

The Technical Scope of the Auckland Household Travel Surveys (extracted from the tender documents)

SECTION C – SCOPE OF SERVICES

1. Scope

1.1 General Background

The ATM2 Project is a joint study undertaken by the Auckland Regional Council (ARC) and Land Transport New Zealand (Land Transport NZ) assisted by Auckland Regional Transport Authority (ARTA), Transit and the Auckland Territorial Authorities (TA's).

The success of this ATM2 project is directly dependent on the quality of the survey information used. The goal of this survey project is to provide accurate, relevant and reliable survey data from the Household Survey for inclusion in the ATM2 Project. The data falls into two specific categories:

1. Household Travel Survey
2. Public Transport Intercept Survey

The Public Transport Intercept Survey is expected be tendered early in 2006 and is not part of this RFT.

1.2 Overall Scope of Household Survey

This section sets out the scope of work for the intended Auckland Household Travel Survey for 2006 (AHTS2006). The aim of the AHTS2006 is to collect information on the trip making behaviour of residents of the region, for use in the development of new Auckland regional transport and land use models.

The scope of work for the agency would encompass:

questionnaires: the content, questions and coding frame would be specified by the ATM2 Project Team and the agency would comment on these specifications and agree the final version and would design the layout and print the questionnaires;

- selection of the sample;
- pilot survey;
- execution of the main survey;
- implementation of quality control to achieve the sample data quality targets;
- coding and editing the data, including geocoding of addresses;
- provision of a survey report and other deliverables.

1.3 Background

This survey is being conducted as part of an overall project, the Auckland Transport Models (ATM2) project, to develop new transportation and land use models for the Auckland Regional

Council. The new models will be known as the Auckland Regional Transport (ART3) model and the Auckland Strategic Planning (ASP3) model.

The specific objectives of the ATM2 project are:

- to update the transportation model in a timely and cost effective manner
- to ensure the satisfactory calibration of the model to 2006 Census of Population information
- to prepare forecast models for future years
- to ensure that the model development work receives approval from a Transfund New Zealand appointed Peer Reviewer
- to provide full documentation with respect to the modelling
- to ensure training and familiarity of Council staff in the use of the re-calibrated model.

The specific objectives of AHTS2006 are:

- to collect household, person and trip information to enable recalibration of the transport model (ART3);
- to collect sufficient information on public transport trips to enable the development of a reasonable OD matrix;
- to collect information on commercial vehicle and business trips made by members of the selected households;
- to expand the sample data so as to represent the population as described by the 2006 Census;

1.4 Type of survey

A self-completion questionnaire is the currently preferred option.

The method described below is preferred for reasons of cost-effectiveness, maximum response rate, minimal respondent burden, and acceptable quality of data. However, if the survey agency believes that a variation on this survey design could collect the required data in a more cost-effective manner, without compromising the quality of the data, they should outline the technique in their response, providing information on the cost savings achieved and on the effects of these changes on data quality.

To maximise response rates, it is suggested that the questionnaires be hand-delivered to households and hand-collected from households. At the initial contact, interviewers will obtain some very brief information, including telephone number, to assist in the conduct of the survey. The day before the Travel Day, each household for which a phone number is available will be phoned to check that they received the surveys, answer any questions about the survey and to remind them that their Travel Day is tomorrow. When the questionnaires are collected, the interviewer can answer any questions that the household had in the completion of the surveys and will perform an initial check of the data provided on the questionnaires (particularly checking that the correct number of Travel Diaries have been returned). After collection of the questionnaires, households may again be phoned to clarify any doubtful or missing information on their questionnaires (and to thank them for participating in the survey).

In the week before the delivery of the questionnaires, the sampled households will receive a Pre-Contact Letter on ARC letterhead paper, notifying them that they have been selected in the sample, explaining briefly what the survey is about and letting them know that their survey materials will be delivered later that week. Exactly how the list of sampled households will be constructed will depend on the type of sample frame selected for the survey. The Pre-Contact Letter delivery will be performed on a weekday in the week preceding the delivery of the questionnaires.

All deliveries and collections of questionnaires will be performed on weekends. Interviewers will make up to three attempts to reach households to undertake a personal delivery of the survey forms, with a minimum time between each attempted contact to maximise the chance of contact. If personal contact has not been made after the third attempt, the questionnaire materials will be left at the household with an explanatory postcard. If contact is made, it will be suggested to respondents that they leave their completed forms in a specified location on the following weekend to enable simplified collection. While personal contact at pickup is sometimes useful, it is not as essential as personal contact at delivery. Asking respondents to leave their completed forms in a specified place increases the chances that their completed forms will be picked up on the day, and not have to be returned in a reply-paid envelope that would otherwise be left at the household.

On the weekend after the Travel Day, interviewers will make up to two attempts to reach households to pick-up the survey forms. Again, there will be a minimum time between each attempted contact to maximise the chance of contact. The interviewer will first look in the nominated location for where the completed forms were planned to be left. If the completed forms are not found and it personal contact has not been made after the second attempt, the interviewer will leave an explanatory note with the household with a stamped self-addressed envelope for return of the completed survey forms.

A toll-free phone number will be established in the survey office for enquiries by respondents during the course of the survey.

1.5 Survey study area

The Survey Study Area will cover the same area as that of the new transport model, ART3. This area is not yet finally determined, but will be at least the same as the study area for the existing ART model. This includes the whole of Auckland, North Shore and Waitakere Cities, the urban areas of Manukau City, the whole of Papakura District, and parts of Rodney (in the northwest and the Hibiscus Coast). The boundaries are Hatfields Beach (north of Orewa) in the north, State Highway 17, Riverhead and Waimakau in the northwest, and Maraetai in the southeast and the Papakura boundary in the south.

Possible extensions to this for the new model include: to Warkworth, Coatsville, to Helensville, to Pukekohe, and the Bombay area. Decisions on these are expected early in 2006.

The TA areas could be used for sample stratification and possible sub-areas within these include:

- Rodney: Hibiscus Coast and elsewhere (dependent on any study area extensions)
- North Shore: north and south of Constellation Drive;
- Waitakere City: north and south of Henderson;
- Manukau City: Howick/Pakuranga, East Tamaki/Flat Bush, Mangere/Papatoetoe/Manurewa

Franklin is not within the current ART model area, so sample requirements for this are dependent on whether parts are included for ART3.

1.6 Survey period

The preliminary planning phase for the AHTS2006 started in November 2005. The draft final design will be completed in December 2005. The survey agency will be appointed in early-February 2006. The Pilot Survey will be conducted in early-April 2006. The main survey will commence on May 1, 2006 and will be completed no later than October 20, 2006. There will be breaks from surveying during school holidays and, preferably, during university student holidays and exam periods. However, the influence of university holidays on overall travel patterns should be considered before deciding to suspend surveying during university holidays.

1.7 Sample selection & size

Quotations are required for a sample of 6,000 responding households. Tenderers should note that a rate for additional surveys and supporting processes is required in the Additional Services Schedule.

A responding household is defined as:

- at least 50% of travel diaries provided;
- no missing data on Key Items of information. These Key Items are defined in the Executive Summary of Attachment A for household, person and travel data;
- no more than 10% of missing responses for all variables other than those defined as Key Items and for this test missing diaries are not counted.

Across the entire sample of households, there shall be:

- no more than 5% of diaries missing from members of households;
- no more than 10% of diaries missing from members of households in any one of the sampling regions identified below (this allows for differential, but not excessive, non-response in any one region);
- no missing data on Key Items of information. These Key Items are defined in the Executive Summary of Attachment A for household, person and travel data;
- no more than 3% of missing responses for all variables other than those defined as Key Items (except for the personal income question where 15% missing data will be regarded as a maximum).

The survey agency should advise on the level of quality control checks they will use to ensure the veracity of data collected in the field by interviewers.

Independent, random audit checks will be conducted by the ATM2 Project Team with responding households.

A random household sample is required, with stratification by geographic area (sub-divisions of territorial local authorities). A description of the current ART study area and possible extensions to it for the new transport model are given above, as are some suggested possible sub-areas for geographic stratification.

The number of households sampled in each of sub-area will be a compromise between equal household sampling rate and equal household sample size in each region. Additionally, because of the hand-delivery and hand-pickup of surveys, it may be efficient to use a geographically clustered sample design (based on Census meshblocks) to reduce the costs of survey delivery and pickup, with no more than 20 randomly selected households per cluster.

The Travel Day for households will be equally divided within each of the sub-regions across the five weekdays (Monday-Friday). As described below, special arrangements may be made for the collection of data on weekend travel.

Advice is sought from agencies on the details of their approach to sample selection, specifically including details of the sample frame they would use for selection of the households. Potential sample biases should be discussed.

If the survey agency believes that a variation on this sample design and on the definition of responding households could collect the required data in an more cost-effective manner, without compromising the quality of the data collected, they should outline the technique in their response, providing information on the cost savings achieved and on the effects of these changes on data quality.

1.8 Travel diaries

The AHTS2006 will be conducted as a survey of households. Household and vehicle data will be collected for the household. Person data will be collected for all persons resident in the household (including visitors on the night before the Travel Day), while travel data will be collected for all persons normally resident in the household (excluding visitors and children younger than 5 years of age).

In order to collect information about travel on weekends, without sacrificing data on weekday travel, those households selected for a Friday or a Monday Travel Day may also be asked to provide travel data for the adjacent weekend day. Thus 60% of the sample would provide travel data for one day, while 40% of the sample would provide travel data for two consecutive days. The survey agency is asked to comment on the viability of this proposal, including its effect on respondent burden, overall response rates and the cost of the survey.

Travel information will be collected in the context of the activities to which respondents are travelling, i.e. respondents will be asked about the next activity they undertook, and then about how they got to that activity. A draft of such questions will be provided to the survey agency by SKM on the signing of contracts to undertake the survey.

Travel details will be collected at the level of the trip stage (where a stage is a single-purpose, single-mode segment of travel). The ATM2 Project Team will be responsible for using established procedures for combining trip stages into trips, journeys and chains.

Travel data will be obtained using the “announce-in-advance” technique, whereby respondents are contacted in advance of the Travel Day on which they are to record their travel behaviour. For households completing two-day diaries, the two-day diary will be delivered in advance of the first of the travel days.

Questionnaires will only be printed in English. However, an information sheet should be produced in the major foreign languages in the region explaining what the survey is about and providing a

phone number for respondents to call if they are having language problems. This information sheet should be distributed with the Pre-Contact Letter. Interviewers with specific language skills should be recruited and assigned to work in areas where it might be expected (from an analysis of Census data) that they would be needed for deliveries and collections.

1.9 Supplementary Travel Information

While household travel surveys are very good at collecting data on the broad spectrum of travel made by typical households, they are not ideal for collecting data on relatively “rare” travel behaviour. In the context of daily travel, such rare behaviour would include trips by public transport, heavy commercial vehicles and bicycle.

Additional data on these important but rare trips will therefore need to be collected by other means. In addition, there is a desire to collect extra information for land use modelling.

For public transport trips, no special attempts will be made within the household travel survey to gather extra information. Rather, extra information on public transport trips will be gathered by means of an intercept survey of public transport travel.

For commercial vehicle trips, no special attempts will be made to collect data about trips made in medium and heavy CVs, since a separate Commercial Vehicle Survey will be conducted which will pick up information about these trips. The HTS will collect data about trips made during the course of work in cars, vans and utilities. This has been shown to be feasible in similar previous surveys.

For bicycle trip data and land-use data questions about residential and employment mobility, two options are available for the collection of extra data. Firstly, extra questions (or a set of separate questions) could be included as part of the household travel survey, but directed towards those to whom they apply. The problem with this approach is that the extra questions directed towards a minority can make the survey appear overly complex to the majority (to whom the questions don’t actually apply). This can have the effect of reducing the overall response rate, so that the extra questions result in less, rather than more, data being collected in total. Even if care is taken to explain that these extra questions don’t apply to everyone, one needs to realise that most respondents do not read instructions in detail, and base their judgements of complexity on their first impressions.

An alternative approach is to include some questions in the survey that help identify those members of the population of interest (e.g. a question on bicycle ownership to identify cyclists, and a question about duration of living at current address to identify the transient population). After the main survey is completed, a sample of these populations is selected from the respondents, and a specific follow-up survey (on cycling or residential and employment mobility) is then conducted with the selected population. This follow-up survey should be conducted as soon as possible after the main survey. This approach has the advantage of targeting the specific population in question, without discouraging the rest of the population from responding to the main survey. The survey technique chosen for the follow-up survey will depend on the number and complexity of the questions that are required to be answered. If the follow-up survey is relatively simple, then a telephone survey may be appropriate. If the questions are more numerous and complex, then a self-completion questionnaire survey may again be required.

1.10 Questionnaire content & design

The AHTS2006 will obtain data from four perspectives for each household; household information, vehicle information, person information and travel information. Based on a review of previous

surveys, and bearing in mind the data needs for the new ATM2, it is anticipated that the following data items may be required. Note that *italics* below indicates that this item is not considered essential for modelling purposes and may be dropped in the final design.

The background to the following draft list (which will be finalised over the next few months), with more details on possible categories and usage of the data, is given in the draft report on Questionnaire Content attached as Attachment A.

Household data

- *Dwelling Type*
- *Dwelling Ownership*
- Household Size
- Contact phone number
- Number of vehicles/bicycles
- *Ownership status of home*
- *Length of time at current address*

Data for each household vehicle

- *Vehicle type*
- *Year of manufacture*
- *Vehicle make*
- *Vehicle model*
- *Number of cylinders*
- *Type of fuel*
- *Private or company ownership*
- *Current odometer reading*
- *Availability for use on travel day*
- *Main driver*
- *Employer subsidies on ownership, use and parking*

Data for each person in the household

- Relationship to oldest person in household
- Sex
- Age
- Resident or Visitor
- *Country of Birth*
- *Primary Language Spoken*
- Work/Study status
- Other activity status
- Licence holding status
- Personal income
- *Modes excluded through impairment/disability*

- *ARTA attitudinal questions*
- *Willingness to participate in follow-up study*

Data for each Employee in Household

- Employment status
- *Occupation*
- *Employer type*
- *Work times*
- *Work address (to simplify geocoding)*
- *Employer car subsidies*
- *Car Sharing as driver/passenger*
- *Workplace choice*

Data for each Student in Household

- Study status
- *Study address (to simplify geocoding)*
- *Car Sharing as driver/passenger*

Trip stage data for every trip stage on the travel day(s)

- Where was Travel Day started
- Reason if no trips were made on Travel Day
- *When was last trip made (if no travel on Travel Day)*
- Time of starting each trip stage
- Type of place at end of trip stage
- Destination location (full address or landmark name)
- Reason for trip stage
- *Who else in household travelled with respondent*
- Mode of transport on trip stage
- If trip made by private vehicle:
 - Vehicle used
 - Occupants in vehicle
 - Type of car parking
 - Was a parking fee paid, and by whom
- If trip made by public transport:
 - Type of ticket used
- Time of arrival at each destination
- *Captivity to modes*

The survey agency will be provided with a complete draft questionnaire incorporating all of the above questions on the signing of contracts to undertake the survey. The survey agency will be responsible for checking the wording of questions and response categories to ensure compatibility with common NZ usage of terms. They will also be responsible for the final layout and format of

the questionnaires. Final approval of questionnaire design rests with the ATM2 Project Team, after which the survey agency will be responsible for the printing of the questionnaires.

1.11 Pilot Survey

It is anticipated that a Pilot Survey will be conducted for the equivalent of one full day of the main survey to ensure that all survey operations have been tested under anticipated workload conditions. This means that the size of the Pilot Survey will be approximately 150 responding households. The survey will be pilot tested in early-April 2006. The pilot survey will test all aspects of the final survey, and will not be confined simply to a test of the questionnaire design. If significant changes are not made to the survey methodology after conduct of the Pilot Survey, it may be possible to add the responses obtained in the Pilot Survey to the main survey data set.

1.12 Coding and editing

Data will be entered into relational databases, using a unique ID number to link the household, person, vehicle and trip stage databases. Where possible (for example, occupation and personal income), data will be coded using codes that enable easy comparison with other databases (such as the NZ Census).

All destination locations will be geo-coded to x-y coordinates. Given the vital importance of the accuracy of the geo-coded data to the subsequent construction of the models, the quality of geo-coding must be high. An example of an acceptable level of detail in geo-coding is provided in Attachment B, based on the geo-coding methods employed in the recent Melbourne Area Travel Survey (MATS). If necessary for privacy reasons, all household locations must be randomised within 100 metres (but staying within the same meshblock) before the data is handed over to the Project Team at the end of the project. The survey agency must retain an equivalency table of the randomised locations, so that actual locations can be retrieved if necessary, until instructed to discard the equivalency table at the end of the project by the Project Team.

Agencies are asked to provide details of their geocoding capabilities, in line with the methods outlined in Attachment B, including their ability to geo-code locations for which a complete address is not provided, but a landmark name is provided (e.g. the name of a shop, a school, a public building, a transport terminal, a restaurant/café and other similar locations).

As outlined in Attachment B, all geo-coded locations must have a supplementary code attached, indicating the type of geo-coding method used to obtain the x-y coordinate. This will serve as an indicator of the quality of geo-coding processes.

The survey agency need only code all destination locations to x-y coordinates. The ATM2 Project Team will be responsible for the conversion of the x-y coordinates to any required zoning system (such as meshblocks, traffic zones etc).

The data entry programs will contain sufficient range and logic checks to ensure the integrity of the data. A list of possible range and logic checks is attached as Attachment C, but the agency will be required to submit a complete list which is tailored to the final survey design for AHTS2006. Agencies should note the specific requirement to identify and, if appropriate, correct outliers on calculated speeds (by mode of travel).

Missing data will be coded in a consistent manner (e.g. -1 for missing data, -2 for not applicable) to clearly distinguish missing data from fields with valid zeroes (e.g. number of cars in household).

No blank fields should exist in the final databases. Instead, fields intentionally left without a data entry should have a distinguishing code (e.g. -3).

1.13 Data management and control

Full records should be kept of all administrative procedures employed in the survey (e.g. allocation of sample to interviewers, results of contacts with households, receipt of completed surveys etc.) to ensure that information on response rates and other aspects of survey quality can be calculated and reported on an ongoing basis.

The survey agency will provide a weekly progress report to the Project Team, summarising the procedural results obtained to-date (e.g. delivery rates, pickup rates, response rates) and highlighting any problems encountered with field operations. Progress reports will be due by close of business on the Monday of each week during the survey period.

In addition, the survey agency will provide to the Project Team weekly downloads of data collected to date, to enable their own audit checks on data quality to be undertaken. Data downloads will be due by close of business on the Monday of each week during the survey period.

1.14 Data for expansion

The sample data from AHTS2006 will be expanded to population estimates using data from the 2006 NZ Census. Expansion will be done using common household and person variables in the Census and AHTS2006. While the Project Team will perform the actual expansion, the survey agency is responsible for interacting with the Team during the design of the sample and the survey to ensure that any design decisions made by the survey agency are compatible with the requirements for sample expansion.

1.15 Deliverables

The major deliverables from the project by the survey agency are:

- Microsoft Access relational database files for the administration, household, person, vehicle and trip stage data;
- full documentation of the survey process, in the form of a survey report including a completed Survey Design Checklist (see www.transportsurveymethods.com.au);
- coding frames for all data sets.

The data sets, coding frames and documentation should be contained on a single CD-ROM.

The final “clean” data set, including full documentation of the survey, all coding frames and the data files, will be provided to the ATM2 Project Team by 1 December 2006

1.16 List of Attachments

- Attachment A: Household Survey Content Requirements
- Attachment B: Prototype Geo-coding Methods
- Attachment C: Range and Logic Checks

Attachment A – Household Survey Required Data Content

1 Introduction

The purposes of this document are to clarify survey quality requirements in order that (i) the implications are clear to the survey agencies tendering for the household survey and (ii) the consequent issues for data processing are identified and resolved. This is a draft statement of requirements and will be finalised over the next few months.

The first table in the following sections specifies the questionnaire requirements. At this stage, as many possibilities as can be envisaged have been included. Consequently there will be a need in the final design to reduce the number of questions. *Italics* indicate that the question is not considered essential for modelling purposes and may be dropped in the final design, subject to consultation. Items in **red** are possible new questions arising out of ATM2 objectives. No attempt has been made to finalise the categories for each question, which will be firmed up in final design.

We have also defined a concept of Minimum Information Content (MIC), which identifies data which we cannot do without. This is given in the second table in each section. We identify the action to be taken in this case. We also identify the action to be taken where other information is missing:

- MIC: if Yes (Y) then this data is essential; questions classified as MIC=Y are emboldened in the tables; if No (N) then omission of this information in the questionnaire will not lead to rejection;
- Action: which states what actions are needed on each question if the data is missing; No (N) implies that it will simply be left as a non-response.

Interviews will be rejected if they do not contain the following information:

- Household Data
 - Household size;
 - Number of passenger vehicles;
- Person Data
 - Age;
 - Employment status;
 - Work address;
 - Study address.

Trips will be rejected if they do not contain the following information:

- Location of day start (for first trip only);
- Time start trip stage;
- Type of place at end of trip stage;
- Address at end of trip stage;
- Trip stage purpose;
- Trip stage mode of travel;
- Time of arrival at next stop.

2. Household Data

2.1 General

Question	Responses	Issues
Survey date		
Household address		

Question	Responses	MIC	Action
Survey date		N	
Household address		Y	Reject interview. Accuracy

2.2 Household Details

Question	Responses	Issues
Dwelling type	Separate House Flat or Apartment Terrace house / Townhouse / semi-detached Other <i>Extend for student accommodation etc?</i>	Small possibility that this data may be used for expansion purposes, but would primarily be of use for other stakeholders.
Household Size	Number of people who are usually resident Number of visitors	We need to clarify how we handle visitors in regards to the travel diary.
Phone	Presence of telephone Number	
Number of vehicles	passenger vehicles motor cycles commercial vehicles other vehicles	Treatment of commercial vehicles Split lights, less than 3.5t gw, from mediums/heavies, or use some other classification like vans/utes and trucks.
Number of bicycles	<i>By type? (see later section)</i>	<i>Exclude irrelevant types? Eg in good working condition & child's bikes</i>
Ownership status of home	Owned Being bought/mortgaged Rented	Not relevant for modelling. May be relevant for other stakeholders.
Length of time at this address		Not relevant for modelling.
<i>Stay/move house choice</i>		<i>Land use model questions to come</i>

Question	Responses	MIC	Action
Dwelling type	Separate House Flat or Apartment Terrace house / Townhouse / semi-detached Other <i>Extend for student accommodation etc?</i>	N	
Household Size	Number of people who are usually resident Number of visitors	Y	Reject interview, required for expansion.
Phone	Presence of telephone Number	N	

Question	Responses	MIC	Action
Number of vehicles	passenger vehicles motor cycles commercial vehicles other vehicles	Y N N N	Reject interview if no. of cars is not given, as needed possibly for bias correction but also in modelling.
Number of bicycles	By type? (see later section)	N	
Ownership status of home	Owned Being bought/mortgaged Rented	N	
Length of time at this address		N	
Stay/move house choice			

3. Vehicle Data

For all registered vehicles. Employer subsidies could presumably also be addressed on the person form, so this option is also highlighted.

Question	Responses	Issues
<i>Details</i>	<i>Type: (car, 4WD, van, ute, truck ...)</i> <i>Year of manufacture</i> <i>Make</i> <i>Model</i> <i>Fuel type (petrol, gas, diesel)</i> <i>Number of cylinders</i> <i>Mileage</i>	<i>This information can be used to calculate detailed vehicle ownership and operating costs. Little of this is directly need for modelling, but it relates to future technology issues.</i> <i>Other technology data?</i>
Employer subsidies	Ownership costs: private or company or government ownership or novated lease Running costs: private, company or government or novated lease Employer provided/paid for parking space <i>Any other company assistance?</i>	Need to establish NZ tax practice with company vehicles and subsidies.
<i>Vehicle available for use on travel day</i>	Yes <i>No: off road, in for service, elsewhere ...</i>	
Main driver of vehicle		

Question	Responses	MIC	Action
<i>Details</i>	<i>Type: (car, 4WD, van, ute, truck ...)</i> <i>Year of manufacture</i> <i>Make</i> <i>Model</i> <i>Fuel type (petrol, gas, diesel)</i> <i>Number of cylinders</i> <i>Mileage</i>	N	<i>This information can be used to calculate detailed vehicle ownership and operating costs. Little of this is directly need for modelling, but it relates to future technology issues.</i> <i>Other technology data?</i>
Employer subsidies	Ownership costs: private or company or government ownership or novated lease Running costs: private, company or government or novated lease Employer provided/paid for parking space <i>Any other company assistance?</i>	N	Need to establish NZ tax practice with company vehicles and subsidies.
<i>Vehicle available for use on travel day</i>	Yes <i>No: off road, in for service, elsewhere ...</i>	N	
Main driver of vehicle		Y	

4. Person Data

To illustrate an approach to extra questions on subsidies and car sharing, the questions are split into those for all members, those for employees and those for students/schoolchildren. This does not imply separation in the final questionnaire.

4.1 General

Question	Responses	Issues
Relationship to head of household/first respondent	Head of household Spouse/partner Child Brother/sister Parent Grandchild Other relative Unrelated co-tenant Other	
Sex	Male Female	
Age	Year of Birth	
Resident or Visitor	Resident Visitor Address	
Country of birth	Country of Birth	
Primary language	Language primarily spoken	
Work/Study/Other status	Employed Studying/at School Pre-school Not yet at school At home Keeping house Unemployed Retired Pensioner Other Unable to work	
Licences held	Car Motorcycle None HCV Bus Other Any other important categories (eg provisional ...?)	
<i>Modes excluded through impairment or disability</i>		<i>Doubtful modelling relevance</i>
<i>ARTA questions??</i>		
Personal income		
Willing to participate in follow-up survey	Should be specific	If these are agreed

Question	Responses	MIC	Action
Relationship to head of household/first respondent	Head of household Spouse/partner Child Brother/sister Parent	N	

Question	Responses	MIC	Action
	Grandchild Other relative Unrelated co-tenant Other		
Sex	Male Female	N	
Age	Year of Birth	Y	If adult/child distinction cannot be inferred for bias correction, reject interview
Resident or Visitor	Resident Visitor Address	N	
Country of birth	Country of Birth	N	
Primary language	Language primarily spoken	N	
Work/Study/Other status	Employed Studying/at School Pre-school Not yet at school At home Keeping house Unemployed Retired Pensioner Other Unable to work	Y	
Licences held	Car Motorcycle None HCV Bus Other Any other important categories (eg provisional ...?)	N	
<i>Modes excluded through impairment or disability</i>		N	<i>Doubtful modelling relevance</i>
<i>ARTA questions??</i>		N	
Personal income		N	Synthesise
Willing to participate in follow-up survey	Should be specific	N	

4.2 Employees

Question	Responses	Issues
Employment status	Fulltime (>35 hours) Part-time (< 35 hours) Casual	
Occupation/Industry	Occupation (show card?) Tasks/Duties Industry type	Question needs to relate to standard definitions. In modelling terms need limited to simple segmentation like blue/white collar.
Employer type	Wages Self employed no employees Self employed and employees Family business – no pay Unpaid voluntary	Not all of these segments are relevant to modelling
Work time/location	Fixed Flexi Variable Rostered shifts From home Add frequencies (of working at home, attending main workplace ...)?	
Work address		To simplify geocoding of trips.
Employer car subsidies	Ownership costs: private or company or government ownership or novated lease Running costs: private, company or government or novated lease Employer provided/paid for parking space	Any other company assistance? Need to establish NZ tax practice with company vehicles and subsidies.
Parking at Work	On site Offsite details: type of park, location (distance from work) or address and fee.	Alternative to trip questionnaire
Car sharing as driver	Give a lift to another employee? Frequency If not family member: same workplace?	Tempting to ask for additional addresses but this would be onerous.
Car sharing as passenger	Receive a lift to work? Frequency If not family member: same workplace?	
Workplace choice		Land use model questions – to come.

Question	Responses	MIC	Action
Employment status	Fulltime (>35 hours) Part-time (< 35 hours) Casual	Y	Reject interview. Needed for bias correction and modelling.
Occupation/Industry	Occupation (show card?) Tasks/Duties Industry type	N	
Employer type	Wages Self employed no employees Self employed and employees Family business – no pay Unpaid voluntary	N	

Question	Responses	MIC	Action
Work time/location	Fixed Flexi Variable Rostered shifts From home Add frequencies (of working at home, attending main workplace ...)?	N	
Work address		Y	Reject interview as much of travel diary will be of no value. Accuracy
Employer car subsidies	Ownership costs: private or company or government ownership or novated lease Running costs: private, company or government or novated lease Employer provided/paid for parking space	N	
Parking at Work	On site Offsite details: type of park, location (distance from work) or address and fee.	N	
Car sharing as driver	Give a lift to another employee? Frequency If not family member: same workplace?	N	
Car sharig as passenger	Receive a lift to work? Frequency If not family member: same workplace?	N	
Workplace choice			

4.3 Students

Question	Responses	Issues
Study status	Primary school Secondary school University or polytechnic – fulltime University or polytechnic – parttime University or polytechnic – offcampus Foreign English student	
Study address		To simplify geocoding of trips.
Car passenger	Receive a lift to school/uni? Frequency If not family member: same school/uni?	
Car driver	Give a lift to another student? Frequency If not family member: same school/uni?	Tempting to ask for additional addresses but this would be onerous.

Question	Responses	MIC	Action
Study status	Primary school Secondary school University or polytechnic –	Y	

Question	Responses	MIC	Action
	fulltime University or polytechnic – parttime University or polytechnic – offcampus Foreign English student		
Study address		Y	Reject interview as much of travel diary will be of no value. Accuracy
<i>Car passenger</i>	<i>Receive a lift to school/uni?</i> <i>Frequency</i> <i>If not family member: same school/uni?</i>	N	
<i>Car driver</i>	<i>Give a lift to another student?</i> <i>Frequency</i> <i>If not family member: same school/uni?</i>	N	

5. One Day Trip Diary

Critical issues here are to ensure that:

- key segments (trip purposes) can be identified from the information;
- key trip stages are available (eg related to parking where car parks need to be identified as potential intermediate stops, access to public transport).

Question	Responses	Issues
Location of day start	Survey address Work address Different address	
Reason if no trips were made on Travel Day		This is a prompt to reduce under-reporting
When was last trip made (if no travel on Travel Day)		Not needed
Time start	Time leave Did not leave house	
What / where next stop	Home address – no address details Work address - no address details Study address - no address details Train station – name Ferry stop Bus stop Other address inside study region Other address outside study area	Addresses fro intermediate stops (bus stops, stations, car parks) are not requested.
Address	Place / Business name Building name Street number Street name Suburb Postcode	
Why travel to stop	Change mode of travel To go to work Work related business Education Home Social visit Medical/Dental Recreation Entertainment Sport – participate Sport – spectate Holiday Personal business To accompany someone – their purpose To drop someone off – their purpose Shopping – <i>by type?</i> To pickup or deliver something Other	
Mode	Walking Bicycle	

Question	Responses	Issues
	Taxi Car driver Car Passenger Train School bus Other bus Ferry Wheelchair Motorcycle Van/ute driver Van/ute passenger Truck driver Truck passenger Other	
Private vehicle	Was car listed on form Vehicle number Company / private / rental car	
<i>Car availability/captivity Driver availability Public transport availability</i>		<i>For modelling purposes, these are better determined from answers to other questions</i>
Occupancy	Number of people in vehicle Number from household in vehicle Identification of household member occupants	
Car passenger in non-household vehicle		<i>Questions related to HOV issues?</i>
Car parking	On street Off street public Off street private residential Off street private non residential Not parked	
Other parking data?	Parking address? Time to walk from car to destination? Other?	
Fee paid	No fee paid Short term Daily Weekly Monthly > Monthly Fee paid by me Fee paid by employer Fee paid by someone else	
Who paid parking fee	Person in vehicle Employer Other	
PT ticket type	Options?	
Arrival time	Time of arrival at next stop	
Information related to: NHB/HB trip linkage Tours?		<i>Do not think that there are any further questions needed.</i>
Further trips		To direct to end or next stop

Question	Responses	MIC	Action
----------	-----------	-----	--------

Question	Responses	MIC	Action
Location of day start	Survey address Work address Different address	Y	Reject trip
Reason if no trips were made on Travel Day		N	
When was last trip made (if no travel on Travel Day)		N	
Time start	Time leave Did not leave house	Y	Reject trip
What / where next stop	Home address – no address details Work address - no address details Study address - no address details Train station – name Ferry stop Bus stop Other address inside study region Other address outside study area	Y	Reject trip
Address	Place / Business name Building name Street number Street name Suburb Postcode	Y	Reject trip Accuracy
Why travel to stop	Change mode of travel To go to work Work related business Education Home Social visit Medical/Dental Recreation Entertainment Sport – participate Sport – spectate Holiday Personal business To accompany someone – their purpose To drop someone off – their purpose Shopping – <i>by type?</i> To pickup or deliver something Other	Y	Reject trip
Mode	Walking Bicycle Taxi Car driver Car Passenger Train School bus Other bus Ferry <i>Wheelchair</i>	Y	Reject trip

Question	Responses	MIC	Action
	Motorcycle Van/ute driver Van/ute passenger Truck driver Truck passenger Other		
Private vehicle	Was car listed on form Vehicle number Company / private / rental car	N	
<i>Car availability/captivity</i> <i>Driver availability</i> <i>Public transport availability</i>		<i>N</i>	
Occupancy	Number of people in vehicle Number from household in vehicle <i>Identification of household member occupants</i>	<i>N</i>	
<i>Car passenger in non-household vehicle</i>			
Car parking	On street Off street public Off street private residential Off street private non residential Not parked	<i>N</i>	
<i>Other parking data?</i>	<i>Parking address?</i> <i>Time to walk from car to destination?</i> <i>Other?</i>	<i>N</i>	
Fee paid	No fee paid Short term Daily Weekly Monthly > Monthly Fee paid by me Fee paid by employer Fee paid by someone else	<i>N</i>	
<i>Who paid parking fee</i>	<i>Person in vehicle</i> <i>Employer</i> <i>Other</i>	<i>N</i>	
PT ticket type	Options?	N	
Arrival time	Time of arrival at next stop	Y	Reject trip
<i>Information related to:</i> <i>NHB/HB trip linkage</i> <i>Tours?</i>		<i>N</i>	
Further trips		Y	Reject trip

6. Key issues

Notes are given here on how missing data should be handled.

6.1 Person Characteristics

The person data is likely to be used in bias correction and modelling.

The survey sample would be expanded to the total number of households in an area (check...) controlling for household size. Bias correction would be carried out over the data set as a whole, to other characteristics which were expected to affect response bias. These could for example include number of employed persons per household, number of cars per household, number of children and housing tenure (using census distributions).

6.2 Address Accuracy

It is desirable if we agree some targets for address recording accuracy.

6.3 Data Synthesis

This would generally be by drawing randomly from the household data distributions. For important parameters, the distributions would be segmented relevantly.

6.4 Missing Trip Diaries

There appear to be two options:

- to factor the household's successful trip diaries up to the total number of persons in the household, or
- to try something based on the travel of similar person types in other households.

On the basis that missing trip diaries will be a rare phenomenon, the former simple approach is preferred. If the frequency was more significant, the distribution of missing trip diaries by person type could be analysed, and bias correction factors computed based on differential trip rates by mode and purpose by person type.

A similar approach for missing trips (deleted in editing) would be taken.

6.5 Fault Frequencies

It is desirable if we agree on some targets for fault frequencies. Examples are:

- the frequency of non-response to any individual question across the data set should not exceed 5% (with the exception of income);
- the frequency of non-response to questions should not exceed 5 % for any individual household, otherwise it will be rejected.

The risk with these tests is that false data will be inserted to avoid test failures. Given this risk, there is a question as to whether these requirements are contractually imposed.

6.6 Risks

Clearly substantial data shortcomings and omissions undermine model quality and the extra processing to correct for omissions increases costs.

7. Students

For tertiary students, there are three living arrangement situations:

- those living at home in the family house,
- those living along or with housemates in a private residence,
- those living in institutional dormitory arrangements.

The first two groups would be covered by the standard AHTS survey, since their households would be in-scope. No special questionnaires would be used, even for foreign students living in private residences, since previous surveys of this type have shown no bias in response by country of birth. However it will be essential to ensure that these difficult-to-intercept persons are not under-sampled in the survey.

For students living in institutional residences, a decision needs to be made as to whether to design special surveys (especially sampling strategies) or whether to simply treat them as out-of-scope. This will depend on the size of this population and the geographic proximity of the residence to their place of study. If the population size is small and/or the residence is very close to the campus (meaning that most of their trips would be on foot anyway), then this group of students might be excluded from consideration without significantly affecting the overall measured travel patterns.. If they are included, then the standard AHTS questionnaire would be used to survey them.

Attachment B Geocoding and the Use of Landmarks

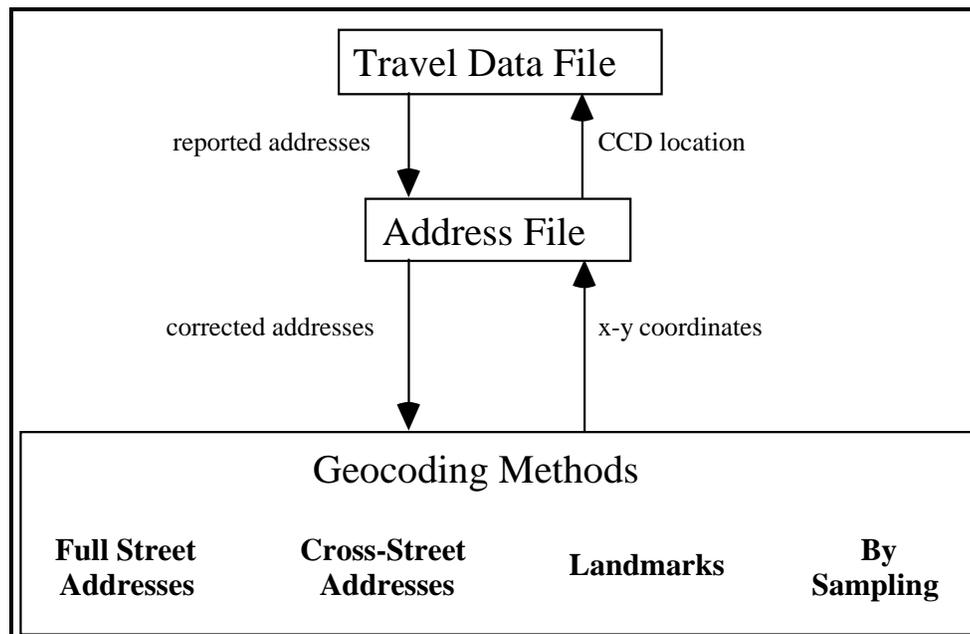
(Note that this geocoding for this household survey will need to be compatible with ARC's systems and those of its regional partners. These include the ESRI suite of GIS products including ArcGIS Desktop, ArcView, ArcIMS, ArcSDE.)

1. Introduction

In past travel surveys, destination locations have often been coded directly to rather aggregate traffic zones, at suburb level of detail, with the result that considerable information has been lost about the location of destinations. However, coding survey data to x-y coordinates and then to the level of the Census Collectors District (CCD) (meshblock in the NZ context) is extremely useful for the plotting of trip information, for more accurate calculation of distances between destinations, and allows greater flexibility for the design of more specific zoning systems (e.g. for the analysis of public transport corridors).

The most efficient method of coding locational information for large-scale travel surveys, is the direct geocoding of street names and suburbs (and other principal locations). This method involves the use of a computer program whereby the user enters an address, the computer checks through a list of such addresses (in much the same way as a coder would look through a street directory index), and then returns an x-y coordinate for that location. The computer program should be able to match coordinates with incorrect addresses (caused by misspelling of street, or the use of adjacent suburb name) and should take account of house numbers, especially on long streets.

A general procedure adopted for the geocoding of locations is shown below.



Geocoding may be performed at two points in the data coding process; either interactively as the data is first being coded, or in batch mode after all the data has been entered. While interactive geocoding is somewhat more complex, it has the major advantage that assigning geocodes to locations as the data is first entered enables a wider array of data editing to be performed

interactively, thus allowing the data coder to detect and correct problems as they occur, rather than leaving them to compound throughout the remainder of the data coding process. The following description of the geocoding process applies equally to both methods, but is often worded in the context of batch mode geocoding. For interactive geocoding, simply assume that the “address file” contains only one address at a time.

Locational information is obtained from the travel data files in the form of reported addresses. These addresses may be from the sample frame database of residential addresses in the case of the household file addresses, or from the respondents, in the case of the stop file destination locations. These addresses are transferred to an address file which contains only the address and an identifier which enables the geocoded CCD location to be transferred back to the travel files at the end of the geocoding process. The locational information, especially from respondents, is of varying degrees of completeness and accuracy. Therefore, before attempting to geocode the address information, the addresses have to be corrected to put them in a format which is compatible with the GIS database of address coordinates. These corrected addresses are then geocoded by one of various methods of geocoding, as described below. The x-y coordinates of the addresses are then transferred back to the address file. By comparing these coordinates with the CCD (meshblock) boundary files, the CCD in which the address is located can be obtained, and this CCD number is then transferred back to the travel data files.

The geocoding procedure consists of a series of geocoding methods applied in a hierarchical fashion to obtain a likely geocode for an address. The accuracy of the geocode is dependent on the geocoding method used. Therefore, the more reliable methods are attempted first.

The degree of accuracy of the geocoding depends on two factors; the accuracy with which the respondent can supply the locational information, and the accuracy with which the GIS program (in this case, MapInfo[®]) can use that information to generate a set of coordinates. For example, a respondent might know that they went shopping at the Safeway supermarket in Ringwood. From their point of view, this is the most accurate description of their destination. However, whether MapInfo[®] can geocode this location correctly will depend on what information it has about the location of Safeway supermarkets. If all Safeway supermarkets are in a landmarks datafile, which gives the geocodes for named locations, then this should provide a very accurate geocode. However, if they are not in a landmarks file, then the very accurate locational information provided by the respondent will be of little use, unless an alternative method of locating Safeway supermarkets can be found. For example, it is possible to look up the Yellow Pages (either the paper version or the electronic version on CD-ROM database) and find that the Safeway supermarket in Ringwood is on the corner of Smith and Brown Roads. This information, in that form, is still not very useful since MapInfo[®] needs a street name and number to find a geocode. However, as will be described later, it is possible to write a special module which finds geocodes based on the specification of cross-streets. Therefore, the accurate locational information supplied by the respondent can eventually be converted into an accurate geocode. On the other hand, the information that MapInfo[®] is most accurate in working with (i.e. full street name, number and suburb) is often not easily supplied by the respondent. For example, very few people would know the street number of the Safeway supermarket in Ringwood, even if they knew what street it was on. If they provided only the street name, then we would be forced to select a random position along the street within the suburb - providing a less accurate geocode than that provided by use of the shop name.

These geocoding principles have been employed in several recent travel surveys, including the Victorian Activity & Travel Survey (VATS), the South-East Queensland Travel Survey (SEQTS), the North-Eastern Suburbs Travel Survey (NESTS) in Melbourne, and the Melbourne Area Travel Survey (MATS). In the actual computer implementation of the geocoding methods, four program modules were developed for the MATS project. These are:

- geocoding using MapInfo[®] cadastre files;
- geocoding using a cross-street database;
- geocoding with a landmark file; and
- geocoding by sampling.

The next few sections will discuss how addresses are prepared to make them suitable for geocoding and then details of the four geocoding program modules mentioned above will be provided.

2. Preparation of the address data

A crucial factor in geocoding is the success of matching the address information (i.e. street name and suburb name) provided by the respondents to that used in the electronic reference maps. Slight differences in spellings result in a mismatch and consequently a geocoding failure.

Steps were made to minimise spelling mismatches in the MATS data (which used interactive geocoding at the time of data coding) by providing a pop-up dictionary of street names, suburb names and postcodes in the data entry program for the travel data. Using a pop-up list of street names and suburbs avoids the problems caused by different abbreviation of street types (e.g. Rd vs Road), and by reversals of suburb names (e.g. East Doncaster vs Doncaster East).

3. Geocoding full street addresses

The geocoding of full street addresses in MATS was performed using a database of address geocodes based on a cadastre file of all properties in the study area. A cadastre file contains the property boundaries of all properties, linked to an address and centroid coordinates. Cadastre files are available for all of Australia and New Zealand in MapInfo format from a variety of data retailers. The addresses and centroid coordinates were extracted from the cadastre file into an Access database, and functioned as a giant lookup table (with about 1.6 million records for all of Melbourne).

It is quite common that respondents give incorrect suburb information and so the address cannot initially be geocoded. This, however, is often circumvented by assuming that respondents are likely to give a suburb not far from the correct suburb. Respondents often upgrade their suburb to a nearby, more socially distinguished, suburb. By using this assumption, success in geocoding can be improved by re-attempting to geocode using an increasingly larger boundary file. Postcode boundaries are generally larger than suburb boundaries and so they are used in the geocoding process after the suburb boundary, by allowing the user to search within the postcode boundary of the nominated suburb, rather than using the suburb boundary. In this way, the street address was often found in a neighbouring suburb.

Once an x-y coordinate had been attached to an address, the CCD in which this coordinate was located was found by overlaying the boundaries of the CCDs on the geocoded coordinates. The region (CCD) in which the geocoded point was located was then transferred back to the travel data files as the most disaggregate description of the location of that address.

4. Geocoding cross-street addresses

For many types of destination, the best information that the respondent can provide is the nearest intersection. To enable geocoding using this information, a database of cross-street geocodes was constructed by finding the points where different streets intersected in the MapInfo database of streets. The data coder could then specify one of the street names (in a particular suburb) and the program would then show all intersections with that street in a pop-up list, from which the cross-street (and its geocode) could be selected.

5. Geocoding landmarks

It was allowable in the MATS survey for respondents to nominate a landmark as a destination address. Examples of landmarks include the name of a restaurant, a school, a bank, a government office, a shopping centre, a park, a beach, etc. To be effective as a valid address, a landmark has to be qualified to identify it uniquely from all others with a similar name. A bank, for example, needs to have the branch (usually a suburb) appended to its name.

The geocoding of landmarks requires the compilation of information from various sources such as Mapinfo features files, telephone books and street directories on a variety of landmarks, such as:

- schools, pre-schools and childcare centres
- universities and colleges
- shopping centres
- food outlets
- sporting centres
- places of interest
- parks, ovals and reserves
- caravan parks
- hospitals
- ambulance stations
- police stations
- fire stations
- churches
- bus and airline offices
- ferry terminals
- post offices
- public libraries
- council offices
- bays and beaches
- boat ramps
- theatres and cinemas
- hotels and motels
- commercial buildings
- racecourses

- golf courses
- bowling centres
- swimming pools

For the MATS survey, a landmark file with approximately 50,000 entries was assembled.

For each of these landmarks, an equivalent full street address or cross-street address was obtained from these sources, and then the geocoding methods for full street addresses and cross-street addresses (described earlier) were used to generate the geocodes.

Not all landmarks are easily identified by a street address. Finding an address for a landmark poses a problem in cases where one is not available and/or the area covered by the landmark is large (e.g. beaches and parks). For such large areas, the area centroid may represent a more appropriate definition of the location to be used as a geocode. Centroids of areas can be marked and geocoded in a MapInfo map, from which the geocode coordinates can then be extracted.

Using the landmarks for geocoding within MATS proceeded in a hierarchical four-level fashion using dropdown menus. For example, in order to find the geocode for a specific greengrocer, the coder would select Retail (at level 1), Food Store (at level 2), Greengrocer (at level 3), and then the specific greengrocer identified by name, street address and suburb (at level 4). Once a level 4 selection has been made, the geocode coordinates are automatically returned to the coding program.

6. Geocoding by sampling

Addresses provided by respondents are not always complete. Some respondents intentionally omit street numbers or just indicate their suburb or locality - possibly for privacy reasons. The approach that was used to geocode these cases in the MATS survey was to sample a point along the length of the street, if a street name was given, or to sample a point within a suburb, if a suburb was all that was available.

7. Recording the type of geocode

Because of the different accuracies of the various types of geocoding procedure, it is important to record which method of geocoding was used to find the coordinates for a location. This information helps later when editing the data by indicating the level of confidence that can be placed in the geocoded location. The types of geocoding employed in MATS (in decreasing level of precision) were:

- Survey Address
- Landmark
- Cadastre – suburb
- Cadastre – postcode
- Cross-street – suburb
- Cross-street – postcode
- Nearest Landmark
- Street – Suburb
- Street – Postcode
- Town – Suburb

- Town – Postcode
- Manual Geocoding
- Interstate
- Overseas

Attachment C Range and Logic Checks

1. Possible Range Checks

Permissible range error checks are all within a single data file.

Household Form

- Household size cannot be 0 when number of visitors is 0 (error)
- Household size is usually not more than 10 (warning)
- Household size cannot be negative (error)
- Number of visitors is usually not more than 10 (warning)
- Number of visitors cannot be negative (error)
- Number of vehicles should equal sum of all vehicle types (error)
- Number of vehicles is usually not more than 10 (warning)

Person Form

- Number of person records cannot be more than household size (incl. visitors) on household form (error)

Vehicle Form

- Number of vehicle records cannot be more than number of registered vehicles on household form (error)

Trip Stage Form

- Arrival time cannot be less than 0400 (error)
- Departure time cannot be less than arrival time for trip stage (error)
- Arrival time cannot be less than departure time of previous trip stage (error)

2. Possible Logic Checks

Logic checks are cross-tabulation checks, sometimes within one file and sometimes across more than one file.

Within Stop File

- The last trip of the day should normally be to home. Check other destinations.
- Trips with home as the origin and destination should be checked. Usually indicates a missing stop record. The same applies to any other location (not purpose or place) when it appears as both the origin and destination (e.g. "my workplace" to "my workplace" without an intermediate destination).
- Check for combinations of destination place and purpose
- If the mode is public transport, then the destination place should normally be a terminal for that mode (e.g. a bus trip to a bus stop).
- Trips with very high speeds (for the mode concerned) should be checked (enables incorrect address codes to be identified such as, for example, duplicate street names).
- All trips of more than 2 hours duration should be checked.
- Walk trips of more than 1 hour duration should be checked.

Within Person File

- Check year of birth against driver's licence (age of licensed drivers should not be less than 15)
- Check year of birth against full-time employment (investigate if age is less than 15)
- Check year of birth against retired/old age pension (investigate if age is less than 55)
- Check year of birth against preschool/childcare (investigate if age is more than 6 years old)
- Check year of birth against primary school (age should normally be between 4 and 13 years old)
- Check year of birth against secondary school (age should normally be between 12 and 20 years old)
- Check year of birth against university/college (age should normally be greater than 16 years old)
- Compare entries in employment, studying and other activities fields. Should normally be at least one valid entry in one of the fields; if so, other fields should be coded as "not applicable"; if not, all three fields should be coded as "missing".

Within Vehicle File

- Check spelling of vehicle makes and models
- Switch make and model name, if necessary (e.g. Falcon Ford should become Ford Falcon)
- Check number of cylinders against make and model.

Between Admin and Household Files

- Those households on the Administration file with a response code corresponding to a valid response should appear on the Household file.

- Conversely, those households on the Administration file without a response code corresponding to a valid response should not appear on the Household file.

Between Household and Person Files

- The number of records in the Person file for a household should correspond to the number of residents and visitors specified on the Household file.

Between Household and Vehicle Files

- The number of registered vehicles on the Household file should agree with the number of vehicles for which information is supplied on the Vehicle file. If vehicle details are missing from the Vehicle file, missing values should be entered.

Between Person and Stop Files

- People without licences in the Person file should not appear as car drivers in the Stop file.

Between Vehicle and Stop Files

- The vehicle number specified for any particular Stop record should correspond to an actual vehicle record on the Vehicle file.