The project manager and coordinators conducted training sessions, which included information on the purpose and scope of the survey, interviewing techniques, a detailed review of the questionnaire, and practice interviews. Training was broken into 4 components. The components involved were:

Component 1: Orientation to project and general phone skills
Component 2: Recruitment Calls
Component 3: Reminder and Data Retrieval calls
Component 4: Verification Calls & Error Checking

Supervisory staff continually reviewed the performance of data collection, coding and entry staff, and initiated remedial training as required. An assistant second coordinator was hired in order to assist general supervision, training, and provide logistical support.

In order to ensure that the number of completed surveys was achieved in the study time frame, IBI Group established performance criteria for data collection staff and offered some reasonable incentives to keep staff interested in this heavy workload for the duration of the project.

2.4.5 Monitoring

The project coordinators, project manager and quality control supervisor monitored interviews on a regular basis to ensure that interviewers were adhering to established procedures. In addition, where forms were completed manually offline, forms were vetted for completeness, legibility and accuracy prior to data entry.

The performance of individual staff members was monitored, with the assistance of assigned team leaders, in order to identify potential problems with low productivity, high

refusal rates, incomplete forms, high error rates, etc. This performance monitoring process enabled immediate rectification of problems that occurred.

2.5 DATA COLLECTION PROCESS

The data collection process was divided into in manageable waves of 2000 to 3500 households per wave and each wave was executed in three steps. The three steps entailed:

- notification and recruitment;
- reminder; and
- retrieval.

Each of these steps is briefly described below.

2.5.1 Notification and Recruitment

NOTIFICATION LETTERS

Notification letters were prepared and sent to respondents a minimum of 7-10 days prior to their project recruitment call. The purpose of the notification letter was to inform respondents of the nature and purpose of the survey and to indicate the types of information to be collected and the benefits that would accrue from its successful completion. Two samples of the notification letters (one from the City of Calgary and the other from the Province), that were prepared in consultation with the client, are attached in Appendix B. These letters were produced on official City or Provincial (for the Region) letterhead and contained official signatures. They were laser printed and mailed to selected households.

Based on the response rate assumptions experienced during the pilot studies and the capacity that the Call Centre staff could manage weekly, the appropriate number of households were introduced into the system accordingly during each wave. For example, when the study was first initiated, only 2000 households were introduced per week (expected yield 350 to 500 completed surveys) but as the staff performance increased, we were able to increase that to 3000+ and to achieve 700 to 800 completions per week.

RECRUITMENT CALLS

Recruitment calls were placed to households that were sent a notification letter. Using the developed scripts as a guide, interviewers sought the complete participation of various households. Interviewers were visually and electronically monitored by supervisors and were asked to emphasize the intensive nature of the study as well as its overall benefit to the City. The typical time period of recruitment was from approximately 6:00 p.m. through 9:30 p.m., Monday through Friday evenings, and from 10:00 a.m. to 4:00 p.m. on Saturdays.

The project manager and project coordinators insured the constant retraining of data collection staff. The project coordinators coordinated with the data collection supervisors to ensure the timely delivery of notification letters to respondents, schedule interviewers, assign questionnaires to them, and monitor their performance.

The project coordinators and quality control supervisor implemented nightly verification and progress reporting to maintain the quality of the data collection, coding and entry processes, and conduct verification calls to a sample of respondents as required. Adjustments were made on a daily basis.

SURVEY PACKAGE MAIL-OUT

Successfully recruited households were requested to confirm their address, preferred call back times, designated contact person and general household information. The recruited households were then advanced in the database system and directed to have a random travel day assigned to them. At this point a mailing list of the recruited households was generated by the system and their personalized individual mail-out packages prepared. The project manager and the quality control supervisor conducted routine inspections of the mail out packages to insure completeness. A sample of the mail-out package is attached in Appendix A. Each mail out package included:

- Introduction Letter
- Personalized Household Memory Jogger Sheet
- Participant's Guide
- Example Survey Forms
- Household Information (Form A)
- Person Forms (Form B)
- Person Forms (Form C)
- Activity Diary Form (Form D)
- Travel Diary Form (Form E)
- 2000 City of Calgary Supplemental Building Directory booklet

In an effort to save costs, household survey packages were set up in three different sizes, each including a different number of activity and travel forms that were appropriate for different household sizes (number of people). A small, medium or large survey package was mailed to each household according to the information provided with respect to the number of people in their household at the time of our initial recruitment call. Although most of the household data was to be collected directly over the phone and the forms were required only for reference, some households preferred to submit their hard copy instead. Follow-up phone calls were often required to ensure the data was complete.

2.5.2 Reminder Calls

The project supervisor scheduled reminder calls the day before each households' assigned travel day based on respondents request for the most convenient call times. The

database system helped automate this function and ensured that anyone that needed to be contacted was recalled on the system accordingly.

During this contact opportunity, staff again addressed all survey-related questions, put participants at ease, and would encourage complete household participation. Up to four attempts were made to contact the participant, with messages being left on the third and fourth call.

2.5.3 Data Retrieval Calls

Interviewers were located at separate workstations, and were visually and electronically monitored by supervisors. As the interview progressed, interviewers directly recorded data on the survey forms set up on the computer systems. Forms were automatically reviewed by imbedded error checks and supervisors performed an overall sweep once a week to minimize accumulation of errors or repetition of common staff omissions. Any staff re-training was carried out as required. Up to nine attempts were made to reach each household. At that point, a message was left and households had the opportunity to call us back at their convenience, fax, or mail in their survey on paper. Although, this was not the preferred route, we wanted to provide all households equal chance to submit their information to maintain the truest representation of the population. Staff followed up with a clarification call if necessary with respect to surveys received on paper.

As the survey progressed, the number of calls was extended to 15 before expelling the household in cases where households were located in geographic districts where a lower response rate was being experienced. For example, the response rates for district 1, 2, 17 and 21 were more heavily targeted during the later stages of the survey. In Section 4.1.1, the final distribution of respondents by districts is illustrated in greater detail. The response rates by district are identified in Section 3.4 and illustrated by Exhibit 3.1.

During the latter stages of the survey, daytime data retrievals were also initiated. This offered a larger window to gather data from households. Many of the contact persons expressed that they could be reached during the daytime hours and this option was, therefore, implemented.

DATA ENTRY

Data entry was performed online while interview staff were speaking with respondents. During the data entry process, discrepancies, deficiencies and responses requiring clarification were identified by data entry personal based on the feedback provided by the data entry program. Survey forms requiring review were returned to the coding staff or data collection supervisors for correction, completion or callbacks.

RESPONSIVENESS TO LANGUAGES

In cases where respondents are encountered with language barriers, IBI Group staff members were prepared to manage households that required French, Taiwanese, Spanish, Mandarin, Cantonese, Ukrainian, Polish, and Malay. Efforts were made to involve households of different cultures in order to achieve higher levels of representation. Using the 1996 Federal Census as a reference point, which reported 15,060 non-english speakers in Calgary, the following major non-english language households were anticipated:

- Chinese (unspecified) 7,805,
- Punjabi –1,440,
- Vietnamese -1,270,
- Spanish – 670,
- Arabic 435,
- Polish- 355,
- Italian 310

Although non-English versions of the survey were not formally prepared, staff with related language skills offered to translate the survey for their respective languages on a as-needed basis. The results of the efforts to collect data from non-english speaking households are discussed in more detail in Section 4.1.2.

2.5.4 Data Checking Protocols and Callback Verifications

IBI Group drew on its survey and transport experience to provide a methodology designed to deliver the high standards of data reliability and accuracy required by this benchmark study. It was our intention to ensure that as little coding as possible was required for completed survey forms. That is, the survey forms should be sufficiently complete to ensure that there is little or no interpretation of the data required.

As completed surveys on paper (mailed or faxed in) were received, they were coded and given to the data entry staff who used the Access database input forms to record the data. If there were questions about the content of the forms, data entry staff referred the questions to the supervisor on hand who asked the originating data collection staff to confirm the content of the form. Follow-up with the participating respondent was done when required.

As discussed, the database was automated for address checking and matching. If a matched address was not found, follow-up with the participating respondent was done when required. The software checked each record for completeness, and performed certain range checks and logical checks on the data. Any errors identified by the software were reported for remedial action, which could include re-entry of data, a manual review of the survey form, or possibly a call-back to the respondent.

2.5.5 Geo-Coding Of Data

Following data entry and the initial round of error checking and editing, the geographic references were geo-coded in batch mode by accessing the City address database with IBI Group software. Previous City experience indicates that approximately 5% - 10% of the geographic references cannot be successfully coded on the first attempt. Unsuccessful attempts at geo-coding were reported, and returned to the coding team for rectification. In general, these errors were corrected through spelling revisions, correction of data entry errors, manual look-ups, and only in some instances callbacks were required.

2.5.6 Verification Calls

Coordinators and supervisors made verification calls to randomly selected households which had fully completed surveys, or which had refused participation. It is important that refusals be verified to insure both quality control and to investigate methods to increase responsiveness. Supervisors, along with project coordinators, verified that contact was made, and confirmed two or three responses on each form. It is estimated that 6-9% of completions and refusals were verified.

3.0 DATA COLLECTION PROCESS RESULTS & RESPONSE RATES

OBJECTIVE

The 2001 Household Activity Survey was targeted to capture 9,500 household data completions. These 9500 completions comprise of the following:

- 8400 City of Calgary Households
- 850 Regional Households
- 250 Banff and Canmore Households

The final retrieval results at the close of data retrievals is as follows:

	Target	**Collected**	**Surplus**
City of Calgary Households	8400	8545	145
Regional Households	850	943	93
Banff and Canmore Households	250	282	32
Total:	**9500**	**9770**	**270**

There were two interruptions that were part of the 2001 HAS data retrieval process. As a result the data was collected in three segments. The breakdown of household data based on the period in which they were collected is as follows:

	Fall 2000	**Spring 2001**	**Fall 2001**
City of Calgary Households	1234	685	6626
Regional Households	0	0	943
Banff and Canmore Households	0	0	282
Total:	**1234**	**685**	**7851**

3.1 NOTIFICATION

Based on the response rates obtained during the pilot studies, as well as the varying response rates for the Region that was experienced during the course of the survey, a projected sample set of households were obtained in order to achieve the required number of completed surveys. Where required, during the course of the study, the sample set was added to if initial data retrievals were not meeting expectations. For example, additional household samples had to be obtained for the region due to lower response rates. Additional City samples were also obtained in order to get additional households in target districts that were experiencing lower than average response rates. The initial projected samples required were based on a 25% response rate. As shown in Section 3.4 below, the response rates varied between the City and the Region, as well as between City districts.

In the end the following list shows the number of households that were sampled and the final number of households that were sent notification letters.

	Sampled	Notified
City of Calgary	43,000	35,596
Region	6,700	4,710
Banff & Canmore	2,902	2,139
Total:	**52,602**	**42,445**

3.2 RECRUITMENT

During the course of the study over 106,300 recruitment calls were placed which made led to 15,941 households agreeing to participate and having travel days assigned. On average, over 1030 recruitment calls were placed each day the Call Centre was in operation.

3.3 REMINDER CALLS

Over 27,750 reminder calls were placed during the study. The average number of reminder calls placed per day was 270. Several attempts would be made to reach households in person and failing that, a message would ultimately be left. On any given day, Monday through Sunday, there were on average 140 households assigned to travel. If the strike had not occurred, the average would have been higher, in the range of 175 households traveling per day.

3.4 DATA RETRIEVAL

Of the 15,941 households that were recruited 9770 households were successfully retrieved. The 9770 households represent complete data sets. Approximately 680 households had incomplete or missing data. This resulted in a drop off rate of approximately 38.7% from those recruited. Another ±2200 households had to be expelled either due to the Transit strike or due to the quota being met at the conclusion of this study. Accounting for these expelled households, the drop off rate dropped to approximately 25 to 28%, which was what was originally anticipated. Over 64,650 data retrieval calls were placed during the study period for an approximate average of 628 retrieval calls placed per day. Overall, on any given day, an average of 1928 calls (recruitment, reminder and retrieval) were placed.

Length of Data Retrieval Calls

Data retrieval call times were noted on a daily basis by our staff and the approximate average length of data retrieval calls per household was 35 to 40 minutes. Data retrieval calls ranged from approximately 5 minutes for single person households to 1 hour and 20 minutes for 6 to 9 person households.

3.5 RESPONSE RATE

In consideration of the greater length, detail, complexity and need for accuracy in this benchmark study, IBI and the City made allowances for a response rate in the 25% to 28% range. These rates were confirmed by the pilot studies. Some of the initial loss of households can be attributed to phone listings that were disconnected or inaccurate. Contact with many households were also never established due to a no answer situation or reaching only an answering machine. Due to a finite number of calls that could be placed to each household to avoid fixation on non-cooperative households, messages were left and the interviewers were instructed to move on.

The intensity and personal nature of the study was also another source of refusal to participate. Approximately 40% of households that we were able to contact refused to participate. Of the remaining 60% of households that were recruited, approximately 25% to 30% refused to participated after receipt of the study package. However, given the fact that this was a City endorsed study along with the growing traffic concerns in Calgary, those that did participate were usually very diligent in their activity tracking and were happy to contribute to the process.

The final response rates for the City, the Region and Banff and Canmore combined are given below. The response rate for the City was as expected from the Pilot Studies. The rates for the regional area and Banff/Canmore were significantly lower. In the case of households in the region, many felt less urgency to participate. In both the region and Banff/Canmore, the contact rate was much lower than anticipated. The lifestyle of households living in Banff and Canmore may also have been a contributory reason for the lower response rates.

Within the rates reflected below, the rates shown for the City also contain those households that were withdrawn from the survey due the Transit strike in the Spring of 2001. There were also many households that were not entered at the end of the study after an acceptable cushion to the required quota had been collected. Therefore, if those households were able to remain in the system, the final response rates would have been higher.

	Notified	**Recruited**	**Retrieved**	**Retrieval Rate**
City	35,596	13,706	8537	24.0%
Region	4,710	1,623	950	20.2%
Banff/Canmore	2,139	612	282	13.2%

RESPONSE RATES BY CITY DISTRICTS

Response rates varied by district within the City as is illustrated by Exhibit 3.1. This was detected in midstream of the project and efforts were made to increase the sampling and notification in these areas. Similar efforts were made with the regional component as well. Some gains in representation were achieved through our efforts. However, despite efforts to balance household responses for each district, based on the varying response rates, some areas within the City did not achieve their representative proportion based on population distribution. A more focussed sample draw could have been established but our sampling procedure was random across the entire city and this would have required a large additional draw to yield the necessary households.

Lower response rates in specific areas are not uncommon in surveys of this nature and, when within acceptable ranges, do not undermine the integrity of the data. As long as the expansion of the data account for these variations, the data collected will offer a solid foundation for transportation modelling.

3.6 GEO-CODING

As understood at the start of this survey, there would be locations within the City that may not be matched to the address and geo-code information provided by the City. This was also true for all locations within the region as the geo-code data was not provided for regional home and business addresses. In the end approximately 5240 distinct locations had to be geo-coded manually by our staff. The majority of these addresses were for the home and business locations derived from the regional households that were surveyed. In addition, with the addition of the regional area, any trips made by Calgary households into the region, needed to be geo-coded as well. The last of the addresses that had to be manually geo-coded were addresses within the City that were not geo-coded on the dataset received from the City at the inception of this study.

3.7 TRANSIT STRIKE

During the Spring 2001 data collection period, a City transit strike had occurred and this resulted in the interruption and postponement of the HAS survey process until the strike was resolved. Subsequently, the final leg of the survey was completed in the fall of 2001. During the Spring 2001 collection period, activity data was collected from 685 households, all of which had a travel day occurring during the strike. This included eleven days between March 1st and March 11th, 2001. The duration of the data collection during the strike period and the eventual shutdown was executed as discussed and agreed to by City staff.

The City had requested that IBI Group continue with the retrieval process and special scripts were developed for the call centre staff in order to deal with the strike situation, which at that time was anticipated to be short. However, once it became evident the strike would not be resolved quickly, the study was postponed. A significant amount of time and resources had already been invested to generate the momentum and pool of households into the collection process. Typically, households are first contacted over three to four weeks prior to their assigned travel day. All households that had already been assigned a travel day were allowed to complete the survey, while all recruited but unassigned households were told of the temporary cancellation. A major build-up of work was lost due to the transit strike.

The travel component of the household activity data collected during the strike will not provide a clear foundation to model travel behaviours, as transit had been eliminated as a commuting option. Socio-economic information will remain comparable and the activity data may be useful for other purposes not directly related to transportation modelling, or for the purposes of detecting the impacts of a transit strike on travel behaviour. The integration of travel data from the 685 households noted above into future transportation modelling does not provide a complete assessment of travel behaviour during normal conditions.

4.0 SURVEY DATA RESULTS

All data results below reflect all data collected and unless otherwise indicated, the survey data represents a conglomerate of City and Regional households.

4.1 OVERALL SUMMARY OF DATA COLLECTED

The table below highlights the overall results of the survey. Total persons, travel persons, activities, and trips have all been listed. The information provided in this report may not be consistent with previously reported data for earlier stages of the study. As the final leg of the study was completed, a thorough sweep of the entire data set was undertaken, which would have corrected any errors not previously detected. Any such errors have been updated and reflected in this final report.

Summary of Household Activity Survey Results
All Households: City and Region

	City Pilot I	City Pilot II	Winter 00	Spring 01	Fall 01	Complete
Number of Households	44	13	1234	685	7851	9770
Number of Persons	112	29	3289	1775	20145	25209
Number of Travel Persons			3181	1701	19576	24458
Number of Activities	1325	500	47294	25510	297155	369959
Number of Trips	371	135	13253	6949	79162	99364
Persons per Household	2.5	2.2	2.67	2.59	2.57	2.58
Travel Persons per HH			2.58	2.48	2.49	2.50
Activities per Household	30.1	38.5	38.33	37.24	37.85	37.87
Trips per Household	8.4	10.4	10.74	10.14	10.08	10.17
Vehicles per Household			1.84	1.73	1.77	1.77

The table below show the overall results for the City and the Regional area separately.

Summary of Household Activity Survey Results

	Calgary	Region	Calgary & Region
Number of Households	8545	1225	9770
Number of Persons	21802	3407	25209
Number of Travel Persons	21146	3312	24458
Number of Activities	322128	47831	369959
Number of Trips	87640	11724	99364
Persons per Household	2.55	2.78	2.58
Travel Persons per HH	2.47	2.70	2.50
Activities per Household	37.70	39.05	37.87
Trips per Household	10.26	9.57	10.17
Vehicles per Household	1.74	2.00	1.77

4.1.1 Spatial Distribution

Part of the aim of the 2001 HAS was to capture completions distributed equally across the City and the 33 Transportation districts. In order to effectively monitor the level of representation achieved, a test of spatial distribution was conducted at various points during the data collection. The geographic distribution of all responding households was compared to the 2001 Municipal City census data.

As detailed in Exhibit 4.1, the 2001 HAS surveys show some minor discrepancies to established distributions of dwellings. The resulting data retrieval distribution is slightly off in some areas as identified on Exhibit 4.1. The red areas indicate districts where response rates are low. Overall, the distribution of household completions is fairly close to the dwelling distributions. A few exceptions include higher rates in the south, and lower rates in the central and northeast sectors.

Sector traffic conditions are believed to be one of the key factors in this weighting. It is speculated that the cause of this discrepancy comes from individuals self-selecting at the recruitment stage. Apparently, due to the perceived transportation bottleneck of the south sector, individuals commonly expressed a greater desire to participate in a program that could assist The City in ameliorating traffic difficulties.

The northeast may be under-represented due to socio-economic conditions. As discovered by the two original pilot studies, low-income and ethnic households may be less likely to participate due to time-constraints and language barriers. However, staff were versed in numerous languages, and efforts were made to balance the representation across the City.

By utilizing a digital map provided by the Forecasting Division, spatial representation checks were conducted. These checks were updated bi-weekly and provided the basis for targeted recruitment efforts. As part of the ongoing process, we reviewed the response rate by transportation district and made adjustments to the selection method to increase the records from districts with significantly lower response rates. We attempted to maintain a representative citywide sample during the survey process to avoid heavy concentrations in a particular area. At the conclusion of the survey however, several districts remained under-reported due to their low response rates.

Similar to Exhibit 4.1, Exhibit 4.2 illustrates the distribution of surveyed households based on the regional transportation districts. The population distribution is shown in black while the surveyed distribution is shown in white. The ratio below shows the number of retrieved households over the target households (based on a quota of 850). 950 completed surveys were retrieved in the region.

In addition, residents of Banff and Canmore were also asked to participate in the survey. The target completions for both Banff and Canmore was 250. 282 households were retrieved and although specific targets for Banff and Canmore were not individually requested, it was hoped that retrieval rates would reflect the population relationship

between the two centers. However, based on the low response rates for Banff residents (as discussed in Section 3.5), retrievals in Banff did not achieve the preferred number of 99 households. Only 76 Banff households were retrieved and 206 Canmore households were retrieved based on a target of 151.

4.1.2 Management of Households with Language Barriers

In an effort to offer proper representation of all socio-ethnic groups, language skills were made available at the Call Centre to retrieve data from various non-English speaking households. In many cases, an English speaking family member (18 and over) was available and served as the translation medium. However, in the cases where an English speaking family member was not available, we made note of the language needs and arranged a follow-up call with one of our foreign language staff.

Although certain language skills were initially anticipated, as those listed in Section 2.5.3, the list below shows language skills (and the number that were successfully retrieved using a foreign language) that were actually needed to collect household data. In total, 58 household activity data were collected using a non-English language.

- Cantonese (33)
- Korean (4)
- Spanish (2)
- Vietnamese (8)
- Romanian (2)
- Italian (1)
- Hindi (2)
- French (2)
- Japanese (4)

4.2 HOUSEHOLD SIZE DISTRIBUTION

Comparision by Household Size										
HH SIZE	Adjusted 1999 T/W %	Winter 2000 Collection	Winter 2000 %	Sping 2001 Collection	Spring 2001 %	Fall 2001 Collection	Fall 2001 %	Project Total Retrieved	Project Total %	Variation with Adj. 1999 T/W survey
1	22.9%	227	18.4%	148	21.6%	1605	20.4%	**1980**	**20.3%**	***-2.6%***
2	33.2%	448	36.3%	254	37.1%	2976	37.9%	**3678**	**37.6%**	***4.4%***
3	16.8%	210	17.0%	103	15.0%	1269	16.2%	**1582**	**16.2%**	***-0.6%***
4	17.4%	255	20.7%	115	16.8%	1425	18.2%	**1795**	**18.4%**	***1.0%***
5	6.7%	63	5.1%	45	6.6%	429	5.5%	**537**	**5.5%**	***-1.2%***
6	2.1%	22	1.8%	16	2.3%	115	1.5%	**153**	**1.6%**	***-0.5%***
7	0.6%	6	0.5%	3	0.4%	18	0.2%	**27**	**0.3%**	***-0.3%***
8	0.2%	1	0.1%	1	0.1%	10	0.1%	**12**	**0.1%**	***-0.1%***
9	0.1%	1	0.1%	null	null	2	0.0%	**3**	**0.0%**	***-0.1%***
10	null	1	0.1%	null	null	null	null	**1**	**0.0%**	***null***
11	null	null	null	null	null	2	0.0%	**2**	**0.0%**	***null***
Blank	null	null	null	null	null	null	null	**null**	**null**	***null***
	100.0%	1234	100.0%	685	100.0%	7851	100.0%	**9770**	**100.0%**	***0.0%***

Overall completions need to be representative of the known household size characteristics. To confirm that a representative sampling was collected, a test of the data was conducted on an on-going basis. The final set of responses was compared to accepted City standards (the *1999 Travel to Work* data). As detailed in the table above, household size comparisons are well representative of the city's characteristics. In the table that follows, the surveyed household size distribution is separated by the City and the Region.

Distribution of Households by Size for Calgary and the Region						
		Calgary			Region	
HH SIZE	Adjusted 1999 T/W %	Project Total Retrieved	Project Total %	Variation with Adj. 1999 T/W survey	Project Total Retrieved	Project Total %
1	22.9%	**1793**	**21.0%**	***-1.9%***	**187**	**15.3%**
2	33.2%	**3240**	**37.9%**	***4.7%***	**438**	**35.8%**
3	16.8%	**1376**	**16.1%**	***-0.7%***	**206**	**16.8%**
4	17.4%	**1515**	**17.7%**	***0.3%***	**280**	**22.9%**
5	6.7%	**452**	**5.3%**	***-1.4%***	**85**	**6.9%**
6	2.1%	**128**	**1.5%**	***-0.6%***	**25**	**2.0%**
7	0.6%	**25**	**0.3%**	***-0.3%***	**2**	**0.2%**
8	0.2%	**11**	**0.1%**	***-0.1%***	**1**	**0.1%**
9	0.1%	**2**	**0.0%**	***-0.1%***	**1**	**0.1%**
10	null	**1**	**0.0%**	***null***	**0**	**0.0%**
11	null	**2**	**0.0%**	***null***	**0**	**0.0%**
Blank	null	**null**	**null**	***null***	**null**	**null**
	100.0%	**8545**	**100.0%**	***0.0%***	**1225**	**100.0%**

The overall fielding results were consistent with the high standard of results achieved in the winter and spring fielding. Considering the respondent burden that such an intensive survey has on large families, the close correlation of the 2001 HAS data to accepted standards generates confidence in the data collected. Both initial pilot studies reported that large families were less likely to complete such a detailed survey. Notably, the 2001 HAS average persons per household of 2.58 is significantly closer to actual household size (2.635 based on 2001 Municipal Census) then the results from the first and second pilot tests (2.5 and 2.2 persons per household respectively).

4.3 AGE DISTRIBUTION

At the request of The City, the survey completions were also examined for age characteristics. Several attempts were made to address groups identified by the pilot studies as less likely to participate. These attempts include scripted encouragements at the recruitment and reminder stages, and utilizing interviewers of roughly similar age to the respondent. These attempts have achieved improved results (over the pilot studies), and responses from individuals between 15-35 remain only slight lower than hoped. As shown in the tables below, the survey fielding does show some minor variations from the population in the teenager and young adult ranges but an encouraging response from individuals over 55.

Age Distribution of all Surveyed Households (Calgary and Region)

Age Distribution	# of All Respondents	2001 Civic Census %	% of All Respondents	Variation
<14	4,847	19.10%	**19.82%**	0.72%
15 - 24	2,628	14.50%	**10.74%**	-3.76%
25 - 34	3,093	16.77%	**12.65%**	-4.12%
35 - 54	9,010	33.51%	**36.84%**	3.33%
55 - 64	2,632	7.12%	**10.76%**	3.64%
65+	2,248	9.00%	**9.19%**	0.19%
TOTAL	**24,458**	100%	**100%**	

Age Distribution of all Surveyed Households (Separated by Calgary and Region)

Age Distribution	# of All Calgary Respondents	% of All Calgary Respondents	2001 Civic Census %	Variation	# of All Regional Respondents	% of All Regional Respondents
<14	4063	**19.21%**	19.10%	0.11%	784	**23.67%**
15 - 24	2299	**10.87%**	14.50%	-3.63%	329	**9.93%**
25 - 34	2682	**12.68%**	16.77%	-4.08%	411	**12.41%**
35 - 54	7734	**36.57%**	33.51%	3.07%	1276	**38.53%**
55 - 64	2300	**10.88%**	7.12%	3.75%	332	**10.02%**
65+	2068	**9.78%**	9.00%	0.78%	180	**5.43%**
TOTAL	**21,146**	**100%**	100%		**3,312**	**100%**

The slightly lower response rates for the 15 to 34 age group can be partly attributed to the fact that response rates in District 01 and 02 were low, as indicated in Exhibit 3.1, where the majority of the population are young urban professionals that fall into this age bracket. For example, 36.17% and 50.03% of the population in District 1 and 2,

respectively, fall within this age bracket. This is compared to the City total of 31.27% that fall within this age bracket.

Overall, the indicators that have been tracked suggest that the survey data that has been gathered is in line with what was expected, and should be representative of the City's population and their respective transportation and movement behaviours.

4.4 INCOME

Income Distribution for All Households and by Calgary & Region

Household Income	Total Responses (All)	%	Calgary Total Responses	%	Region Total Responses	%
<25,000	500	5.12%	455	5.32%	45	3.67%
25,000 - 35,000	688	7.04%	317	3.71%	78	6.37%
35,000 - 45,000	722	7.39%	570	6.67%	37	3.02%
45,000 - 55,000	801	8.20%	282	3.30%	91	7.43%
55,000 - 65,000	797	8.16%	597	6.99%	97	7.92%
65,000 - 75,000	734	7.51%	625	7.31%	120	9.80%
75,000 - 100,000	1165	11.92%	681	7.97%	105	8.57%
100,000 - 125,000	648	6.63%	692	8.10%	120	9.80%
125,000 - 150,000	319	3.27%	614	7.19%	150	12.24%
>150,000	345	3.53%	1015	11.88%	28	2.29%
Total Provided	**6719**	**68.77%**	**5848**	**68.44%**	**871**	**71.10%**
Refused to provide	3051	31.23%	2697	31.56%	354	28.90%
Grand Total	**9770**	**100.00%**	**8545**	**100.00%**	**1225**	**100.00%**

An important indicator of the survey process is often the response rate to income questions. This response is often used to gauge how successfully the survey is at extracting detailed personal information.

The winter fielding delivered an impressive 52.6% response rate. The spring fielding offered a 70% response rate to income information. The total fielding yielded 68.77% response rate. The table above highlights the distribution of household income ranges for households with completed surveys. The survey staff were diligent in collecting all requested information fields, and the response rates to income information is indicative of their success in collecting personal information. More importantly, the income distribution of completed households, show an excellent sample across all income ranges. Income data is not available from the Municipal Census and the 2001 federal census figures are not yet available and, therefore, have not be compared here.

4.5 DAY OF WEEK TRAVEL

	Distribution for All Surveyed Households based on Day of Week Travelled									
	Sun	**Mon**	**Tues**	**Wed**	**Thurs**	**Fri**	**Sat**	**TOTAL**	**Week end**	**Week day**
Households	**1240**	**1396**	**1574**	**1527**	**1341**	**1424**	**1268**	**9770**	**2508**	**7262**
% of Total	12.69%	14.29%	16.11%	15.63%	13.73%	14.58%	12.98%		25.67%	74.33%
Calgary	**1009**	**1271**	**1399**	**1397**	**1212**	**1253**	**1004**	**8545**	**2013**	**6532**
% of Total	11.81%	14.87%	16.37%	16.35%	14.18%	14.66%	11.75%		23.56%	76.44%
Regional	**231**	**125**	**175**	**130**	**129**	**171**	**264**	**1225**	**495**	**730**
% of Total	18.86%	10.20%	14.29%	10.61%	10.53%	13.96%	21.55%		40.41%	59.59%

The table above provides a breakdown of all households surveyed based on the day of the week on which they travelled. The breakdowns are shown for all households surveyed as well as by only those in Calgary and in the region around Calgary.

5.0 DATA TRANSFER & SUMMARY

A series of delimited text files have been assembled that represent a summary of all the survey information collected. These files are included on the CD-ROM attached to this document. Appendix C lists and identifies the contents of each file. Critical household, travel and activity information, locations of homes and businesses are attached and linked via household identifier numbers only.

This CD contains extremely valuable information and should be carefully used and is a wealth of information. It should be a benefit to future transportation modeling and funding allocation in Calgary.

Also on the CD is a copy of the database management software that was developed by IBI Group. The interface program was developed using MS Access 2000 and will require the current version of MS Access to open the file. The program contained on the CD is the actual program that was used to collect the data and illustrates the interface and forms that were used.

This purpose of this study was to obtain household travel information as well as activity information, for updating the City's transportation forecasting model, as well as provide the ground data for pioneering transportation and land use modeling. Significant efforts and protocols were executed to ensure that the dataset is accurate, concise and as representative as possible within the confines of the sample size that was prescribed by the client. While there are some limitations under which this data was collected, this data will nonetheless, offer a solid foundation upon which to model transportation and activity behaviour within the City of Calgary and immediate region.