MODELLING INTERCITY BUS PASSENGER TRAVEL DEMAND IN NEWFOUNDLAND

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IN NEWFOUNDLAND

by

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ABSTRACT

The purpose of this study was to develop a passenger forecasting model for intercity bus travel demand in Newfoundland. This involved the use of routinely published census data and mathematical techniques to predict and analyse passenger flow volumes.

Modelling was performed at the trip generation and trip distribution stages of transportation ~~planning~~. Trip generation was achieved using a library computer program for multiple linear regression analysis. During this stage, the most appropriate traffic zone size was assessed. Results were that an aggregation of census areas was proven more effective than single communities in relating passenger and demographic data. Trip distribution was carried out by applying the gravity model. A computer program, which included testing of the gravity model output, was developed and written by the author for this research. A statistical criterion called the chi-square test was successfully applied in analyzing output of the gravity model. This test indicated the closeness between gravity model and observed passenger data and was judged superior to the visual method of determining when the gravity model is considered calibrated. The chi-square statistics were also applied in analysis of test year data.

Testing of the model was achieved through comparison of predicted passenger data with data collected by actual counts during survey periods of four consecutive years following the base year. The model predicted a linear increase in ridership over the test years, whereas the actual data showed that fluctuations were present. Factors relating

to dynamic change in the mode, which were not included in the model, were accountable for deviations between predicted and observed data.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

The island of Newfoundland was first settled along the coastline where people sought to be close to the fishing grounds. From the seventeenth to twentieth centuries, tiny villages and towns consequently sprang up in very remote locations such that there exists today a spread of more than 500,000 people over a ribbon of 6,000 miles.

After entry of the province into confederation in 1949, a plan was developed to overcome the isolation of coastal communities by building of the Trans Canada Highway which was completed in 1965. This brought into existence a transportation artery or corridor crossing the island of Newfoundland and servicing the major population centres. This artery today, as illustrated in Figure 1, consists of the Trans Canada Highway, Canadian National Railways (CN) and air services.

Following completion of the highway rail passenger traffic began to decline rapidly and thus the major carrier, CN, introduced an intercity bus service in January, 1969 as a replacement for the passenger train. This system, which operates between points along the Trans Canada Highway, became known as the 'CN Roadcruiser Service.'

During its first year of operation, the buses carried some 180,000 passengers, whereas in more recent years up to 235,000 have used the service. Initially patronage grew at a rate of seven percent per annum, then levelled off, declined and increased again in 1980 by six percent over 1979.

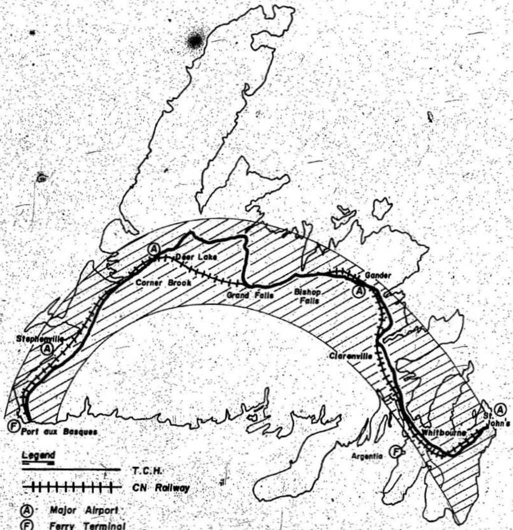


Figure I The Newfoundland Transportation Corridor

The system, which operates at a deficit, had a total operating cost in 1976 of $3,556,000 while revenues generated only $1,315,000. The corresponding figures for the year 1980 were respectively $3,552,000 (operating) and $2,250,000 (revenue). Most of these losses were attributed to bus maintenance and the transport of pass (non-fare) passengers.

A number of privately owned bus companies in addition to CN provide service to various areas of Newfoundland. The Sullivan Commission (1)[+] in 1978 reported this number as twenty-one, the principal routes for which are shown in Figure 2. It was estimated that CN carried over thirty percent of all intercity bus passengers. Data with regards to passenger volumes carried between stations is not kept by the private companies, whereas CN has been compiling such on a regular basis since 1975.

The majority of CN patrons are captive riders. A survey conducted by the Canadian Transport Commission during August 1978 (2) concluded that eighty percent of all users fall into four demographic groups: a) students, b) housewives, c) male blue collar workers and d) unemployed persons. The trip purposes were mainly for reasons of school, medical treatment, shopping, visiting and work or business.

To-date, the forecasting of intercity bus travel demand in Newfoundland has not been carried out to any great extent. For example, the demand for buses or extra sections as determined by CN is made simply on the basis of past year trends and seasonal fluctuations in

[+]Superscripts refer to footnotes, numbers in brackets refer to references on page 114.

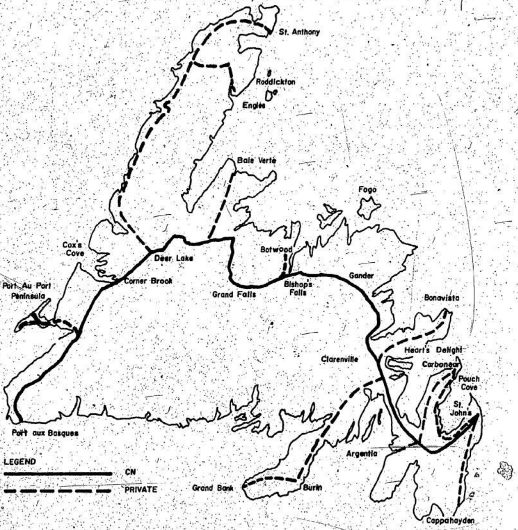


Figure 2 **Intercity bus routes in Newfoundland**

ridership. Long range planning regarding the priorities for new plant or improvements to existing facilities are made on the basis of growth rates in passenger volumes from previous years. The ability to reliably predict future passenger travel demand between stations would be an invaluable asset to management. The possibility of achieving this requirement formed the basis for this investigation. The purpose of the study was therefore to develop and test a model to forecast intercity bus passenger travel demand in Newfoundland.

The main objective was to model trip generation and trip distribution by relating passenger flow, as obtained from ticket records of the major carrier, to routinely published census data. Favourable results from this exercise could eliminate the necessity of a field survey. Coincident with this objective was the application of statistical testing in order to improve interpretation of output from the applied mathematical techniques.

In a subsequent chapter of this thesis, the complete passenger and socio-economic data base used for model development is fully presented and described. Analysis of data is conducted in three separate stages: 1) trip generation, 2) trip distribution and 3) testing of model. Trip generation is performed using a library computer program of the multiple linear regression technique. The trip distribution program used to calibrate and test the gravity model was developed by the author for this study. Testing of the model is carried out by comparing actual and predicted passenger data for four consequtive years following the base year. Discussion of results is performed in accordance with the three forementioned stages of analysis.

Prior to analysis and in order to determine the most suitable techniques for model development, a comprehensive literature review was conducted. A resume of this review is next presented.

CHAPTER TWO

LITERATURE REVIEW

This chapter gives a resume of passenger demand forecasting techniques presently in use, as determined through a major search of current literature.

Many papers, publications and texts were reviewed in order to obtain information on various methods and models developed elsewhere which may be applicable to this study. The majority of these techniques are not referred to directly hereafter. They contain much pertinent information, however, for the interested reader who may wish to further investigate literature regarding travel demand forecasting. For this reason, in addition to a List of References, a Bibliography is provided.

Many papers were obtained directly from such sources as the Canadian Transport Commission, Information Canada, the Roads and Transportation Association of Canada and the United States Bureau of Public Roads.

From the literature it was obvious that numerous classifications of intercity passenger forecasting models were already developed, for example by purpose, mode, mathematical structure and calibration procedure. In general there were no relative indications nor proof that one was better than the other. Model complexity and data requirements were usually traded off against cost, accuracy and ease of operation. Some of the simplest models appeared as those most accurate in replicating observed passenger flows.

The methods of model development most clearly illustrated and thoroughly discussed were those of the U.S. Bureau of Public Roads (BPR). References (3) to (7) inclusive present these techniques in four basic stages of transportation planning:

1) Trip Generation
2) Trip Distribution
3) Modal Split
4) Traffic Assignment

As this study concerns only trip generation and trip distribution, discussion of the above BPR procedures will be limited to these two. The specific model forms and BPR procedures are not presented in this section, as they are thoroughly discussed in the subsequent chapters.

Trip Generation

The modelling of trip generation is possible through a variety of available techniques which principally relate trip ends to the socio-economic characteristics of the study area. Three such methods, somewhat similar in overall general approach (3), (4), (8) are as follows:

1) Land Area Trip Rate Analysis
2) Cross Classification Analysis
3) Regression Analysis

The objective of trip generation analysis is to provide a method of estimating the number of trips that will begin or end in each areal unit such as a traffic zone. Of the methods available for performing trip generation, that of regression analysis is probably the most popular. Regression is a statistical procedure in which the relationship between two or more related items, called variables, may be expressed in an optimum mathematical form. The regression technique is only as accurate and as useful as the validity of the underlying assumptions and the statistical evaluations used to determine the reasonableness of results obtained. Discussion of these important factors and others has been made with their application in subsequent chapters.

Trip Distribution

The models most commonly used to predict horizon year trip interchanges from base year origin destination surveys are as follows:

1) Growth Factor Methods
2) The Intervening Opportunities Model
3) The Competing Opportunities Model
4) The Gravity Model
5) The Linear Graph Model

The most popular method of trip distribution implies usually some form of the gravity model. This model is an analogy to Newton's model describing the gravitational attraction between bodies in space as a function of their mass and the distance between them. Kessler (9) used this very concept for trip distribution in his study of air travel between U.S. cities. His study showed that the gravity model, which has been applied largely to urban planning, may be used in regional transport as well.

The gravity model is based upon the principle that travel is a function of land use and physical separation, usually measured by time or distance between trip origin and trip destination. Since early usage of the model, the travel deterrence has been generally considered as a function of time or distance.

The assumption of stability of travel simulation models over time is an essential element of transportation planning. This postulation is implied through the fact that travel deterrence factors are assumed invariant over time. Normal practice has been to assume the function calibrated for base year conditions will remain constant throughout the planning period. Evidence from studies of work travel patterns in Baltimore (5) and Wisconsin (10) indicate that there is some basis for making the constant travel deterrence assumption.

Travel patterns may also be influenced by various social and economic conditions, the effect of such are accounted for through the use of zone to zone adjustment factors in the gravity model formula. Generally, in large urban areas adjustment factors may be necessary, whereas in smaller urban areas for most cases they are not required (5). Experience has shown that it is for the large traffic generators for which the gravity model trip interchanges must be adjusted. Although the gravity model provides for these adjustments, very few studies have found it necessary to use them (5).

The presence of such obstacles as mountains, rivers, large open areas and toll bridges may also produce resistance to travel. The nature of the influence of such topographical barriers is not completely known (5). To correct for the effect of these barriers, adjustment factors may be inserted in portions of the transport network which traverse the barrier.

Other Model Forms

A linear graph model derived from Kirchoff's Laws was used by Pearson (11), (12), (13) to simulate demands for intercity travel in the Montreal-Windsor corridor.

The model requires that individual components be modelled separately in terms of complimentary pressure and flow variables. The imposition of their interconnection pattern yields a model for the entire system. Each component of the system is described as a terminal graph. A set of terminal graphs connected at the vertices form a one-to-one correspondence with the physical systems graph.

The chord formulation requires that the link resistances, destination city attractions and known origin area flows be measured. Solution of the chord equations, cut set equations and terminal equations yields the unknown link flows and pressures. Origin pressure, created by travellers, is assumed to dissipate as the trip is made.

The basic form of the model postulates that the attraction of a destination in relative terms is given by:

$$A_k = \phi_k \left(B_s \frac{e_s}{e_{s,ave}} + B_H \frac{e_H}{e_{H,ave}} + B_L \frac{e_L}{e_{L,ave}} \right)$$

where : A_k = the relative attraction of a destination city k

ϕ_k = a calibration constant for city k

e_s, e_H, e_L = the employees of a destination city in the service

B_s, B_H, B_L = trip attraction characteristics of each employment type

The linear graph method combines trip generation, distribution and assignment. Pearson discusses some of the advantages which, in his opinion, the linear graph model has over other models such as those of Baumol-Quandt, Kraft-SARC and the BPR.

The Baumol-Quandt Model (14) is basically a donductivity model which forecasts demand directly and includes trip generation, distribution and assignment. It was developed during study of travel in the U.S. Northeast Corridor. The model form is:

$$T_{K_{ij}} = a_o P_i^{K_1} P_j^{K_2} Y_i^{K_3} Y_j^{K_4} M_i^{K_5} M_j^{K_6} N_{ij}^{K_7} f_1(H)\ f_2(C)\ f_3(D)$$

where:

$T_{K_{ij}}$ = travel by mode K between cities i and j

P_i = population of city i

Y_i = median income for i

M_i = institutional character index for i

$H_{K_{ij}}$ = travel time of the K^{th} mode

$D_{K_{ij}}$ = the number of modes serving i and j

$$f_1 = (H_{ij}^b)^{K_1} (H_{K_{ij}})^{K_2}$$

$$f_2 = (C_{ij}^b)^{K_3} (C_{K_{ij}}^r)^{K_4}$$

$$f_3 = (D_{ij}^b)^{K_5} (D_{K_{ij}}^r)^{K_6}$$

A superscript 'b' denotes the best value of the characteristic among all modes and the superscript 'r' denotes the ratio of the value of the characteristics for the best mode. A later form of this model was also developed by Gerald Kraft (Kraft-SARC) (15) during study of travel in the U.S. Northeast Corridor. It was also applied by the IBI Group (16) in modelling passenger flow between major cities in the Atlantic provinces.

The SLAG (Spatial Linkages Analysis Group) Model (17), (18) was developed by the Canadian Transport Commission in study of intercity travel between some ninety-four Canadian cities. The model is of the abstract mode type and was based upon work by S.C. Monsod at Mathematica in the United States. The model consists of three basic terms:

1) a socio-economic term based on a product of population, linguistic differences and average capita income
2) a mode split term comparing services offered by one mode relative to the others
3) a travel impedance term

The model takes the form:

$$T_{ijm} = \underbrace{\left[(\exp 4.12)(P_{ij}^{0.492} L_{ij}^{0.32}) \right]}_{\text{(travel potential term)}} \cdot \underbrace{\left[(\sum_m C_{ijm}^{-2.72} H_{ijm}^{-1.31} D_{ijm}^{0.128})^{0.339} \right]}_{\text{(travel impedance term)}}$$

(modal split term)

$$\cdot \left[(\exp K_m)\,(C_{ijm}^{-2.72}\; H_{ijm}^{-1.31}\; D_{ijm}^{0.128}) \;/\; \sum_m (\exp K_m) \right.$$

(modal split term ct'd.)

$$\left. \cdot\, (C_{ijm}^{-2.72}\; H_{ijm}^{-1.31}\; D_{ijm}^{0.128}) \right] \cdot F_{ijm}$$

where:

T_{ijm} = travel demand for city i to city j on mode m

P_{ij} = population cross products, cities i and j

L_{ij} = linguistic pairing index, cities i and j

C_{ij} = cost or fare (cents) of mode m from city i to j

H_{ijm} = travel time (h) of mode m from city i to j

D_{ijm} = departure frequency (per week) of mode m from city i to city j

K_m = modal constants that may be interpreted as modal acceptability factors representing the unmeasured convenience involved in intercity travel (= -0.377, 0.979, 1.520 and 0 for air, rail, bus, and automobile respectively)

F_{ijm} = city pair modal-specific adjustment factor

Conclusions were made with regards to the effect on passenger volumes by mode resulting from change in a particular mode. Trouble was noted in calibration and several reasons were cited, particularly with regards to data.

There are many other intercity travel demand models including such works as that of Bennett, Ellis, Raymond and Prokopy (19), Bonsall (20), Navin and Wolsfeld (21), Schuldiner (22) and Smith (23). Some are classified as pre-distribution and post-distribution, while others are hybrids or combinations of both. Space does not permit discussion of these models herein, however, the interested reader may pursue them through publications listed in the Bibliography.

Of the methods and models determined through the literature survey as suitable for application in this study, those of the BPR in modelling trip generation (3) and trip distribution (5) were selected. The reasons for making this selection will be given in Chapter Three, Research Design.

CHAPTER THREE

RESEARCH DESIGN

Normally in experimentation, the problem is first defined through a clear statement of the study objectives. The next step is to choose the relative variables to be measured and determine the magnitude of observations or data required. Measurements are usually taken in a controlled environment, excepting for large scale (outside) experiments in which control is practically impossible. In order to carry out an analysis of data, a mathematical model is applied to describe the relationship between the variables of interest. Mathematical models usually involve a number of assumptions concerning conditions under which the model will be valid.

The above general procedures were followed in this research. Design of the experiment required that measurements of variables selected for analysis be obtained from published data sources. Admittedly, there was no control over the environment in which these variables occurred. The variables were, however, investigated in conjunction with assumptions relative to the applied mathematical techniques.

The BPR modelling procedures (3), (4), (5) as recommended for urban trip generation and trip distribution were applied to this regional (intercity) study.

Objectives

Modelling of intercity bus passenger travel demand in Newfoundland has not been previously carried out to any great extent. Unique demographic and geographic conditions common to the province, combined with peculiar patterns of passenger travel, are seldom encountered in other transportation study areas.

In order to develop and test a model to forecast intercity bus passenger travel demand in Newfoundland, the following objectives were set for this study:

1) To model trip generation and trip distribution by relating passenger flow, as obtained from ticket records of the major carrier, to routinely published census data.

2) To apply statistical testing as a method of improvement to the previously developed mathematical modelling techniques used in the analysis.

Favourable results for the first objective would eliminate the necessity of a field survey. In addition to these main objectives, the study investigates the most appropriate size for traffic zones and also determines the effect of Newfoundland conditions in general on the applied modelling techniques.

Data

Very little data which could be used in this research was possessed by authorities responsible for the various modes of travel in Newfoundland. Passenger flow information available from CN contained nothing more than the numbers of passengers travelling between stations on its

Roadcruiser Service. The necessary socio-economic data was obtained mainly from federal and provincial government agencies who have compiled such for the census years (24), (25). As collection of these two data sets was not intended for purposes of modelling passenger travel, extraction and tabulation of information from the census data was necessary before it could be used in the modelling process.

Initially, operators of the major transport modes in Newfoundland were approached with regards to providing intercity passenger travel data. The airlines appeared reluctant to release information, whereas the provincial Department of Transportation and Communications, although co-operative, had not conducted origin-destination surveys of highway traffic. A planned survey was to be performed during the summer of 1981. Data on the CN Roadcruiser Service was readily available through the author's employment with CN. Furthermore, management expressed an interest in the idea of modelling passenger travel on their bus system. It was unfortunate that other intercity bus companies kept no record of passengers carried between stations.

The CN passenger data compiled for the month of August, 1976 is used in this study for development of a forecasting model. The reason for selecting 1976 is that this year corresponds with the national census, thus socio-economic data was also available for the same time period.

Roadcruiser Passenger Data

Records of the total passengers carried annually by CN are available for each year since introduction of the roadcruisers in 1969. The company began in 1975 to compile from ticket records the numbers of passengers carried between stations on its route. Such information was gathered annually for periods during the months of August and November and included both pass and revenue passengers. (The specific survey periods were from August 1st to 21st and November 1st to 30th).

Pass passengers include employees of the company travelling on business as well as employees and their immediate families travelling at leisure. These amount to slightly over 20% of the total passengers carried each year and are not included in development of the model. In most transportation studies, pass passengers are extracted and treated separately or not included.

As bus passenger flow between stations was available for the forementioned survey periods only, model development was limited to either period or a combination of both. The samples represent 100% coverage of passengers carried during the survey periods. This was considered a contributory factor to increased accuracy of the data and model. The number of passengers carried during each month of the year since 1975 is shown in Figure 3. August represents peak travel in practically each year, whereas November is typical of a low travel volume month. Seasonal peaking, as evident in Figure 3, is most certainly attributed to such factors as the summer season, beginning of the school year and to some extent the influence of tourists. It was decided that in forecasting, the maximum demand on the system would be of most interest in determining future requirements. Therefore the model was developed on the basis of August revenue passenger data. This data as compiled from CN ticket records is given in Appendix A, Tables A-1 and A-2. Relating this information by a mathematical model to socio-economic measurements

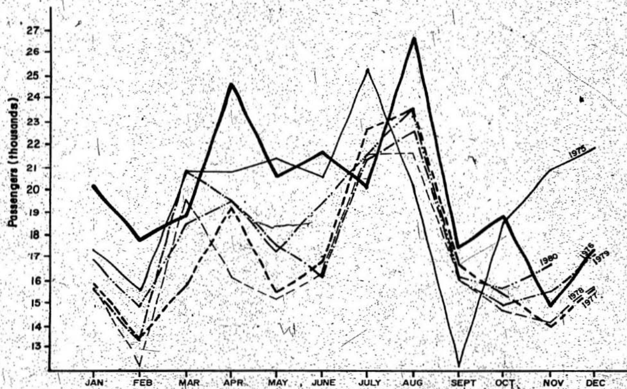


Figure 3 Total Passengers carried monthly on CN Roadcruiser Service 1975 — 1980

of the base year 1976, will produce a means of forecasting revenue passenger travel demand for the corresponding time period (August 1st to 21st) in a horizon year.

Socio-Economic Data

The next step was to collect socio-economic information. This was first approached in general by study of the Census Atlas of Newfoundland (26) along with the provincial highway map. It was noted that population and land use are unevenly distributed with large concentrations on the Avalon Peninsula, central area and west coast, while other large areas are very sparsely populated or totally uninhabited. Division of the island into traffic zones of equal land use or population density was therefore not practical. For this reason, another basis was necessary to aggregate the socio-economic data in relation to bus passenger travel.

The most commonly used socio-economic measurements of passenger travel demand as determined through the literature review, include: population, labour force, dwelling units, employment, automobile registration and student enrollment in secondary institutes. These variables were thought to be readily available and forecasted by agencies such that they would be easily obtained by management for use in a simple prediction model. The principal sources found to possess the socio-economic data considered for this study are given in Table 1.

Statistics Canada conducts a major census every ten years and a mini-census every five years. The Newfoundland Statistics Agency has compiled much of the census data pertaining to Newfoundland (25) as collected by Statistics Canada. This agency provided figures on student

Table 1 Socio-economic data sources

Source	Data	Available for year(s)
Statistics Canada	Population, Labour Force, Dwelling Units, Employment	1971 and 1976
Statistics Canada	Income	1971
Compusearch Limited	Income	1976
Nfld. Statistics Agency	Population, Labour Force, Dwelling Units, Employment	1971 and 1976
Nfld. Statistics Agency	Student Enrollment in Secondary Institutes	Any

enrollment, however, such were not used in this study as only a small number of communities along the roadcruiser route possessed secondary institutes. Data concerning income was available from Statistics Canada for 1971 only, while 1976 figures were obtained from Compusearch Limited.[+] This firm had projected the 1971 Statistics Canada income data to 1976 values.

The provincial Department of Transportation and Communications provided figures regarding automobile registration. These were compiled by electoral district only and also not used in this study as problems were envisaged in relating electoral districts to the census data base.

The province of Newfoundland is divided into ten census divisions and each census division is further divided into various census subdivisions. Each subdivision consists of two portions, one being the organized subdivision (incorporated communities) and the other the

[+]Compusearch Market and Social Research Ltd., 347 Bay Street, Suite 807, Toronto, Ontario, M5H 2R8.

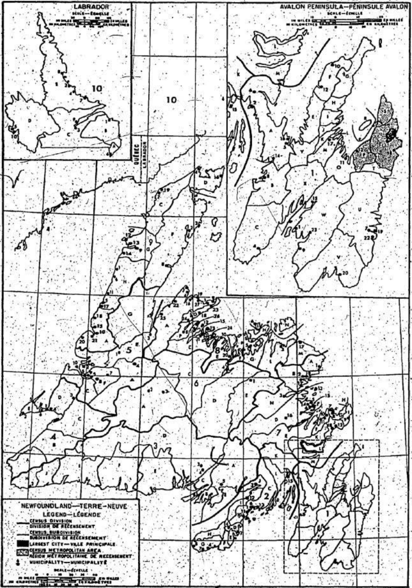
unorganized subdivision (unincorporated communities and rural areas). Detailed census maps[++] of Newfoundland to scale 1:500,000 showing all census boundaries, cities, towns, local improvement districts, highways, etc. were obtained from Statistics Canada for both 1971 and 1976 census years. These maps were very useful in devising a general approach to relating the bus passenger and socio-economic data. Due to their large size copies are not contained herein, however a small map similar in form showing the census divisions and subdivisions has been included as Figure 4.

The census data obtained was very closely related to the census maps as much of the data was compiled according to map areas including: individual communities, organized and unorganized subdivisions as well as the total subdivision. The raw data as obtained from Statistics Canada contained much information which was irrelevant to the model development. Data regarding the forementioned variables were extracted and tabulated into a more applicable format. A sample of such tabulation is included as Appendix A, Table A-3. Due to the fact that the necessary intercity passenger data was not available for years preceding 1975, the 1971 census information was not used except for projection purposes in the model testing phase.

<u>Aeral Units</u>

Populations of the major towns, organized and unorganized subdivisions were extracted from the tabulated data and placed on the census

[+]Source: Canada Department of Energy, Mines and Resources, Surveys and Mapping Branch, Ottawa, Plan No. G71-10A and G76-10.



Source: Statistics Canada

Figure 4 Census Map of Newfoundland

map. The intention was to determine the most appropriate size of the areal unit or traffic zone surrounding each station. Three possible areal units were devised:

1) The individual community containing or serviced by a station stop
2) An aggregation of census subdivisions surrounding each station stop
3) An aggregation of the organized subdivisions (incorporated communities) surrounding each station stop

Common practice in development of travel demand models for many intercity studies (9), (12), (15) was to use socio-economic data associated with each city served along the route. An alternative was to divide the total study area into a number of traffic zones on the basis of land use. In order to determine the most suitable approach for this study, all three of the above areal units were considered. From the tabulated data, the following data bases were set up corresponding to the areal units:

1) Individual communities
2) Zones
3) Incorporated communities

Individual communities (Case 1)—

The communities selected in this data base were those named in each community stop as given in Figure 5. As can be seen from this figure, the roadcruisers make a total of thirty-four station stops in crossing the island. The only demographic variable available for the unincorporated communities was population, whereas for the incorporated

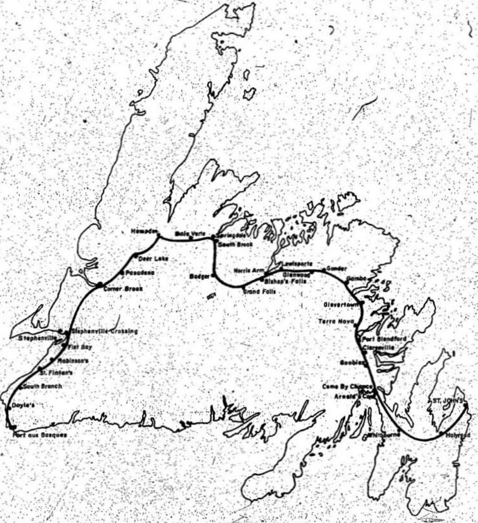


Figure 5 CN Roadcruiser Route

communities many variables were available. Most roadcruiser stops were at incorporated communities, with the exception of four on the west coast: Robinsons, St. Fintans, South Branch and Doyles. In order to complete the data base, census subdivision variables were used for these, consequently the four stops were combined into two, resulting in a total of 32 stops for model analysis. For other cases where the roadcruiser actually stopped at a highway junction, for example Lewisporte, the community named as the station stop was used in the data base.

Values of all socio-economic data available for individual communities are given in Appendix A, Table A-4. The passenger origin-destination (O-D) matrix for this case as presented in Table A-5, was formed by aggregating Tables A-1 and A-2.

Zones (Case 2)--

This areal unit, named for convenience, zones, included an aggregation of census subdivisions surrounding each station stop. Using the 1976 census map with the bus route, population of towns and census subdivisions shown thereon, each subdivision containing a roadcruiser stop was circled. This circling was gradually extended to include other subdivisions until the areas between station stops were practically halved. Care was exercised not to intersect major highways but rather to enclose each route in a zone surrounding each roadcruiser stop. The majority of subdivision aggregations were clustered along the bus route. Not included in the zone formulation were remote locations from the bus route, such as the Great Northern Peninsula and Bay d'Espoir area. As travel to these involve considerable distances off the Trans Canada Highway, it is felt that most people rely on automobile or private bus services and do not connect with CN. The areas are considered to represent potential travel demand for future roadcruiser services.

The Conception Bay area of the Avalon Peninsula presented another exception. In this highly populated region, usage of the roadcruiser is very limited due to the fact that the bus route (Figure 5) does not pass through the coastal communities. Persons using the roadcruiser must begin and terminate their travel at either Holyrood or Whitbourne. Most people in the area commute between St. John's and communities of Conception Bay, therefore one-half of the trip would have to be made by automobile or private service in order to connect with the roadcruisers. Owing to such inconvenience and the short distance to St. John's, most people use some other form of transportation.

The zones finally settled upon as representative of the catchment areas for roadcruiser travel have been transferred from the large census map to Figure 6 for convenience of the reader. Those areas previously mentioned as representing potential passenger travel demand have not been included in forming the zones. There are 23 zones in total as a number of station stops occurred within the same census subdivision or were combined in formation of zonal areas.

The socio-economic data available for census subdivisions composing these zones is presented in Table A-6. The corresponding passenger O-D matrix is given in Table A-7.

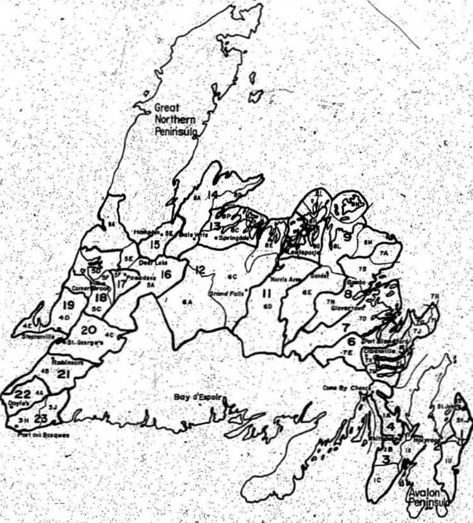


Figure 6 Traffic zones composed of census subdivisions

Incorporated communities (Case 3) --

Communities included in this data base were the organized portions (incorporated communities) in each of the zones formed for Case 2, above. This encompassed the socio-economic variables associated with the major centres in each census subdivision and hence deleted the rural contribution.

The variables available were the same as those for Case 2, however different in value as Case 2 included the total of both the organized and unorganized portions of each census subdivision. The tabulated data for incorporated communities is presented in Appendix A, Table A-8. It may be noted in this table that values for the variable, Average Household Income, are equal for both Case 2 and Case 3. This is because figures for the unorganized portions were not available and therefore incorporated community figures were substituted. It was assumed that the Average Household Income of the incorporated communities in a census subdivision was representative of all communities both organized and unorganized in that subdivision. The passenger O-D matrix for this case is the same as that for Case 2 (Table A-7).

The next step was to devise a method of relating the socio-economic data of each case with that of the respective passenger O-D matrix.

Methods

The BPR methods and models were chosen from the literature survey as most suitable for application to this study. These included modelling of trip generation using multiple linear regression analysis (3) and trip distribution by the gravity model (5). Such a selection was made on the basis of adaptability to the data, simplicity of techniques, clarity of literature, and on the premise that the BPR modelling techniques could be improved.

Trip Generation

The basic purpose of any trip generation procedure is to provide a factual and rational basis of forecasting trip ends for areal units within a transportation study area. In general there are two basic techniques of forecasting values of a variable. One is to forecast directly the variable of interest by extrapolation of a historical trend where the independent variable is time. The other, used in passenger demand prediction, is to assume that there is a causal relationship between the variable of interest and a second variable, or set of variables, such that, if the future values of the independent variables were known or could be predicted, the variable of interest could be readily determined. The former is often used for short term predictions and particularly to include time dependent variations such as seasonality. The latter is very useful where the variable of interest is not well supported by time series data or where it is suspected that past trends may no longer be representative. In either case the set of relationships adduced constitute what is commonly called a model.

In the regression analysis, the socio-economic variables for each of the three cases, Individual Communities, Zones and Incorporated Communities, are related to the trips produced and attracted respectively by each areal unit. Usually a model is developed on the basis of trip purpose, however in this study trip ends are not stratified by purpose, thus the passenger data and resulting prediction equations represent all purposes combined.

The prediction equation of the simple linear regression is:

$$\hat{Y}_i = a + bX_i$$

where:

$\hat{Y}_i$ = an estimated value of the dependent variable at X_i

a and b = regression coefficients

X_i = the independent variable

i = 1,n (observations)

For the multiple linear case, where more than one independent variable is used in the estimation of Y, the above equation may be written in the general form:

$$Y = a + b_1X_1 + b_2X_2 + \ldots\ldots + b_nX_n$$

The usage of logarithmic transformation may be applied in the solution of non-linear forms such as:

$$Y = aX_1^{b_1} \cdot X_2^{b_2} \cdot X_3^{b_3}$$

In this study the multiple linear case is initially used. This analysis is performed through the use of a library computer program titled BMD P1R[+] (27). Output from the program consists of the statistical data presented in Table 2.

The program executes this regression analysis repeatedly, automatically eliminating that independent variable which contributes the

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[+]The Biomedical (BMD) series of computer programs were developed at the Health Sciences Computing Facility, University of California, Berkeley, L.A.

Table 2 Output of multiple linear regression program BMD P1R

Statistical Data	
mean	probabilities
standard deviation	regression coefficients
minimums/maximums of variables	standard error of regression coeffts.
multiple R	covariance matrix
standard error of estimate	correlation matrix
regression sum of squares	scatter plots
residual sum of squares	normal and detrended probability plots
degrees of freedom	partial residual plots
mean squares	residuals
F-statistic	predicted values

least to the regression. This variable is the one which has the smallest partial correlation coefficient with the dependent variable.

Trip Distribution

At the end of the trip generation phase of the modelling process, one has knowledge of how many trips will be generated or attracted by each zone of the study area, however, trip exchange quantities between zones are not known. Trip distribution models enable the determination of such trip interchanges through calculating model parameter values which are found to govern interchanges in the base year.

One type of trip distribution model is the gravity model. As presented by the BPR (5) it takes the form:

$$T_{ij} = \frac{P_i A_j F_{ij} K_{ij}}{\sum_{j=1}^{n} A_j F_{ij} K_{ij}}$$

where: T_{ij} = trips produced in zone i and attracted by zone j

P_i = trips produced by zone i

A_j = trips attracted by zone j

F_{ij} = emperically derived travel deterrence (friction) factor which expresses the average area-wide effect of spatial separation on trip interchange between zones

K_{ij} = a specific zone-to-zone adjustment factor to allow for the incorporation of the effect on travel patterns of social and economic linkages not otherwise accounted for by the gravity model formulation.

Four separate parameters are required before trip interchanges (T_{ij}) can be computed using the above formula. Two of the basic parameters, the number of trips produced (P_i) and the number of trips attracted (A_j) by each traffic zone in the study area are obtained through the trip generation stage.

The BPR presents calibration of the gravity model as five separate phases (5):

1) Process the basic data on the area's travel patterns and transportation facilities in a usable form for analysis purposes.
2) Tabulate the data in 1 above into trip tables indicating the trips produced P_i and attracted A_j. The resulting trip tables are then related to specific travel deterrence factors for all zones to obtain a trip length frequency distribution.
3) Phase three concerns the development of travel deterrence factors for each calibration of the gravity model. The travel deterrence factors (F_{ij}) along with productions (P_i) and

attractions (A_j) are inserted into the model and a table of trip interchanges (T_{ij}) are calculated. The estimated trip length frequency distributions are then visually compared with the appropriate frequency distributions from the surveyed trips and the assumed travel deterrence factors are revised accordingly. A new set of trip interchanges is calculated and the process of trial and adjustment is continued until the two trip length distributions are in approximate agreement.

4) Phase four is concerned with the development if necessary of adjustment factors which may be required to properly calibrate travel patterns. Such factors may result through geographic bias caused by topographic barriers or certain social and economic linkages.

5) Phase five is concerned with the testing of the calibrated gravity model to be certain that it accurately simulates existing travel patterns.

Comparison between actual and estimated trip length frequency curves indicate the degree to which the travel deterrence factors were correctly chosen. The BPR (5) recommends that comparison be made between the O-D curve and gravity model curve based on the following criteria:

1) Both curves should be relatively close to one another when compared visually.

2) The difference between average trip lengths should be within ± 3 percent.

The initial set of travel deterrence factors may be determined in two ways:

1) Each travel deterrence factor may be assumed to have a value of one, that is no effect on trip interchange.

2) Travel deterrence factors derived for a city or area of comparable size may be used.

The most preferred method is the second as it usually requires fewer iterations. The process of calibration determines the travel deterrence factors which produce trip interchanges for the base year from trip ends (productions and attractions), which are observed in the base year.

The BPR recommends that travel deterrence factors be adjusted using the following formula:

$$F_{adj.} = F_{used} \times \frac{OD\%}{GM\%}$$

where: $F_{adj.}$ = travel deterrence factor to be used in next calibration

F_{used} = travel deterrence factor used in the gravity model run being analyzed

OD% = percentage of origin-destination survey trips

GM% = percentage of gravity model trips from the run being analyzed

The adjusted travel deterrence factors are then plotted against increments of time or distance usually on log-log scales. A 'line of best fit' is then drawn through the plot. This line should be as smooth and straight as possible, keeping in mind that it should only approximate the distribution of points. Once the line of best fit has been drawn, a new set of travel deterrence factors is selected from it and then used in the next calibration of the gravity model.

The gravity model formula as applied to the trip distribution in this study varied only slightly from that of the BPR. This variation was a result of excluding the adjustment (K_{ij}) factors:

$$T_{ij} = \frac{P_i A_j F_{ij}}{\sum_{i=1}^{n} A_j F_{ij}}$$

These factors were not initially included because (as stated on page 10 of Chapter Two) they are generally applicable only to large urban areas. Should certain zones in the study area impair calibration of the model, then it was intended to apply the necessary adjustment to such zones.

The travel deterrence (F_{ij}) factors are assumed to be a function of distance. Their initial values are determined through assuming a linear relationship between distance and travel deterrence factors. Values for further iterations are adjusted through the formula as recommended by the BPR.

The calibration procedure as previously outlined is concerned mainly with the comparison of output from successive gravity model iterations with that of the O-D data. The BPR recommends that this comparison be made 'visually' through plotting the trip length frequency distribution of each gravity model output with that of the O-D data. This visual inspection can be improved, as shown in this study, through application of the chi-square 'goodness of fit' test.

The special case of the gravity model when both the friction factor and zone-to-zone adjustment factor are not considered (their values equal one) represents a contingency table.+ The T_{ij} (trips produced in zone i and attracted by zone j) is the expected frequency in the contingency table:

$$T_{ij} = \frac{P_i A_j}{\Sigma A_j} = \frac{\Sigma r_i \ \Sigma k_j}{n} = f_{e_{ij}}$$

where:

T_{ij}, P_i, and ΣA_j are as previously defined

$f_{e_{ij}}$ = expected frequency in the i^{th} row and j^{th} column

Σr_i = sum of observations in the i^{th} row (row total)

Σk_j = sum of observations in the j^{th} column (column total)

n = number of observations (grand total)

The interrelationship between trip productions and attractions can be tested by a chi-square test of independence as applied to this contingency table.

In order to carry out the above statistical analysis, a trip distribution computer program was developed by the author. This program, written in Fortran Watfor, is presented in Appendix A, pages 134 to 149. The respective input and output is listed in Table 3. The program was designed to be flexible, whereby it may be readily applied to similar studies. In addition to the output in Table 3, various statistics including the average, variance, standard deviation and coefficient of variation are calculated for each trip interchange table.

+Tables in which the frequencies are arranged in rows and columns (for example an O-D table) are often referred to as contingency tables.

Table 3 Input and output of trip distribution program

Input	Output
a) community names (zone nodes)	a) community names (zone nodes), zone numbers and east west route distance
b) zone numbers	b) skim tree distance table
c) route distance	c) O-D trip interchange table
d) skim tree distances	d) expected cell frequencies (contingency table)
e) O-D trip interchanges	e) cell values chi-square (contingency table)
f) travel deterrence factors	f) O-D trip length frequency distribution over distance class
g) plotting symbols	g) plot of O-D trip length frequency distribution over distance class
h) various formulae	h) plot of travel deterrence factor over distance class
	i) gravity model trip interchange table
	j) chi-square test between O-D and gravity model trip interchanges
	k) trip interchange differences between O-D and gravity model
	l) O-D and gravity model trip length frequency distribution over distance class
	m) chi-square test between O-D and gravity model trips by distance class
	n) chi-square test between successive calibrations of the gravity model
	o) plot of O-D and gravity model trip length frequency distribution over distance class

Although the program output listed in Table 3 concerns the use of distance in kilometers as a deterrence to travel, the program was also run using travel time in minutes. Either appeared satisfactory and both have been applied to intercity passenger studies (15). Distance was, however, chosen for the analysis in this study.

Application of the Chi-Square Test

The chi-square criterion can be expressed by the following formula:

$$\hat{\chi}^2 = \frac{(f_o - f_e)^2}{f_e}$$

where:

$\hat{\chi}^2$ = calculated chi-square value

f_o = observed frequency

f_e = expected frequency

If the stated null hypothesis is true (that there is no statistically significant difference between the observed and expected frequencies), the calculated chi-square will be distributed as the theoretical chi-square distribution. However, if the hypothesis is not true, the calculated chi-square will not follow that of the theoretical distribution. This is indicated by a significantly larger calculated chi-square than the corresponding table (critical) chi-square value.

The chi-square test was applied to the trip distribution in this study as follows:

1. Test of independence

The distribution of trip productions and attractions are first presented in a contingency table (Table A-7). The null hypothesis is that there is no relationship between trips produced and attracted by any zone. This hypothesis means that the proportions of trips produced by any zone and attracted by a particular zone are independent. The calculated chi-square is then a measure of association between trip productions and attractions.

In order to perform the test of independence, the expected frequencies are calculated from the observed (O-D) data in accordance with the forementioned formula. The observed and expected frequencies are then used to calculate the chi-square cell values. If the total calculated chi-square value of all cells combined is statistically significant (larger than the critical chi-square), then trip productions and attractions are related. This relationship would indicate that there must be reasons for the particular pattern of trip occurrences. In other words, certain zones must possess characteristics which influence the pattern of travel such that this pattern is different from that which may be expected according to the probability of occurrence.

Calculation of the chi-square cell values enable the detection of observed frequencies which are significantly different from those that may be expected. This is the detection of observed cells containing unusual values. Such cells would be a result of the zonal interchange in which they occur. These zones should then be further investigated with regards to characteristics possessed that are influential to passenger travel.

In order to ensure that the chi-square test be valid, the expected frequency in each cell must have a minimum value of five. Expected frequencies of less than five are not regarded in the analysis.

The general formula for the degrees of freedom associated with a test of independence in a contingency table is:

$$df = (r-1)(k-1)$$

where:

r = number of rows

k = number of columns

2. Goodness of fit test

a) The chi-square 'goodness of fit' test is first performed between trip interchanges of each successive gravity model iteration and the O-D table. The gravity model represents the expected (theoretical) frequencies. This test indicates the degree of closeness between the two sets of data. The cell chi-square values determine whether the gravity model trip interchanges are significantly different from the O-D. Also detected are those cells for which differences between the gravity model and O-D are the greatest. The statistical significance may be again related to characteristics which are influential to travel and possessed by zones composing these interchanges.

b) O-D trips by distance classes are compared using the chi-square test to trips produced by the gravity model for corresponding distance classes. If the total chi-square value is significant, then trips per distance class of the two data sets are not close in value and a further iteration is required. This test also detects those classes for which the O-D and gravity model trips are furthest apart. This procedure is a facsimile to the 'visual' comparison of trip length frequency distributions.

c) After the first iteration of the gravity model is performed, then subsequent iterations must be made until no significant differences occur between two successive iterations. Trips by distance class of the precedingg iteration are considered as expected (theoretical) frequencies while trips of the current iteration are the observed frequencies. When the chi-square test indicates that no statistically significant differences exist between trips per distance class of the two iteration sets, then further iterations are not required. An additional calibration would not improve the 'goodness of fit' between the gravity model and O-D data sets.

Testing of Model

Testing of the model is performed through comparison of predicted and actual passenger data for four consecutive years following the base year. The model derived through trip generation and trip distribution is based upon the socio-economic conditions of 1976 and passenger flow data collected during the survey period of August for that year. A constraint placed upon the testing was that values of the socio-economic variables were not available beyond the base year, 1976. In order to overcome this obstacle, the required values were extrapolated by projecting growth rates from census data collected during 1971.

These estimated socio-economic values for each test year are used as input to the trip generation equations. The resulting forecasted trip productions and attractions are then used as input to the trip distribution program. Output of this program is compared statistically and visually with the passenger data as collected for each test year. Chi-square testing is also applied in detecting differences between observed and predicted data. Modification of the trip distribution program also enables comparison of passenger data between successive test years.

Methods Flow Chart

Figure 7 presents a flow chart which illustrates the sequence of procedures followed in design of the research and methods. The left portion refers to the trip generation stage, whereas the right includes trip distribution and model testing. This diagram provides continuous orientation to the reader as the material is presented in each chapter.

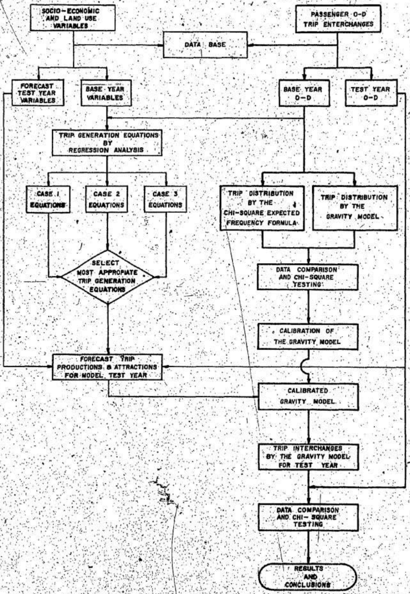


Figure 7 Research design methodology

CHAPTER FOUR

ANALYSIS OF DATA

Trip Generation

Trip generation equations were developed using multiple and simple linear regression analysis. Modelling of three separate sets of areal units was performed in order to assess the most appropriate size for the traffic zones. The intention was to determine whether the size should be limited to an individual community, an aggregation of communities and rural areas or an aggregation of major communities. For convenience these three data sets were respectively named: Individual Communities, Zones and Incorporated Communities.

Considerations

In addition to the necessary statistical assumptions regarding regression analysis, the following criteria as recommended by the BPR (3), (4) were considered in development of the forementioned equations:

1) Ability to forecast independent variables: only independent variables which can be forecasted within a reasonable degree of accuracy should be included.
2) Logic of variables: only those variables which are reasonably related to the dependent variable should be permitted to enter the equations.
3) Association, causation: some variables enter into an equation

due to association between dependent and independent variables which may be caused merely by chance. In order that the relationship be meaningful, it should be causative.

4) Rates versus zonal aggregates: zonal aggregates and rates should not be intermixed in the same equation.

5) Deletion of zero trip end zones: zones which do not contain the necessary characteristics, for example marginally developed zones, should be deleted.

6) Large equation constants: a constant is considered large when it contributes the majority of the estimate of the dependent variable. This may produce some inconsistencies with regards to zones possessing small independent variable values.

7) Signs of independent variables: logic must be considered when examining the positive or negative contribution of the independent variables in a regression equation.

8) Stratification of trip data: the regression results are dependent upon the stability of the data which are used. To achieve such stability, each zone must include a sufficient number of observations of trip making to characterize the entire zonal population.

9) Special generation cases: zones which contain major single activity land uses such as airports, major shopping centres and other large facilities must often be treated separately.

10) Number of variables: not more than two or three independent variables should be included in a predictive equation, as usually little improvement is made after entry of the second variable.

Many of these recommendations were considered in the following analysis and discussion. They are referred to in selection of the independent variables, construction of prediction equations and in discussion of results.

In addition to criteria of the basic statistical assumptions, inadequacies arise due to assuming that relationships between trips and land use (or socio-economic variables) present in the resulting equations maintain stability over time.

Statistical Assumptions of Regression Analysis

The proper interpretation of the results of regression analysis requires that the data conform to the following assumptions:

1) The independent variable is measured without error.
2) At any given value of the independent variable the residuals of dependent variable values are independently and normally distributed with zero mean.
3) For all values of the independent variable the variances of the dependent variable are equal.

Most of the independent variable values presented in the data were obtained from Statistics Canada who have completed actual counts for the census years. Therefore such variables were considered as measured without error. A graphical test for the normal distribution of the dependent variable was carried out by simply plotting frequencies of the dependent variable by classes of the independent variable and comparing this plot to that of the normal distribution curve. The distribution and size of residuals can be observed from the confidence interval plots and from the regression program output. This observation gives indication of the independence of residuals. Bartlett's test (28), (29) was applied to determine the homogenity (equality) of variances of the dependent variable. As testing these assumptions for all independent variables would be a very time consuming task, such testing was limited to those variables included in the final equations. In any case only the results obtained by these equations were used in the actual trip generation.

The BPR (3) appears to have scaled down the importance of the foregoing assumptions through accepting that the socio-economic variables and trip making activity usually meet the underlying criteria of regression. Other literature containing applications of regression in trip generation failed to include any discussion or testing of the assumptions whatsoever. Without proving the validity of these assumptions, the regression analysis may be performed, however statistical interpretation of the multiple correlation coefficient R, the simple correlation coefficient (r) and the standard error of estimate may be misleading. The stated probabilities would not hold and interpretation of these statistical values would not be correct.

One of the greater problems in trip generation by regression analysis is that of collinearity between independent variables. When two highly correlated independent variables are allowed to enter the same equation, not only is the effect of each variable on the dependent clouded, but the least squares technique tends to break down (2). Furthermore, this is contrary to the basic assumptions of multiple linear regression analysis.

Prior to using the variables in the regression program, initial observations were made for relationships between them. Hand plotting indicated that a linear relationship appeared present between the dependent variable and many of the independent variables, as well as between the independent variables themselves. A sample of this plotting is included in Appendix B, Figure B-1.

Regression Equations

The basic linear regression form was used in the final trip generation analysis. All variables collected for each case, abbreviations and numbering as used in the computer programs are presented in Table 4.

Multiple linear regression --

To establish this relationship, the data as discussed in Chapter Three (Research Design) and presented in Appendix A, Tables A-4 to A-8 inclusive, were used in the analysis. In order to obtain the trip productions and attractions from Tables A-5 and A-7 a simple computer program was written in Fortran Watfiv. This program is given in Appendix B, pages 152 and 153. The respective output for Case 1 is presented in Table B-1, while output for Cases 2 and 3 is given in Table B-2. The trip productions and attractions so obtained along with the socio-economic data of Tables A-4, A-6 and A-8 were used as input to the BMD P1R regression program.

Initially all variables as given in Table 4 were included in the regression. The correlation matrices so obtained for trip productions and attractions of each case are presented in Tables 5, 6 and 7. It is evident that the higher correlations between the independent variables and dependent variable are present in Case 2 (Zones). Furthermore, intercorrelation is common between all independent variables with

Table 4 Variables considered for regression analysis

Case 1 Individual Communities	Case 2 Zones	Case 3 Incorporated Communities
Population (POP., X_1)	Population (POP., X_1)	Population (POP., X_1)
Dwelling Units (DWEL., X_2)	Population Males (POP. M., X_2)	Dwelling Units (DWEL., X_2)
Labour Force (LAB. F., X_3)	Dwelling Units (DWEL., X_3)	Owned Dwelling Units (O. DWEL., X_3)
Employed Persons (EMPL. P., X_4)	Owned Dwelling Units (O. DWEL., X_4)	Labour Force (LAB. F., X_4)
Average Household Income (AVE. HI., X_5)	Labour Force (LAB. F., X_5)	Labour Force Males (LAB. FM., X_5)
Trips Produced or Attracted (TRIPS, X_6)	Labour Force Males (LAB., FM., X_6)	Employed Persons (EMPL. P., X_6)
Unemployed Persons (UNEMP., X_9)	Employed Persons (EMPL. P., X_7)	Average Household Income (AVE. HI., X_7)
	Average Household Income (AVE. HI., X_8)	Trips Produced or Attracted (TRIPS, X_8)
	Trips Produced or Attracted (TRIPS., X_9)	Rented Dwelling Units (R. DWEL., X_{11})
	Population Females (POP. F., X_{12})	Labour Force Females (LAB. FE., X_{12})
	Rented Dwelling Units (R. DWEL., X_{13})	Unemployed Persons (UNEMP., X_{13})
	Labour Force Females (LAB. FE., X_{14})	
	Unemployed Persons (UNEMP., X_{15})	

Table 5 Correlation matrices for Case 1 (Individual Communities)

PAGE 3 PRODUCTIONS AUGUST 1976: (INDIVIDUAL COMMUNITIES)

CORRELATION MATRIX

		POP. 1	DWEL. 2	LAB.F. 3	EMPL.P. 4	AVE. HI. 5	TRIPS 6	UNEMP. X(9) 9
POP.	1	1.0000						
DWEL.	2	0.9996	1.0000					
LAB.F.	3	0.9997	0.9998	1.0000				
EMPL.P.	4	0.9995	0.9998	1.0000	1.0000			
AVE. HI.	5	0.4078	0.3983	0.4086	0.4082	1.0000		
TRIPS	6	0.8878	0.8832	0.8862	0.8851	0.5903	1.0000	
X(9) UNEMP.	9	0.9982	0.9966	0.9969	0.9962	0.4113	0.8934	1.0000

PAGE 3 ATTRACTIONS AUGUST 1976: (INDIVIDUAL COMMUNITIES)

CORRELATION MATRIX

		POP. 1	DWEL. 2	LAB.F. 3	EMPL.P. 4	AVE. HI. 5	TRIPS 6	UNEMP. X(9) 9
POP.	1	1.0000						
DWEL.	2	0.9996	1.0000					
LAB.F.	3	0.9997	0.9998	1.0000				
EMPL.P.	4	0.9995	0.9998	1.0000	1.0000			
AVE. HI.	5	0.4078	0.3983	0.4086	0.4082	1.0000		
TRIPS	6	0.8756	0.8689	0.8737	0.8723	0.6230	1.0000	
X(9) UNEMP.	9	0.9982	0.9966	0.9969	0.9962	0.4113	0.8839	1.0000

Table 6 Correlation matrices for Case 2 (Zones)

PAGE 3 PRODUCTIONS AUGUST 1976: (ZONES)

CORRELATION MATRIX

	POP. 1	POP.M. 2	DWEL. 3	O. DWEL. 4	LAB.F. 5	LAB.FM. 6	EMPL.
POP. 1	1.0000						
~~POP.M. 2~~	~~1.0000~~	~~1.0000~~					
DWEL. 3	0.9998	0.9997	1.0000				
O. DWEL. 4	0.9990	0.9990	0.9994	1.0000			
LAB.F. 5	0.9982	0.9983	0.9977	0.9971	1.0000		
~~LAB.FM. 6~~	~~0.9980~~	~~0.9980~~	~~0.9973~~	~~0.9971~~	~~0.9998~~	~~1.0000~~	
EMPL.P. 7	0.9972	0.9973	0.9966	0.9960	0.9999	0.9998	1.0
AVE. HI. 8	0.4108	0.4108	0.4072	0.4000	0.4306	0.4306	0.4
X(9) TRIPS 9	0.9149	0.9145	0.9180	0.9148	0.8957	0.8945	0.8
~~X(12)POP.F.12~~	~~1.0000~~	~~1.0000~~	~~0.9998~~	~~0.9990~~	~~0.9982~~	~~0.9979~~	
X(13)R.DWEL13	0.9917	0.9914	0.9914	0.9861	0.9891	0.9874	0.9
X(14)LAB.FE14	0.9976	0.9975	0.9974	0.9960	0.9991	0.9982	0.9
X(15)UNEMP. 15	0.9944	0.9942	0.9952	0.9938	0.9881	0.9868	0.9

	R.DWEL. X(13) 13	LAB.FE. X(14) 14	UNEMP. X(15) 15
X(13)R.DWEL13	1.0000		
X(14)LAB.FE14	0.9917	1.0000	
X(15)UNEMP. 15	0.9893	0.9896	1.0000

PAGE 3 ATTRACTIONS AUGUST 1976: (ZONES)

CORRELATION MATRIX

	POP. 1	POP.M. 2	DWEL. 3	O. DWEL. 4	LAB.F. 5		
POP. 1	1.0000						
~~POP.M. 2~~	~~1.0000~~	~~1.0000~~					
DWEL. 3	0.9998	0.9997	1.0000				
O. DWEL. 4	0.9990	0.9990	0.9994	1.0000			
LAB.F. 5	0.9982	0.9983	0.9977	0.9971	1.0000		
~~LAB.FM. 6~~	~~0.9980~~	~~0.9980~~	~~0.9973~~	~~0.9971~~	~~0.9998~~	~~1.0000~~	
EMPL.P. 7	0.9972	0.9973	0.9966	0.9960	0.9999	0.9998	1.
AVE. HI. 8	0.4108	0.4108	0.4072	0.4000	0.4306	0.4306	0.
X(9) TRIPS 9	0.9017	0.9011	0.9065	0.9033	0.8841	0.8808	0.
~~X(12)POP.F.12~~	~~1.0000~~	~~1.0000~~	~~0.9998~~	~~0.9990~~	~~0.9982~~	~~0.9979~~	~~0.~~
X(13)R.DWEL13	0.9917	0.9914	0.9914	0.9861	0.9891	0.9874	0.
X(14)LAB.FE14	0.9976	0.9975	0.9974	0.9960	0.9991	0.9982	0.
X(15)UNEMP. 15	0.9944	0.9942	0.9952	0.9938	0.9881	0.9868	0.

	R.DWE. X(13) 13	LAB.FE. X(14) 14	UNEMP. X(15) 15
X(13)R.DWE.13	1.0000		
X(14)LAB.FE14	0.9917	1.0000	
X(15)UNEMP. 15	0.9893	0.9896	1.0000

	. DWEL. 4	LAB.F. 5	LAB.FM. 6	EMPL.P. 7	AVE. HI. 8	TRIPS X(9) 9	POP.F. X(12) 12
	1.0000						
	0.9971	1.0000					
	0.9971	0.9998	1.0000				
	0.9960	0.9999	0.9998	1.0000			
0	0.4000	0.4306	0.4306	0.4376	1.0000		
,6	0.9148	0.8957	0.8945	0.8909	0.3537	1.0000	
19	0.9990	0.9982	0.9979	0.9972	0.4108	0.9152	1.0000
,2	0.9861	0.9891	0.9874	0.9877	0.4297	0.9199	0.9919
77	0.9960	0.9991	0.9982	0.9987	0.4299	0.8973	0.9977
87	0.9938	0.9881	0.9868	0.9854	0.3607	0.9279	0.9946
54							

	. DWEL. 4	LAB.F. 5	LAB.FM. 6	EMPL.P. 7	AVE. HI. 8	TRIPS X(9) 9	POP.F. X(12) 12
	1.0000						
	0.99~1	1.0000					
	0.9	0.9 9	98	1.0000			
00	0.4000	0.4306	0.4306	0.4376	1.0000		
76	0.9033	0.8841	0.8808	0.8791	0.3556	1.0000	
91	0.9990	0.9982	0.9979	0.9972	0.4108	0.9023	1.0000
2	0.9861	0.9891	0.9874	0.9877	0.4297	0.9084	0.9919
,7	0.9960	0.9991	0.9982	0.9987	0.4299	0.8901	0.9977
87	0.9938	0.9881	0.9868	0.9854	0.3607	0.9178	0.9946
54							

2of2

Table 7 Correlation matrices for Case 3 (Incorporated Communities)

PAGE 3 PRODUCTIONS AUGUST 1976: (INCORPORATED COMMUNITIES)

CORRELATION MATRIX

		POP. 1	DWEL. 2	O. DWEL. 3	LAB.F. 4	LAB.FM. 5	EMPL.P. 6	AVE. H
POP.	1	1.0000						
DWEL.	2	0.9998	1.0000					
O. DWEL.	3	0.9993	0.9994	1.0000				
LAB.F.	4	0.9988	0.9986	0.9986	1.0000			
LAB.FM.	5	0.9983	0.9980	0.9983	0.9998	1.0000		
EMPL.P.	6	0.9979	0.9977	0.9979	0.9998	0.9999	1.0000	
AVE. HI.	7	0.4225	0.4201	0.4157	0.4321	0.4374	0.4401	1.00
TRIPS	8	0.8983	0.9024	0.8956	0.8856	0.8819	0.8802	0.35
X(11) R.DWEL	11	0.9909	0.9916	0.9865	0.9880	0.9862	0.9863	0.43
X(12) LAB.FE	12	0.9982	0.9985	0.9979	0.9989	0.9977	0.9980	0.41
X(13) UNEMP.	13	0.9864	0.9868	0.9850	0.9819	0.9789	0.9777	0.35

		UNEMP. X(13) 13
X(13)	13	1.0000

PAGE 3 ATTRACTIONS AUGUST 1976: (INCORPORATED COMMUNITIES)

CORRELATION MATRIX

		POP. 1	DWEL. 2	O. DWEL. 3	LAB.F. 4	LAB.FM. 5	EMPL.P. 6	AVE. H
POP.	1	1.0000						
DWEL.	2	0.9998	1.0000					
O. DWEL.	3	0.9993	0.9994	1.0000				
LAB.F.	4	0.9988	0.9986	0. 86	1.0000			
LAB.FM.	5	0.9983	0.9980	0.				
EMPL.P.	6	0.9979	0.9977	0. 9 9	.9 8	0.9 9	1.0000	
AVE. HI.	7	0.4225	0.4201	0.4157	0.4 21	0.4374	0.4401	1.00
TRIPS	8	0.8851	0.8908	0.8842	0.8743	0.8690	0.8690	0.35
X(11) R.DWEL	11	0.9909	0.9916	0.9865	0.9880	0.9862	0.9863	0.
X(12) LAB.FE	12	0.9982	0.9985	0.9979	0.9989	0.9977	0.9980	0.41
X(13) UNEMP.	13	0.9864	0.9868	0.9850	0.9819	0.9789	0.9777	0.35

		UNEMP. X(13) 13
X(13)	13	1.0000

Communities)

ED COMMUNITIES)

AB.F. 4	LAB.FM. 5	EMPL.P. 6	AVE. HI. 7	TRIPS 8	R.DWEL. X(11) 11	LAB.FE. X(12) 12
1.0000						
0.9998	1.0000					
0.9998	0.9999	1.0000				
0.4321	0.4374	0.4401	1.0000			
0.8856	0.8819	0.8802	0.3537	1.0000		
0.9880	0.9862	0.9863	0.4318	0.9181	1.0000	
0.9989	0.9977	0.9980	0.4199	0.8921	0.9904	1.0000
0.9819	0.9789	0.9777	0.3518	0.9157	0.9830	0.9870

ED COMMUNITIES)

AB.F. 4	LAB.FM. 5	EMPL.P. 6	AVE. HI. 7	TRIPS 8	R.DWEL. X(11) 11	LAB.FE. X(12) 12
1.0000						
0.9998	1.0000					
0.9998	0.9999	1.0000				
0. 321	0.4374	0.4401	1.0000			
0. 743	0.8690	0.869	. 5	1.0 0		
.99[illegible]	0. [illegible]	. 8	[illegible]	0.884	[illegible]	1.0000
.981	0. 78	0.9 77	0.3 7	0.9045	0.9 30	0.9870

53

2 of 2

the exception of Average Household Income. In fact all independent variables excluding this one exception are highly correlated with the dependent variable. The intercorrelation present suggests that the independent variables are measurements of the same underlying phenomenon.

The regression program has a built in feature which causes the automatic selection of independent variables for inclusion in the regression. Selections are made strictly on a statistical basis, therefore the variables included may not necessarily conform to the forementioned BPR criteria. Hence, resulting equations and statistical values of the first regression run are not presented.

Simple linear regression --

In review of Table 4, it is fairly obvious that the more stable independent variables are Population, Dwelling Units and probably Labour Force. Those such as Average Household Income, Employed and Unemployed Persons tend to fluctuate greatly with the economic state. The BPR highly recommends the use of Dwelling Units and does not recommend income especially at the zonal level.

The independent variable (Average Household Income) was forecasted from 1971 values to that of 1976 by the data source. This most certainly presents some instability with regards to the basic assumptions of regression as well as the BPR recommendations. In addition, poor correlation of this variable with the dependent variable as evident in Tables 5, 6 and 7 provided little support for its inclusion in further running of the regression program. Nevertheless, in order to determine whether the variable could present improvement to the final equations, it was later included.

Due to the problem of collinearity between the independent variables and the poor standing of Average Household Income, the regression analysis was repeated using only one independent variable. On the basis of correlation between the dependent and independent variables, as well as adherence to the BPR recommendations, the most appropriate variable for modelling in each case is presented in Table 8.

Table 8 Independent variables selected for modelling each case

Case	Independent Variable	Correlation with Dependent Variable	
		Productions	Attractions
1) Individual Communities	Population	.8878	.8756
2) Zones	Dwelling Units	.9180	.9065
3) Incorporated Communities	Dwelling Units	.9024	.8908

The numerical and graphical output of the regression program for each case using the variables given in Table 8 are respectively presented in Appendix B, pages 156 to 173. This output indicates the statistical results obtained and enables a comparison between the cases.

The resulting prediction equations which relate base year passenger survey data to demographic variables for that year are as follows:

(T_p = trips produced by a zone, T_A = trips attracted by a zone)

Case 1 (Individual Communities):

$$T_P = 242 + 0.03542 \text{ POP.}$$

$$T_A = 242 + 0.03541 \text{ POP.}$$

<u>Case 2</u> (Zones):

$$T_P = 247 + 0.11192 \text{ DWEL.}$$

$$T_A = 254 + 0.10982 \text{ DWEL.}$$

<u>Case 3</u> (Incorporated Communities):

$$T_P = 290 + 0.10957 \text{ DWEL.}$$

$$T_A = 296 + 0.10747 \text{ DWEL.}$$

In order to facilitate ease of comparison between the cases, the statistical values from the program output are presented in Table 9. The independent and dependent variable are best related in Case 2 (Zones). To improve the overall prediction, the regression was repeated with inclusion of an additional independent variable (Average Household Income) which was not correlated with the other independent variables. However this analysis did not yield improvement in Case 2 or Case 3, while slight improvement was achieved in Case 1. In this latter case, the improvement was not good enough (Productions R^2 = .8028, Attractions R^2 = .7913) to warrant selection of this case over Case 2.

The precision of the developed equations for Case 2 is expressed by the 95% confidence interval band for mean values of the dependent variable on the regression line (Figure 8). This band is used to detect observations which have unusually large discrepancies from the regression line. Due to the fact that trip productions and attractions of each individual zone are very close in value as evident in Table B-2 and also in statistical significance (Table 9), the confidence interval was constructed for productions only. The pertinent formulae and calculations for construction of this confidence band are given in

Table 9 Comparison of statistical values for each regression case

Statistics	Case 1, Individual Communities Productions	Case 1, Individual Communities Attractions	Case 2, Zones Productions	Case 2, Zones Attractions	Case 3, Incorporated C Productions	Case 3, Incorporated C Attraction
1) Simple Correlation Coefficient (r)	.8878	.8756	.9180	.9065	.9024	.8908
2) Multiple Correlation Coefficient (R)	.8878	.8756	.9180	.9065	.9024	.8908
3) Coefficient of Determination (R^2)	.7882	.7667	.8427	.8217	.8143	.7936
4) Standard Error of Estimate ($S_{Y.X}$)	288.07	306.42	286.58	303.12	311.31	326.18
5) F-Ratio (F)	111.58**	98.58**	112.47**	96.79**	92.1**	80.72**
6) Intercept (a)	242	242	247	254	290	296
7) Regression Coefficient (b_1)	.03542	.03541	.11192	.10982	.10957	.10747
8) t-value (t_{x_1})	10.563**	9.928**	10.605**	9.838**	9.597**	8.985**
9) P (2-Tail) (P_{x_1})	.000	.000	.000	.000	.000	.000
10) Coefficient of Variation C_v	2.535	2.535	1.297	1.297	1.437	1.437

Case 2, ...ones :tions	Attractions	Case 3, Incorporated Communities Productions	Attractions	Comment
180	.9065	.9024	.8908	The independent variable having the highest correlation with the dependent variable is present in Case 2, followed by Case 3 and Case 1, respectively.
180	.9065	.9024	.8908	Same values as in 1) above because only one variable was included in regression. Independent and dependent variables are more closely associated in Case 2 than in Case 3 and Case 1 respectively.
127	.8217	.8143	.7936	Regression line fits data closely in all cases but best fit is for Case 2 followed by Case 3 and Case 1 respectively.
.58	303.12	311.31	326.18	Less error can be expected in prediction of dependent variable for Case 2.
.47**	96.79**	92.1**	80.72**	All are significant at the 1% level of testing (**). Productions are more significant for Case 2, and Attractions are more significant for Case 1. The F-values for Case 2 and Case 1 are very close.
7	254	290	296	Case 1 has the lower intercept values and are not greatly different from those of Case 2.
92	.10982	.10957	.10747	Constants for inclusion with intercept values in resulting equations.
.605**	9.838**	9.597**	8.985**	All are significant at the 1% level of testing. Productions are more significant for Case 2 and Attractions are more significant for Case 1. The t-values for Case 2 and Case 1 are very close.
.000	.000	.000	.000	The probability of a 2-Tail error is nil.
.297	1.297	1.437	1.437	Independent variable varies least for Case 2, followed by Case 3 and Case 1 respectively.

2 of 2

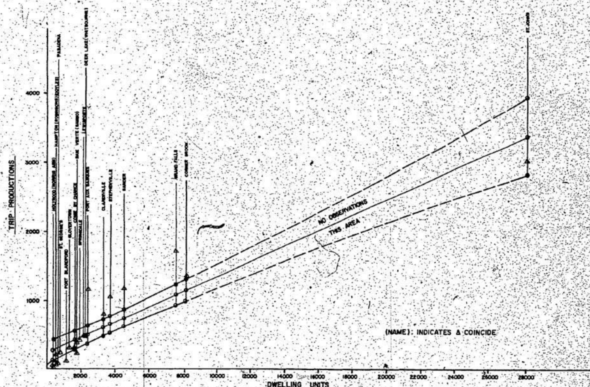
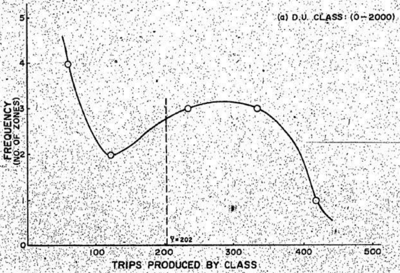


Figure 8 95% Confidence band for mean values of the dependent variable on the regression line

Appendix B, Table B-15. More than one-half of the observations fall outside of the 95% confidence interval which indicates that bias exists in the data. Since there are no observations between 8,200 and 28,000 numbers of dwelling units, the inclusion of St. John's data in the regression analysis is probably not justified. Actually, it is quite possible over the range of the data (300 to 28,200) that the relationship is not linear.

To accept the trip production and attraction equations it is necessary, as stated earlier, that the data conform to the underlying assumptions of regression analysis. The independent variable (Dwelling Units) obtained from Statistics Canada, was assumed to be measured without error. The dependent variable values (Trips Produced- Case 2) were tested for normality by class interval (Appendix B, Table B-16). The independent variable was first divided into two classes (high and low values of dwelling units) such that frequency of the dependent variable observations would be approximately equal in each class. The dependent variable was subsequently divided into classes and then the class frequency of trip occurrences by zone were plotted, the results of which are shown in Figure 9. For the low dwelling unit values (top graph) the four observations in the first trip class (0-100) makes the plot deviate from the normal shape. The high dwelling unit values (lower graph) approximates the normal curve.

No particular testing was carried out for the independence of residuals because of insufficient observations (only 23 zones). However, the confidence band (Figure 8) and regression residuals (Table B-8) give some indication of non-independence: too many observations



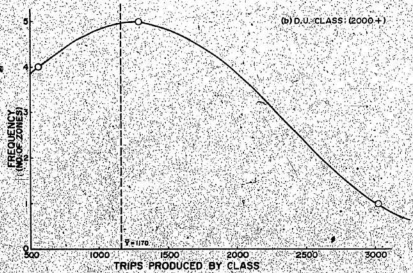


Figure 9 Frequency distribution of dependent variable (Trips Produced) by low (a) and high (b) classes of dwelling units.

fall outside the 95% confidence band and too many consecutive residuals have negative values.

The results of these tests for independent and normal distribution of residuals cannot be considered conclusive because of the limited number of trip observations by dwelling unit classes. Therefore some error may be present in the regression equations, however sufficient test evidence is not available to refute validity of the equations.

Bartlett's test for the equality of variances was carried out for the dependent variable by classes of the independent variable. The pertinent formulae and calculations are given in Appendix B, page 176 and Table B-17. This table, which includes all zones, shows that variances between the classes are not equal. The test was then repeated after one of the zones was eliminated.

Figure 8 indicates that the Zone 1 (St. John's) data tends to pull the regression line down. For the large concentration of dwelling units in this zone, there does not exist a corresponding usage of the bus service to that of the smaller communities. The effect of Zone 1 along with the uneven distribution of dwelling units (no observations between 8,200 and 28,000) makes it more difficult to ascertain the exact shape of the relationship in Figure 8. As sufficient observations were not available to determine such, it was decided to eliminate the Zone 1 data and proceed on the basis of a linear model for the remaining 22 zones.

The assumptions of regression analysis were tested again, using only 22 zones. The effect of removing Zone 1 (as evident in Figure 9) would not improve conformation of the frequency curve to the normal shape. Bartlett's test for the equality of variances (Appendix B, Table B-18), however, showed that the variance between the classes were consequently equal and thus this assumption had been fulfilled.

Output of the regression program using 22 zones is presented in Appendix B, pages 179 to 185. The resulting equations are:

$$T_P = 49 + 0.20782 \text{ DWEL.}$$

$$T_A = 33 + 0.21680 \text{ DWEL.}$$

A comparison of the program output using 23 zones with that of 22 zones is made in Table 10. The exclusion of Zone 1 from the analysis produced improved prediction equations. This improvement is reflected through reduction in residual values from those of the former models (Appendix B, Tables B-8 and B-10) to those of the latter (Tables B-21 and B-23). Trip ends associated with the smaller dwelling unit values are generally overpredicted resulting in negative residuals. The under-predictions resulting in positive residuals are large for zones containing Gander, Stephenville and Port aux Basques. More passengers are produced and attracted by these zones and such movements are not in proportion to that of the other zones.

The 95% confidence band constructed for the 22 zone regression line (Appendix B, Table B-24) is shown compared to that using 23 zones in Figure 10. The 22 zone confidence interval (dotted line) enclosed more of the actual observations than that of the former (23 zone) equation. Noticeable as outside of both confidence bands are zones containing Gander, Stephenville and Port aux Basques. Explanations for these unusual occurrences will be made in a subsequent chapter.

Table 10 Comparison of statistical values for Case 2 (Zones), including and excluding Zone 1 (St. John's)

Statistics	23 Zones (Zone 1 included) Productions	Attractions	22 Zones (Zone 1 excluded) Productions	Attractions	Comment (when Zone 1 is excluded:)
1) Simple Correlation Coefficient (r)	.9180	.9065	.9232	.9325	The independent variable, dwelling units, correlates better with the dependent variable.
2) Multiple Correlation Coefficient (R)	.9180	.9065	.9232	.9325	The independent and dependent variables are more closely associated.
3) Coefficient of Determination (R^2)	.8427	.8217	.8523	.8696	The regression line fits the data more closely.
4) Standard Error of Estimate ($S_{Y.X}$)	286.58	303.12	189.10	183.47	Less error can be expected in prediction of the dependent variable.
5) F-Ratio (F)	112.47**	96.79**	115.41**	133.42**	A more statistically significant relationship is present. (** significant at 1% level of testing)
6) Intercept (a)	247	254	49	33	The constant term of the equation is reduced.
7) Regression Coefficient (b_1)	.11192	.10982	.20782	.21680	The regression coefficients are increased indicating that further reliance is placed upon the independent variable.
8) t-Value	10.605**	9.838**	10.743**	11.551**	Indicates that independent variable is more significant.

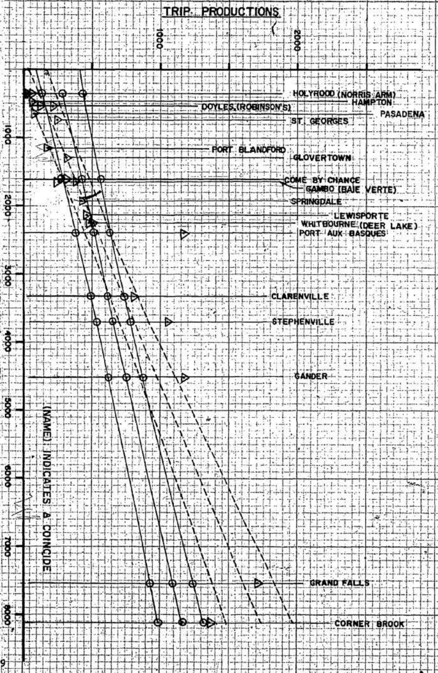


Figure 10 95% Confidence band comparison of 22-zone and 23-zone equations

Solid line: zone 1 (included) Broken line: zone 1 (excluded)

Trip Distribution

The BPR procedures (3), (5) were used in general terms in this research. Particular attention was paid to improving these procedures by introducing appropriate statistical testing during the regression and correlation analysis and especially in the trip distribution. The following portion of this chapter presents results of the trip distribution analysis.

The O-D and Expected Trip Interchanges

General data --

Appendix C, Table C-1 contains a list of communities considered as zone nodes and the corresponding zone numbers. Also given are the accumulating east-west route distances from the end nodes. This table is useful for referral purposes in presentation of the computer program output. Distances between each zone node are given in Appendix C, Table C-2. The zone numbers across the top of the table and down the far left refer to communities in Table C-1. Numerical values on each side of the diagonal correspond as the left portion represents east to west distances and the right west to east. A value for each cell was necessary in program input whereas only half of the table need be printed.

Zone to zone trip interchanges (O-D) for the base year survey period are presented in Table C-3. Productions and attractions are the same as those used during the trip generation stage (Appendix B, Table B-2). With reference to Table C-1 it is obvious that the greater numbers of trip interchanges are made between zones containing the larger population centres. These include: Zone 1 (St. John's), Zone 5 (Clarenville), Zone 9 (Gander), Zone 12 (Grand Falls), Zone 18 (Corner Brook), Zone 19 (Stephenville) and Zone 23 (Port aux Basques).

Some statistical values for the O-D table are calculated and presented. The sum of squares of differences between the cell values and mean (abbreviated SUM. SQS.) is used in calculation of the variance. The variance is used in calculation of the standard deviation and also in comparison of the variance produced by the gravity model. The standard deviation (STD. DEV) along with the coefficient of variation indicates that the data of Table C-3 is spread by more than twice the mean value. This is attributed to a wide range from small to large numbers of trip interchanges.

Table C-4 contains the expected trip interchanges (contingency table) as determined from the O-D survey trip productions and attractions using the expected frequency formula as presented on page 37 of Chapter Three. The row and column totals are exactly the same as those of the O-D survey as this is a constraint for the contingency table. The cell values are more evenly distributed than those of the O-D table. This indicates that there must be reasons for such deviation from the expected pattern. There are expected interchanges in each cell including those of the top left to bottom right diagonal, for example 627 trips are expected within Zone 1. These diagonal interchanges in actuality are not possible and are not considered in the analysis.

Trips of the O-D data were categorized by distance classes in increments of 20 kilometers as presented in Table C-5. This interval of 20 kilometers was arbitrarily chosen and a greater or lesser interval could as well have been used. Classes containing greater numbers of trips correspond with distances between the major centres. The trip length frequency distribution graph resulting from this table is presented in Appendix C, Figure C-1. The plot appears to be somewhat normally distributed and slightly skewed to the right. A noticeable exception to this skewness is presented by class 900 to 919 which includes travel between Zone 1 (St. John's) and Zone 23 (Port aux Basques).

Test of independence --

Table C-6 contains the cell values chi-square between the observed (O-D) and expected trip interchanges. This is a test of independence or association between the rows and columns (productions and attractions). Due to the commonly used constraint that the expected frequency of any cell must be at least five, chi-square values for cells having expected frequencies of less than five were ignored. The total chi-square value of Table C-6 is far greater than the critical chi-square at the 5% and 1% levels of significance, thus the rows and columns are dependent upon each other. This indicates that there is a reason for the pattern of O-D trip occurrences and this pattern is influenced by some characteristic of the passengers or zones.

Calibration of the Gravity Model

First iteration --

A linear relationship between distance class and travel deterrence factor was first assumed as shown in Appendix C, Figure C-2. Values corresponding to each class were picked from the graph as travel deterence factors. These factors along with the O-D trip productions and attractions were used as input to the gravity model formula.

Trip interchanges obtained through the first iteration are presented in Table C-7. The column (trip production) totals are exactly the same as those of the O-D table, whereas the row (trip attraction) totals differ. This is an inherent product of the gravity model as the applied form is production constrained. The recommended procedure in some studies is to apply an adjustment to the attractions derived from the final calibrated model. Such adjustment may be required to zones which possess obviously erroneous attraction values.

The total number of trip interchanges as well as the average is exactly the same for both the gravity model output and the O-D data. The variance, standard deviation and coefficient of variation are all less than those of the O-D table. This indicates that the trip interchanges are less spread in the gravity model output. However such spread is large as the standard deviation is almost twice the mean value. The gravity model output appears to be closer to that of the expected frequencies, Table C-4, than to the O-D data of Table C-3. Trip interchanges of the O-D table are more irregularly distributed than those of the expected and gravity model tables.

Table C-8 presents trip interchange differences between the gravity model output and those of the O-D data. The statistical values given at the end of this table are those recommended by the BPR for analysis of results. Such include the mean difference, variance, standard deviation, mean square error and root mean square error. These values are used in comparison with those obtained through later iterations of the gravity model.

Coincident with Table C-8, a chi-square 'goodness of fit' test was run between trip interchanges of the gravity model and O-D data. This test (Table C-9) determined the degree of closeness between cell values of the two data sets and detected those cells having significant differences. In total, 135 cells were significant at the 1% level and 57 significant at the 5% level.

Results of chi-square 'goodness of fit' testing between trips of the O-D and gravity model by distance class as well as chi-square testing between successive iterations of the gravity model are presented in Table C-10. The former determines how well each successive iteration of the gravity model fits or becomes closer to that of the O-D. The latter indicates through the lack of statistical significance in values when and if no further iterations are required. This strengthens the method of visually comparing trip length frequency distributions of the O-D and gravity model.

The first chi-square test in Table C-10 (column 5) was performed between the O-D and model using the O-D as observed and the gravity model as expected in the chi-square formula. Results of this test are presented in column 5 as the 'Number of Trips Chi-Square.' These values determine for which classes the differences between the O-D and gravity model are the greatest, that is the points for which the trip length frequency distribution plot would be furthest apart. The chi-square values are calculated for both actual trips per distance class (column 5) and percentage total trips per distance class (column 8). The total chi-square value of column 5 is larger than the critical chi-square at both the 5% and 1% levels of significance, thus there exist significant differences in trip interchanges between the gravity model output and O-D data. A further iteration is required from a statistical viewpoint in order to determine whether these differences would be reduced or eliminated.

The BPR method of calibration expresses number of trips as percentages of total over travel time or distance interval. Correspondingly, in this study, chi-square testing was performed between the O-D and gravity model percentages of total trips per distance class. The results are given in column 8 (Table C-10). As the total chi-square value is less than the critical chi-square at the 5% and 1% levels, percentages in this case were not considered as determinants of statistical significance. This decision was made because actual trip interchanges were earlier shown to be significantly different.

For convenience the travel deterrence factors used in iteration no. 1 are presented in column 9 of Table C-10. These values were extracted from the straight line relationship shown in Figure C-2 and as previously discussed.

Table C-10 (columns 10 and 11) makes provision for chi-square testing between successive iterations of the gravity model. This test uses trips by distance class of the current iteration as observed and trips of the previous iteration as expected in the chi-square formula. Generally in iterative methods, the procedure is to stop iterating when successive iterations do not yield significantly different results. Therefore, the chi-square test was used to measure the amount of calibration brought about by each iteration of the model and also to determine when no further iterations are necessary. The reason that the chi-square values (columns 10 and 11) are all zeros is that a preceding iteration does not exist at this stage.

Trip length frequency distributions for both gravity model iteration no. 1 and the O-D data are presented in a comparative graphical display as Figure C-3. This plot is similar to that recommended by the BPR (Figure 11) for comparison of 'visual closeness' between the data sets. Naturally such closeness depends upon the scale. Figure C-3 clearly indicates that the plots are not close as differences range from 0 to 600 (4% total) passengers. Distance classes possessing large differences in numbers of trips between the O-D and gravity model are very obvious in the figure.

Results obtained through the first iteration are summarized in Table 11 and Figure 11. These presentations incorporate the computer program results given in Table C-10 and Figure C-3. The larger differences in numbers of trips per distance class between the O-D and gravity model correspond with the presence of statistically significant values in Table 11 and fluctuations in the plot of Figure 11. In addition to the lack of visual closeness, the average trip lengths of the O-D and gravity model in Figure 11 are not within ± 3 percent. Therefore both the chi-square test results and BPR procedures indicate that a further iteration is required.

Subsequent iterations --

The entire process as described for the first iteration was repeated. The tabular and graphical output for the second iteration are presented in Appendix C, pages 201 to 206.

Table 11 Chi-square test results by distance class for gravity model iteration no. 1

Class No.	Class Dist.	Trip Diff. (OD-GM)	χ^2	Class No.	Class Dist.	Trip Diff. (OD-GM)	χ^2
1	0-19	18	14.12**	24	460-479	-90	21.76**
2	20-39	96	26.45**	25	480-499	-17	8.61**
3	40-59	-598	363.11**	26	500-519	4	0.75
4	60-79	90	41.49**	27	520-539	-52	9.63**
5	80-99	-244	55.22**	28	540-559	29	4.14*
6	100-119	- 18	0.76	29	560-579	- 6	1.54
7	120-139	- 35	6.80**	30	580-599	-11	1.72
8	140-159	- 52	3.70	31	600-619	-58	21.74**
9	160-179	112	38.93**	32	620-639	-17	0.93
10	180-199	34	1.30	33	640-659	80	31.09**
11	200-219	112	15.59**	34	660-679	-19	8.11**
12	220-239	16	2.87	35	680-699	219	100.12**
13	240-259	-2	0.00	36	700-719	- 3	0.10
14	260-279	33	2.23	37	720-739	257	254.93**
15	280-299	34	4.18*	38	740-759	27	24.46**
16	300-319	- 86	15.29**	39	760-779	-22	11.43**
17	320-339	- 45	2.40	40	780-799	-20	9.45**
18	340-359	- 91	15.75**	41	800-819	0	0.0
19	360-379	23	1.43	42	820-839	- 1	0.67
20	380-399	80	29.67**	43	840-859	0	0.02
21	400-419	-102	43.83**	44	860-879	7	2.46
22	420-439	145	25.34**	45	880-899	0	0.0
23	440-459	- 30	7.99**	46	900-919	317	779.82**
						Total	2011.91**

$\chi^2_{0.95,1} = 3.84$ $\chi^2_{0.95,45} = 61.63$ *(significant at 5% level)

$\chi^2_{0.99,1} = 6.63$ $\chi^2_{0.99,45} = 79.77$ **(significant at 1% level)

χ^2 (between O-D and GM iteration no. 1)

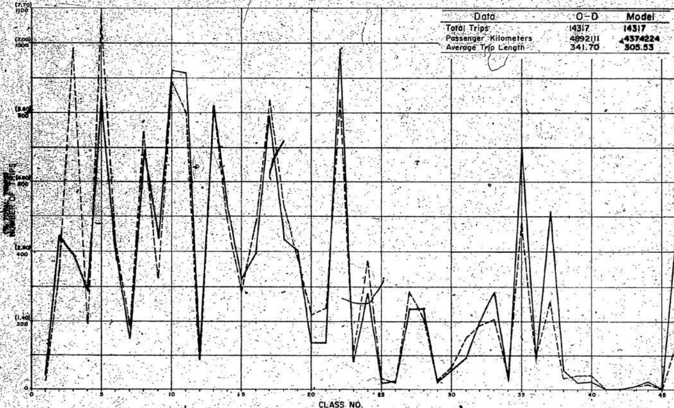


Figure 11 Trip length frequency distribution comparison for iteration no. I

O-D:(solid line) Gravity Model:(broken line)

Travel deterrence factors applied in this iteration (Figure C-4) were calculated using the recommended BPR formula as presented in Chapter Three. The rationale for using discrete points obtained through this formula over points selected from the 'line of best fit' will be discussed later.

Trip interchanges resulting from the gravity model (Table C-11) produced an overall variance, standard deviation and coefficient of variation greater than that of iteration no. 1 and closer to those values of the O-D data. The trip interchange differences (Table C-12) between gravity model iteration no. 2 and those of the O-D data declined in value. This decrease in differences was also detected through the chi-square test results between trip interchanges of the gravity model and O-D data (Table C-13). There were 113 cells significant at the 1% level of significance and 52 significant at the 5% level. This represented an improvement over similar results for iteration no. 1 and indicated that the model output was converging to the O-D data.

Chi-square values which determine the 'goodness of fit' between gravity model iteration no. 2 and the O-D trips by distance class (Table C-14, column 5) totalled less than the critical value at the 5% and 1% levels. Therefore differences between the two data sets by distance class were not statistically significant. Chi-square values of column 10 (Table C-14) enabled measurement of iteration no. 2 relative to iteration no. 1 and the determination of whether an additional iteration was necessary. The total chi-square value of column 10 for trip interchanges was greater than the critical chi-square, thus results of iteration no. 2 were significantly different from those of iteration no. 1. This indicated that a third iteration should be carried out in order to determine whether results would be significantly different from those of the second iteration. The trip length frequency distributions (Figure C-5) may be considered 'visually close' as discrepancies in the range of only 10 to 70 (0.5 percent) passengers were produced.

The summarized results of the second iteration are presented in Table 12 and Figure 12. The total chi-square value (χ^2_A) for testing between trips of the gravity model and O-D data by distance class is not significant. The number of classes possessing significant values (only three) have decreased greatly from iteration no. 1 which had twenty-eight. The trip length frequency distribution of the model (Figure 12) has converged closer to that of the O-D in comparison with Figure 11 and the average trip lengths are now practically within ± 3 percent. One could consider the model calibrated at this point as a result of visual closeness in plots and the lack of statistically significant difference in total between the O-D and model. However, chi-square results (χ^2_B) of testing between trips by distance class of iteration no. 2 and iteration no. 1 produced thirty significantly different classes and a significantly different total. This supported the requirement for a third iteration.

Computer program output for the third iteration is presented in Appendix C, pages 207 to 213. The summarized results are presented in Table 13 and Figure 13. The trip length frequency curves are very close, the average trip lengths are within ± 3 percent, and the total chi-square (χ^2_B) indicates that statistically significant results from

Table 12 Chi-square test results by distance class for gravity model iteration no. 2

Class No.	Class Dist.	Trip Diff. (OD−GM)	χ^2_A	χ^2_B	Class No.	Class Dist.	Trip Diff. (OD−GM)	χ^2_A	χ^2_B
1	0–19	− 4	0.31	23.48**	24	460–479	4	0.06	23.44**
2	20–39	−10	0.22	32.47**	25	480–499	− 1	0.07	7.44**
3	40–59	−36	3.10	320.43**	26	500–519	0	0.01	1.06
4	60–79	−16	0.12	47.44**	27	520–539	6	0.17	11.90**
5	80–99	−42	1.97	37.90**	28	540–559	− 1	0.00	4.68*
6	100–119	−19	0.84	0.00	29	560–579	0	0.00	1.29
7	120–139	− 6	0.22	4.65*	30	580–599	0	0.00	1.53
8	140–159	−11	0.18	2.23	31	600–619	− 3	0.12	18.90**
9	160–179	−19	0.78	53.64**	32	620–639	3	0.05	0.65
10	180–199	11	0.12	0.62	33	640–659	− 1	0.00	32.43**
11	200–219	3	0.01	14.73**	34	660–679	2	0.10	9.38**
12	220–239	− 6	0.31	5.37*	35	680–699	26	1.01	77.69**
13	240–259	−64	4.64*	4.84*	36	700–719	5	0.23	0.59
14	260–279	15	0.44	0.74	37	720–739	29	1.70	201.87**
15	280–299	4	0.06	3.35	38	740–759	5	0.49	17.50**
16	300–319	−57	3.09	4.90*	39	760–779	1	0.09	12.42**
17	320–339	14	0.26	4.06*	40	780–799	1	0.06	9.88**
18	340–359	−46	4.39*	3.86*	41	800–819	0	0.00	0.00
19	360–379	0	0.00	1.50	42	820–839	0	0.00	0.00
20	380–399	− 2	0.03	27.67**	43	840–859	0	0.02	0.06
21	400–419	−12	0.99	33.94**	44	860–879	2	0.24	1.32
22	420–439	29	0.91	16.31**	45	880–899	0	0.00	0.00
23	440–459	− 6	0.36	4.92*	46	900–919	55	7.86**	538.72**
						Total		35.62	1621.80**

$\chi^2_{0.95,1} = 3.84$ $\chi^2_{0.95,45} = 61.63$

$\chi^2_{0.99,1} = 6.63$ $\chi^2_{0.99,45} = 79.77$

* (significant at 5% level)

** (significant at 1% level)

χ^2_A (between O-D and GM iteration no. 2)

χ^2_B (between GM iteration no. 1 and iteration no. 2)

Table 13 Chi-square test results by distance class for gravity model iteration no. 3

Class No.	Class Dist.	Trip Diff. (OD-GM)	χ^2_A	χ^2_B	Class No.	Class Dist.	Trip Diff. (OD-GM)	χ^2_A	χ^2_B
1	0-19	- 1	.02	.10	24	460-479	-1	.01	.14
2	20-39	- 7	.12	.01	25	480-499	0	.00	.03
3	40-59	- 9	.21	1.72	26	500-519	0	.01	.01
4	60-79	- 5	.10	.00	27	520-539	0	.00	.20
5	80-99	-15	.26	.77	28	540-559	-3	.03	.03
6	100-119	- 8	.15	.28	29	560-579	0	.01	.01
7	120-139	- 3	.07	.02	30	580-599	0	.00	.04
8	140-159	- 6	.05	.04	31	600-619	-2	.04	.01
9	160-179	-10	.23	.14	32	620-639	1	.01	.04
10	180-199	- 1	.00	.17	33	640-659	-1	.01	.01
11	200-219	- 7	.05	.12	34	660-679	0	.00	.16
12	220-239	- 2	.04	.08	35	680-699	2	.00	.96
13	240-259	-22	.56	1.95	36	700-719	1	.00	.22
14	260-279	4	.03	.24	37	720-739	2	.01	1.49
15	280-299	- 3	.01	.14	38	740-759	1	.02	.48
16	300-319	-10	.26	1.55	39	760-779	0	.00	.20
17	320-339	1	.00	.26	40	780-799	0	.00	.18
18	340-359	-12	.35	2.20	41	800-819	0	.00	.00
19	360-379	- 1	.00	.01	42	820-839	0	.00	.00
20	380-399	- 2	.02	.00	43	840-859	0	.00	.13
21	400-419	- 3	.08	.51	44	860-879	0	.00	.36
22	420-439	- 1	.00	1.03	45	880-899	0	.00	.00
23	440-459	- 2	.04	.11	46	900-919	13	.38	4.79*
						Total		3.18	20.91

$\chi^2_{0.95,1} = 3.84$ $\chi^2_{0.95,45} = 61.63$

$\chi^2_{0.99,1} = 6.63$ $\chi^2_{0.99,45} = 79.77$

* (significant at 5% level)

** (significant at 1% level)

χ^2_A (between OD and GM iteration no. 3)

χ^2_B (between iteration no. 2 and iteration no. 3)

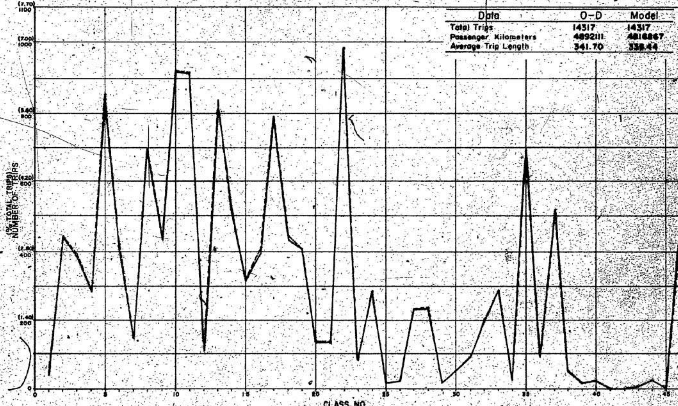


Figure 13 Trip length frequency distribution comparison for iteration no. 3

O-D:(solid line) Gravity Model:(broken line)

the second iteration were not produced. Generally small improvements are evident throughout the distance classes, however only one (class 900–919) contained results significantly different from the second iteration. The model was considered calibrated.

Testing of Model

The analysis as conducted in the trip generation and trip distribution phases resulted in a model calibrated on the basis of 1976 data. The validity of the model was tested by using it to predict zone to zone passenger movements for subsequent years and then comparing this output with actual passenger counts for the same periods as supplied by the operating company.

Trip productions and attractions were estimated by applying the equations as developed in the trip generation phase. Trip interchanges were calculated through the gravity model using these estimated productions and attractions as well as the calibrated travel deterrence factors.

Demographic Data for Model Testing

Zonal passenger trip interchange data were readily available from CN for corresponding survey periods of subsequent years, however zonal demographic data necessary for usage in the trip generation equations was not available. This presented a constraint to the model testing phase. The problem was overcome, however, through extrapolation of dwelling unit estimates from census data collected for years 1971 and 1976. Although extrapolation of this nature is risky and perhaps even open to large errors, this method was used as a suitable alternative was not available. (The independent variable was therefore estimated and not measured.) Allowing for such inherent weakness, the following assumptions were made in conjunction with the extrapolations:

1) Since a large portion of the study area is mainly rural and that no major changes in growth patterns or industrialization had taken place during the years 1971 to 1980, it was assumed that the growth rate in dwelling units during 1971 to 1976 would continue through to 1980.

2) Familiarity with Newfoundland conditions between 1971 and 1980 revealed that no major location shifts occurred in population, nor were any new towns encountered. This supported a stable growth rate in dwelling units from 1971 to 1980.

3) There was no dramatic influx of population relating to economic or other activity, neither was there a sudden decline in population for natural or other reasons. Therefore the growth rate in dwelling units remained stable.

The 1971 numbers of dwelling units were compiled for each traffic zone along with the 1976 values as used in the model development data base. Projections were made on a straight line percentage basis for each traffic zone between 1971 and 1976 and projected through to 1980. The results are presented in Appendix D, Table D-1. This method is rather crude in that the true relationship of dwelling units over time is not known. This relationship may not be simply linear but rather complex reflecting the socio-economic aspects of each individual traffic zone.

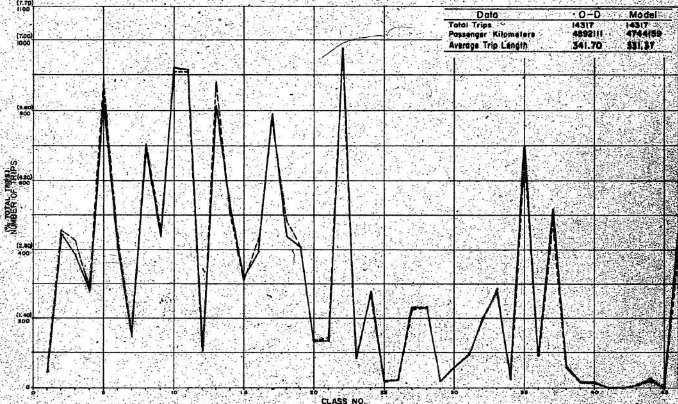


Figure 12 Trip length frequency distribution comparison for iteration no. 2

O–D (solid line) Gravity Model (broken line)

<u>Predicted and Observed Passenger Data</u>

The final trip generation equations developed to predict peak season (August 1st to 21st) passenger travel demand were:

$$T_P = 49 + 0.20782 \text{ DWEL.}$$
$$T_A = 33 + 0.21680 \text{ DWEL.}$$

where:

T_P = trips produced by a zone

T_A = trips attracted by a zone

DWEL. = number of dwelling units in the zone

These equations were the result of the regression run which excluded Zone 1 (St. John's), thus their reliability in predicting activity of that zone may be somewhat limited. The analysis of data indicated that Zone 1 tends to pull the regression line down possibly out of a linear relationship, consequently the above equations would overestimate trip productions and attractions for that zone.

The developed relationship which included St. John's, accurately predicted activity of this zone (Figure 8), but the underlying assumptions of regression were not fulfilled. These equations were:

$$T_P = 247 + 0.11192 \text{ DWEL.}$$
$$T_A = 254 + 0.10982 \text{ DWEL.}$$

Either of the foregoing sets of equations may be applied to model testing, however as shown in the trip generation analysis more precise results would be attained using the set which excluded Zone 1. This precision would not extend to predictions regarding that zone. To overcome the problem associated with Zone 1, it was decided to use the second set of equations to make predictions for this zone only.

Trip productions and attractions for survey periods (August 1st to 21st) of years 1977 to 1980 inclusive as estimated using the above equations are presented in Appendix D, Table D-2. Application of these equations and rounding of figures in Table D-2 resulted in a slight difference (approximately 0.4% total trips) between the number of trip productions and attractions within each year. This small difference was nullified by adjustment of attractions for Zone 1.

The model predictions given in Table D-2 along with the passenger O-D data for each test year were used as input to the trip-distribution program. This enabled comparison of the observed and predicted data in accordance with the methods applied in the trip distribution. The computer output is included in Appendix D, pages 217 to 240.

Observed passenger trip interchanges for each model test year are presented in Tables D-3 to D-6 respectively. The total passengers carried during the survey periods (August of years 1977 to 1980 inclusive) were fewer than that of the base year 1976. The total number of trips declined during August, 1977 and 1978, however increased in 1979 and 1980 but not to the 1976 volume. A wide range of trip interchanges from small to large values are common in each O-D table, which indicates that the data is widely spread. This means that greater numbers of trips are made between certain zones, whereas relatively fewer trips are made between other zones. The estimated total trip productions and attractions for each test year (Table D-2) are all greater than their corresponding observed trip totals (Tables D-3 to D-6 inclusive).

Chi-square 'goodness of fit' test results and trip differences by distance class for each test year are summarized in Table 14. The total chi-square values are significant which indicates that the predicted and observed trip data are not close. Furthermore, many large differences and significant chi-square values are present between corresponding predicted and observed trips by class. This lack of closeness is reflected in the trip length frequency distributions of Figures 14 to 17. Although the curves are very similar in shape (all peaks correspond) for each individual test year, the fact that the predicted trips are greater than the observed are obvious in each plot. Furthermore, the average trip lengths are not within ± 3 percent.

A comparison of passenger data between each of the test years was carried out in order to further assess consistency and to evaluate the discrepancies. This comparison was performed through the trip distribution computer, the output of which is presented in Appendix D, pages 241 to 252. From this information, it is obvious that there are variations in the actual data from year to year and these variations are not necessarily gradual increments. The larger differences and chi-square values are associated with 1977 and 1978 in which the passenger volume declined greatly. During 1979 and 1980 increases in volume occurred, however through the frequency plots and chi-square values these increases appear not to be as significantly different as the decreases. The total chi-square values indicate that the data of each year is significantly different from the next.

Table 14 Chi-square test results by distance class for test years 1977 to 1980

Class No.	Class Dist.	Trip Diff. (OD-GM) 1977	1978	1979	1980	χ^2 (between OD and GM) 1977	1978	1979	1980
1	0-19	- 33	- 54	- 51	- 52	17.31**	46.08**	40.51**	41.23**
2	20-39	-162	-206	-207	-264	48.19**	76.59**	75.19**	120.49**
3	40-59	- 49	- 54	35	- 90	5.76*	6.82**	2.81	17.78**
4	60-79	-139	-188	-184	-208	53.95**	95.86**	89.06**	110.29**
5	80-99	-356	-461	-356	-342	139.64**	228.96**	133.68**	121.12**
6	100-119	-103	-193	-130	-106	22.15**	77.24**	34.44**	22.35**
7	120-139	- 17	- 26	- 24	- 61	1.60	3.55	3.11	19.34**
8	140-159	-143	-228	-287	-239	20.49**	65.25**	99.39**	66.20**
9	160-179	- 74	- 50	- 56	- 64	12.87**	4.93*	5.99*	7.70**
10	180-199	-307	-250	-249	-112	106.47**	68.94**	67.41**	13.26**
11	200-219	95	-199	- 27	- 80	9.19**	39.46**	0.69	6.05*
12	220-239	- 66	- 86	- 80	- 84	29.11**	47.75**	40.15**	41.91**
13	240-259	-290	-233	-348	-377	92.39**	58.69**	128.65**	148.32**
14	260-279	189	54	56	88	78.27**	6.23*	6.59*	15.61**
15	280-299	- 57	- 75	- 44	- 56	8.09**	14.04**	4.80*	7.45**
16	300-319	- 21	-114	-136	-146	1.08	31.31**	43.15**	48.36**
17	320-339	68	-171	-173	- 22	6.28*	38.41**	38.40**	0.61
18	340-359	- 71	- 82	- 80	- 17	11.05**	14.83**	13.58**	0.64
19	360-379	- 41	- 77	- 79	- 58	3.73	12.70**	12.69**	6.69**
20	380-399	99	7	- 33	- 31	9.24**	0.29	6.12*	5.29*
21	400-419	3	- 26	18	- 42	0.09	5.65*	2.58	13.84**
22	420-439	-190	-255	-336	-314	30.46**	53.32**	90.06**	75.39**
23	440-459	2	- 2	9	2	0.03	0.05	0.92	0.03
24	460-479	174	89	85	- 45	143.78**	37.11**	32.42**	8.79**
25	480-499	27	6	2	8	31.70**	1.68	0.15	2.13
26	500-519	- 18	- 23	- 6	- 12	8.71**	19.28**	1.05	3.41
27	520-539	17	- 9	19	45	1.19	0.28	1.36	7.46**
28	540-559	-116	- 85	- 93	-101	45.60**	24.26**	28.29**	33.03**
29	560-579	- 15	- 6	- 10	- 11	10.42**	1.35	4.18*	5.21*
30	580-599	- 9	- 55	- 22	0	0.90	33.07**	5.00*	0.00
31	600-619	61	79	87	81	41.29**	68.83**	81.06**	70.8**
32	620-639	17	- 19	- 6	- 27	1.24	1.61	0.16	3.05
33	640-659	104	- 18	- 15	0	63.95**	1.82	1.23	0.00
34	660-679	31	- 3	5	8	23.29**	52.26**	0.66	1.49
35	680-699	-268	-330	-216	-255	81.58**	122.70**	51.96**	70.10**
36	700-719	77	44	18	12	135.10**	42.94**	6.89**	3.00
37	720-739	-236	-310	-296	-301	117.90**	197.90**	176.05**	176.29**
38	740-759	75	3	2	16	180.36**	0.27	0.15	6.26*
39	760-779	- 2	- 9	8	- 2	0.11	3.75	3.17	0.23
40	780-799	- 8	8	2	2	3.49	3.10	0.11	0.20
41	800-819	0	0	0	0	0.00	0.00	0.00	0.00
42	820-839	1	0	1	0	0.00	0.00	0.00	0.00
43	840-859	12	5	11	0	39.81**	8.25**	32.75**	0.00
44	860-879	- 11	-17	- 11	- 7	3.84*	8.70**	3.43	1.37
45	880-899	0	0	0	0	0.00	0.00	0.00	0.00
46	900-919	499	92	204	86	1088.75**	36.20**	170.86**	29.31**
						2730.45**	1657.25**	1540.90**	1332.06**

$\chi^2_{0.95,1} = 3.84$ $\chi^2_{0.95,45} = 61.63$ * (significant at 5% level)

$\chi^2_{0.99,1} = 6.63$ $\chi^2_{0.99,45} = 79.77$ ** (significant at 1% level)

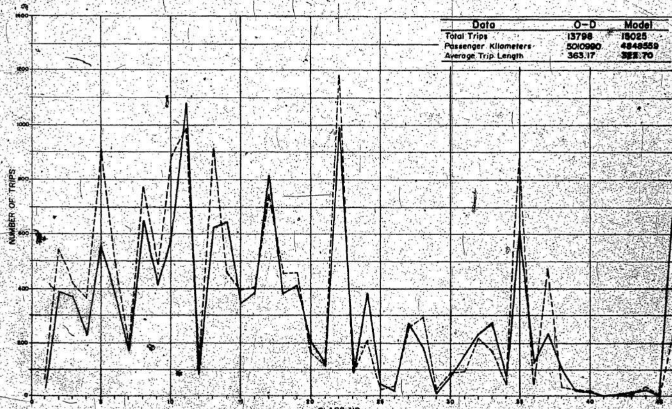


Figure 14 Trip length frequency distribution comparison for test year 1977

O–D:(solid line) Gravity Model:(broken line)

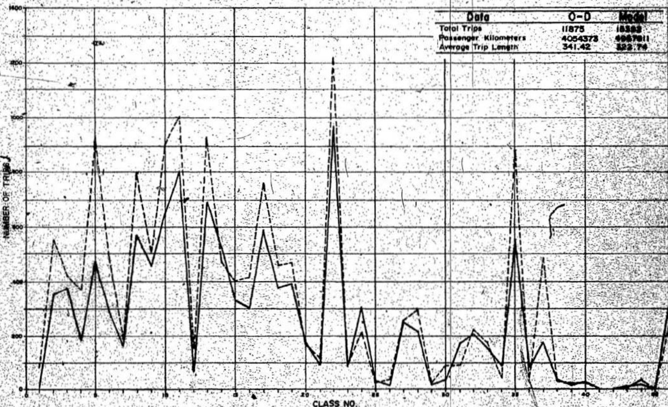


Figure 15 Trip length frequency distribution comparison for test year 1978

O-D: (solid line) Gravity Model: (broken line)

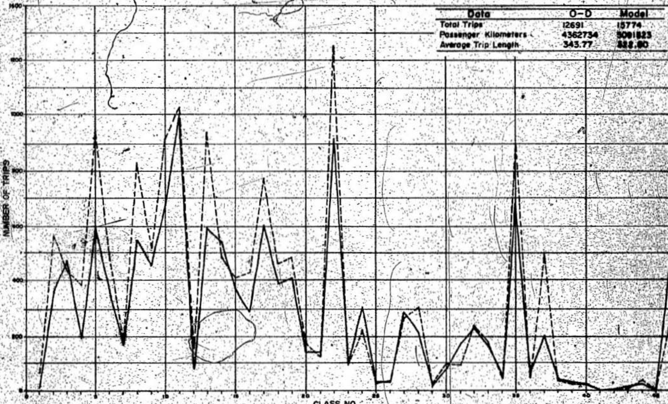


Figure 16 Trip length frequency distribution comparison for test year 1979

O-D (solid line) Gravity Model: (broken line)

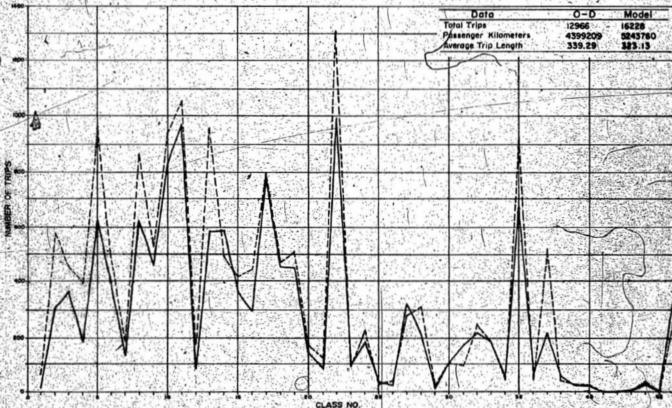


Figure 17 Trip length frequency distribution comparison for test year 1980

O-D:(solid line) Gravity Model:(broken line)

CHAPTER FIVE

DISCUSSION OF RESULTS

Trip Generation

Much of the trip generation phase was purely analytical, the results of which given in Chapter Four require very little discussion. Nevertheless, there are some facts worth mentioning.

Base year trip productions are practically equal to attractions (Table B-2) for each individual zone. Those zones possessing notably large trip productions and attractions include centres such as: St. John's, Clarenville, Gander, Grand Falls, Corner Brook, Stephenville and Port aux Basques. Many of these as indicated in Table A-4 are major urban centres.

Two sets of prediction equations were developed. Improved results were obtained by the equations which did not include the St. John's zone. This was illustrated in construction of the 95% confidence bands as presented in Figures 8 and 10. These bands are used to detect unusual observation occurrences. In accordance with probability theory, 95% of the trip productions (or 19 out of 20 observations) should fall within the confidence limits. The confidence band of Figure 8 contains only 11 observations (48%) within the limits. This is improved greatly in the 22-zone model results of Figure 10, which contains 18 observations (82%) that may be considered within the limits. As 4 out of 22 observations (Stephenville, Gander, Corner Brook and Port aux Basques) occur well outside the band, this suggests that some bias exists in the trip generation. Therefore the error variances are not necessarily independent and the data may not be normally distributed. This bias may then be expected to produce some inaccuracy in the prediction equations. The amount of inaccuracy, however, would not invalidate the model in general.

Results of the final regression run for trip productions and attractions (Tables B-21 and B-23) produce large residuals for zones given in Table 15.

Table 15 Zones possessing large residuals in final regression run

Trip Productions (Table B-21)		Trip Attractions (Table B-23)	
Zone	Residual	Zone	Residual
Port Blandford	-170	Port Blandford	-200
Gander	184	Gander	236
Corner Brook	-381	Grand Falls	-263
Baie Verte	-148	Baie Verte	-169
Stephenville	236	Stephenville	160
Port aux Basques	609	Port aux Basques	612

This table includes those zones which are well outside the confidence bands of Figures 8 and 10. The large positive values in Table 15 associated with Gander, Stephenville and Port aux Basques suggest that far more trips are produced and attracted by these zones and such activity is not in accordance with the ratio of trip ends to dwelling units present for many other zones. There are some obvious reasons which account for the high productive and attractive capability of these zones. Gander is a principal urban centre with related facilities such as hospitals, schools and shops. It also possesses a major international airport. Stephenville is an urban centre containing related facilities and also a large airport. Port aux Basques is the major entry and exit point for all highway traffic to and from the province. It also contains the terminus of the roadcruiser route which maintains connective schedules with the inter-provincial ferry service. The large negative values associated with Grand Falls and Corner Brook may be accounted for through the fact that these zones contain the second and third largest urban centres in Newfoundland. As many service facilities are contained within these centres the necessity of intercity trips per dwelling unit may be somewhat less than that for other zones. Furthermore, influencing factors such as car ownership and income per capita may contribute to the use of alternate modes.

Exclusion of the St. John's zone was a good example of how in regression analysis improvements may be achieved through deletion of highly influential (unusual) observations. The exclusion of certain other zones, such as those of Table 15 may result in even more improved equations. A suggestion for further research would be the investigation of an additional model to encompass the excluded zones only. This may involve determination of the numbers of passengers travelling to and from destinations outside the study area.

Trip Distribution

Evaluation of Results

Chi-square testing between the base year O-D and expected trip interchanges (Table C-6) resulted in large significant cell values for zonal pairs as given in Table 16.

Table 16 Large cell values chi-square in testing between O-D and expected trip interchanges

From Zone	To Zone	X^2
1 (St. John's)	5 (Clarenville)	162**
1 (St. John's)	12 (Grand Falls)	108**
5 (Clarenville)	1 (St. John's)	226**
18 (Corner Brook)	12 (Grand Falls)	101**
19 (Stephenville)	21 (Robinsons)	223**
19 (Stephenville)	22 (Doyles)	120**
19 (Stephenville)	23 (Port aux Basques)	115**
20 (St. Georges)	19 (Stephenville)	642**
21 (Robinsons)	19 (Stephenville)	244**
23 (Port aux Basques)	18 (Corner Brook)	613**

** (significant at 1% level)

These results indicated that either far more or far fewer trip interchanges occur between these zonal pairs than may be expected. In comparison of the O-D data (Table C-3) and expected frequencies (Table C44), it is obvious that the observed trip interchanges are greater than the expected. The large chi-square values of Table 16 indicate that these are the zonal pairs which depend upon each other more so than the other zones. Therefore they must possess characteristics of uniqueness which produce and attract greater passenger volumes.

Some reasons for this pattern of trip making activity were made evident in the trip generation discussion. Many of the zones possess major urban centres or are connecting points to other transportation modes. St. John's is the largest urban centre which contains facilities such as: hospitals, a university, technical colleges, shopping centres and a large airport. Grand Falls and Corner Brook are heavy industrial centres. Clarenville is the connecting point for traffic to and from the Bonavista Peninsula. St. Georges, Robinsons and Doyles are not major centres, thus the reason for large chi-square values associated with these zones may be simply attributed to the fact that people in the west coast corridor are more frequent users of the bus service.

Closeness of cell values between the O-D and first gravity model iteration were presented through the trip interchange differences (Table C-8) and chi-square test results (Table C-9). The larger concentrations of differences and chi-square cell values occurred between zones as presented in Table 17.

Concentrations of large differences and chi-square values in Table 17 are associated with practically the same zonal trip interchanges as previously mentioned in discussion of observed and expected data. An addition is Zone 3 (Whitbourne) which is a connecting point for passengers entering and leaving the province during the summer by way of ferry at Argentia. The established trip activity pattern is very pronounced as detected by both the table of differences and cell values chi-square. The gravity model output (Table C-7) is probably more close to the expected frequencies (Table C-4) than to the O-D data.

The chi-square 'goodness of fit' test of trips by distance class (Table 11) between the O-D and first gravity model iteration produced results in which large chi-square values corresponded to distances between those zones of Tables 16 and 17. This was also reflected by fluctuations present in the trip length frequency curves of Figure 11.

Table 17 Large differences and cell values chi-square in testing between the O-D and gravity model, iteration no. 1

From Zone	To Zone	Trip Interchange Diff. (OD-GM)	χ^2
1 (St. John's)	3 (Whitbourne)	-116	60**
1 (St. John's)	19 (Stephenville)	112	83**
1 (St. John's)	23 (Port aux Basques)	140	295**
5 (Clarenville)	1 (St. John's)	148	104**
12 (Grand Falls)	1 (St. John's)	144	66**
12 (Grand Falls)	23 (Port aux Basques)	108	101**
18 (Corner Brook)	1 (St. John's)	179	197**
18 (Corner Brook)	19 (Stephenville)	143	127**
19 (Stephenville)	1 (St. John's)	145	195**
19 (Stephenville)	18 (Corner Brook)	142	95**
19 (Stephenville)	3 (Whitbourne)	65	194**
19 (Stephenville)	21 (Robinsons)	47	98**
20 (St. Georges)	19 (Stephenville)	95	328**
21 (Robinsons)	19 (Stephenville)	50	112**
23 (Port aux Basques)	1 (St. John's)	177	503**
23 (Port aux Basques)	12 (Grand Falls)	-118	94**
23 (Port aux Basques)	18 (Corner Brook)	139	72**

** (significant at 1% level)

Throughout the two succeeding gravity model iterations (which resulted in convergence between the O-D and model data), the cells of the gravity model output which displayed the most change in value corresponded to those for which the gravity model and O-D were furthest apart.

The trip distribution analysis presented an additional method of determining when the gravity model may be considered calibrated. This statistical procedure which used the chi-square test was found superior to the current method of calibrating the gravity model by 'visual comparison' of trip length frequency curves. An advantage which the chi-square 'goodness of fit' test has over the visual method is that actual numerical values with expected probability percentages are applied and presented as a measurement of difference between the O-D and gravity model. The amount of significant difference is measured relative to the critical chi-square value at that particular level of significance. Accuracy of the trip length frequency curve is most certainly dependent upon scale of the plot in the visual comparison. Tabulated output, all in numerical form, including trips by distance class for both the O-D and gravity model along with the associated chi-square values, presents an effective and convenient means of comparison and measurement of difference between the two data sets. Easy detection of unusual values and their magnitude relative to those of other classes makes the chi-square test very advantageous.

Travel Deterrence Factors

A linear relationship between distance and travel deterrence factor (Figure C-2) was ~~first~~ assumed for application of the gravity model. Values of travel deterrence factors for succeeding iterations were calculated using the established BPR formula given in Chapter Three. The 'line of best fit' resulting through the first iteration (Figure C-4) had the shape of a declining parabolic curve over distance. There were however some obvious deviations from this line, for example classes: 40-59, 160-179, 400-419, 720-739, 740-759 and 900-919. These classes corresponded with those of Table 11 which had large differences between the O-D and gravity model trips as well as large chi-square values. A smooth decline in trips over increasing distance was apparently not the case. The major centres produced deviations from the line of best fit and such were reflected in travel deterrence factor values. If these centres were excluded, then possibly travel deterrence factor over distance would be a smooth curve.

The choice of discrete values over those from the 'line of best fit' was made after both alternatives were explored. Values from the line of best fit (Figure C-4) were entered into the trip distribution program. The resulting statistical and graphical output was very close in values to that of iteration no. 1 using the straight line. The travel deterrence relationship for the second iteration using points from the succeeding line of best fit, reverted to exactly the same plot as given in Figure C-4 (result of the first iteration). Therefore it was concluded that the use of discrete points provided convergence in fewer iterations than using points from the line of best fit. For comparative purposes (with Figure C-4), the plot generated by the second iteration using points from the line of best fit is included as Figure C-8.

Testing of Model

Evaluation of Results

There are many characteristics which may affect patronage of a transportation system. Some of these which are relative to the mode include: quantity of service, quality, schedule changes, fares, competition as well as capital and operating costs. Models which attempt to encompass many of these modal characteristics are usually complex and awkward to handle (15). The model as developed in this study is simple, whereby trip productions and attractions are predicted based solely upon a characteristic of land use (dwelling units per zone) and trip interchanges are determined through applying the gravity model. Such simplicity, however, may impose limitations with regards to use of the model as characteristics of the mode are not taken into account.

There can be problems associated with the gravity model in relation to travel deterrence factors as mentioned in Chapter Two. Although the gravity model was initially applied to intercity passenger transport studies, it is now used mainly in urban works (5). The model is considered most accurate when applied to densely populated areas or between zones of equal population or land use activity.

Modelling was made of only the bus mode at the trip generation stage. For this reason, it was not intended to accommodate mode shift (for example, passengers leaving the bus system and travelling by air or vice versa). Thus if a large increase or decrease in ridership occurred for reasons not incorporated into the model, then one is unable to determine whether passengers preferred an alternate mode or in fact travelled at all. The model is therefore a measurement of a static condition which reflects bus travel as a function of land use only. The assumption made at this stage is that factors affecting bus travel today will continue to have a similar effect in future. Accordingly, the model does not account for dynamic change in characteristics of the mode itself.

The model was tested for validity with the assumption that all conditions relevant to bus travel remained constant for the test periods. This testing determined the reliability of the model in forecasting future intercity bus travel demand. Bearing in mind the previously described limitations, testing could also indicate the magnitude of fluctuations in ridership caused by changes in characteristics of the mode.

Testing as described in Chapter Four was carried out for four successive years following the base year. This was done by comparing predicted and observed passenger data for the survey period (August 1st to 21st) of each test year. It was known prior to model development that patronage of the bus system over time, as shown in Figure 3 (for total passengers) and Figure 18 (for revenue passengers), was not stable. Fluctuations were common between corresponding months of successive years and that of August was no exception. Figure 19 shows the total revenue and pass passengers carried during the full month of August from 1975 to 1980. It is evident from the figure that a decline in ridership occurred during 1977 and 1978 followed by a gradual increase in 1979 and 1980. Barring these fluctuations, development of a model on the basis of 1976 data was tested to determine whether ridership could be expressed as a function of the demographic variable,

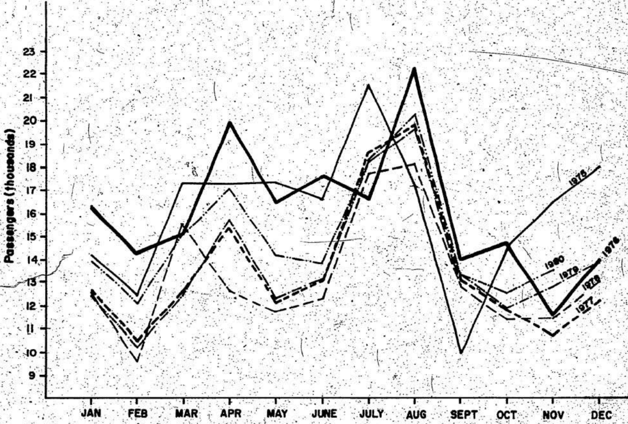


Figure 18 Revenue Passengers carried monthly on CN Roadcruiser Service 1975 — 1980

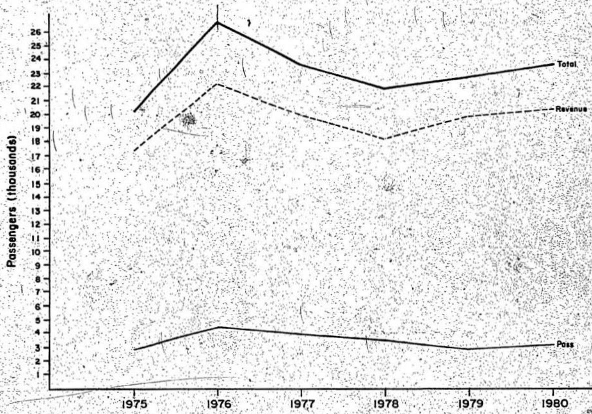


Figure 19 Passengers carried on CN Roadcruiser Service during August 1975-1980

dwelling units, and then acceptably distributed between the various traffic zones.

To enable comparison of predicted and observed data in accordance with procedures used in the trip distribution, zonal trip productions and attractions for each test year were entered into the computer program. Trip productions and attractions predicted by the model for the test years (Table D-2) were greater in value than the observed data (Tables D-3 to D-5) for practically each corresponding traffic zone. This difference was also reflected in the total trips. The trip interchange differences (Tables D-11 to D-14) and chi-square cell values (Tables D-15 to D-18) indicated that the larger differences were present for trip interchanges between major centres. The chi-square 'goodness of fit' test by distance class (Table 14) showed through the total chi-square values that the predicted data was significantly different from the observed for each test year. However, the amount of significant difference decreased over the years. This indicated that the differences were becoming less. The trip length frequency curves of Figures 14 to 17 inclusive were considered as not visually close. The predicted trips appeared above the observed for practically each distance class. The peaks in each figure, however, coincided over distance which represented some consistency in the model.

The difference between predicted and observed total trips is illustrated in Figure 20. The observed number of passengers carried during each survey period did not increase gradually over the test years and some fluctuation appears evident.

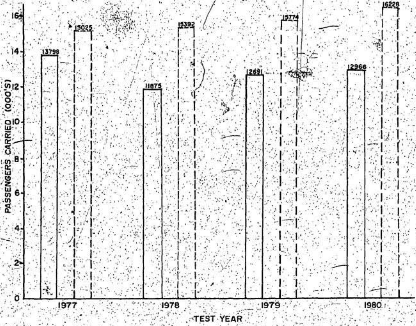


Figure 20 Comparison of predicted and observed passenger volumes (August 1st to 21st) 1977-1980; Observed: (solid line) Predicted: (broken line)

Consideration of Dynamic Changes in the Mode

The lack of consistency in the observed passenger data as shown in Figures 18, 19 and 20 indicate that ridership fluctuates over time. The large decline during 1977 and 1978 is very pronounced. August 1976 (Figure 19) represents a peak in patronage after which ridership declined and has not up to now been totally regained. The cause of this decrease can be explained in terms of a characteristic change in the mode.

The roadcruiser service operates at a deficit and during late 1976, CN initiated action to reduce operating costs. This was achieved through the curtailment of services by removing some of the less profitable runs. During the survey period of 1976, the roadcruiser schedule consisted of eleven runs daily covering a distance of 7,300 kilometers, whereas in 1977 the service was reduced to eight runs and 4,900 kilometers daily. This schedule change, as illustrated in Figure 21, was not acceptable to patrons of the service and caused a large decrease in passengers carried. This basic schedule remained in effect until November 1980. The slight increase in ridership during 1979 and 1980 (Figure 19) may be attributed to several factors. Over time patrons adjusted to the schedule change of 1976 and began to use the service more frequently. During the years 1979 and 1980, sixteen of the twenty-two buses in the fleet were replaced with new modern units. The fares and costs of alternate modes of travel increased at a greater rate than did bus fares. As a consequence of these factors, CN regained some of the patrons lost during 1977 and 1978.

The effects on the model of this dynamic (schedule) change in the mode or system may be best expressed through discussion of Figure 22. This figure illustrates the relationship between actual and predicted passengers carried during each survey period. The lack of consistency in the observed data relative to the model prediction indicates that factors other than those included in the model affect ridership. As predictions are made on the basis of the number of dwelling units in each individual traffic zone, the predicted line may not necessarily be linear. It may be curved, reflecting the growth rate in dwelling

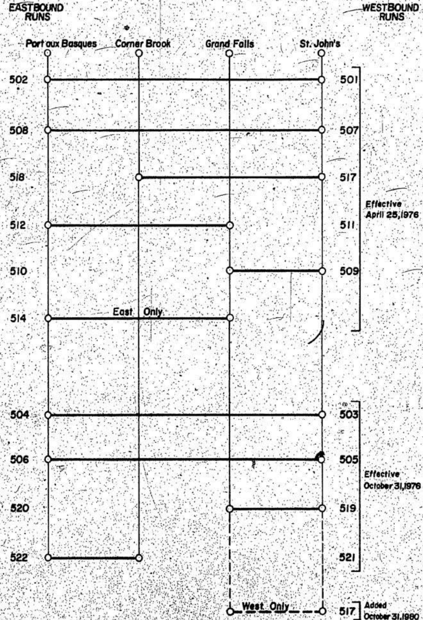


Figure 21 CN Roadcruiser daily service 1976 — 1980

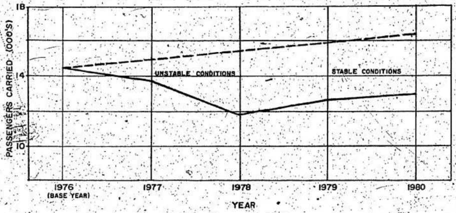


Figure 22 Relative relationship between predicted and observed passenger data; Observed: (solid line), Predicted: (broken line)

units of each zone. In this study the number of dwelling units for the test years were obtained through projecting growth rates of the individual zones. These rates were all positive, consequently the predicted total trips as shown in Figure 22 increased in accordance with the linear relationship contained in the prediction equations. However, the observed total trips did not follow this pattern and fluctuated. The total trips predicted by the model through the trip generation equations were greater in number than those observed, consequently a corresponding difference was evident in the trip distribution phase of the model testing. (These results were presented in Chapter Four.)

Following the decline in ridership during 1977 and 1978, patronage of the system stabilized and the number of passengers carried began to increase. The rate of this increase as expressed by slope of the lines in Figure 22 was very close to that predicted by the model. The amount by which the model over-predicts the observed data in each test year is given in terms of the ratio (observed to predicted passengers carried) in Table 18.

Table 18 Observed and predicted passenger data for each test year survey period

	Total Trips		
Test Year	Observed	Predicted	Ratio $(\frac{Obs.}{Pred.})$
1977	13,798	15,025	.92
1978	11,875	15,392	.77
1979	12,691	15,774	.80
1980	12,996	16,228	.80

This ratio for years 1979 and 1980, representing what may be considered stable conditions, is constant. Therefore, it may be speculated that accuracy of the model, when used in forecasting, can be improved through adjustment of the predicted total trips by the amount of this constant ratio. This could be achieved through multiplying the trips predicted for each zone by the ratio. However, the adjustment would only be valid as long as characteristics of the mode remain unchanged. A change in the system would necessitate another adjustment factor. Equating predicted and observed data in this manner over future years could possibly establish a reliable means of determining from the model the effects on ridership of dynamic changes in the mode.

An alternate method of investigating this effect would be to model passenger data with regards to all modes serving Newfoundland. Such an investigation is suggested for further research as a follow up of this study.

CHAPTER SIX

SUMMARY AND CONCLUSIONS

Summary

Modelling of intercity bus travel demand in Newfoundland was investigated through the application of mathematical techniques to data that had already been collected by various sources. This investigation was carried out for the transportation planning stages of trip generation and trip distribution. Trip generation equations were developed using multiple and simple linear regression analysis, whereas the gravity model was applied to trip distribution.

The island of Newfoundland was divided into three types of areal units or traffic zones according to size. The most appropriate size was assessed through interpretation of the trip generation results. Trip productions and attractions were modelled upon the basis of socio-economic measurements of these zones. A complete trip distribution computer program which included statistical testing of the gravity model output was written by the author for this research. The chi-square 'goodness of fit' test was used to investigate the association between zonal trip productions and attractions and to determine when the gravity model may be considered calibrated. This method was compared with the established method of visually performing the same.

Testing of results was carried out through the comparison of predicted and observed passenger data for four successive years following the base year. On the basis of the various analyses and testing, a model was devised which could be used to forecast intercity bus travel demand in Newfoundland.

Conclusions

When the results of this study are compared with its objectives, it must be concluded that for the most part the study was successful.

Objective number one, to model trip generation and trip distribution through relating intercity bus passenger flow obtained from tickets of the major carrier to routinely published census data, has been accomplished. The developed prediction equations related trip productions and attractions of the most appropriate traffic zone size to the demographic variable dwelling units per zone. The best equations developed using simple linear regression and excluding the influence of the St. John's zone were:

$$T_P = 49 + 0.20782 \text{ DWEL.}$$

$$T_A = 33 + 0.21680 \text{ DWEL.}$$

where:

T_P = trips produced by a zone

T_A = trips attracted by a zone

DWEL. = number of dwelling units in the zone

Those used in predicting St. John's traffic were:

$$T_P = 247 + 0.11192 \text{ DWEL.}$$

$$T_A = 254 + 0.10982 \text{ DWEL.}$$

Statistics used in determining the relationship between the independent and dependent variable possessed favourable values. For example, the simple correlation coefficient in each of the above equations was greater than 0.9.

Travel deterrence factors applied in the trip distribution were calibrated over distance using trip interchange data collected during the base year survey period. A distinct pattern of travel deterrence values were apparent over distances throughout the gravity model iterations.

All of the above modelling was achieved through passenger data obtained from the major carrier, Canadian National, and demographic data from Statistics Canada. The model structure developed and tested reasonably replicated existing intercity travel by CN bus in the Trans-Newfoundland Corridor. The model test results, however, demonstrated that further model development would be required in order to provide an accurate forecasting tool for future use. This development work would necessitate a more extensive data base than was available for this research. Such a data base would include information that describes the competing modes of travel in the corridor as well as factors important in modal choice decisions.

Objective number two, application of statistical testing in order to improve interpretation of output from the applied mathematical techniques, was also accomplished. The appropriate statistics were used to interpret the results of regression analysis, including construction of the 95% confidence band to determine the most appropriate prediction equations and to detect those zones creating unusual values.

The chi-square 'goodness of fit' test was used to indicate when the gravity model may be considered calibrated. It measured through statistical significance the closeness between the observed and gravity model data. The lack of statistically significant difference between the two data sets and between successive gravity model iterations proved to be a very effective tool in determining when the model was calibrated. This method produced favourable results when compared to the established calibration procedure of visual comparison between trip length frequency curves. It is an analytical procedure which provides an alternative to the visual method. The chi-square test was also proven effective in the detection of unusual values in the O-D data and was further extended to comparison of predicted and observed data during the model testing phase.

Besides these main objectives secondary objectives have been accomplished as follows:

1) Three alternative sizes of traffic zones were considered and the most appropriate size selected through the trip generation analysis. For Newfoundland conditions, the zones which produced the more favourable results consisted of an aggregation of census subdivisions including all communities and rural areas surrounding each bus stop.

2) The effects of Newfoundland conditions in general on the applied modelling techniques are evident throughout the analysis and model testing. Certain zones which are connecting points to travel outside the study area as well as zones containing the major centres produce deviations from the general pattern of trip-making common to the remaining zones.

It may be concluded from the testing that factors other than those included in the model affect ridership. The applied model was developed upon a characteristic of land use (dwelling units per zone) while it was shown that characteristics of the mode (schedule changes) also affect ridership. This was evident in each test year as the predicted trips were greater in number than those observed. It is speculated that accuracy of the model could be improved through adjustment of the predicted trips by the amount for which the model overpredicts the observed trips during stable mode conditions. However, adjustments as such, would increase complexity of the model.

As this study included only intercity bus passenger data of the major carrier, the results may be considered as being satisfactory. However, the conclusion is that a better understanding of bus travel demand in Newfoundland could be achieved through inclusion of the other bus operators and modes of transportation.

LIST OF REFERENCES

1. Commission of Inquiry into Newfoundland Transportation, REPORT OF INQUIRY INTO NEWFOUNDLAND TRANSPORTATION, VOLUME 1, Minister of Supply and Services Canada, July 1978.

2. Dodd, R.W., A SURVEY OF CN ROADCRUISER BUS PASSENGERS IN NEWFOUNDLAND, Canadian Transport Commission, Research Branch, Report No. 40-78-22, Nov. 1978.

3. U.S. Department of Transportation, GUIDELINES FOR TRIP GENERATION, Federal Highway Administration, Bureau of Public Roads, Washington, D.C., June 1967.

4. U.S. Department of Transportation, TRIP GENERATION ANALYSIS, Federal Highway Administration, Bureau of Public Roads, Washington D.C., August 1975.

5. U.S. Department of Transportation, CALIBRATING AND TESTING A GRAVITY MODEL FOR ANY SIZE URBAN AREA, Federal Highway Administration, Bureau of Public Roads, Washington D.C., October 1973.

6. U.S. Department of Transportation, TRAFFIC ASSIGNMENT, Federal Highway Administration, Bureau of Public Roads, Washington D.C., August 1973.

7. U.S. Department of Commerce, MODAL SPLIT, Bureau of Public Roads, Office of Planning, Washington D.C., December 1966.

8. Hutchingson, B.G., et.al., A REVIEW OF TRIP GENERATION PROCEDURES USED IN CANADIAN URBAN TRANSPORTATION STUDIES, Technical Publication No. 4, Roads and Transportation Association of Canada, Ottawa, Ontario, 1974.

9. Kessler, D.S., RELATIONSHIPS BETWEEN INTERCITY AIR PASSENGERS AND ECONOMIC AND DEMOGRAPHIC FACTORS, M.S.E. Thesis, Princeton University, New York, 1965.

10. Yunker, K.R., TESTS OF TEMPORAL STABILITY OF TRAVEL SIMULATION MODELS IN SOUTHERN WISCONSIN, Transportation Research Record 610, National Academy of Sciences, Washington D.C., 1976.

11. Pearson, P.M., THE PLANNING AND EVALUATION OF INTERCITY TRAVEL SYSTEMS, Ph.D. Dissertation, University of Waterloo, 1969.

12. Pearson, P.M., DEMAND FOR TRAVEL ON THE CANADIAN AIRWAY SYSTEM, Highway Research Record 369, National Research Council, Washington D.C., 1971.

13. Pearson, P.M. and McLaughlin, W.A., A SIMULATION OF INTERCITY TRAVEL DEMANDS, A paper for presentation, Transportation Science Section, Joint National Meeting of Operations Research Society of America and American Astronautical Society, Denver, June 1969.

14. Quandt, R.E. and Baumol, W.J., THE DEMAND FOR ABSTRACT TRANSPORT MODES THEORY AND MEASUREMENT, Journal of Regional Science, Vol. 6, No. 2, 1966, University of Pennsylvania.

15. Hartgen, D.T. and Cohen, G.S., INTERCITY PASSENGER DEMAND MODELS: A STATE OF THE ART, Preliminary Research Report 112, Planning Research Unit, New York State Department of Transportation, Albany, New York, Dec. 1976.

16. IBI Group, ATLANTIC REGION INTER-MODAL PASSENGER STUDY, TECHNICAL WORKING PAPER No. 3, ANALYSIS OF POSSIBLE CHANGES IN TRAVEL DEMAND, Federal Provincial Committee on Atlantic Transportation in association with ADI Limited, Fredericton, N.B., March 1977.

17. Rea, J.C., INTERCITY PASSENGER TRANSPORT IN CANADA, A review of Existing Systems, Report No. 252, Canadian Transport Commission, Ottawa, Ontario, December 1975.

18. Rea, J.C., Wills, M.J., Platts, J.B., EVALUATION OF POTENTIAL POLICIES FOR INTERCITY PASSENGER TRANSPORTATION IN CANADA, Transportation Research Record 637, Transportation Research Board, National Research Council, Washington D.C., 1977.

19. Bennett, J.C., Ellis, R.H. and Prokopy, J.C., A COMPARATIVE EVALUATION OF INTERCITY MODAL SPLIT MODELS, Transportation Research Board, National Research Council, Washington D.C., 1974.

20. Bonsall, P.W., et.al., TRANSPORT MODELLING: SENSITIVITY ANALYSIS AND POLICY TESTING, Program Press Inc., New York, Vol. 7, Part 3, Progress in Planning, 1977.

21. Navin, F.P. and Wolsfeld, R.P., ANALYSIS OF AIR PASSENGER TRAVEL IN THE TWIN CITIES METROPOLITAN AREA, Highway Research Record No. 369, Highway Research Board, National Research Council, Washington D.C., 1971.

22. Schuldiner, P.W., NORTHEAST CORRIDOR TRANSPORTATION PROJECT: STRUCTURE AND OPERATION OF MODEL SYSTEM, Transportation Engineering Journal, Proceedings of ASCE, Vol. 96, No. TE4, New York, Nov. 1970.

23. Smith, K.V., A MIX-OF-MODES EVALUATION MODEL FOR TRANSPORTATION SYSTEMS, Rand Corporation, Santa Monica, California, 1969.

24. Statistics Canada, CENSUS OF CANADA, 1971 and 1976, Cansim Division, Ottawa.

25. Newfoundland Statistics Agency, Executive Council, HISTORICAL STATISTICS OF NEWFOUNDLAND AND LABRADOR, Division of Printing Services, Government of Newfoundland and Labrador, St. John's, August 1979.

26. Institute of Social and Economic Research, CENSUS ATLAS OF NEWFOUNDLAND, Geography Department, Memorial University of Nfld., St. John's, 1977.

27. Dixon, W.J., BIOMEDICAL COMPUTER PROGRAMS, Health Sciences Computing Facility, University of California, Los Angeles, U.S.A., 1970.

28. Wine, R.L., STATISTICS FOR SCIENTISTS AND ENGINEERS, Prentice-Hall Incorporated, New Jersey, 1964.

29. Walker, H.M. and Lev, J., STATISTICAL INFERENCE, Henry Holt and Company, New York, 1953.

BIBLIOGRAPHY

1. Acres Consulting Services, NEWFOUNDLAND-MAINLAND TRANSPORTATION STUDY, AN ANALYSIS OF THE AIR TRANSPORTATION SYSTEM BETWEEN THE MAINLAND AND THE PROVINCE OF NEWFOUNDLAND, Prepared for Canadian Surface Transportation Administration, Ministry of Transport, Ottawa, March 1972.

2. Afifi, A.A. and Azen, S.P., STATISTICAL ANALYSIS, A COMPUTER ORIENTED APPROACH, Academic Press, New York, 1979.

3. Albertin, R.D., SUMMARY OF NEW YORK STATE INTERCITY TRAVEL DATA, New York State Department of Transportation, Albany, New York, March 1973.

4. Andrews, M.G., TRAVEL CHARACTERISTICS OF SELECTED MANUFACTURING INDUSTRIES IN KITCHENER-WATERLOO, MSCE Thesis, Department of Civil Engineering, University of Waterloo, Waterloo, Ontario, 1972.

5. Bennett, John C., Ellis, Raymond H., and Prokopy, John C., A COMPARATIVE EVALUATION OF INTER-CITY MODAL SPLIT MODELS, Transportation Research Record 526, Transportation Research Board, National Research Council, Washington D.C., 1974.

6. Bonsall, P.W. et al, TRANSPORT MODELLING: SENSITIVITY ANALYSIS AND POLICY TESTING, Program Press Inc., New York, Vol. 7, Part 3, Progress in Planning, 1977.

7. Brown, Samuel L. and Watkins, Wayne S., THE DEMAND FOR AIR TRAVEL: A REGRESSION STUDY OF TIME SERIES AND CROSS SECTIONAL DATA IN THE U.S. DOMESTIC MARKET, Highway Research Record No. 213, Highway Research Board, National Research Council, Washington D.C., 1968.

8. Canadian Transport Commission, Ottawa Research Branch, INTERCITY PASSENGER TRANSPORT IN CANADA, A REVIEW OF EXISTING SYSTEMS, Report No. 252, Ottawa, December 1975.

9. Canadian Transport Commission, TRANSPORT REVIEW, TRENDS AND SELECTED ISSUES, Ottawa, March 1979.

10. Canadian Transport Commission, Economic and Social Analysis Branch, REPORT ON TRANSPORT DEMAND FORECASTING PROGRAM, PHASE ONE, Ottawa, December 1975.

11. Christie, J.S., INTERCITY BUS PASSENGER DEMAND MODELS, MSE Thesis in Engineering, University of New Brunswick, Fredericton, N.B., 1976.

12. Clark, G.A. and Sobieniak, J.W., OPERATING COSTS FOR CONVENTIONAL AND STOL AIRCRAFT, INTERCITY PASSENGER STUDY, Canadian Transport Commission, Report 08, Ottawa, Sept. 1970.

13. Commission of Inquiry into Newfoundland Transportation, Supplementary Report, A COMPARISON OF ENERGY CONSUMPTION BETWEEN SELECTED MODES, Brief.

14. Commission of Inquiry into Newfoundland Transportation, Supplementary Report, A STUDY OF THE FEASIBILITY OF OPERATING AN INTEGRATED BUS SYSTEM IN NEWFOUNDLAND, Brief.

15. Commission of Inquiry into Newfoundland Transportation, REPORT OF THE COMMISSION OF INQUIRY INTO NEWFOUNDLAND TRANSPORTATION, VOLUME 1, Minister of Supply and Services Canada, July 1978.

16. Commission of Inquiry in Newfoundland Transportation, POPULATION, LABOUR FORCE, INCOME LEVELS AND EMPLOYMENT IN THE TRUCKING INDUSTRY BY TRAFFIC ZONE, Brief.

17. Crow, R.T. et al, MODELS OF INTERCITY TRAVEL DEMAND, PART 1, THEORETICAL ASPECTS, Mathematica, Princeton, N.J., 1971.

18. Dawes, P. et al, MIDWESTERN ONTARIO - BRUCE PUBLIC TRANSPORT STUDY, PART 1, Transport Service Appraisal Division, Report 75, Canadian Transport Commission, Systems Analysis and Research Data-Base Branch, December 1973.

19. DeLeuw, Cather & Co. of Canada Ltd., A NEW APPROACH FOR URBAN TRANSPORTATION PLANNING, For Dept. of Highways, Ont., 1969.

20. Department of Environment, THE SPACE AVERAGING OF DETERRENT FUNCTIONS FOR USE IN GRAVITY MODEL DISTRIBUTION CALCULATIONS, Urban Transport Division, Crowthorne, Berkshire, 1972.

21. Dobson, Richardo and McGarvey, William E., AN IMPERICAL COMPARISON OF DISAGGREGATE CATEGORY AND REGRESSION TRIP GENERATION ANALYSIS TECHNIQUES, Transportation, Vol. 6, n. 3, Elsevier Scientific Publishing Company, Amsterdam, Sept. 1977.

22. Dodd, R.W., A SURVEY OF CN ROADCRUISER BUS PASSENGERS IN NEWFOUNDLAND, Canadian Transport Commission, Research Branch, Report No. 40-78-22, Nov. 1978.

23. Dubin, A.P., TRANSPORTATION DEMAND FORECASTING, Intersoc. Conference on Transportation, 4th Annual Proceedings of ASME, New York, July 1973.

24. Draper, N.R. and Smith, H., APPLIED REGRESSION ANALYSIS, John Wiley & Sons Inc., New York, 1966.

25. Economic Research Centre, European Conference of Ministers of Transport.

ECMT ROUND TABLE 28, IMPACT OF THE STRUCTURE AND EXTENT OF URBAN DEVELOPMENT ON THE CHOICE OF MODES OF TRANSPORT, THE CASE OF MEDIUM SIZE CONTRIBUTIONS, Paris, 1976.

ECMT ROUND TABLE 32, PASSENGER TRANSPORT DEMAND IN URBAN AREAS, METHODOLOGY FOR ANALYSING AND FORECASTING, Paris, 1976.

ECMT ROUNT TABLE 33, IMPACT OF THE STRUCTURE AND EXTENT OF URBAN DEVELOPMENT ON THE CHOICE OF MODES OF TRANSPORT, THE CASE OF LARGE CONTRIBUTIONS, Paris, 1976.

ECMT ROUND TABLE 35, ORGANIZATION OF REGIONAL PASSENGER TRANSPORT, Paris, 1977.

26. Ellis, R.H. et al, CONSIDERATION OF INTERMODAL COMPETITION IN THE FORECASTING OF NATIONAL INTERCITY TRAVEL, Highway Research Record No. 369, National Research Council, Washington D.C., 1971.

27. Ellis, R.H. et al, NATIONAL INTERCITY TRAVEL, DEVELOPMENT AND IMPLEMENTATION OF A DEMAND FORECASTING FRAMEWORK, Peat Marwick Livingston and Co., Washington D.C., March 1970.

28. Evans, S.P., DERIVATION AND ANALYSIS OF SOME MODELS FOR COMBINING TRIP DISTRIBUTION AND ASSIGNMENT, University of Bristol, Transportation Research, Vol. 10, pp. 37-57, Pergamon Press, U.K., 1976.

29. Foster, R.E., TEXAS AIRPORT SYSTEM PLAN, AIR PASSENGERS DEMAND MODEL: DATA BASE, Texas Transportation Institute College Station, Oct. 1972.

30. Foster, R.E., TEXAS AIRPORTS SYSTEMS PLAN, AIR PASSENGER DEMAND MODEL, Texas Transportation Institute College Station, Jan. 1973.

31. Hajj, H.M., SYNTHESIS OF VEHICLE TRIP PATTERNS IN SMALL URBAN AREAS, Paper prepared for: 50th Annual Meeting, Highway Research Board, Washington D.C., Jan. 1971.

32. Hartgen, D.T., BEHAVIORAL MODELS IN TRANSPORTATION: PERSPECTIVES, PROBLEMS AND PROSPECTS, Preliminary Research Report 152, Planning Research Unit, New York State Department of Transportation, Albany, New York, May 1979.

33. Hargen, David T. and Cohen, Gerald S., INTERCITY PASSENGER DEMAND MODELS: STATE OF THE ART, Preliminary Research Report 112, Planning Research Unit, New York State Department of Transportation, Albany, New York, Dec. 1976.

34. Hesse, J.E., Dubin, A.P., Gobetz, F.W., PREDICTING TRANSPORTATION DEMAND, Paper no. 73-ICT-103, ASME Meeting, Sept. 23-27, Denver, 1973.

35. Hooper, Terry J. and Johnston, Everett E., MID-WESTERN ONTARIO BRUCE PUBLIC TRANSPORT STUDY, PART 3, Transport Appraisal Division, Report 77, Canadian Transport Commission, Systems Analysis and Research Data Base Branch, Ottawa, Feb. 1974.

36. Horst, P., FACTOR ANALYSIS OF DATA MATRICES, Holt, Rinehart and Winston, Inc., New York, 1965.

37. Hutchingson, B.G., PRINCIPLES OF URBAN TRANSPORT SYSTEMS PLANNING, Scripta Book Company, Washington D.C., 1974.

38. Hutchingson, B.G. et al, A REVIEW OF TRIP GENERATION ANALYSIS PROCEDURES USED IN CANADIAN URBAN TRANSPORTATION STUDIES, Technical Publication No. 4, Roads and Transportation Association of Canada, Ottawa, Ontario, 1974.

39. IBI Group, ATLANTIC REGION INTER-MODAL PASSENGER STUDY, TECHNICAL WORKING PAPER NO. 1, DEMOGRAPHIC CHARACTERISTICS, Federal Provincial Committee on Atlantic Transportation in association with ADI Limited, Planning Development Associates Ltd., Fredericton, N.B., March 1977.

40. IBI Group, ATLANTIC REGION INTER-MODAL PASSENGER STUDY, TECHNICAL WORKING PAPER NO. 2, EXISTING TRANSPORTATION, Federal Provincial Committee on Atlantic Transportation in association with ADI Limited, Planning Development Associates Ltd., Fredericton, N.B., March 1977.

41. IBI Group, ATLANTIC REGION INTER-MODAL PASSENGER STUDY, TECHNICAL WORKING PAPER NO. 3, ANALYSIS OF POSSIBLE CHANGES IN TRAVEL DEMAND, Federal Provincial Committee on Atlantic Transportation in association with ADI Limited, Planning Development Associates Ltd., Fredericton, N.B., March 1977.

42. IBI Group, ATLANTIC REGION INTER-MODAL PASSENGER STUDY, TECHNICAL WORKING PAPER No. 4, ANALYSIS OF FINANCIAL IMPLICATIONS, Federal Provincial Committee on Atlantic Transportation in association with ADI Limited, Planning Development Associates Ltd., Fredericton, N.B., March 1977.

43. IBI Group, ATLANTIC REGION INTER-MODAL PASSENGER STUDY, FINAL REPORT, Federal Provincial Committee on Atlantic Transportation in association with ADI Limited, Planning Development Associates Ltd., Fredericton, N.B., March 1977.

44. Institute of Social and Economic Research, CENSUS ATLAS OF NEWFOUNDLAND, Memorial University of Newfoundland, St. John's, 1977.

45. Kates, Peat, Marwick & Co., TRANS-NEWFOUNDLAND TRANSPORTATION STUDY, VOLUME A, INTERCITY BUS SERVICES, Canadian Transport Commission, Ottawa, 1974.

46. Kates, Peat, Marwick & Co., TRANS-NEWFOUNDLAND CORRIDOR TRANSPORTATION STUDY, VOLUME F, PASSENGER TRANSPORTATION DEMAND CHARACTERISTICS AND USER OPINION, Canadian Transport Commission, Ottawa, 1974.

47. Kates, Peat, Marwick & Co., TRANS-NEWFOUNDLAND CORRIDOR TRANSPORTATION STUDY, VOLUME I, AIR TRANSPORT, Canadian Transport Commission, Ottawa, 1974.

48. Kates, Peat, Marwick & Co., TRANS-NEWFOUNDLAND CORRIDOR TRANSPORTATION STUDY, SUMMARY DOCUMENT, Canadian Transport Commission, Ottawa, March 1974.

49. Kates, Peat, Marwick & Co., TRANS-NEWFOUNDLAND CORRIDOR TRANSPORTATION STUDY, VOLUME J, CORRIDOR TRANSPORTATION SYSTEM, PRESENT PERFORMANCE AND PROSPECTIVE IMPROVEMENTS, Canadian Transport Commission, Ottawa, March 1974.

50. Kazmier, L.J., BUSINESS STATISTICS, Schaum's Outline Series, McGraw Hill Book Company, New York, 1976.

51. Kessler, D.S., RELATIONSHIPS BETWEEN INTERCITY AIR PASSENGERS AND ECONOMIC AND DEMOGRAPHIC FACTORS—A MULTIPLE LINEAR REGRESSION ANALYSIS, M.S.E. Thesis, Princeton University, New York, 1965.

52. Kresge, David T. and Roberts, Paul O., TECHNIQUES OF TRANSPORT PLANNING, VOLUME 2, SYSTEMS ANALYSIS AND SIMULATIONS MODELS, The Book Institution, Transport Research Program, Washington D.C., 1972.

53. Lane, R., Powell, T.J. and Smith, P.R., ANALYTICAL TRANSPORT PLANNING, Anchor Press Ltd., Tiptree, England, 1971.

54. Lipschutz, S. and Poe, A., PROGRAMMING WITH FORTRAN, Schaum's Outline Series in Computers, McGraw-Hill Book Company, New York, 1978.

55. Leake, G.R. and Underwood, J.R., ENTROPY MODEL AND INTERCITY MODAL SPLIT IN THE UK, Transportation Engineering Journal of ASCE, Vol. 102, No. TE2, May 1976.

56. MacLean, A.S., MAXIMUM LIKELIHOOD AND THE GRAVITY MODEL, Transportation Research, Vol. 10, pp. 287-297, Pergamon Press, U.K., 1976.

57. McCracken, D.D., A GUIDE TO FORTRAN IV PROGRAMMING, John Wiley & Sons, Inc., New York, 1965.

58. McCuen, R.H., FORTRAN PROGRAMMING FOR CIVIL ENGINEERS, Prentice-Hall Inc., New Jersey, 1975.

59. Miller, R.D., NEWFOUNDLAND-MAINLAND TRANSPORTATION STUDY, VOLUME 2, TRAFFIC FORECASTS, Canadian Surface Transportation Administration, Ministry of Transport, Ottawa, 1972.

60. Ministry of Transport, AN INTERIM REPORT ON PASSENGER MOVEMENT IN CANADA, Transport Canada, Ottawa, June 1965.

61. Moroney, M.J., FACTS FROM FIGURES, Penguin Books Ltd., Harmondsworth, Middlesex, England, 1958.

62. Moursund, D.B., PROBLEMS ANALYSIS AND SOLUTION USING FORTRAN IV, Wadsworth Publishing Company Inc., Belmont, California, 1970.

63. Navin, F.P. and Wolsfeld, R.P., ANALYSIS OF AIR PASSENGER TRAVEL IN THE TWIN CITIES METROPOLITAN AREA, Highway Research Record No. 369, Highway Research Board, National Research Council, Washington D.C., 1971.

64. Newfoundland Statistics Agency, Executive Council, Government of Newfoundland and Labrador, HISTORICAL STATISTICS OF NEWFOUNDLAND AND LABRADOR, Division of Printing Services, August 1979.

65. Omnifacts Research Limited, REPORT ON THE TRANSPORTATION SYSTEM IN NEWFOUNDLAND AND LABRADOR, Prepared for Commission of Inquiry into Newfoundland Transportation, St. John's, Newfoundland, Jan. 1978.

66. Paquette, Randor J. et al, TRANSPORTATION ENGINEERING, The Ronald Press Company, New York, 1972.

67. Parkinson, Tom E., PASSENGER TRANSPORT IN CANADIAN URBAN AREAS, Research Branch, Canadian Transport Commission, Ottawa, Dec. 1970.

68. Parkinson, T.E. et al, INTERCITY PASSENGER TRANSPORT STUDY, Research Branch, Canadian Transport Commission, Ottawa, Sept. 1970.

69. Pearson, P.M. and McLaughlin, W.A., A SIMULATION OF INTERCITY TRAVEL DEMANDS, A paper for presentation, Transportation Science Section, Joint National Meeting of Operations Research Society of America and American Astronautical Society, Denver, June 1969.

70. Pearson, P.M., DEMAND FOR TRAVEL ON THE CANADIAN AIRWAY SYSTEM, Highway Research Record 369, National Research Council, Washington D.C., 1971.

71. Pearson, P.M., THE PLANNING AND EVALUATION OF INTERCITY TRAVEL SYSTEMS, Ph.D. Dissertation, University of Waterloo, 1969.

72. Peat, Marwick, Mitchell & Co., TRANS-NEWFOUNDLAND CORRIDOR TRANSPORTATION STUDY, RAIL FREIGHT AND PASSENGER SERVICES, Canadian Transport Commission, Ottawa, March 1974.

73. Peers, John B. and Bevilacqua M., STRUCTURAL TRAVEL DEMAND MODELS--AN INTERCITY APPLICATION, Transportation Research Record 569, Transportation Research Board, National Research Council, Washington D.C., 1976.

74. Pilgrim, R.W., INTERCITY PASSENGER FORECASTING MODELS--A STATE OF THE ART, Faculty of Engineering and Applied Science, Memorial University of Newfoundland, St. John's, Newfoundland, Nov. 1979.

75. Planning Branch, Traffic and Planning Studies Division, EASTERN ONTARIO HIGHWAY PLANNING STUDY, Department of Highways, Ontario, 1966.

76. Planning Branch, Traffic and Planning Studies Division, SOUTH-WESTERN ONTARIO HIGHWAY PLANNING STUDY, Department of Highways, Ontario, 1967.

77. Quandt, R.E. and Baumol, W.J., THE DEMAND FOR ABSTRACT TRANSPORT MODES THEORY AND MEASUREMENT, Journal of Regional Science, Vol. 6, No. 2, 1966, University of Pennsylvania.

78. Rassam, Paul R. et al, THE n-DIMENSIONAL LOGIT MODEL: DEVELOPMENT AND APPLICATION, Highway Research Record 369, National Research Council, Washington D.C., 1971.

79. Rea, J.C. et al, MIDWESTERN ONTARIO--BRUCE PUBLIC TRANSPORT STUDY, PART 2, Transport Service Appraisal Division, Report 76, Canadian Transport Commission, Ottawa, Dec. 1973.

80. Rea, J.C., INTERCITY PASSENGER TRANSPORT IN CANADA, ANALYSIS OF THE CONSEQUENCES OF ALTERNATIVE PRICING AND NETWORK STRATEGIES, Report No. 254, Canadian Transport Commission, Ottawa, March 1976.

81. Rea, J.C., Wills, M.J. and Platts, J.B., EVALUATION OF POTENTIAL POLICIES FOR INTERCITY PASSENGER TRANSPORTATION IN CANADA, Transportation Research Record 637, Transportation Research Board, National Research Council, Washington D.C., 1971.

82. Resecon Inc., ANALYSIS OF VARIABLE COST PROBLEMS IN PASSENGER SERVICE, Canadian Transport Commission, Ottawa, Feb. 1977.

83. Roads and Transportation Association of Canada, TRANSPORTATION RESEARCH IN CANADA 1975-1976, Ottawa, 1976.

84. Roberts, Paul O. Jr. and Dewees, Donald N., ECONOMIC ANALYSIS FOR TRANSPORT CHOICE, A Charles River Associates Research Study, D.C. Heath and Company, Lexington, Mass., Toronto, 1971.

85. Shuldiner, Paul W., NORTHEAST CORRIDOR TRANSPORTATION PROJECT: STRUCTURE AND OPERATION OF MODEL SYSTEM, Transportation Engineering Journal, Proceedings of ASCE, Vol. 96, No. TE4, New York, Nov. 1970.

86. Smith, K.V., A MIX-OF-MODES EVALUATION MODEL FOR TRANSPORTATION SYSTEMS, Rand Corporation, Santa Monica, California, 1969.

87. Stevens, A.M. and Wilson, F.R., ATLANTIC PROVINCES AIR TRANSPORTATION STUDY--APATS 69, VOLUME 1, ADI Limited, Fredericton, N.B., September 21, 1970.

88. Stevens, A.M. and Wilson, F.R., ATLANTIC PROVINCES AIR TRANSPORTATION STUDY--APATS 69, VOLUME 2, ADI Limited, Fredericton, N.B., September 21, 1970.

89. The Newfoundland Transportation Division of CN, CN ROADCRUISER SERVICE IN NEWFOUNDLAND, Submission to the Canadian Transport Commission, 26 June 1979.

90. U.S. Department of Commerce, MODAL SPLIT, Bureau of Public Roads, Office of Planning, Washington D.C., December 1966.

91. U.S. Department of Transportation, GUIDELINES FOR TRIP GENERATION ANALYSIS, Federal Highway Administration, Bureau of Public Roads, Washington D.C., June 1967.

92. U.S. Department of Transportation, TRIP GENERATION ANALYSIS, Federal Highway Administration, Bureau of Public Roads, Washington D.C., August 1975.

93. U.S. Department of Transportation, CALIBRATING AND TESTING A GRAVITY MODEL FOR ANY SIZE URBAN AREA, Federal Highway Administration, Bureau of Public Roads, Reprinted, Washington D.C., October 1973.

94. U.S. Department of Transportation, TRAFFIC ASSIGNMENT, Federal Highway Administration, Bureau of Public Roads, Washington D.C., August 1973.

95. U.S. Department of Transportation, THE ROLE OF ECONOMIC STUDIES IN URBAN TRANSPORTATION PLANNING, Federal Highway Administration, Bureau of Public Roads, Washington D.C., Reprinted November 1979.

96. Yunker, K.R., TESTS OF TEMPORAL STABILITY OF TRAVEL SIMULATION MODELS IN SOUTHEASTERN WISCONSIN, Transportation Research Record 610, National Academy of Sciences, Washington D.C. 1976.

97. Zerillo, R.J. and Neveu, A.J., AN ANALYSIS OF INTERCITY TRAVEL MARKETS IN NEW YORK STATE, Planning Research Unit, New York State Department of Transportation, State Campus, Albany, New York, August 1979.

APPENDIX 'A'

This appendix presents material referred to in Chapter Three, Research Design for both the Data and Method of Investigation. The socio-economic and passenger data base for model development are given in tabular form. Much of this data was entered directly into the multiple linear regression computer program at the trip generation stage. Also included in this appendix is the trip distribution computer program which was written by the author.

TABLE A-I CN ROADCRUISER REVENUE PASSENGER FLOW (WESTBOUND)

Survey period: August 1 to 31, 1976

	ST. JOHN'S	HOLYROOD	WHITBOURNE	ARNOLD'S COVE	COME BY CHANCE	GOOBIES	CLARENVILLE	PORT BLANDFORD	TERRA NOVA	GLOVERTOWN	GAMBO	GANDER	GLENWOOD	LEWISPORTE JCT.	NORRIS ARM	BISHOP'S FALLS	GRAND FALLS	BADGER	SOUTH BROOK	SPRINGDALE JCT.	BAIE VERTE JCT.	HAMPTON JCT.	DEER LAKE	PASADENA	CORNER BROOK	STEPHENVILLE	STEPHENVILLE XING	ST. GEORGE'S	FLAT BAY JCT.	ROBINSON'S JCT.	ST. FINTAN'S	SOUTH BRANCH	DOYLE'S	PORT AUX BASQUES
ST. JOHN'S																																		
HOLYROOD	3																																	
WHITBOURNE	111	1																																
ARNOLD'S COVE	40	0	0																															
COME BY CHANCE	10	0	0	0																														
GOOBIES	96	3	0	0	4																													
CLARENVILLE	367	1	15	0	11	6																												
PORT BLANDFORD	34	0	6	0	2	1	6																											
TERRA NOVA	13	0	5	1	0	0	3	0																										
GLOVERTOWN	106	1	13	2	3	0	4	0	0																									
GAMBO	130	0	19	6	0	11	15	5	0	31																								
GANDER	372	13	46	5	6	10	107	17	0	36	60																							
GLENWOOD	17	2	9	1	0	4	11	1	0	0	1	15																						
LEWISPORTE JCT.	171	3	21	4	0	3	15	0	0	13	3	44	0																					
NORRIS ARM	1	0	0	0	0	0	2	0	0	0	0	0	0	0																				
BISHOP'S FALLS	119	4	12	0	1	0	12	3	4	1	11	25	4	2	0																			
GRAND FALLS	[illegible]	10	22	3	0	9	53	2	0	5	13	60	2	36	7	5																		
BADGER	18	4	40	0	0	3	11	1	0	2	4	13	3	14	0	2	75																	
SOUTH BROOK	36	0	1	2	0	6	6	0	0	2	1	10	0	6	0	1	23	0																
SPRINGDALE JCT.	43	0	10	0	0	6	12	0	0	0	0	22	1	8	0	2	67	1	0															
BAIE VERTE JCT.	62	0	9	0	0	3	2	0	0	0	11	10	0	16	1	6	36	2	1	2														
HAMPTON JCT.	15	0	6	0	0	2	5	0	2	1	4	0	0	11	10	4	5	1	0	1	0													
DEER LAKE	97	3	29	0	0	9	24	0	1	6	24	60	1	27	0	22	80	17	12	15	9	0												
PASADENA	7	1	11	0	9	0	2	3	0	0	16	18	0	10	0	1	14	4	2	5	0	0	7											
CORNER BROOK	[illegible]	5	61	3	0	21	93	1	2	14	16	113	1	34	0	21	181	30	12	66	21	4	84	5										
STEPHENVILLE	[illegible]	13	31	0	1	0	0	3	0	6	10	29	1	[illegible]	0	11	89	7	7	37	7	12	41	3	9									
STEPHENVILLE XING	4	1	3	0	0	0	0	0	0	0	0	3	0	1	0	0	5	0	0	[illegible]	0	0	3	2	11	7								
ST. GEORGE'S	10	0	3	2	0	0	0	0	0	0	0	1	0	0	1	0	6	1	0	0	0	0	8	2	45	19	21							
FLAT BAY JCT.	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	7	1	2	0						
ROBINSON'S JCT.	5	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	5	0	0	1	0	0	0	0	29	29	5	7	0					
ST. FINTAN'S	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	27	52	3	5	0	0				
SOUTH BRANCH	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	8	3	0	0	0	1	1			
DOYLE'S	10	0	1	0	1	1	2	0	0	0	2	0	0	0	2	0	9	2	0	0	0	0	1	0	20	40	1	0	0	3	1	0		
PORT AUX BASQUES	[illegible]	1	23	0	7	44	45	[illegible]	0	2	8	60	3	[illegible]	5	3	206	16	1	27	26	1	16	6	[illegible]	[illegible]	22	25	1	32	22	11	13	

TABLE A-2 CN ROADCRUISER REVENUE PASSENGER FLOW (EASTBOUND)

Survey period: August 1 to 31, 1976

	ST. JOHN'S	HOLYROOD	WHITBOURNE	ARNOLD'S COVE	COME BY CHANCE	GOOBIES	CLARENVILLE	PORT BLANDFORD	TERRA NOVA	GLOVERTOWN	GAMBO	GANDER	GLENWOOD	LEWISPORTE JCT.	NORRIS ARM	BISHOP'S FALLS	GRAND FALLS
ST. JOHN'S																	
HOLYROOD	0																
WHITBOURNE	15	1															
ARNOLD'S COVE	40	0	7														
COME BY CHANCE	14	1	3	0													
GOOBIES	61	0	0	0	2												
CLARENVILLE	380	3	0	3	3	4											
PORT BLANDFORD	45	11	14	0	3	0	12										
TERRA NOVA	6	2	5	0	0	0	0	0									
GLOVERTOWN	116	23	3	0	1	2	4	0	0								
GAMBO	116	1	9	3	0	12	23	5	0	10							
GANDER	310	16	17	15	5	19	93	12	11	7	47						
GLENWOOD	20	2	62	0	0	0	2	0	0	1	3	80					
LEWISPORTE JCT.	152	1	2	3	0	12	16	4	0	2	6	37	0				
NORRIS ARM	1	0	26	0	0	0	0	0	0	0	0	1	0	0			
BISHOP'S FALLS	115	4	3	7	0	1	19	0	1	5	1	17	5	5	4		
GRAND FALLS	366	13	13	6	0	7	56	6	2	21	12	123	5	20	2	8	
BADGER	16	2	22	0	0	2	12	2	0	0	3	22	0	4	0	2	123
SOUTH BROOK	19	2	11	4	0	1	1	2	0	1	0	8	1	17	0	2	9
SPRINGDALE JCT.	48	0	4	0	2	3	20	0	0	0	[illegible]	18	1	8	0	1	57
BAIE VERTE JCT.	57	0	2	0	0	6	5	0	0	4	7	8	0	14	1	10	29
HAMPTON JCT.	8	0	6	0	0	3	4	0	[illegible]	0	2	2	0	4	0	6	4
DEER LAKE	101	6	9	0	2	6	22	1	6	3	11	46	4	28	0	11	30
PASADENA	6	2	4	2	0	1	3	0	0	11	0	3	0	2	0	3	3
CORNER BROOK	346	30	4	2	2	14	106	5	1	16	23	112	9	190	9	29	197
STEPHENVILLE	248	15	81	5	2	11	46	0	0	4	1	83	17	31	0	3	64
STEPHENVILLE XING	11	0	28	0	0	0	1	0	0	0	0	8	2	3	0	0	3
ST. GEORGE'S	6	0	4	0	0	0	0	0	0	0	0	1	0	0	0	0	3
FLAT BAY JCT.	2	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0
ROBINSON'S JCT.	10	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0
ST. FINTAN'S	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SOUTH BRANCH	5	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
DOYLE'S	9	0	1	0	0	0	0	0	0	0	5	0	0	0	0	0	0
PORT AUX BASQUES	[illegible]	6	34	2	0	23	29	0	0	0	3	60	1	137	3	15	5

	BADGER	SOUTH BROOK	SPRINGDALE JCT.	BAIE VERTE JCT.	HAMPTON JCT.	DEER LAKE	PASADENA	CORNER BROOK	STEPHENVILLE	STEPHENVILLE XING	ST. GEORGE'S	FLAT BAY JCT.	ROBINSON'S JCT.	ST. FINTAN'S	SOUTH BRANCH	DOYLE'S	PORT AUX BASQUES
SOUTH BROOK	0																
SPRINGDALE JCT.	2	3															
BAIE VERTE JCT.	3	0	4														
HAMPTON JCT.	1	0	0	8													
DEER LAKE	7	6	12	10	8												
PASADENA	1	1	4	2	0	4											
CORNER BROOK	23	18	16	15	6	17	7										
STEPHENVILLE	12	4	9	3	0	24	0	64									
STEPHENVILLE XING	0	1	0	0	0	4	1	8	39								
ST. GEORGE'S	1	0	0	11	0	8	0	42	100	23							
FLAT BAY JCT.	0	0	0	0	0	0	0	11	0	0	0						
ROBINSON'S JCT.	0	0	5	2	1	1	0	20	33	7	8	0					
ST. FINTAN'S	0	0	0	0	0	0	0	17	33	0	1	1	0				
SOUTH BRANCH	0	1	0	0	0	1	0	6	0	0	0	0	2	0			
DOYLE'S	1	0	0	0	0	2	2	33	23	1	1	0	0	2	2		
PORT AUX BASQUES	7	4	5	3	0	33	8	408	130	25	14	3	17	10	3	9	

TABLE A - 3 TABULATED 1976 CENSUS DATA

SUBDIVISION + COMMUNITY	POPULATION			DWELLING UNITS			LABOUR FORCE			EMPLOYED PERSONS		INCOME (HOUSE HOLD)					
	TOTAL	MALES	F-MALES	TOTAL	OWNED	RENTED	TOTAL	MALES	F-MALES	EMPL-OYED	UNEM-PLOYED	AVE.	<6K	6K TO 10K	10K TO 15K	15K TO 25K	25K +
SUB. IA IST. OF AVALON:	7135	3675	3460	1605	1495	110	2000	1495	505	1590	405	15780					
ARNOLD'S COVE	1160			295			340			265	75	13607	39	66	78	92	20
CHANCE COVE	487			110			80			60	20	22551	16	19	18	34	17
CHAPEL ARM	712			145			200			160	40	16828	18	20	19	64	24
COME BY CHANCE	380			80			130			85	45	16393	18	14	6	32	10
LG. HARBOUR-MT. AR.	675			145			205			170	35	19169	6	16	24	61	32
NORMANS-LONG COVE	1155			255			380			330	50	14562	32	49	56	91	28
SOUTHERN HR.	759			140			160			130	30	11935	20	32	38	43	12
SUNNYSIDE	726			180			195			135	60	11655	35	49	40	28	8
UNORGANIZED IA:	1081			250	230	20	310	245	70	265	55		184	265	279	445	151
BELL VIEW	348																
FAIR HAVEN	154																
GOOBIES	167																
LITTLE HARBOUR	212																
THORNLEA	190																
SUB. IB PLACENTIA:	7815	4040	3775	1690	1385	305	2330	1585	745	1800	530	13691	37	86	60	108	24
DUNVILLE	1909			445			575			440	135	12612	40	103	92	176	33
FOX HARBOUR	627			125			200			160	40	15530	19	22	21	42	17
FRESHWATER	1426			290			385			290	95	10120	49	100	54	80	12
JERSEYSIDE	1027			215			280			210	70	14110	24	80	40	54	13
PLACENTIA	2209			500			715			550	165	16083	52	127	93	186	49
UNORGANIZED IB:	617			115	95	20	180	115	65	155	25		184	432	300	538	119
ARGENTIA	68																
LITTLE BARASWAY	19																
POINT VERDE	277																
SHIP HARBOUR	252																
SUB. IC ST. BRIDES	1551	860	691	345	335	10	510	390	115	360	145	14578	19	23	22	14	9
BRANCH	452			110			150			100	50	8567	27	32	29	12	9
POINT LANCE	135			25			45			40	5	22231	3	4	4	8	6
ST. BRIDES	578			125			220			170	50	12937	26	34	33	21	11
UNORGANIZED:	368			85	80	5	80	60	20	50	30		56	70	66	41	26
ANGEL'S COVE	41																
CAPE ST. MARY'S	10																
CUSLETT	107																
GREAT BARASWAY	35																
PATRICK'S COVE	162																
SHIP COVE	27																
SB IF HTS. DELIGHT:	4603	2310	2293	1095	1035	60	1425	970	455	1245	180	11083	30	31	29	22	7
HTS. DELIGHT-ISLINGTON	942			210			265			245	20	10947	59	58	42	38	13
HEARTS DESIRE	380			70			95			75	20	9789	19	21	18	15	3
WHITEWAY	260			60			80			75	5	12454	13	14	11	14	4
UNORGANIZED:	3121			755	710	50	980	660	320	850	130		121	93	71	65	20
BROAD COVE	106																
CAVENDISH	340																
CROCKER'S COVE	50																
DILDO	858																
GREEN'S HARBOUR	705																
HOPEALL	249																
NEW HARBOUR	179																

TOTAL A-4 SOCIO-ECONOMIC DATA BASE FOR CASE 1, INDIVIDUAL COMMUNITIES (1976 CENSUS)							
NO.	COMMUNITY NAME	TOTAL POPULATION	TOTAL DWELLING UNITS	TOTAL LABOR FORCE	EMPLOYED PERSONS	UNEMPLOYED PERSONS	AVERAGE HOUSEHOLD INCOME
1	St. John's	86576	22830	35105	31730	3375	20186
2	Holyrood	1610	365	490	445	45	16865
3	Whitbourne	1268	305	400	315	85	13203
4	Arnolds Cove	1160	295	340	265	75	13607
5	Come by Chance	380	80	130	85	45	16393
6	Goobies	167	39	48	39	9	15780
7	Clarenville	2807	740	995	845	150	18651
8	Port Blandford	815	205	255	195	60	12997
9	Terra Nova	88	25	25	20	5	11200
10	Glovertown	2176	555	635	490	145	12067
11	Gambo	2994	630	810	650	160	15105
12	Gander	9301	2345	3895	3515	380	22540
13	Glenwood	1128	240	355	240	115	15397
14	Lewisporte	3782	915	1255	1080	180	16896
15	Norris Arm	1342	270	390	295	95	13237
16	Bishops Falls	4504	1010	1475	1230	245	15171
17	Grand Falls	8729	2245	3505	3120	385	20873
18	Badger	1160	255	280	235	45	14374
19	South Brook	828	180	180	120	160	11749
20	Springdale	3513	820	1140	970	170	17691
21	Baie Verte	2528	535	845	745	100	22070
22	Hampden	780	145	160	105	55	12759
23	Deer Lake	4546	1050	1480	1275	205	18545
24	Pasadena	1850	465	690	615	75	20072
25	Corner Brook	25198	6100	9775	8655	1120	22095
26	Stephenville	10284	2325	3500	2950	550	17082
27	Stephenville Crossing	2207	485	500	410	90	13299
28	St. George's	1976	410	415	315	100	13616
29	Flat Bay	385	76	75	55	20	13753
30	Robinsons	2044	510	620	475	145	13777
31	Doyles	2488	515	650	495	155	13777
32	Port aux Basques	6187	1455	2210	1960	50	17285

TABLE A-5 ROADCRUISER PASSENGER O-D MATRIX FOR CASE 1 (INDIVIDUAL COMMUNITIES)

TO \ FROM	ST. J	HOLY	WHIT	ACOV	CBC	COOB	CVLE	PTRL	TBRO	GLMN	GMBO	GAMD	GLEN	LMIS	MORA	BPAL	GPAL	BADO	SBRK	SDLE	DAVE	HAMP	DELA	PASA	CHRK	SVLE	XING	ST.G	FBAY	ROSS	SFTN	SBRN	DOTS	PAR
ST. J	0	0	115	40	14	61	360	45	8	116	116	310	20	153	1	115	328	16	15	45	87	8	101	6	343	242	11	5	2	10	3	5	9	239
HOLY	5	0	1	0	1	0	3	11	2	33	1	16	2	1	0	4	13	2	2	0	0	0	8	3	30	15	0	0	0	0	0	0	0	6
WHIT	111	1	0	1	3	0	0	14	3	3	9	17	62	2	26	3	13	22	11	4	9	8	9	4	4	61	26	4	3	0	1	0	1	34
ACOV	48	0	0	0	0	0	3	0	0	0	3	15	0	3	0	7	6	0	4	0	0	0	0	2	2	6	0	0	0	0	0	0	0	2
CBC	10	0	0	0	0	2	5	3	0	1	0	5	0	0	0	0	0	0	0	2	0	0	2	0	2	2	0	0	0	0	0	0	0	0
COOB	96	3	0	0	4	0	4	0	0	2	12	19	0	12	0	1	7	2	1	3	6	3	6	1	14	11	0	0	0	0	0	5	0	25
CVLE	367	1	15	0	11	6	0	12	0	14	23	93	2	16	0	19	56	12	1	20	5	4	22	3	106	46	1	0	0	6	0	0	0	39
PTRL	34	0	6	0	2	1	6	0	0	0	5	12	0	4	0	0	6	2	2	0	0	0	1	0	5	0	0	0	0	0	0	0	0	0
TBRO	13	0	6	1	0	0	2	0	0	0	0	11	0	0	0	1	2	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	0	0
GLMN	106	1	13	2	3	0	4	0	0	0	10	7	1	2	0	5	21	0	1	0	4	0	3	11	16	4	0	0	0	0	0	0	0	0
GMBO	130	0	19	6	0	11	15	5	0	31	0	47	3	6	0	3	12	3	0	8	7	2	11	0	23	1	0	0	0	0	0	0	3	8
GAMD	373	13	44	5	6	10	107	17	0	38	80	0	30	37	1	19	123	22	5	18	8	2	46	3	112	33	3	1	1	0	0	0	0	56
GLEN	17	2	9	1	0	4	11	1	0	0	1	15	0	0	0	5	5	0	1	1	0	0	4	0	9	17	2	0	0	0	0	0	0	1
LMIS	171	3	21	4	0	9	18	0	0	13	9	44	0	0	0	5	20	4	17	8	14	1	28	2	40	31	3	0	0	0	0	0	0	29
MORA	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4	2	0	0	0	1	0	0	0	5	0	0	0	0	0	0	0	0	2
BPAL	118	4	12	0	1	0	12	3	4	1	11	23	4	2	0	0	9	2	2	1	10	5	11	3	29	3	0	0	0	0	0	0	0	15
GPAL	345	10	22	9	0	9	53	2	0	5	13	89	2	18	7	6	0	122	9	57	29	4	30	3	197	64	3	3	0	0	0	0	0	8
BADO	15	4	10	0	0	3	11	1	0	2	4	18	0	14	0	2	75	0	0	2	3	1	7	1	23	12	0	1	0	0	0	0	1	7
SBRK	34	0	1	2	0	6	6	0	0	2	1	10	0	6	0	1	23	0	0	3	0	0	6	1	18	4	1	0	0	0	0	1	0	4
SDLE	43	0	10	0	0	8	12	0	0	0	0	22	1	5	0	2	67	1	0	0	4	0	12	4	16	8	0	0	0	3	0	0	0	8
DAVE	62	0	8	0	0	3	2	0	0	0	11	10	0	16	1	8	36	2	1	2	0	5	10	3	15	5	0	11	0	2	0	0	0	5
HAMP	15	0	6	0	0	2	3	0	2	1	4	0	0	11	0	4	5	1	0	1	0	0	6	0	6	0	0	0	0	1	0	0	0	0
DELA	97	5	29	0	0	9	24	0	1	6	24	50	1	87	0	22	50	17	12	13	9	0	0	4	17	24	4	3	0	1	0	1	2	33
PASA	7	1	11	0	0	0	2	3	0	0	16	12	0	10	0	1	14	4	2	4	0	0	7	0	7	0	1	0	0	0	0	0	3	9
CHRK	326	5	61	3	0	21	35	1	2	14	18	113	1	54	0	21	181	30	12	66	21	4	64	5	0	64	5	42	11	20	17	6	33	406
SVLE	256	13	21	0	1	0	0	3	0	6	10	35	1	39	0	11	59	7	7	37	7	12	41	3	8	0	39	100	0	33	33	0	22	139
XING	6	1	3	0	0	0	0	0	0	0	0	5	0	1	0	0	3	0	0	0	0	0	3	2	11	7	0	23	0	7	0	0	1	25
ST. G	10	0	3	2	0	0	0	0	0	0	0	1	0	0	1	0	6	1	0	0	0	0	2	2	45	19	21	0	0	5	1	0	1	14
FBAY	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	7	1	2	0	0	0	1	0	0	3
ROSS	3	0	1	0	0	0	2	0	0	0	0	1	0	0	0	0	5	0	0	1	0	0	0	0	29	29	5	7	0	0	0	2	0	17
SFTN	4	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	27	32	3	3	0	0	0	0	2	10
SBSH	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	8	3	0	0	0	1	1	0	2	3
DOTS	10	0	1	0	1	1	2	0	0	0	2	0	0	0	0	0	8	2	0	0	0	0	3	0	28	40	1	0	0	3	1	0	0	9
PAR	207	1	23	0	7	24	43	0	0	2	8	80	3	15	3	3	205	16	1	22	16	1	18	8	155	153	32	29	1	32	22	11	13	0

TABLE A-6 SOCIO-ECONOMIC DATA BASE FOR CASE 2, ZONES (1976 CENSUS)

No.	Node	Population Total	Population Male	Population F.Male	Dwelling Units Total	Dwelling Units Owned	Dwelling Units Rented	Labour Force Total	Labour Force Male	Labour Force F.Male	Employed Persons	Unemployed Persons	Average Household Income
1	St. John's	123540	62511	61029	28135	22367	5768	49505	34100	15405	44645	4860	17080
2	Holyrood	1610	833	777	365	331	34	490	332	158	445	45	16865
3	Whitbourne	10123	5215	4908	2255	1905	350	3045	2100	945	2385	660	13447
4	Come by Chance	7135	3675	3460	1605	1495	110	2000	1495	505	1590	405	15780
5	Clarenville	13273	6768	6505	3325	3005	320	3745	2685	1060	2955	790	12773
6	Port Blandford	4692	2405	2287	1165	1090	75	1275	930	345	940	335	12352
7	Glovertown	5158	2670	2488	1290	1195	95	1425	1070	355	1090	335	11254
8	Gambo	7879	4035	3844	1635	1520	115	1830	1405	425	1335	495	11576
9	Gander	18693	9470	9223	4510	3495	1015	6030	4110	1920	5115	915	13895
10	Lewisporte	9374	4757	4617	2135	1930	205	2425	1740	685	1920	505	12111
11	Norris Arm	1736	926	810	370	340	30	490	380	110	370	120	13237
12	Grand Falls	32752	16590	16162	7540	6030	1510	10710	7445	3265	9130	1580	14653
13	Springdale	8390	4318	4072	1910	1685	225	2345	1790	555	1825	520	11752
14	Baie Verte	8099	4260	3839	1630	1325	305	2225	1630	595	1840	385	14477
15	Hampden	2276	1250	1120	475	455	20	600	470	130	400	200	13799
16	Deer Lake	9941	5176	4765	2235	1965	270	2890	2060	830	2385	505	12429
17	Pasadena	2624	1315	1309	630	502	128	1015	684	331	835	180	15918
18	Corner Brook	34459	17325	17134	8130	6423	1707	12630	8201	4429	10910	1720	13267
19	Stephenville	16776	8465	8311	3700	2445	1255	5115	3390	1725	4195	1320	13755
20	St. Georges	3339	1720	1619	730	650	80	690	550	140	505	185	13616
21	Robinsons	2044	1075	969	510	480	30	620	460	160	475	145	13777
22	Doyles	2488	1315	1173	515	490	25	650	470	180	495	155	13777
23	Port aux Basques	10503	5420	5083	2395	2130	265	3505	2615	890	3145	360	15289

TABLE A-7 ROADCRUISER PASSENGER O-D MATRIX FOR CASE 2 (ZONES)

FROM

TO	ST. J	HOLY	WHIT	CBC	CVLE	PTEL	GLWN	GMBO	GAND	LWIS	NORA	GPAL	SDLE	BAVE	HAMP	DELA	PASA	CBRK	SVLE	ST. G	ROBS	DOYS	PAB
ST. J	0	0	115	115	360	45	124	116	330	153	1	459	60	87	8	101	6	343	253	7	13	14	239
HOLY	5	0	1	1	3	11	35	1	18	1	0	19	2	0	0	8	3	30	15	0	0	0	6
WHIT	111	1	0	4	0	14	6	9	79	2	26	38	15	9	8	9	4	4	87	7	1	1	39
CBC	154	3	0	0	12	3	3	15	39	15	0	23	10	6	3	8	3	18	19	0	0	5	27
CVLE	367	7	15	17	0	12	4	23	95	16	0	87	21	5	4	22	3	106	47	0	6	0	39
PTEL	34	0	6	3	6	0	0	5	12	4	0	8	2	0	0	1	0	5	0	0	0	0	0
GLWN	119	1	19	6	6	0	0	10	19	2	0	29	1	4	0	6	11	17	4	0	0	0	0
GMBO	130	0	19	17	15	5	31	0	50	6	0	18	8	7	2	11	0	23	1	0	0	3	8
GAND	390	15	53	26	118	18	38	81	0	37	1	174	25	8	2	50	3	121	55	2	0	0	57
LWIS	171	3	21	13	18	0	13	9	44	0	0	29	25	14	1	28	2	40	34	0	0	0	29
NORA	1	0	0	0	2	0	0	0	0	0	0	6	0	1	0	0	0	5	0	0	0	0	2
GPAL	478	18	44	22	76	6	12	28	136	34	7	0	71	42	10	48	7	249	82	4	0	1	30
SDLE	77	0	11	16	18	0	2	1	33	11	0	94	0	4	0	18	5	34	13	0	3	1	12
BAVE	62	0	8	3	2	0	0	11	10	16	1	46	3	0	5	10	3	15	5	11	2	0	5
HAMP	15	0	6	2	3	0	3	4	0	11	0	10	1	0	0	6	0	6	0	C	1	0	0
DELA	97	5	29	9	24	0	7	24	51	27	0	89	25	9	0	0	4	17	28	3	1	3	33
PASA	7	1	11	0	2	3	0	16	12	10	C	19	6	0	0	7	0	7	1	0	0	3	9
CBRK	326	5	61	24	95	1	16	18	114	54	0	232	78	21	4	64	5	0	69	53	37	39	406
SVLE	262	14	24	1	0	3	6	10	41	40	0	80	44	7	12	44	5	19	0	123	73	23	164
ST. G	12	0	4	2	0	0	0	0	1	0	1	8	0	0	0	2	2	52	43	0	7	1	17
ROBS	7	0	1	0	2	0	0	0	3	0	0	5	1	0	0	C	1	56	69	10	0	4	27
DOYS	10	0	1	4	2	0	0	2	0	0	0	12	1	0	0	3	0	36	44	0	6	0	12
PAB	207	1	23	31	43	0	2	8	83	25	3	224	23	16	1	18	8	155	185	30	54	24	0

TABLE A-8 SOCIO-ECONOMIC DATA BASE FOR CASE 3, INCORPORATED COMMUNITIES (1976 CENSUS)

No.	Node	Total Population	Total Dwellings Total	Owned	Rented	Labour Force Total	Male	F.Male	Employed Persons	Unemployed Persons	Average Household Income
1	St. John's	123540	28135	22367	5768	49505	34100	15405	44645	4860	17080
2	Holyrood	1610	365	331	34	490	332	158	445	45	16865
3	Whitbourne	8466	1875	1525	350	2550	1760	790	1955	595	13447
4	Come by Chance	6054	1355	1265	90	1690	1250	440	1335	355	15780
5	Clarenville	5400	1425	1195	230	1805	1260	545	1485	320	12773
6	Port Blandford	1456	370	335	35	430	325	105	320	110	12352
7	Glovertown	4783	1185	1095	90	1285	975	310	995	290	11254
8	Gambo	7879	1635	1520	115	1830	1405	425	1335	495	11576
9	Gander	14088	3490	2520	970	5140	3410	1730	4445	695	13895
10	Lewisporte	7651	1745	1560	185	2095	1480	615	1795	300	12111
11	Norris Arm	1342	275	255	20	395	305	90	300	95	13237
12	Grand Falls	29140	6720	5210	1510	9545	6555	2990	8130	1415	14653
13	Springdale	7562	1725	1505	120	2130	1465	665	1805	325	11752
14	Baie Verte	7571	1535	1240	295	2095	1530	565	1755	340	14477
15	Hampden	1710	360	345	15	445	360	85	310	135	13799
16	Deer Lake	8783	1980	1735	245	2640	1875	765	2206	435	12429
17	Pasadena	2296	545	434	111	870	586	284	735	135	15918
18	Corner Brook	34002	8040	6333	1707	12495	8111	4384	10800	1695	13267
19	Stephenville	15794	3505	2260	1245	4925	3250	1675	4055	870	13755
20	St. Georges	1976	410	350	60	415	315	100	315	100	13616
21	Robinsons	2044	510	480	30	620	460	160	475	145	13777
22	Doyles	2488	515	490	25	650	470	180	495	155	13777
23	Port aux Basques	9355	2135	1880	255	3165	2335	830	2830	335	15289

```
          C---------------------------------------------------------
          C---------------------------------------------------------
          C
          C THE GRAVITY MODEL AND SELECTED STATISTICAL TESTING
          C
          C---------------------------------------------------------
          C---------------------------------------------------------
          C
0001            DIMENSION NAME(53,23)
0002            INTEGER TRIP(23,23),SUMRO(23),SUMCO(23)
0003            DIMENSION G(23,23),SUMG(23)
0004            INTEGER IST(23,23)
0005            DIMENSION TCAT(60),ODP(60)
0006            DIMENSION LIML(53),LIMU(53)
0007            DIMENSION ECF(23,23),CH(23,23)
0008            DIMENSION SUMUP(23),SUMDN(23)
0009            DIMENSION SUMAC(23),SUMDW(23)
0010            DIMENSION F(53),X(23,23),SUMX(23)
0011            DIMENSION T(23,23),TRIPS(60),PERCT(60)
0012            DIMENSION CA(53),KQ(53),HOLD(53)
0013            INTEGER CLAL(53),CLAU(53),STORE(53)
0014            REAL KQ,MODEL,LINE,KQU
0015            DIMENSION SUMTA(23),SUMTD(23)
0016            DIMENSION Y(23,23),SUMY(23)
0017            DIMENSION CS(23,23),SUMCSD(23),SUMCSA(23)
0018            DIMENSION DIF(23,23),SUMD(23),SUMDA(23)
0019            DIMENSION R(23,23),SUMR(23)
0020            DIMENSION SQ(23,23),SUMS(23)
0021            DIMENSION LINE(110),FREQ(53)
0022            DIMENSION STARS(112)
0023            INTEGER ZONE(23),ZON(23)
0024            DIMENSION FRE(53),FACT(53)
0025            DIMENSION SYM(110),SYMB(110),SYBO(110)
0026            DIMENSION SQU(53),KQU(53)
          C READ NUMBER OF ZONES
0027            READ 2,L,M
0028          2 FORMAT(2I2)
          C READ NAMES OF COMMUNITIES (ZONE NODES) AND ROUTE DISTANCE
0029            READ(5,406) ((NAME(I,J),I=1,53),J=1,M)
0030        406 FORMAT(53A1)
          C READ THE OD TRIP DATA
0031            READ(5,150) ((TRIP(I,J),I=1,L),J=1,M)
0032        150 FORMAT(23I3)
          C READ THE DISTANCE (SKIM TREE) TABLE
0033            READ(5,209) ((IST(I,J),I=1,L),J=1,M)
0034        209 FORMAT(23I3)
          C READ FRICTION FACTORS
0035            READ 18,(F(I),I=1,50)
```

```
      18 FORMAT(16F5.2,/,16F5.2,/,16F5.2,/,2F5.2)
C READ THE PLOTTING SYMBOLS
         READ(5,1)BLANK,DOT,STAR,PER
       1 FORMAT(4A1)
         READ(5,87)OD,MODEL,DASH,ANF
      87 FORMAT(4A1)
C READ THE ZONE NUMBERS
         READ 400,(ZONE(I),I=1,L)
     400 FORMAT(23I2)
         READ 401,(ZON(J),J=1,M)
     401 FORMAT(23I2)
C
C PRINT NAMES OF COMMUNITIES, ZONE NUMBERS AND ROUTE DISTANCE
C
         PRINT 407
     407 FORMAT('1',2X,'TABLE           ',4X,'ROADCRUISER COMMUNITY STOPS ZONE
       2 NUMBERS AND ROUTE DISTANCE')
         PRINT 159
     159 FORMAT(' ',130(1H=)/)
         PRINT 409
     409 FORMAT(/35X,'COMMUNITY',9X,'ZONE',6X,'WEST DIRECTION',4X,
       2'EAST DIRECTION')
         PRINT 410
     410 FORMAT(34X,'STOP (NODE)',7X,'NUMBER',6X,'DISTANCE (KM)',5X,
       2'DISTANCE (KM)')
         PRINT 425
     425 FORMAT(34X,'============',7X,'======',6X,'==============',
       25X,'==============='/)
         DO 412 J=1,23
     412 PRINT 411,(NAME(I,J),I=1,53)
     411 FORMAT(23(35X,53A1,/))
         PRINT 159
C
C PRINT THE DISTANCE, SKIM TREE TABLE
C
         PRINT 426
     426 FORMAT('1',2X,'TABLE           ',4X,'DISTANCE IN KILOMETERS BETWEEN Z
       3ONE NODES: (SKIM TREE TABLE)')
         PRINT 159
         PRINT 428
     428 FORMAT(4X,'TO /',5X,'FROM ZONE')
         PRINT 429,(ZONE(I),I=1,L)
     429 FORMAT(2X,'ZONE/',23I5 )
         PRINT 453
     453 FORMAT(/58X,'KILOMETERS')
         DO 430 J=1,M
     430 PRINT 431,ZON(J),(IST(I,J),I=1,L)
     431 FORMAT(/4X,I2,1X,23I5)
```

```
              PRINT 159
        C
        C---------------------------------------------
        C COMPUTE TRIP PRODUCTIONS AND ATTRACTIONS
        C---------------------------------------------
        C
              DO 152 I=1,L
              SUMCO(I)=0.0
              DO 152 J=1,M
              SUMCO(I)=SUMCO(I)+TRIP(I,J)
          152 CONTINUE
              DO 153 J=1,M
              SUMRO(J)=0.0
              DO 153 I=1,L
              SUMRO(J)=SUMRO(J)+TRIP(I,J)
          153 CONTINUE
        C COMPUTE THE TOTAL TRIPS
              ITOT=0
              DO 158 I=1,L
              ITOT=ITOT+SUMCO(I)
          158 CONTINUE
              PRINT 154
          154 FORMAT('1',2X,'TABLE       ',4X,'ROADCRUISER PASSENGER OD SURVEY
             2TRIP DATA FOR ZONES AUGUST 1976')
              PRINT 159
              PRINT 403
          403 FORMAT(4X,'TO /',5X,'FROM ZONE')
              PRINT 404,(ZONE(I),I=1,L)
          404 FORMAT(2X,'ZONE/',23I5,3X,'TOTAL' )
              PRINT 479
          479 FORMAT(125X,'ATTR.')
              PRINT 454
          454 FORMAT(/55X,'NUMBER OF TRIPS')
              DO 161 J=1,M
          161 PRINT 163,ZON(J),(TRIP(I,J),I=1,L),SUMRO(J)
          163 FORMAT(/3X,I2,2X,23I5,I7)
              PRINT 162
          162 FORMAT(/2X,'TOTAL')
              PRINT 157,(SUMCO(I),I=1,L),ITOT
          157 FORMAT(2X,'PROD.',23I5,I7)
              PRINT 159
        C
        C COMPUTE THE MEAN,VARIANCE,STANDARD DEVIATION AND COEF. OF VARIATION
        C
              AVE=FLOAT(ITOT)/(L*M)
              DO 201 I=1,L
              SUMG(I)=0.0
              DO 201 J=1,M
```

```
          G(I,J)=((FLOAT(TRIP(I,J)))-AVE)**2
          SUMG(I)=SUMG(I)+G(I,J)
  201     CONTINUE
          SUMTO=0.0
          DO 204 I=1,L
          SUMTO=SUMTO+SUMG(I)
  204     CONTINUE
          VAR=SUMTO/(L*M)
          SD=SQRT(VAR)
          CV=SD/AVE
          PRINT 203,SUMTO,AVE,VAR,SD,CV
  203     FORMAT(5X,'SUM SQS. = ',F8.0,5X,'AVERAGE = ',F5.0,5X,'VARIANCE
         2 = ',F8.2,5X,'STD. DEV. = ',F5.2,5X,'COEFFT. OF VARIATION = ',
         3F6.2)
C
C-----------------------------------------------------------------
C CHI-SQUARE TEST FOR INDEPENDENCE BETWEEN ROWS AND COLUMNS
C-----------------------------------------------------------------
C
C COMPUTE THE EXPECTED CELL FREQUENCIES
          DO 220 I=1,L
          DO 220 J=1,M
          ECF(I,J)=(FLOAT(SUMCO(I))*FLOAT(SUMRO(J)))/FLOAT(ITOT)
  220     CONTINUE
          DO 235 I=1,L
          SUMAC(I)=0.0
          DO 235 J=1,M
          SUMAC(I)=SUMAC(I)+ECF(I,J)
  235     CONTINUE
          DO 236 J=1,M
          SUMDW(J)=0.0
          DO 236 I=1,L
          SUMDW(J)=SUMDW(J)+ECF(I,J)
  236     CONTINUE
C COMPUTE THE TOTAL EXPECTED VALUE
          SUMEPT=0.0
          DO 240 I=1,L
          SUMEPT=SUMEPT+SUMAC(I)
  240     CONTINUE
          PRINT 221
  221     FORMAT('1',2X,'TABLE          ',4X,'ROADCRUISER PASSENGER OD SURVEY
         2TRIP DATA: EXPECTED CELL FREQUENCIES  (CONTINGENCY TABLE)')
          PRINT 159
          PRINT 415
  415     FORMAT(4X,'TO /',5X,'FROM ZONE')
          PRINT 416,(ZONE(I),I=1,L)
  416     FORMAT(2X,'ZONE/',23I5,3X,'TOTAL' )
          PRINT 454
```

```
      DO 222 J=1,M
  222 PRINT 237,ZON(J),(ECF(I,J),I=1,23),SUMDW(J)
  237 FORMAT(/3X,I2,2X,23F5.0,F7.0)
      PRINT 238,(SUMAC(I),I=1,L),SUMEPT
  238 FORMAT(//1X,'TOTAL',1X,23F5.0,F7.0)
      PRINT 159
C COMPUTE THE CHI-SQUARE CELL VALUES
      DO 223 I=1,L
      DO 223 J=1,M
      IF(ECF(I,J).EQ.0) GOTO  234
      CH(I,J)=(FLOAT(TRIP(I,J))-ECF(I,J))**2/ECF(I,J)
      GOTO 223
  234 CH(I,J)=0.0
  223 CONTINUE
      DO 226 I=1,L
      SUMUP(I)=0.0
      DO 226 J=1,M
      SUMUP(I)=SUMUP(I)+CH(I,J)
  226 CONTINUE
      DO 227 J=1,M
      SUMDN(J)=0.0
      DO 227 I=1,L
      SUMDN(J)=SUMDN(J)+CH(I,J)
  227 CONTINUE
C COMPUTE THE TOTAL CHI SQUARE VALUE
      SUMALL=0.0
      DO 231 I=1,L
      SUMALL=SUMALL+SUMUP(I)
  231 CONTINUE
      PRINT 224
  224 FORMAT('1',2X,'TABLE          ',4X,'ROADCRUISER PASSENGER OD SURVEY
     2 TRIP DATA (CONTINGENCY TABLE)')
      PRINT 159
      PRINT 417
  417 FORMAT(4X,'TO /',5X,'FROM ZONE')
      PRINT 418,(ZONE(I),I=1,L)
  418 FORMAT(2X,'ZONE/',23I5,3X,'TOTAL' )
      PRINT 455
  455 FORMAT(/53X,'CELL VALUES CHI-SQUARE')
      DO 225 J=1,M
  225 PRINT 228,ZON(J),(CH(I,J),I=1,L),SUMDN(J)
  228 FORMAT(/3X,I2,2X,23F5.0,F7.0)
      PRINT 229,(SUMUP(I),I=1,L),SUMALL
  229 FORMAT(//1X,'TOTAL',1X,23F5.0,F7.0)
      PRINT 159
      PRINT 160
  160 FORMAT(10X,'DEGREES OF FREEDOM = 484 ',10X,'CH. SQ. TABLE VALUE AT
     2 5 PERCT. LEVEL = 536')
```

```
                C
                C-----------------------------------------------------------------
                C CALCULATE THE PERCENTAGE OF TOTAL TRIPS IN EACH DISTANCE CLASS
                C-----------------------------------------------------------------
                C
0191                  DO 210 INT=1,51
0192                  TCAT(INT)=0.0
0193              210 CONTINUE
0194                  LIML(1)=0.0
0195                  LIMU(1)=19
0196                  INT=0.0
0197              213 INT=INT+1
0198                  DO 211 I=1,L
0199                  DO 211 J=1,M
0200                  IF(IST(I,J).LE.LIML(INT)) GOTO 211
0201                  IF(IST(I,J).GT.LIMU(INT)) GOTO 211
0202                  TCAT(INT)=TCAT(INT)+FLOAT(TRIP(I,J))
0203              211 CONTINUE
0204                  LIML(INT+1)=LIML(INT)+20
0205                  LIMU(INT+1)=LIMU(INT)+20
0206                  IF(INT.LE.51) GOTO 213
0207                  DO 214 INT=1,51
0208                  ODP(INT)=(TCAT(INT)/FLOAT(ITOT))*100
0209              214 CONTINUE
0210                  IAA=1
0211                  IXA=25
0212                  PRINT 215
0213              215 FORMAT('1',2X,'TABLE         ',4X,'ROADCRUISER PASSENGER OD TRIP DA
                     2TA BY DISTANCE CLASSES')
0214                  PRINT 159
0215                  PRINT 216
0216              216 FORMAT( 9X,'DISTANCE CLASS',4X,'NUMBER', 4X,'PERCENT',24X,'DISTANC
                     2E CLASS',4X,'NUMBER',4X,'PERCENT').
0217                  PRINT 202
0218              202 FORMAT(13X,'(KM)',9X,'OF TRIPS',3X,'OF TOTAL',27X,'(KM)',9X,'OF T9
                     2IPS',3X,'OF TOTAL')
0219                  DO 212 INT=IAA,IXA
0220                  INN=INT+25
0221                  PRINT 218,LIML(INT),DASH,LIMU(INT),TCAT(INT),ODP(INT),LIML(INN),DA
                     2SH,LIMU(INN),TCAT(INN),ODP(INN)
0222              218 FORMAT(/10X,I4,1X,A1,I4,7X,F5.0,5X,F6.2,26X,I4,1X,A1,I4,7X,F5.0,5X
                     2,F6.2)
0223              212 CONTINUE
0224                  PRINT 159
                C
                C-----------------------------------------------------------------
                C PLOT THE TRIP LENGTH FREQUENCY DISTRIBUTION OF OD DATA
                C-----------------------------------------------------------------
```

```
C
      IWW=1
      IZZ=12
      DO 29 K=1,4
      PRINT 449
  449 FORMAT('1')
      PRINT 33
   33 FORMAT(38X,'NUMBER OF TRIPS (FREQUENCY)',10X,'* (10 PASSENGERS)'/)
      PRINT 4
    4 FORMAT(19X,'0',8X,'100',7X,'200',7X,'300',7X,'400',7X,'500',
     27X,'600',7X,'700',7X,'800',7X,'900',6X,'1000')
      PRINT 5
    5 FORMAT(19X,'+',10(9X,'+'))
      DO 6 I=1,110
      LINE(I)=PER
    6 CONTINUE
      PRINT 8,LINE
    8 FORMAT(9X,'DISTANCE',2X,110A1)
      PRINT 9,DOT
    9 FORMAT(8X,'CLASS (KM)',1X,A1)
      DO 11 INT=IWW,IZZ
      FREQ(INT)=TCAT(INT)/10
      DO 12 J=1,112
      IF(J.LT.FREQ(INT)) GOTO 13
      GOTO 14
   13 STARS(J)=STAR
   14 CONTINUE
      IF(J.GT.FREQ(INT)) GOTO 15
      GOTO 16
   15 STARS(J)=BLANK
   16 CONTINUE
   12 CONTINUE
      PRINT 25,DOT
   25 FORMAT(19X,A1)
      PRINT 17,DOT,STARS
   17 FORMAT(19X,A1,112A1)
      PRINT 27,LIML(INT),DASH,LIMU(INT),DOT,STARS
   27 FORMAT(8X,I4,1X,A1,1X,I3,1X,A1,112A1)
      PRINT 19,DOT,STARS
   19 FORMAT(19X,A1,112A1)
   11 CONTINUE
      PRINT 23
   23 FORMAT(    ///9X,'FIGURE            ',4X,'TRIP LENGTH FREQUENCY DISTRI
     2BUTION FOR OD DATA')
      IWW=IWW+12
      IZZ=IZZ+12
   29 CONTINUE
      PRINT 449
```

```
      PRINT 33
      PRINT 4
      PRINT 5
      PRINT 8,LINE
      PRINT 9,DOT
      DO 457 INT=1,48
      DO 470 J=1,112
      IF (J.LT.FREQ(INT)) GOTO 471
      GOTO 472
  471 STARS(J)=STAR
  472 CONTINUE
      IF(J.GT.FREQ(INT)) GOTO 473
      GOTO 474
  473 STARS(J)=BLANK
  474 CONTINUE
  470 CONTINUE
      PRINT 27,LIML(INT),DASH,LIMU(INT),DOT,STARS
  457 CONTINUE
      PRINT 23
C
C-----------------------------------------------------
C PLOT DISTANCE CLASS VS. TRAVEL DETERRENCE FACTOR
C-----------------------------------------------------
C
      DO 34 IS=1,4
      PRINT 449
      PRINT 310
  310 FORMAT(60X,'TRAVEL DETERRENCE (FRICTION) FACTOR')
      PRINT 312
  312 FORMAT(21X,'0',23X,'1.00',21X,'2.00',21X,'3.00',21X,'4.00')
      PRINT 318
  318 FORMAT(5X,'DISTANCE CLASS',2X,'+',20(4X,'+'))
      PRINT 436,LINE
  436 FORMAT(14X,'(KM)',3X,110A1)
      DO 444 INT=1,51
      FACT(INT)=F(INT)*25
      DO 187 J=1,110
      IF(J.LT.IFIX(FACT(INT))) GOTO 408
      GOTO 427
  408 SYBO(J)=DASH
  427 CONTINUE
      IF(J.EQ.IFIX(FACT(INT))) GOTO 476
      GOTO 477
  476 SYBO(J)=ANF
  477 CONTINUE
      IF(J.GT.IFIX(FACT(INT))) GOTO 433
      GOTO 434
  433 SYBO(J)=BLANK
```

```
  434 CONTINUE
  187 CONTINUE
      PRINT 435,LIML(INT),DASH,LIMU(INT),DOT,SYBO
  435 FORMAT(9X,I4,1X,A1,I4,2X,A1,110A1)
  444 CONTINUE
      PRINT 311
  311 FORMAT(///9X,'FIGURE          ',3X,'DISTANCE CLASS OVER TRAVEL DETERR
     2ENCE FACTOR')
C
C-----------------------------------
C CALIBRATION OF THE GRAVITY MODEL
C-----------------------------------
C
C CALCULATE GM TRIP INTERCHANGES
      DO 20 I=1,L
      SUMX(I)=0.0
      DO 22 J=1,M
      X(I,J)=SUMRO(J)*F(((IST(I,J)-1)/20)+1)
      IF(IST(I,J).EQ.0)X(I,J)=0
      SUMX(I)=SUMX(I)+X(I,J)
   22 CONTINUE
      DO 24 J=1,M
      T(I,J)=SUMCO(I)*SUMRO(J)*F(((IST(I,J)-1)/20)+1)/SUMX(I)
      IF(IST(I,J).EQ.0)T(I,J)=0
   24 CONTINUE
   20 CONTINUE
      DO 65 I=1,L
      SUMTA(I)=0.0
      DO 65 J=1,M
      SUMTA(I)=SUMTA(I)+T(I,J)
   65 CONTINUE
      DO 66 J=1,M
      SUMTD(J)=0.0
      DO 66 I=1,L
      SUMTD(J)=SUMTD(J)+T(I,J)
   66 CONTINUE
C COMPUTE THE TOTAL GM TRIPS
      SUMTTP=0.0
      DO 71 I=1,L
      SUMTTP=SUMTTP+SUMTA(I)
   71 CONTINUE
      PRINT 60
   60 FORMAT('1',2X,'TABLE          ',4X,'TRIP DISTRIBUTION BY THE GRAVITY
     2 MODEL, ITERATION NO.    ')
      PRINT 159
      PRINT 419
  419 FORMAT(4X,'TO /',5X,'FROM ZONE')
      PRINT 420,(ZONE(I),I=1,L)
```

```
0          42       1ZONE/',2315,3X,'TOTAL' )
0
                 6     5,M
               INT  8,ZON(J),(T(I,J),I=1,L),SUMTD(J)
           68  ORMAT(/3X,I2,2X,23F5.0,F7.0)
               RINT 69,(SUMTA(I),I=1,L),SUMTTP
     8     69  ORMAT(//1X,'TOTAL',1X,23F5.0,F7.0)
0              PRINT 159
        C
        C COMPUTE THE MEAN VARIANCE AND STANDARD DEVIATION OF GM TRIPS
        C
0360           AVG=SUMTTP/(L*M)
0361           DO 74 I=1,L
0362           SUMY(I)=0.0
0363           DO 74 J=1,M
0364           Y(I,J)=(T(I,J)-AVG)**2
0365           SUMY(I)=SUMY(I)+Y(I,J)
0366       74  CONTINUE
0367           SUMOFY=0.0
0368           DO 75 I=1,L
0369           SUMOFY=SUMOFY+SUMY(I)
0370       75  CONTINUE
0371           VNC=SUMOFY/(L*M)
0372           SDV=SQRT(VNC)
0373           COV=SDV/AVG
0374           PRINT 77,SUMOFY,AVG,VNC,SDV,COV
0375       77  FORMAT(5X,'SUM SQS. = ',F8.0,5X,'AVERAGE = ',F5.0,5X,'VARIANCE = '
              2,F8.2,5X,'STD. DEV. = ',F5.2,5X,'COEFFT. OF VARIATION = ',F6.2)
        C
        C-----------------------------------------------
        C STATISTICAL CHECKS BETWEEN OD AND GM TRIPS
        C-----------------------------------------------
        C
        C CHI-SQUARE TEST BETWEEN OD DATA AND GRAVITY MODEL
        C
        C CALCULATE THE CHI-SQUARE CELL VALUES
0376           DO 171 I=1,L
0377           DO 171 J=1,M
0378           IF(T(I,J).EQ.0) GOTO 194
0379           CS(I,J)=((FLOAT(TRIP(I,J))-T(I,J))**2)/T(I,J)
0380           GOTO 171
0381      194  CS(I,J)=0.0
0382      171  CONTINUE
0383           DO 175 I=1,L
0384           SUMCSD(I)=0.0
0385           DO 175 J=1,M
0386           SUMCSD(I)=SUMCSD(I)+CS(I,J)
0387      175  CONTINUE
```

```
          DO 176 J=1,M
          SUMCSA(J)=0.0
          DO 176 I=1,L
          SUMCSA(J)=SUMCSA(J)+CS(I,J)
      176 CONTINUE
C COMPUTE THE TOTAL CHI-SQUARE VALUE/OD/GM
          SUMCSV=0.0
          DO 324 I=1,L
          SUMCSV=SUMCSV+SUMCSD(I)
      324 CONTINUE
          PRINT 172
      172 FORMAT('1',2X,'TABLE          ',4X,'CHI-SQUARE CELL VALUES BETWEEN T
         2HE OD TRIP DATA AND GRAVITY MODEL ITERATION NO.    ')
          PRINT 159
          PRINT 421
      421 FORMAT(4X,'TO /',5X,'FROM ZONE')
          PRINT 422,(ZONE(I),I=1,L)
      422 FORMAT(2X,'ZONE/',23I5,3X,'TOTAL'/)
          PRINT 480
      480 FORMAT(/55X,'CHI-SQUARE VALUES')
          DO 173 J=1,M
      173 PRINT 174,ZON(J),(CS(I,J),I=1,L),SUMCSA(J)
      174 FORMAT(/3X,I2,2X,23F5.0,F7.0)
          PRINT 177,(SUMCSD(I),I=1,L),SUMCSV
      177 FORMAT(//1X,'TOTAL',1X,23F5.0,F7.0)
          PRINT 159
          PRINT 305
      305 FORMAT(10X,'DEGREES OF FREEDOM = 484 ', 10X,'CH. SQ. TABLE VALUE A
         2T 5 PERCT. LEVEL = 536')
C
C COMPUTE TRIP CELL DIFFERENCES BETWEEN OD AND GM
C
          DO 300 I=1,L
          DO 300 J=1,M
          DIF(I,J)=(FLOAT(TRIP(I,J))-T(I,J))
      300 CONTINUE
          DO 327 I=1,L
          SUMD(I)=0.0
          DO 327 J=1,M
          SUMD(I)=SUMD(I)+DIF(I,J)
      327 CONTINUE
          DO 328 J=1,M
          SUMDA(J)=0.0
          DO 328 I=1,L
          SUMDA(J)=SUMDA(J)+DIF(I,J)
      328 CONTINUE
C COMPUTE SUM OF DIFFERENCES
          SUMDT=0.0
```

```
      DO 304 I=1,L
      SUMDT=SUMDT+SUMD(I)
  304 CONTINUE
      PRINT 331
  331 FORMAT('1',2X,'TABLE         ',4X,'DIFFERENCES BETWEEN OD TRIP DATA
     2 AND GRAVITY MODEL, ITERATION NO.    ')
      PRINT 159
      PRINT 413
  413 FORMAT(4X,'TO /',5X,'FROM ZONE')
      PRINT 414,(ZONE(I),I=1,L)
  414 FORMAT(2X,'ZONE/',23I5,3X,'TOTAL'/)
      PRINT 454
      DO 332 J=1,M
  332 PRINT 303,ZON(J),(DIF(I,J),I=1,L),SUMDA(J)
  303 FORMAT(/3X,I2,2X,23F5.0,F7.0)
      PRINT 329,(SUMD(I),I=1,L),SUMDT
  329 FORMAT(//1X,'TOTAL',1X,23F5.0,F7.0)
      PRINT 159
C COMPUTE SUM OF SQUARES OF DIFFERENCES
      DO 307 I=1,L
      DO 307 J=1,M
      SQ(I,J)=DIF(I,J)**2
  307 CONTINUE
      DO 308 I=1,L
      SUMS(I)=0
      DO 308 J=1,M
      SUMS(I)=SUMS(I)+SQ(I,J)
  308 CONTINUE
      SUMSQS=0.0
      DO 309 I=1,L
      SUMSQS=SUMSQS+SUMS(I)
  309 CONTINUE
C COMPUTE THE MEAN DIFFERENCE
      AV=SUMDT/(23*23)
C COMPUTE THE VARIANCE AND STANDARD DEVIATION
      DO 314 I=1,L
      SUMR(I)=0
      DO 314 J=1,M
      R(I,J)=(DIF(I,J)-AV)**2
      SUMR(I)=SUMR(I)+R(I,J)
  314 CONTINUE
      SUMSO=0.0
      DO 315 I=1,L
      SUMSO=SUMSO+SUMR(I)
  315 CONTINUE
      VA=SUMSO/(23*23)
      STD=SQRT(VA)
C COMPUTE THE MEAN SQUARE ERROR AND ROOT MSE
```

```
0472          EU=SUMSQS/((L-1)*(M-1))
0473          RT=SQRT(EU)
0474          PRINT 319,SUMSQS,AV,VA,STD,EU,RT
0475      319 FORMAT(2X,'SUM SQS. = ',F8.0,4X,'MEAN DIF. = ',F3.0,4X,'VARIANCE =
             2 ',F8.2,4X,'STD. DEV. = ',F5.2,4X,'M.S.E. = ',F6.2,4X,'ROOT M.S.E.
             3 = ',F6.2)
          C
          C CALCULATE TRIP LENGTH FREQUENCY DISTRIBUTION
          C
0476          DO 72 INT=1,51
0477          STORE(INT)=TRIPS(INT)
0478       72 CONTINUE
0479          DO 26 INT=1,51
0480          TRIPS(INT)=0.0
0481       26 CONTINUE
0482          CLAL(1)=0.0
0483          CLAU(1)=19.0
0484          INT=0
0485       28 INT=INT+1
0486          DO 30 I=1,L
0487          DO 30 J=1,M
0488          IF(IST(I,J).LE.CLAL(INT)) GOTO 30
0489          IF(IST(I,J).GT.CLAU(INT)) GOTO 30
0490          TRIPS(INT)=TRIPS(INT)+T(I,J)
0491       30 CONTINUE
0492          CLAL(INT+1)=CLAL(INT)+20
0493          CLAU(INT+1)=CLAU(INT)+20
0494          IF(INT.LE.51) GOTO 28
0495          TOTAL =0.0
0496          DO 32 INT=1,51
0497          TOTAL=TOTAL+TRIPS(INT)
0498       32 CONTINUE
0499          DO 42 INT=1,51
0500          HOLD(INT)=PERCT(INT)
0501       42 CONTINUE
0502          DO 31 INT=1,51
0503          PERCT(INT)=(TRIPS(INT)/TOTAL)*100
0504       31 CONTINUE
          C
          C CHI-SQUARE TEST OD SURVEY VS. GM
          C     (NO. TRIPS AND PERCENT TOTAL TRIPS PER DISTANCE CLASS)
          C
0505          DO 180 INT=1,51
0506          IF(PERCT(INT).EQ.0.0) GOTO 95
0507          CA(INT)=((ODP(INT)-PERCT(INT))**2/PERCT(INT))
0508          GOTO 180
0509       95 CA(INT)=0.0
0510      180 CONTINUE
```

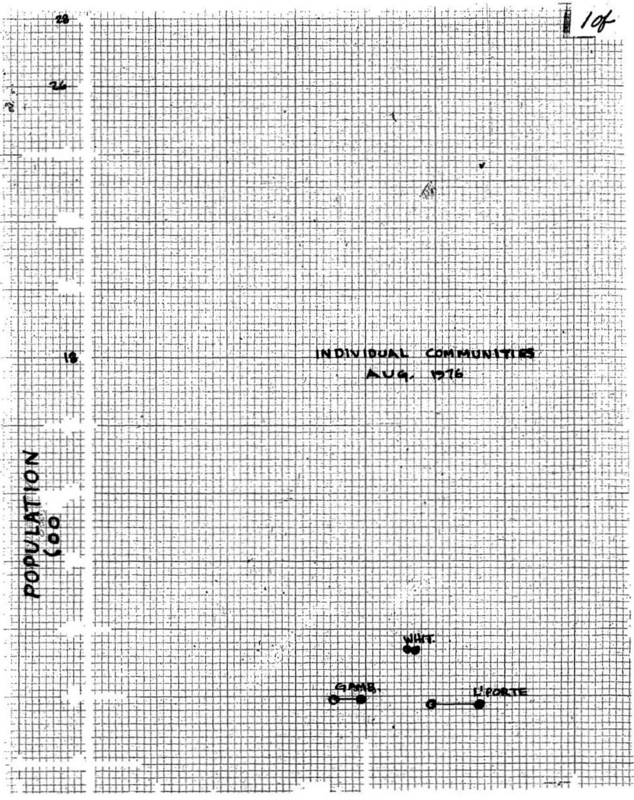
```
0511          DO 241 INT=1,51
0512          IF(TRIPS(INT).EQ.0.0) GOTO 242
0513          SQU(INT)=((TCAT(INT)-TRIPS(INT))**2)/TRIPS(INT)
0514          GOTO 241
0515      242 SQU(INT)=0.0
0516      241 CONTINUE
        C
        C CALCULATE CHI-SQUARE VALUES BETWEEN NO. TRIPS AND PERCENT TOTAL
        C       TRIPS PER CLASS FOR GM ITERATIONS
        C
0517          IF(IS.EQ.1) GOTO 44
0518          KQ(1)=0.0
0519          DO 43 INT=1,51
0520          IF(HOLD(INT).EQ.0.0) GOTO 301
0521          KQ(INT)=(PERCT(INT)-HOLD(INT))**2/HOLD(INT)
0522          GOTO 302
0523      301 KQ(INT)=0.0
0524      302 CONTINUE
0525       43 CONTINUE
0526       44 CONTINUE
0527          IF(IS.EQ.1) GOTO 232
0528          KQU(1)=0.0
0529          DO 233 INT=1,51
0530          IF(STORE(INT).EQ.0.0) GOTO 306
0531          KQU(INT)=(TRIPS(INT)-STORE(INT))**2/STORE(INT)
0532          GOTO 323
0533      306 KQU(INT)=0.0
0534      323 CONTINUE
0535      233 CONTINUE
0536      232 CONTINUE
0537          IDD=1
0538          ICC=26
0539          DO 73 K=1,2
0540          PRINT 326
0541      326 FORMAT('1',3X,'TABLE         ',4X,'TRIPS BY DISTANCE CLASSES AND RE
             2LATED CHI-SQUARES')
0542          PRINT 159
0543          PRINT 102
0544      102 FORMAT(5X,'DISTANCE CLASS',13X,'NUMBER  OF  TRIPS',14X,'PERCENT TO
             2TAL TRIPS',5X,'FRICTION',5X,'CHI-SQ.',8X,'CHI-SQ.')
0545          PRINT 103
0546      103 FORMAT(9X,'(KM)',14X,'OD SURVEY',3X,'MODEL',3X,'CHI-SQ.',4X,'OD SU
             2RVEY',3X,'MODEL',3X,'CHI-SQ.',3X,'FACTOR',4X,'MODEL TRIPS',4X,'MOD
             3EL PERCENT')
0547          DO 37 INT=IDD,ICC
0548       37 PRINT 36,CLAL(INT),DASH,CLAU(INT),TCAT(INT),TRIPS(INT),SQU(INT),
             2ODP(INT),PERCT(INT),CA(INT),F(INT),KQU(INT),KQ(INT)
0549       36 FORMAT(/6X,I4,1X,A1,I4,14X,F4.0,4X,F5.0,2X,F7.2,7X,F6.2,2(5X,F4.2)
```

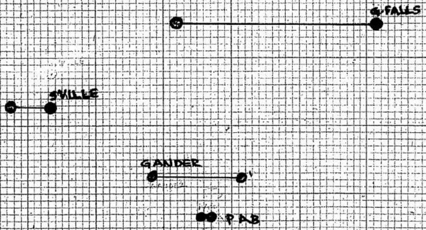
```
      2,6X,F5.2,2(7X,F7.2))
       IF(INT.EQ.26) GOTO 38
       GOTO 39
    38 PRINT 159
    39 CONTINUE
       IDD=IDD+26
       ICC=ICC+25
    73 CONTINUE
C CALCULATE THE TOTAL CHI-SQUARE VALUES
       SUMCA=0.0
       DO 183 INT=1,51
       SUMCA=SUMCA+CA(INT)
   183 CONTINUE
       SUMKQ=0.0
       DO 106 INT=1,51
       SUMKQ=SUMKQ+KQ(INT)
   106 CONTINUE
       SUMSQU=0.0
       DO 70 INT=1,51
       SUMSQU=SUMSQU+SQU(INT)
    70 CONTINUE
       SUMKQU=0.0
       DO 105 INT=1,51
       SUMKQU=SUMKQU+KQU(INT)
   105 CONTINUE
       PRINT 184
   184 FORMAT(/46X,'------',25X,'------',19X,'------',8X,'------')
       PRINT 185,SUMSQU,SUMCA,SUMKQU,SUMKQ
   185 FORMAT(5X,'TOTAL CHI-SQUARE VALUES',14X,F10.2,21X,F10.2,15X,F10.2,
      28X,F6.2)
       PRINT 186
   186 FORMAT(/5X,'DEGREES OF FREEDOM = 50 ','CH. SQ. TABLE VALUE AT 5 PE
      2RCT. LEVEL = 67.5')
       PRINT 159
C
C-------------------------------------------------------------
C PLOT THE TRIP LENGTH FREQUENCY DISTRIBUTION OF  OD AND GM
C-------------------------------------------------------------
C
       IWB=1
       IZB=24
       DO 91 K=1,2
       PRINT 449
       PRINT 52
    52 FORMAT(4X,'(PERCENT)',4X,'(0)',6X,'(0.7)',5X,'(1.40)',4X,'(2.10)'
      2,4X,'(2.80)',4X,'(3.50)',4X,'(4.20)',4X,'(4.90)',4X,'(5.60)',4X,
      3'(6.30)',4X,'(7.00)')
       PRINT 53
```

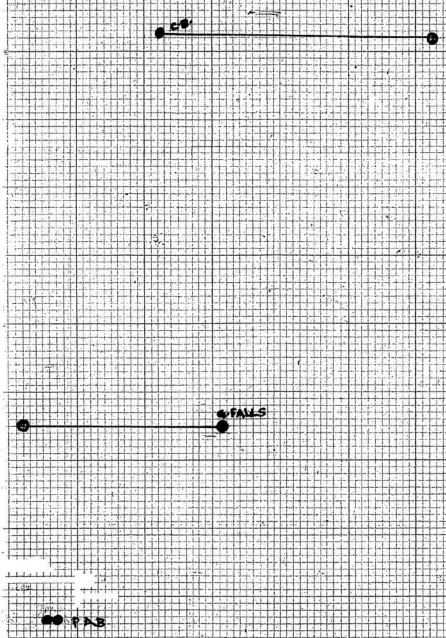
```
0587          53 FORMAT(4X,'NO. TRIPS',5X,'0',8X,'100',7X,'200',7X,'300',7X,'400',
                4 7X,'500',7X,'600',7X,'700',7X,'800',7X,'900',6X,'1000')
0588             PRINT 54
0589          54 FORMAT(/3X,'DISTANCE CLASS',1X,'+',11(9X,'+'))
0590             DO 55 I=1,110
0591             LINE(I)=PER
0592          55 CONTINUE
0593             PRINT 92,LINE
0594          92 FORMAT(8X,'(KM)',6X,110A1)
0595             DO 57 INT=IWB,IZB
0596             FREQ(INT)=TCAT(INT)/10
0597             FRE(INT)=TRIPS(INT)/10
0598             DO 58 J=1,110
0599             IF(J.LT.FREQ(INT)) GOTO 59
0600             GOTO 80
0601          59 SYM(J)=OD
0602          80 CONTINUE
0603             IF(J.GT.FREQ(INT)) GOTO 81
0604             GOTO 82
0605          81 SYM(J)=BLANK
0606          82 CONTINUE
0607             IF(J.LT.FRE(INT)) GOTO 83
0608             GOTO 84
0609          83 SYMB(J)=MODEL
0610          84 CONTINUE
0611             IF(J.GT.FRE(INT)) GOTO 85
0612             GOTO 86
0613          85 SYMB(J)=BLANK
0614          86 CONTINUE
0615          58 CONTINUE
0616             PRINT 89,LIML(INT),DASH,LIMU(INT),DOT,SYM
0617             PRINT 89,LIML(INT),DASH,LIMU(INT),DOT,SYMB
0618          89 FORMAT(6X,I4,1X,A1,I4,2X,A1,110A1)
0619          57 CONTINUE
0620             PRINT 3
0621           3 FORMAT( /30X,'OD SURVEY: O (10 PASSENGERS)',10X,'GRAVITY MODEL: M
                2(10 PASSENGERS)')
0622             PRINT 50
0623          50 FORMAT(  //9X,' FIGURE          ',3X,'TRIP LENGTH FREQUENCY DISTRIBU
                2TION OF OD SURVEY AND GRAVITY MODEL ITERATION NO.   ')
0624             IWB=IWB+24
0625             IZB=IZB+24
0626          91 CONTINUE
            C
            C----------------------------------------
            C CALCULATE NEW TRAVEL DETERRENCE FACTOR
            C----------------------------------------
            C
0627             DO 100 KF=1,51
0628             IF(PERCT(KF).EQ.0.0) GOTO 108
0629             F(KF)=F(KF)*(ODP(KF)/PERCT(KF))
0630             GOTO 100
0631         108 F(KF)=0.0
0632         100 CONTINUE
0633          34 CONTINUE
0634             STOP
0635             END
```

APPENDIX 'B'

This appendix presents mainly output of the multiple linear regression analysis (Trip Generation) computer program. The material is referred to in Chapter Four, Analysis of Data. This output, in tabular and graphical form, consists of the statistics used to evaluate each trip generation case. Also included are the formulae and calculations for the 95% confidence intervals and Bartlett's test for equality of variances.


28
26
18
POPULATION
(00
INDIVIDUAL COMMUNITIES
AUG. 1976
WHIT.
GAMB.
L'PORTE


G FALLS
S'VILLE
GANDER
PAB



3of

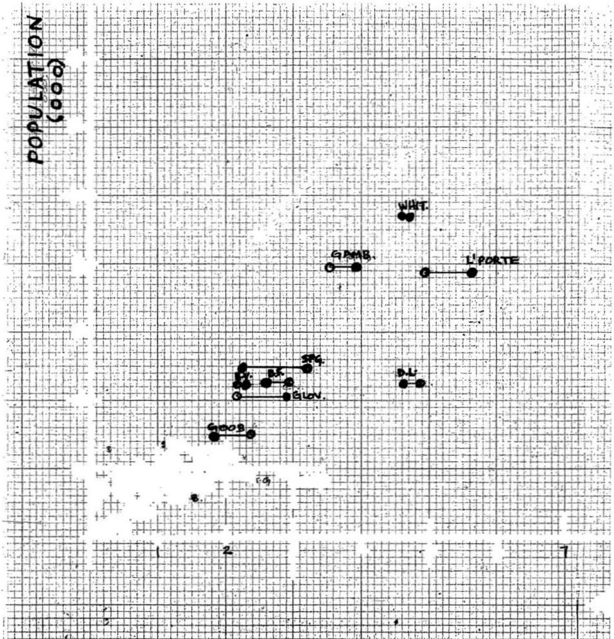
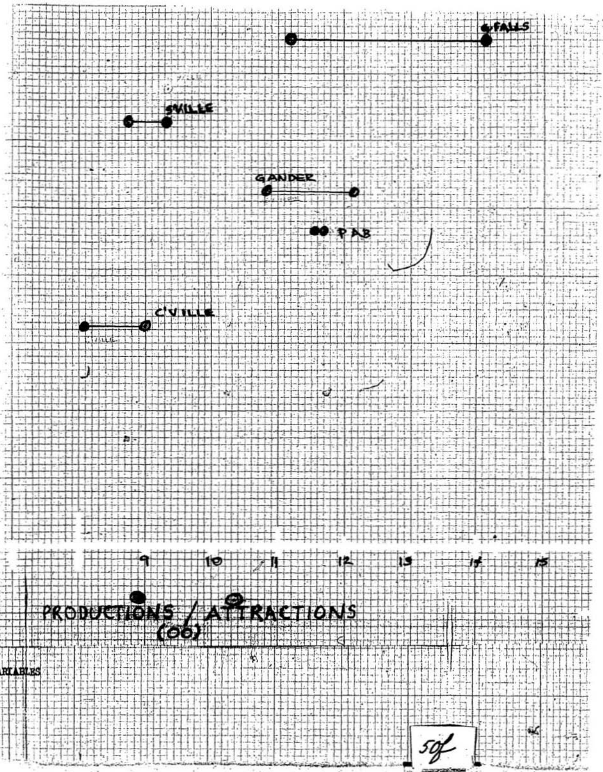


FIGURE B - 1 SAMPLE HAND PLOT FOR DETERMINATION OF RELATIONSHIP BETWEEN VARIABLES

4of


G.FALLS
S'VILLE
GANDER
PAB
C'VILLE
9
10
11
12
13
14
15
PRODUCTIONS / ATTRACTIONS
(00)
ARIABLES
50f

FALLS

DER

PAB

1

K

151

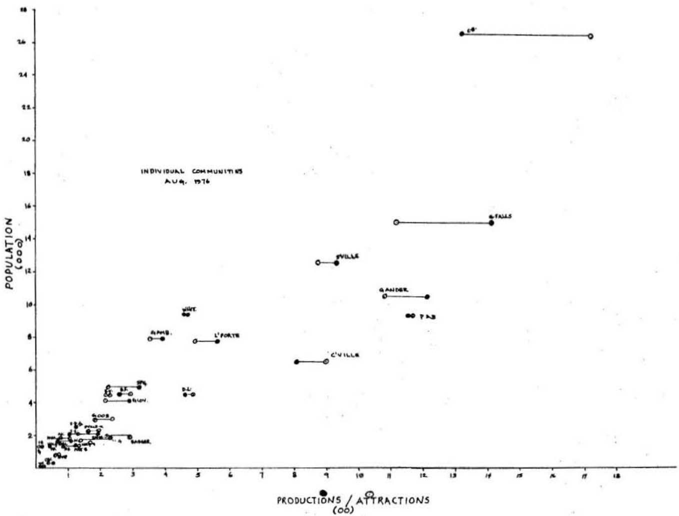


FIGURE B - 1 SAMPLE HAND PLOT FOR DETERMINATION OF RELATIONSHIP BETWEEN VARIABLES

```
$COMPILE              B.  PILGRIM
C
C
      INTEGER TRIPS(34),SUMCO(34),SUMRO
      INTEGER TRIP(23),SUMDW(23),SUMAC
      CHARACTER*15 NAME(34)
      CHARACTER*6 NAME1(34)
      CHARACTER*5 NAME2(23)
      INTEGER TOTAL, TOTL
C
      READ 99,K,N,L,M
   99 FORMAT(4I2)
      READ 101,(NAME1(I),I=1,K)
  101 FORMAT(12A6)
      READ 102,(NAME(I),I=1,K)
  102 FORMAT(5A15)
      READ 82,(NAME2(I),I=1,L)
   82 FORMAT(12A5)
C
C-----------------------------------------------
C COMPUTE THE TRIP PRODUCTIONS AND ATTRACTIONS
C                         FOR INDIVIDUAL COMMUNITIES
C-----------------------------------------------
C
      DO 98 I=1,K
      SUMCO(I)=0
   98 CONTINUE
      KW=1
      KY=18
      DO 106 IS=1,2
      PRINT 88
   88 FORMAT('1',2X,'TABLE          ROADCRUISER PASSENGER OD SURVEY TRIP D
     2ATA FOR INDIVIDUAL COMMUNITIES AUGUST 1976')
      PRINT 108
  108 FORMAT(1X ,129(1H-)/)
      PRINT 111,(NAME1(I),I=1,K),'TOTAL'
  111 FORMAT(19X,17A6,/,21X,17A6,2X,A6)
      PRINT 116
  116 FORMAT(/15X,'TO /',5X,'FROM',27X,'NUMBER  OF  TRIPS')
      DO 109 I=KW,KY
      READ 104,(TRIPS(J),J=1,N)
  104 FORMAT(17I3,/,17I3)
      SUMRO=0
      DO 105 J=1,N
      SUMRO=SUMRO+TRIPS(J)
      SUMCO(J)=SUMCO(J)+TRIPS(J)
  105 CONTINUE
      PRINT 110,NAME(I),(TRIPS(J),J=1,N),SUMRO
  110 FORMAT(3X,A15,17I6,/,21X,17I6,I8,/)
      IF(I.EQ.18) PRINT 108
  109 CONTINUE
      KW=KW+18
      KY=KY+16
  106 CONTINUE
      TOTAL=0
      DO 112 I=1,K
      TOTAL=TOTAL+SUMCO(I)
  112 CONTINUE
      PRINT 113,(SUMCO(J),J=1,N),TOTAL
  113 FORMAT(//11X,'TOTAL',2X,17I6,/,19X,17I6,I8)
```

```
      PRINT 108
C
C-----------------------------------------------------------
C COMPUTE THE TRIP PRODUCTIONS AND ATTRACTIONS FOR ZONES
C-----------------------------------------------------------
C
      DO 84 I=1,L
      SUMDW(I)=0
   84 CONTINUE
      PRINT 100
  100 FORMAT('1',2X,'TABLE        ROADCRUISER PASSENGER OD SURVEY TRIP D
     2ATA FOR ZONES AUGUST 1976')
      PRINT 108
      PRINT 91,(NAME2(I),I=1,L),'TOTAL'
   91 FORMAT(9X,23A5,1X,A6/)
      PRINT 81
   81 FORMAT(7X,'TO /',7X,'FROM',27X,'NUMBER  OF  TRIPS')
      DO 90 I=1,L
      READ 86,(TRIP(J),J=1,M)
   86 FORMAT(23I3)
      SUMAC=0
      DO 87 J=1,M
      SUMAC=SUMAC+TRIP(J)
      SUMDW(J)=SUMDW(J)+TRIP(J)
   87 CONTINUE
      PRINT 89,NAME2(I),(TRIP(J),J=1,M),SUMAC
   89 FORMAT(/3X,A5,23I5,I7)
   90 CONTINUE
      TOTL=0
      DO 92 I=1,L
      TOTL=TOTL+SUMDW(I)
   92 CONTINUE
      PRINT 93,(SUMDW(J),J=1,M),TOTL
   93 FORMAT(//1X,'TOTAL',2X,23I5,I7)
      PRINT 108
      RETURN
      END

$EXECUTE
```

NUMBER OF TRIPS

TO / FROM	ST.J	BADG	HOLY	SBRK	WHIT	SDLE	ACOV	BAVE	CBC	HAMP	GOOB	DELA	CVLE	PASA	PTBL	CBRK	TENO	SVLE	GLWN	XING	GMBO	ST.G	GA
ST.JOHN'S	0	16	0	15	115	45	40	87	14	8	61	101	360	6	45	343	8	242	116	11	116	5	31
HOLYROOD	5	2	0	2	1	0	0	0	1	0	0	8	3	3	11	30	2	15	33	0	1	0	1
WHITBOURNE	111	22	1	11	0	4	1	9	3	8	0	9	0	4	14	4	3	61	3	26	9	4	1
ARNOLD'S COVE	48	0	0	4	0	0	0	0	0	0	0	0	3	2	0	2	0	6	0	0	3	0	1
COME BY CHANCE	10	0	0	0	0	2	0	0	0	0	2	2	5	0	3	2	0	2	1	0	0	0	
GOOBIES	96	2	3	1	0	3	0	6	4	3	0	6	4	1	0	14	0	11	2	0	12	0	1
CLARENVILLE	367	12	1	1	15	20	0	5	11	4	6	22	0	3	12	106	0	46	14	1	23	0	
PORT BLANDFORD	34	2	0	2	6	0	0	0	2	0	1	1	6	0	0	5	0	0	0	0	5	0	1
TERRA NOVA	13	0	0	0	6	0	1	0	0	0	0	3	2	0	0	1	0	0	0	0	0	0	1
GLOVERTOWN	106	0	1	1	13	0	2	4	3	0	0	3	4	11	0	16	0	4	0	0	10	0	
GAMBO	130	3	0	0	19	8	6	7	0	2	11	11	15	0	5	23	0	1	31	0	0	0	
GANDER	373	22	13	5	44	18	5	8	6	2	10	46	107	3	17	112	0	33	38	3	80	1	
GLENWOOD	17	0	2	1	9	1	1	0	0	0	4	4	11	0	1	9	0	17	0	2	1	0	1
LEWISPORTE	171	4	3	17	21	8	4	14	0	1	9	28	18	2	0	40	0	31	13	3	9	0	4
NORRIS ARM	1	0	0	0	0	0	0	1	0	0	0	0	2	0	0	5	0	0	0	0	0	0	
BISHOP'S FALLS	118	2	4	2	12	1	0	10	1	5	0	11	12	3	3	29	4	3	1	0	11	0	2
GRAND FALLS	345	122	10	9	22	57	9	29	0	4	9	30	53	3	2	197	0	64	5	3	13	3	8
BADGER	15	0	4	0	10	2	0	3	0	1	3	7	11	1	1	83	0	12	8	0	4	1	1
SOUTH BROOK	34	0	0	0	1	3	2	0	0	0	0	6	6	1	0	18	0	4	2	1	1	0	1
SPRINGDALE	43	1	0	0	10	0	0	4	0	0	8	12	12	4	0	16	0	8	0	0	0	0	
BAIE VERTE	62	2	0	1	8	2	0	0	0	5	3	10	2	3	0	15	0	5	0	0	11	11	1
HAMPDEN	15	1	0	0	6	1	0	0	0	0	2	6	3	0	0	6	2	0	1	0	4	0	
DEER LAKE	97	17	5	12	29	13	0	9	0	0	9	0	24	4	0	17	1	24	6	4	24	3	5
PASADENA	7	4	1	2	11	4	0	0	0	0	0	7	2	0	3	7	0	0	0	1	16	0	1
CORNER BROOK	326	30	5	12	61	66	3	21	0	4	21	64	95	5	1	0	2	64	14	5	18	42	1
STEPHENVILLE	256	7	13	7	21	37	0	7	1	12	0	41	0	3	3	8	0	0	6	39	18	100	3
S'VILLE X'ING	6	0	1	0	3	0	0	0	0	0	0	3	0	2	0	11	0	7	0	0	0	23	
ST.GEORGE'S	10	1	0	0	3	0	2	0	0	0	0	2	0	2	0	45	0	19	0	21			
FLAT BAY	2		0		1		0		0		0		0		0		0		0				

10f

	OV	CBC	GOOB	CVLE	PTBU	TEND	GLWN	GMBD	GAND	GLEN	LWIS	NORA	BFAL	GFAL	
	BAVE	HAMP	DELA	PASA	CBRK	SVLE	XING	ST.G	FBAY	ROBS	SFIN	SBRH	DOYS	PAB	TOTAL
	NUMBER OF TRIPS														
	0	14	61	360	45	8	116	116	310	20	153	1	115	328	
	87	8	181	6	343	242	11	5	2	10	3	5	9	239	2949
	1	0	3	11	2	33	1	16	2	1	0	4	13		
	0	0	8	3	30	15	0	0	0	0	0	0	0	6	159
	3	0	0	14	3	3	9	17	62	2	26	3	13		
	9	8	9	4	4	61	26	4	3	0	1	0	1	34	469
	0	0	3	0	0	0	3	15	0	3	0	7	6		
	0	0	0	2	2	6	0	0	0	0	0	0	0	2	101
	0	2	5	3	0	1	0	5	0	0	0	0	0		
	0	0	2	0	2	2	0	0	0	0	0	0	0	0	34
	4	0	4	0	0	2	12	19	0	12	0	1	7		
	6	3	6	1	14	11	0	0	0	0	0	5	0	25	237
	11	6	0	12	0	14	23	93	2	16	0	19	56		
	5	4	22	3	106	46	1	0	0	6	0	0	0	39	900
	2	1	6	0	0	0	5	12	0	4	0	0	6		
	0	0	1	0	5	0	0	0	0	0	0	0	0	0	
	0	0	2	0	0	0	0	11	0	0	0	1	2		
	0	0	3	0	1	0	0	0	0	0	0	0	0	0	40
	3	0	4	0	0	0	10	7	1	2	0	5	21		
	4	0	3	11	16	4	0	0	0	0	0	0	0	0	214
	0	11	15	5	0	31	0	47	3	6	0	3	12		
	7	2	11	0	23	1	0	0	0	0	0	0	3	8	354
	6	10	107	17	0	38	80	0	30	37	1	19	123		
	8	2	46	3	112	33	3	1	1	0	0	0	0	56	1213
	0	4	11	1	0	0	1	15	0	0	0	5	5		
	0	0	4	0	9	17	2	0	0	0	0	0	0	1	186
	0	9	18	0	0	13	9	44	0	0	0	5	20		
	14	1	28	2	40	31	3	0	0	0	0	0	0	29	494
	0	0	2	0	0	0	0	0	0	0	0	4			
	1	0	0	0	5	0	0	0	0	0	0	0	0	2	17
	1	0	12	3	4	1	11	23	4	2	0	0	9		
	10	5	11	3	29	3	0	0	0	0					
	0	9	53	2	0	5	13	89	2	18	7	6	0		
	29	4	30	3	197	64	3	3	0	0	0	0	0	0	1119
	0	3	11	1	0	2	4	18	0	14	0	2	75		
	3	1	7	1	23	12	0	1	0	0	0	0	1	7	217
	0	0	6	0	0	2	1	10	0	0	0	1	23		
	0	0	6	1	10	0	1	0	0	0	0	1	0	4	130
	0	8	12	0	0	0	0	22	1	5	0	2	67		
	4	0	12	4	16	8	0	0	0	3	0	0	0	8	226
	0	3	2	0	0	0	11	10	0	16	1	0	36		
	0	5	10	3	15	5	0	11	0	2	0	0	0	5	218
	0	2	3	0	2	1	4	0	0	11	0	4	5		
	0	0	6	0	6	0	0	0	0	1	0	0	0		
	0	9	24	0	1	6	24	50	1	27	0	22	50		
	9	0	0	4	17	24	4	3	0	1	0	1	2	33	485
	0	0	2	3	0	0	16	12	0	10	0	1	14		
	0	0	7	0	7	0	1	0	0	0	0	0	3	9	114
	0	21	95	1	2	14	18	113	1	54	0	21	181		
1	21	4	64	5	0	64	5	42	11	20	17	6	33	406	1722
	1	0	0	3	0	6	10	35	1	39	0	11	59		
	7	12	41	3	0	0	39	100	0	33	33	0	22	139	
	0	0	0	0	0	0	0	5	0	1	0	0	3		
	0	0	3	2	11	7	0	23	0	7	0	0	1	25	2of
	0	0	0	0	0	0	0	1	0	0	1	0	6		
	0	0	2	2	45	19	21	0	0	5	1	0	1	14	134
	0	0	0	0	0	0	0	0	0	0	0	0			

TERRA NOVA	13	0	0	0		0		0		0		3		0		1		0		0		0	
GLOVERTOWN	106	0	1	1	13	0	2	4	3	0	0	3	4	11	0	16	0	4	0	0	10	0	
GAMBO	130	3	0	0	19	8	6	7	0	2	11	11	15	0	5	23	0	1	31	0	0	0	4
GANDER	373	22	13	5	44	10	5	6	6	2	10	46	107	3	17	112	0	33	38	3	80	1	
GLENWOOD	17	0	2	1	9	1	1	0	0	0	4	4	11	0	1	9	0	17	0	2	1	0	1
LEWISPORTE	171	4	3	17	21	8	4	14	0	1	9	28	18	2	0	40	0	31	13	3	9	0	4
NORRIS ARM	1	0	0	0	0	0	0	1	0	0	0	0	2	0	0	5	0	0	0	0	0	0	
BISHOP'S FALLS	118	2	4	2	12	1	0	10	1	5	0	11	12	3	3	29	4	3	1	0	11	0	2
GRAND FALLS	345	122	10	9	22	57	9	29	0	4	9	30	53	3	2	197	0	64	5	3	13	3	
BADGER	15	0	4	0	10	2	0	3	0	1	3	7	11	1	1	23	0	12	0	0	4	1	1
SOUTH BROOK	34	0	0	0	1	3	2	0	0	0	0	6	6	1	0	10	0	4	2	1	1	0	
SPRINGDALE	43	1	0	0	10	0	0	4	0	0	0	12	12	4	0	16	0	0	0	0	0	0	
BAIE VERTE	62	2	0	1	0	2	0	0	0	5	3	10	2	3	0	15	0	5	0	0	11	11	1
HAMPDEN	15	1	0	0	6	1	0	0	0	0	2	6	3	0	0	6	2	0	1	0	4	0	
DEER LAKE	97	17	5	12	29	13	0	9	0	0	9	0	24	4	0	17	1	24	6	4	24	3	5
PASADENA	7	4	1	2	11	4	0	0	0	0	0	7	2	0	3	7	0	0	0	1	16	0	1
CORNER BROOK	326	30	5	12	61	66	3	21	0	4	21	64	95	5	1	0	2	64	14	5	10	42	
STEPHENVILLE	256	7	13	7	21	37	0	7	1	12	0	41	0	3	3	0	0		6		10		
S'VILLE X'ING	6	0	1	0	3	0	0	0	0	0	0	3	0	2	0	11	0	7	0	0	0	23	
ST.GEORGE'S	10	1	0	0	3	0	2	0	0	0	0	2	0	2	0	45	0	19	0	21	0	0	
FLAT BAY	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	7	0	1	0	2		0	
ROBINSON'S	3	0	0	0	1	1	0	0	0	0	0	0	2	0	0	29	0	29	0	5	0	7	
ST.FINTAN'S	4	0	0	0	0	0	0	0	0	0	0	0	0	1	0	27	0	32	0	3	0	3	
SOUTH BRANCH	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	8	0	3	0	0	0	0	
DOYLE'S	10	2	0	0	1	0	0	0	1	0	1	3	2	0	0	20	0	40	0	1	2	0	
PORT AUX BASQUE	207	16	1	1	23	22	0	16	7	1	24	10	43	8	0	159	0	153	2	32	8	29	
TOTAL	3842		68		472		76		54		192		807		121		22		298		391		
		290		187		318		240		60		464		75		1338		937		163		232	

3of

FOR

0		0		1		0		5		0		0		0		0		0		0		0		0		0	86
0	0	0	0	3	2	0	0	1	0	0	0	0	0	0	11	0	0	0	0	0	0	0	1	0	2	0	40
4	3	0	0	3	4	11	0	16	0	4	0	0	10	0	7	0	1	0	2	0	0	0	5	0	21	0	214
7	0	2	11	11	15	0	5	23	0	1	31	0	0	0	47	0	3	0	6	0	0	0	3	3	12	8	354
8	6	2	10	46	107	3	17	112	0	33	38	3	80	1	0	1	30	0	37	0	1	0	19	0	123	56	1213
0	0	0	4	4	11	0	1	9	0	17	0	2	1	0	15	0	0	0	0	0	0	0	5	0	5	1	106
4	0	1	9	28	18	2	0	40	0	31	13	3	9	0	44	0	0	0	0	0	0	0	5	0	20	29	494
1	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	2	2	17
0	1	5	0	11	12	3	3	29	4	3	1	0	11	0	23	0	4	0	2	0	0	0	0	0	9	15	285
9	0	4	9	30	53	3	2	197	0	64	5	3	13	3	89	0	2	0	18	0	7	0	6	0	0	0	1119
3	0	1	3	7	11	1	1	83	0	12	2	0	4	1	18	0	0	0	14	0	0	0	2	1	75	7	817
0	0	0	0	6	6	1	0	10	0	0	2	1	1	0	10	0	0	0	0	0	0	1	1	0	23	4	130
4	0	0	8	12	12	4	0	16	0	8	0	0	0	0	28	0	1	3	5	0	0	0	2	0	67	8	226
0	0	5	3	10	2	3	0	15	0	5	0	0	11	11	10	0	0	2	14	0	1	0	0	0	36	5	218
0	0	0	2	6	3	0	0	6	2	0	1	0	4	0	0	0	0	1	11	0	0	0	4	0	5	0	68
9	0	0	9	0	24	4	0	17	1	24	6	4	24	3	50	0	1	1	27	0	0	1	22	2	50	33	405
0	0	0	0	7	2	0	3	7	0	0	0	1	16	0	12	0	0	0	10	0	0	0	1	3	14	9	114
1	0	4	21	64	95	5	1	0	2	64	14	5	18	42	113	11	1	20	54	17	0	6	21	33	181	406	1722
7	1	12	0	41	0	3	3	0	0	0	6	39	10	100	35	0	1	33	39	33	0	0	11	22	59	139	943
0	0	0	0	3	0	2	0	11	0	7	0	0	0	23	5	0	0	7	1	0	0	0	0	1	3	25	98
0	0	0	0	2	0	2	0	45	0	19	0	21	0	0	1	0	0	5	0	1	1	0	0	1	6	14	134
0	0	0	0	0	0	0	0	7	0	1	0	2	0	0	0	0	0	0	0	1	0	0	0	0	1	3	18
0	0	0	0	0	2	0	0	29	0	29	0	5	0	7	1	0	0	0	0	0	0	2	0	0	5	17	102
0	0	0	0	0	0	1	0	27	0	32	0	3	0	3	2	0	0	0	0	0	0	0	0	2	0	10	84
0	0	0	2	0	0	0	0	8	0	3	0	0	0	0	0	0	0	1	0	1	0	0	0	2	2	3	23
0	1	0	1	3	2	0	0	28	0	40	0	1	2	0	0	0	0	3	0	1	0	0	0	0	8	9	112
6	7	1	24	18	43	0	0	155	0	153	2	32	8	29	80	1	3	32	25	22	3	11	3	13	205	0	1164
60	54	464	192	75	807	1358	181	937	28	163	298	232	391	18	1082	124	133	88	464	31	48	93	272	1156	1363		14635

TABLE B - 2 ROADCRUISER PASSENGER OD SURVEY TRIP DATA FOR ZONES AUGUST 1976

9

TO / FROM	ST.J	HOLY	WHIT	CBC	CVLE	PTBL	GLWN	GMBO	GAND	LWIS	NORA	GFAL	SDLE	SAVE	HAMP	DE
								NUMBER OF TRIPS								
ST.J	0	0	115	115	360	45	124	116	330	153	1	459	60	87	8	10
HOLY	5	0	1	1	3	11	35	1	18	1	0	19	2	0	0	
WHIT	111	1	0	4	0	14	6	9	79	2	26	38	15	9	8	
CBC	154	3	0	0	12	3	3	15	39	15	0	23	10	6	3	
CVLE	367	1	15	17	0	12	14	23	95	16	0	87	21	5	4	2
PTBL	34	0	6	3	6	0	0	5	12	4	0	8	2	0	0	
GLWN	119	1	19	6	6	0	0	10	19	2	0	29	1	4	0	
GMBO	130	0	19	17	15	5	31	0	50	6	0	18	8	7	2	1
GAND	390	15	53	26	118	18	38	81	0	37	1	174	25	8	2	5
LWIS	171	3	21	13	18	0	13	9	44	0	0	29	25	14	1	2
NORA	1	0	0	0	2	0	0	0	0	0	0	6	0	1	0	
GFAL	478	18	44	22	76	6	12	28	136	34	7	0	71	48	18	4
SDLE	77	0	11	16	18	0	2	1	33	11	0	94	0	4	0	1
SAVE	62	0	8	3	2	0	0	11	10	16	1	46	3	0	5	1
HAMP	15	0	6	2	3	0	3	4	0	11	0	10	1	0	0	
DELA	97	5	29	9	24	0	7	24	51	27	0	89	25	9	0	
PASA	7	1	11	0	2	3	0	16	12	10	0	19	6	0	0	
CBRK	326	5	61	24	95	1	16	18	114	54	0	232	78	21	4	6
SVLE	262	14	24	1	0	3	6	10	41	40	0	80	44	7	12	4
ST.G	12	0	4	2	0	0	0	0	1	0	1	8	0	0	0	
ROSS	7	0	1	0	2	0	0	0	3	0	0	5	1	0	0	
DOYS	10	0	1	4	2	0	0	2	0	0	0	12	1	0	0	
FAB	207	1	23	31	43	0	2	8	83	25	3	224	23	16	1	1
TOTAL	3042	68	472	316	807	121	312	391	1170	464	40	1709	422	240	60	46

STATEMENTS EXECUTED= 5641

ATA FOR ZO $ AUGUST 976

LWIS	NORA	GFAL	SDLE	BAVE	HAMP	DELA	PASA	CBRK	SVLE	ST.G	ROBS	DOYS	PAB	TOTAL
OF	TRIPS													
153	1	459	60	87	8	101	6	343	253	7	13	14	239	2949
1	0	19	2	0	0	8	3	30	15	0	0	0	6	159
2	26	38	15	9	8	9	4	4	87	7	1	1	34	469
15	0	23	10	6	3	8	3	18	19	0	0	5	27	366
16	0	87	21	5	4	22	3	106	47	0	6	0	39	908
4	0	8	2	0	0	1	0	5	0	0	0	0	0	86
2	0	29	1	4	0	6	11	17	4	0	0	0	0	254
6	0	18	8	7	2	11	0	23	1	0	0	3	8	354
37	1	174	25	8	2	50	3	121	55	2	0	0	57	1274
0	0	29	25	14	1	28	2	40	34	0	0	0	29	494
0	0	6	0	1	0	0	0	5	0	0	0	0	2	17
34	7	0	71	42	10	48	7	249	82	4	0	1	30	1405
11	0	94	0	4	0	18	5	34	13	0	3	1	12	353
16	1	46	3	0	5	10	3	15	5	11	2	0	5	218
11	0	10	1	0	0	6	0	6	0	0	1	0	0	68
27	0	89	25	9	0	0	4	17	28	3	1	3	33	485
10	0	19	6	0	0	7	0	7	1	0	0	3	9	114
54	0	232	78	21	4	64	5	0	69	53	37	39	406	1722
40	0	80	44	7	12	44	5	19	0	123	73	23	164	995
0	1	8	0	0	0	2	2	52	43	0	7	1	17	152
0	0	5	1	0	0	0	1	56	69	10	[illegible]	4	27	186
0	0	12	1	0	0	3	0	36	44	0	6	0	12	133
25	3	224	23	16	1	18	8	155	185	30	54	24	0	1164
464	40	1789	422	240	60	464	75	1358	1054	250	204	122	1156	14317

155

2 of 2

PRINTED IN CANADA

TABLE B - 3 ANALYSIS OF VARIANCE FOR TRIP PRODUCTIONS CASE I (INDIVIDUAL COMMUNITIES)

REGRESSION TITLE. . . . . PRODUCTIONS AUGUST 1976: (INDIVIDUAL COMMUNITIES)
DEPENDENT VARIABLE. . . . . 6 TRIPS
TOLERANCE 0.0100
ALL DATA CONSIDERED AS A SINGLE GROUP

MULTIPLE R 0.8878 STD. ERROR OF EST. 288.0686
MULTIPLE R-SQUARE 0.7881

ANALYSIS OF VARIANCE

	SUM OF SQUARES	DF	MEAN SQUARE	F RATIO	P(TAIL)
REGRESSION	9259366.000	1	9259366.000	111.581	0.00000
RESIDUAL	2489507.000	30	82983.563		

VARIABLE		COEFFICIENT	STD. ERROR	STD. REG COEFF	T	P(2 TAIL)	TOLERANCE
INTERCEPT		241.73830					
POP.	1	0.03542	0.003	0.888	10.563	0.0	1.000000

VARIABLE	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION	MINIMUM	MAXIMUM
1 POP.	6087.50781	15430.96094	2.53486	88.00000	86576.00000
2 DWEL.	1513.12305	4056.63647	2.68097	25.00000	22830.00000
3 LAB.F.	2269.62183	6274.34375	2.76449	25.00000	35105.00000
4 EMPL.P.	1998.09131	5672.54688	2.83898	20.00000	31730.00000
5 AVE. HI.	15991.16016	3252.87793	0.20342	11200.00000	22540.00000
6 TRIPS	457.34204	615.62646	1.34610	18.00000	3042.00000
9 X(9)	271.52954	603.87671	2.22398	5.00000	3375.00000

TABLE B - 4 PREDICTED, OBSERVED AND RESIDUAL VALUES FOR TRIP PRODUCTIONS : CASE 1 (INDIVIDUAL

~~PAGE 5 PRODUCTIONS AUGUST 1976: (INDIVIDUAL COMMUNITIES)~~
LIST OF PREDICTED VALUES, RESIDUALS, AND VARIABLES
NOTE - NEGATIVE CASE NUMBER DENOTES A CASE WITH MISSING VALUES.
THE NUMBER OF STANDARD DEVIATIONS FROM THE MEAN IS DENOTED BY UP TO 3
OF EACH RESIDUAL OR VARIABLE.
MISSING VALUES ARE DENOTED BY MORE THAN THREE ASTERISKS.

CASE LABEL	NO.	RESIDUAL	PREDICTED VALUE	VARIABLES 1 POP. / 9 X(9)	2 DWEL.	3 LAB.F.
ST.J	1	-266.0356	3308.0356	86576.0000*** / 3375.0000***	22830.0000***	35105.0000*
HOLY	2	-230.7603	298.7603	1610.0000 / 45.0000	365.0000	490.0000
WHIT	3	185.3525	286.6475	1268.0000 / 85.0000	305.0000	400.0000
ACOV	4	-206.8223	282.8223	1160.0000 / 75.0000	295.0000	340.0000
CBC	5	-201.1969	255.1969	380.0000 / 45.0000	80.0000	130.0000
GOOB	6	-55.6530	247.6530	167.0000 / 9.0000	39.0000	48.0000
CVLE	7	465.8452 *	341.1548	2807.0000 / 150.0000	740.0000	995.0000
PTBL	8	-149.6033	270.6033	815.0000 / 60.0000	205.0000	255.0000
TENO	9	-222.8550	244.8550	88.0000 / 5.0000	25.0000	25.0000
GLWN	10	-28.8064	318.8064	2176.0000 / 145.0000	555.0000	635.0000
GMBO	11	43.2222	347.7778	2994.0000 / 160.0000	630.0000	810.0000
GAND	12	510.8445 *	571.1555	9301.0000 / 380.0000	2345.0000	3895.0000
GLEN	13	-148.6890	281.6890	1128.0000 / 115.0000	240.0000	355.0000
LWIS	14	88.3132	375.6868	3782.0000 / 175.0000	915.0000	1255.0000
NORA	15	-249.2683	289.2683	1342.0000 / 95.0000	270.0000	390.0000
BFAL	16	-129.2583	401.2583	4504.0000 / 245.0000	1010.0000	1475.0000
GFAL	17	812.1033 **	550.8967	8729.0000 / 385.0000	2245.0000	3505.0000
BADG	18	7.1777	282.8223	1160.0000 / 45.0000	255.0000	280.0000
SBRK	19	-164.0637	271.0637	828.0000 / 60.0000	180.0000	180.0000
SDLE	20	-48.1594	366.1594	3513.0000 / 170.0000	820.0000	1140.0000
BAVE	21	-91.2734	331.2734	2528.0000 / 100.0000	535.0000	845.0000
HAMP	22	-209.3638	269.3638	780.0000 / 55.0000	145.0000	160.0000
DELA	23	61.2544	402.7456	4546.0000 / 205.0000	1050.0000	1480.0000
PASA	24	-232.2605	307.2605	1850.0000 / 75.0000	465.0000	690.0000
CBRK	25	223.8140	1134.1860	25198.0000* / 1120.0000*	6100.0000*	9775.0000*
SVLE	26	331.0293 *	605.9707	10284.0000 / 550.0000	2325.0000	3500.0000
XING	27	-156.9043	319.9043	2207.0000 / 90.0000	485.0000	500.0000
ST.G	28	-79.7229	311.7229	1976.0000 / 100.0000	410.0000	415.0000
FBAY	29	-237.3740	255.3740	385.0000 / 20.0000	76.0000	75.0000
ROBS	30	-110.1313	314.1313	2044.0000 / 145.0000	510.0000	620.0000
DOYS	31	-205.8567	329.8567	2488.0000 / 155.0000	515.0000	650.0000
PAB	32	695.1343 **	460.8657	6187.0000 / 250.0000	1455.0000	2210.0000

TRIP PRODUCTIONS : CASE 1 (INDIVIDUAL COMMUNITIES)

MUNITIES)

WITH MISSING VALUES.
ROM THE MEAN IS DENOTED BY UP TO 3 ASTERISKS TO THE RIGHT

THAN THREE ASTERISKS.

BLES P. (9)	2 DWEL.	3 LAB.F.	4 EMPL.P.	5 AVE. HI.	6 TRIPS
.0000***	22830.0000***	35105.0000***	31730.0000***	20186.0000*	3042.0000***
.0000	365.0000	490.0000	445.0000	16865.0000	68.0000
.0000	305.0000	400.0000	315.0000	13203.0000	472.0000
.0000	295.0000	340.0000	265.0000	13607.0000	76.0000
.0000	80.0000	130.0000	85.0000	16393.0000	54.0000
.0000	39.0000	48.0000	39.0000	15780.0000	192.0000
.0000	740.0000	995.0000	845.0000	18651.0000	807.0000
.0000	205.0000	255.0000	195.0000	12997.0000	121.0000
.0000	25.0000	25.0000	20.0000	11200.0000*	22.0000
.0000	555.0000	635.0000	490.0000	12067.0000*	290.0000
.0000	630.0000	810.0000	650.0000	15105.0000	391.0000
.0000	2345.0000	3895.0000	3515.0000	22540.0000**	1082.0000*
.0000	240.0000	355.0000	240.0000	15397.0000	133.0000
.0000	915.0000	1255.0000	1080.0000	16896.0000	464.0000
.0000	270.0000	390.0000	295.0000	13237.0000	40.0000
0000	1010.0000	1475.0000	1230.0000	15171.0000	272.0000
0000	2245.0000	3505.0000	3120.0000	20873.0000*	1363.0000*
.0000	255.0000	280.0000	235.0000	14374.0000	290.0000
.0000	180.0000	180.0000	120.0000	11749.0000*	107.0000
.0000	820.0000	1140.0000	970.0000	17697.0000	318.0000
.0000	535.0000	845.0000	745.0000	22070.0000*	240.0000
.0000	145.0000	160.0000	105.0000	12359.0000*	60.0000
0000	1050.0000	1480.0000	1275.0000	18545.0000	464.0000
0000	465.0000	690.0000	615.0000	20072.0000*	75.0000
0000*	6100.0000*	9775.0000*	8655.0000*	22095.0000*	1358.0000*
0000*					
0000	2325.0000	3500.0000	2950.0000	17082.0000	937.0000
0000	485.0000	500.0000	410.0000	13299.0000	163.0000
0000	410.0000	415.0000	315.0000	13616.0000	232.0000
0000	76.0000	75.0000	55.0000	13753.0000	18.0000
.0000	510.0000	620.0000	475.0000	13777.0000	204.0000
0000	515.0000	650.0000	495.0000	13777.0000	124.0000
0000	1455.0000	2210.0000	1960.0000	17285.0000	1156.0000*

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2 of 2

1of

PAGE 7 PRODUCTIONS AUGUST 1976: (INDIVIDUAL COMMUNITIES) PAGE 8 PRODUCTI

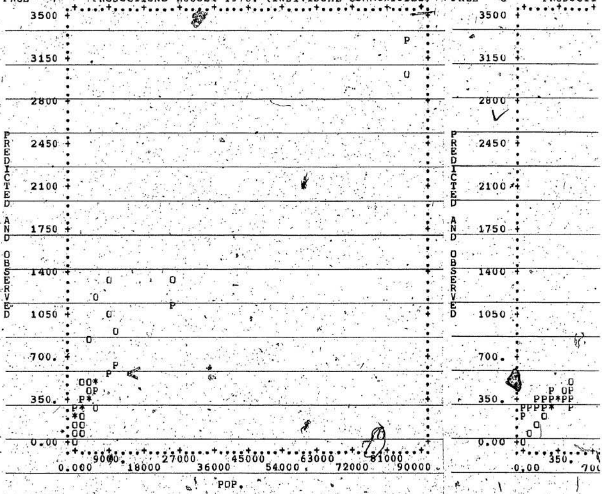
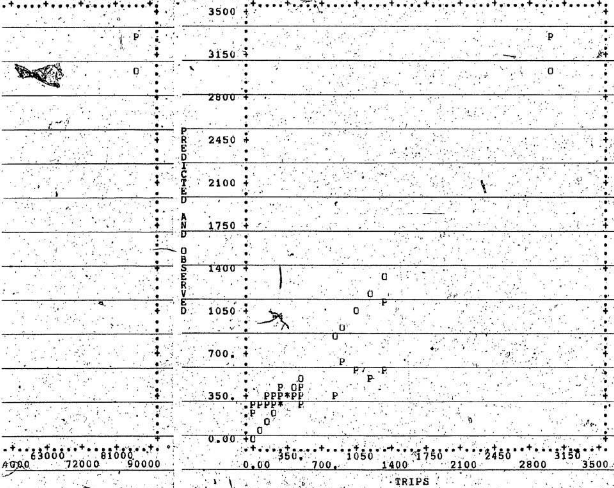


FIGURE B - 2 PREDICTED AND OBSERVED TRIP PRODUCTIONS VS. POPULATION AND TRIPS PRODUCED CASE 1

2 of 2

INDIVIDUAL COMMUNITIES)   PAGE 8   PRODUCTIONS AUGUST 1976: (INDIVIDUAL COMMUNITIES)



PRODUCTIONS VS. POPULATION AND TRIPS PRODUCED CASE 1 (INDIVIDUAL COMMUNITIES)

TABLE B-5 ANALYSIS OF VARIANCE FOR TRIP ATTRACTIONS CASE 1 (INDIVIDUAL COMMUNITIES)

PAGE 4 ATTRACTIONS AUGUST 1976: (INDIVIDUAL COMMUNITIES)

REGRESSION TITLE. . . . . ATTRACTIONS AUGUST 1976: (INDIVIDUAL COMMUNITIES)
DEPENDENT VARIABLE. . . . . 6 TRIPS
TOLERANCE 0.0100
ALL DATA CONSIDERED AS A SINGLE GROUP

MULTIPLE R 0.8756 STD. ERROR OF EST. 306.4177
MULTIPLE R-SQUARE 0.7667

ANALYSIS OF VARIANCE

	SUM OF SQUARES	DF	MEAN SQUARE	F RATIO	P(TAIL)
REGRESSION	9255360.000	1	9255360.000	98.575	0.00000
RESIDUAL	2816756.000	30	93891.813		

VARIABLE		COEFFICIENT	STD. ERROR	STD. REG COEFF	T	P(2 TAIL)	TOLERANCE
INTERCEPT		241.78447					
POP.	1	0.03541	0.004	0.876	9.928	0.000	1.000000

VARIABLE	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION	MINIMUM	MAXIMUM
1 POP.	6087.50781	15430.96094	2.53486	88.00000	86576.00000
2 DWEL.	1513.12305	4056.63647	2.68097	25.00000	22830.00000
3 LAB.F.	2269.62183	6274.34375	2.76449	25.00000	35105.00000
4 EMPL.P.	1998.09131	5672.54688	2.83898	20.00000	31730.00000
5 AVE. HI.	15991.16016	3252.87793	0.20342	11200.00000	22540.00000
6 TRIPS	457.34155	624.03784	1.36449	17.00000	2949.00000
9 X(9)	271.52954	603.87671	2.22398	5.00000	3375.00000

TABLE B - 6 PREDICTED, OBSERVED AND RESIDUAL VALUES FOR TRIP ATTRACTIONS : CASE 1 (INDIVIDUAL

PAGE 5 ATTRACTIONS AUGUST 1976: (INDIVIDUAL COMMUNITIES)
LIST OF PREDICTED VALUES, RESIDUALS, AND VARIABLES
NOTE - NEGATIVE CASE NUMBER DENOTES A CASE WITH MISSING VALUES.
THE NUMBER OF STANDARD DEVIATIONS FROM THE MEAN IS DENOTED BY UP TO 3
OF EACH RESIDUAL OR VARIABLE.
MISSING VALUES ARE DENOTED BY MORE THAN THREE ASTERISKS.

CASE LABEL	NO.	RESIDUAL	PREDICTED VALUE	VARIABLES 1 POP. / 9 X(9)	2 DWEL.	3 LAB.F.
ST.J	1	-358.4165 *	3307.4185	86576.0000*** / 3375.0000***	22830.0000***	35105.0000*
HOLY	2	-139.7939	298.7939	1610.0000 / 45.0000	365.0000	490.0000
WHIT	3	182.3162	266.6838	1268.0000 / 85.0000	305.0000	400.0000
ACOV	4	-181.8596	282.8596	1160.0000 / 75.0000	295.0000	340.0000
CBC	5	-221.2402	255.2402	380.0000 / 45.0000	80.0000	130.0000
GOOB	6	-10.6979	247.6979	167.0000 / 9.0000	39.0000	48.0000
CVLE	7	558.8206 *	341.1794	2807.0000 / 150.0000	740.0000	995.0000
PTBL	8	-184.6433	270.6433	815.0000 / 60.0000	205.0000	255.0000
TENO	9	-204.9005	244.9005	88.0000 / 5.0000	25.0000	25.0000
GLWN	10	-104.8359	318.8359	2176.0000 / 145.0000	555.0000	635.0000
GMBU	11	6.1990	347.8010	2994.0000 / 160.0000	630.0000	810.0000
GAND	12	641.8696 **	571.1304	9301.0000 / 380.0000	2345.0000	3895.0000
GLEN	13	-175.7266	281.7266	1128.0000 / 115.0000	240.0000	355.0000
LWIS	14	118.2959	375.7041	3782.0000 / 175.0000	915.0000	1255.0000
NORA	15	-272.3042	289.3042	1342.0000 / 95.0000	270.0000	390.0000
BFAL	16	-116.2698	401.2698	4504.0000 / 245.0000	1010.0000	1475.0000
GFAL	17	568.1240 *	550.8760	8729.0000 / 385.0000	2245.0000	3505.0000
BADG	18	-65.8596	282.8596	1160.0000 / 45.0000	255.0000	280.0000
SBRK	19	-141.1035	271.1035	828.0000 / 60.0000	180.0000	180.0000
SDLE	20	-140.1787	366.1787	3513.0000 / 170.0000	820.0000	1140.0000
BAVE	21	-113.3003	331.3003	2528.0000 / 100.0000	535.0000	845.0000
HAMP	22	-201.4041	269.4041	780.0000 / 55.0000	145.0000	160.0000
DELA	23	82.2429	402.7571	4546.0000 / 205.0000	1050.0000	1480.0000
PASA	24	-193.2925	307.2925	1850.0000 / 75.0000	465.0000	690.0000
CBRK	25	587.9609 *	1134.0391	25198.0000* / 1120.0000*	6100.0000*	9775.0000*
SVLE	26	337.0618 *	605.9382	10284.0000 / 550.0000	2325.0000	3500.0000
XING	27	-221.9336	319.9336	2207.0000 / 90.0000	485.0000	500.0000
ST.G	28	-177.7539	311.7539	1976.0000 / 100.0000	410.0000	415.0000
FBAY	29	-237.4172	255.4172	385.0000 / 20.0000	76.0000	75.0000
ROBS	30	-128.1619	314.1619	2044.0000 / 145.0000	510.0000	620.0000
DOYS	31	-194.8838	329.8838	2488.0000 / 155.0000	515.0000	650.0000
PAB	32	703.1355 **	460.8645	6187.0000 / 250.0000	1455.0000	2210.0000

2 of 2

T IP ATTRACTIONS : CASE 1 (INDIVIDUAL COMMUNITIES)

MUNITIES)

WITH MISSING VALUES.
UM THE MEAN IS DENOTED BY UP TO 3 ASTERISKS TO THE RIGHT

HAN THREE ASTERISKS.

LES P. 9)	2 DWEL.	3 LAB.F.	4 EMPL.P.	5 AVE. HI.	6 TRIPS
0000***	22830.0000***	35105.0000***	31730.0000***	20186.0000*	2949.0000***
0000*** 0000	365.0000	490.0000	445.0000	16865.0000	159.0000
0000 0000	305.0000	400.0000	315.0000	13203.0000	469.0000
0000 0000	295.0000	340.0000	265.0000	13607.0000	101.0000
0000 0000	80.0000	130.0000	85.0000	16393.0000	34.0000
0000 0000	39.0000	48.0000	39.0000	15780.0000	237.0000
0000 0000	740.0000	995.0000	845.0000	18651.0000	900.0000
0000 0000	205.0000	255.0000	195.0000	12997.0000	86.0000
0000 0000	25.0000	25.0000	20.0000	11200.0000*	40.0000
0000 0000	555.0000	635.0000	490.0000	12067.0000*	214.0000
0000 0000	630.0000	810.0000	650.0000	15105.0000	354.0000
0000 0000	2345.0000	3895.0000	3515.0000	22540.0000**	1213.0000*
0000 0000	240.0000	355.0000	240.0000	15397.0000	106.0000
0000 0000	915.0000	1255.0000	1080.0000	16896.0000	494.0000
0000 0000	270.0000	390.0000	295.0000	13237.0000	17.0000
0000 0000	1010.0000	1475.0000	1230.0000	15171.0000	285.0000
0000 0000	2245.0000	3505.0000	3120.0000	20873.0000*	1119.0000*
0000 0000	255.0000	280.0000	235.0000	14374.0000	217.0000
0000 0000	180.0000	180.0000	120.0000	11749.0000*	130.0000
0000 0000	820.0000	1140.0000	970.0000	17697.0000	226.0000
0000 000	535.0000	845.0000	745.0000	22070.0000*	218.0000
0000 0000	145.0000	160.0000	105.0000	12359.0000*	68.0000
		1480.0000	1275.0000	18545.0000	485.0000
0000 0000	465.0000	690.0000	615.0000	20072.0000*	114.0000
0000*	6100.0000*	9775.0000*	8655.0000*	22095.0000*	1722.0000**
0000 0000	2325.0000	3500.0000	2950.0000	17082.0000	943.0000
0000 0000	485.0000	500.0000	410.0000	13299.0000	98.0000
0000 0000	410.0000	415.0000	315.0000	13616.0000	134.0000
0000 0000	76.0000	75.0000	55.0000	13753.0000	18.0000
0000 0000	510.0000	620.0000	475.0000	13777.0000	186.0000
0000 0000	515.0000	650.0000	495.0000	13777.0000	135.0000
0000 0000	1455.0000	2210.0000	1960.0000	17285.0000	1164.0000*

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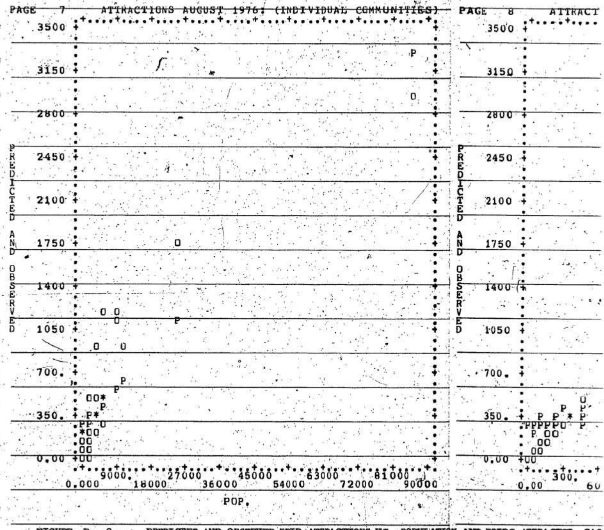
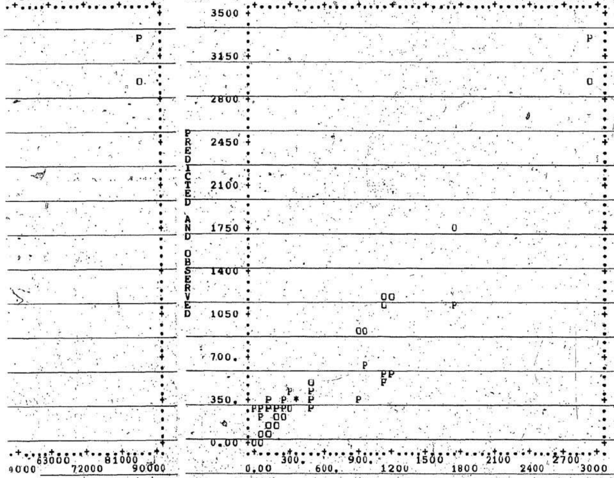


FIGURE B - 3 PREDICTED AND OBSERVED TRIP ATTRACTIONS VS. POPULATION AND TRIPS ATTRACTED CAS

2of2

INDIVIDUAL COMMUNITIES) PAGE 8 ATTRACTIONS AUGUST 1976: (INDIVIDUAL COMMUNITIES)



TRIP ATTRACTIONS VS. POPULATION AND TRIPS ATTRACTED CASE 1 (INDIVIDUAL COMMUNITIES)

TABLE B - 7 ANALYSIS OF VARIANCE FOR TRIP PRODUCTIONS , CASE 2 (ZONES)

```
PAGE    4    PRODUCTIONS AUGUST 1976: (ZONES)

  REGRESSION TITLE. . . . . . . . . . . . . . . . . .PRODUCTIONS AUGUST 1976: (ZONES)
  DEPENDENT VARIABLE. . . . . . . . . . . . . . . .        9 X(9)
  TOLERANCE . . . . . . . . . . . . . . . . . . . .     0.0100
ALL DATA CONSIDERED AS A SINGLE GROUP

MULTIPLE R            0.9180        STD. ERROR OF EST.      286.5840
MULTIPLE R-SQUARE     0.8427

ANALYSIS OF VARIANCE
                      SUM OF SQUARES     DF     MEAN SQUARE         F RATIO    P(TAIL)
         REGRESSION    9237467.000        1     9237467.000         112.473    0.00000
         RESIDUAL      1724740.000       21       82130.438

                                                STD. REG
  VARIABLE        COEFFICIENT    STD. ERROR      COEFF           T     P(2 TAIL) TOLERA

INTERCEPT          246.86328
DWEL.      3         0.11192       0.011          0.918      10.605       0.0       1.000000
```

				ON		
1 POP.	14647.98438	25343.57422	1. 3 1	1610.00000	123540.000	0
2 POP.M.	7456.23828	12805.56250	1. 1743	833.00000	625 1.000	0
3 DWEL.	3356.08105	5789.69922	1.72514	365.00000	2	
4 O. DWEL.	2750. 2817	4573.88672	1.66315	31.00000	2230 . 0000	
5 A .F.	501 . 6641	10189.91797	2.03348	90.00000	49505.00000	
FM.	48 . 451	6988.04688	2.00626	2.00000	341 . 000	
8 AV . HI.	13 . 24 2	1 98.69 6	0.1 0	112 .0000	1 0 . 00	
9 X(1	. 77	70 .	.1 00	40.000 0	3042.0000	
12 (	719	1 .	.7 43	777.000 0	61029.0000	
1						
14 X(1	15. . 5	05. 5 .	.0 14	110.00000	1 405.0000	
15 X(1)	709. 8149	02.14.33	.4 90	45.00000	4860.0000	

PAGE 5 PRODUCTIONS AUGUST 1976: (ZONES)
LIST OF PREDICTED VALUES, RESIDUALS, AND VARIABLES
NOTE - NEGATIVE CASE NUMBER DENOTES A CASE WITH MISSING VALUES.
THE NUMBER OF STANDARD DEVIATIONS FROM THE MEAN IS DENOTED BY UP TO
OF EACH RESIDUAL OR VARIABLE.
MISSING VALUES ARE DENOTED BY MORE THAN THREE ASTERISKS.

CASE LABEL	NO.	RESIDUAL	PREDICTED VALUE	1 POP.	2 POP.M.	3 DWEL.	7 EMPL.P.	8 AVE. HI.	9 X(9)	15 X(15)
ST.J	1	-353.7424 *	3395.7424	123540.0000 ***	62511.0000***	28135.000	44645.0000***	17080.0000**	3042.000	4860.0000***
HOLY	2	-219.7141	287.7141	1610.0000	833.0000	365.000	445.0000	16865.0000*	68.000	45.0000
WHIT	3	-27.2437	499.2437	10123.0000	5215.0000	2255.000	2385.0000	13447.0000	472.000	660.0000
CBC	4	-110.4954	426.4954	7135.0000	3675.0000	1605.000	1590.0000	15780.0000*	316.000	410.0000
CVLE	5	188.0017	618.9983	13273.0000	6768.0000	3325.000	2955.0000	12773.0000	807.000	790.0000
PTBL	6	-256.2505	377.2505	4692.0000	2405.0000	1165.000	940.0000	12352.0000	121.000	335.0000
GLWN	7	-79.2405	391.2405	5158.0000	2670.0000	1290.000	1090.0000	11254.0000*	312.000	335.0000
GMBO	8	-38.8530	429.8530	7879.0000	4035.0000	1635.000	1335.0000	11576.0000*	391.000	495.0000
GAND	9	418.3760 *	751.6240	18693.0000	9470.0000	4510.000	5115.0000	13895.0000	1170.000	915.0000
LWIS	10	-21.8132	485.8132	9374.0000	4757.0000	2135.000	1920.0000	12111.0000*	464.000	505.0000
NORA	11	-248.2737	288.2737	1736.0000	926.0000	370.000	370.0000	13237.0000	40.000	120.0000
GFAL	12	618.2573 **	1090.7427	32752.0000	16590.0000	7540.000	9130.0000	14653.0000	1709.000	1580.0000
SDALE	13	-38.6311	460.6311	8390.0000	4318.0000	1910.000	1825.0000	11752.0000*	422.000	520.0000
BAVE	14	-189.2935	429.2935	8099.0000	4260.0000	1630.00	1840.0000	14477.0000	240.000	385.0000
HAMP	15	-240.0254	300.0254	2276.0000	1250.0000	475.000	400.0000	13799.0000	60.00	200.0000
DELA	16	-33.0051	497.0051	9941.0000	5176.0000	2235.00	2385.0000	12429.0000	464.00	505.0000
PASA	17	-242.3730	317.3730	2624.0000	1315.0000	6	835.0000	15918.0000*		180.0000
CBRK	18	201.2244	1156.7756	34459.0000	17325.0000	8130.000	10910.0000	13267.0000	1358.000	1720.0000*
SVLE	19	393.0315 *	660.9685	16776.0000	8465.0000	3700.000	4195.0000	13755.0000	1054.000	920.0000
ST.G	20	-78.5649	328.5649	3339.0000	1720.0000	730.000	505.0000	13616.0000	250.000	185.0000
ROBS	21	-99.9426	303.9426	2044.0000	1075.0000	510.000	475.0000	13777.0000	204.000	145.0000
DOYS	22	-182.5022	304.5022	2488.0000	1315.0000	515.000	495.0000	13777.0000	122.000	155.0000
PAB	23	641.0876 **	514.9124	10503.0000	5420.0000	2395.000	3145.0000	15289.0000	1156.000	360.0000

TRIP PRODUCTIONS : CASE 2 (ZONES)

3 WITH MISSING VALUES.
OM THE MEAN IS DENOTED BY UP TO 3 ASTERISKS TO THE RIGHT

HAN THREE ASTERISKS.

LES					
P.	2 POP.M.	3 DWEL.	4 O. DWEL.	5 LAB.F.	6 LAB.FM.
PL.P.	8 AVE. HI.	9 X(9)	12 X(12)	13 X(13)	14 X(14)
15)					
** 00 ***	62511.0000***	28135.0000***	22367.0000***	49505.0000***	34100.0000***
** 0000***	17080.0000**	3042.0000***	61029.0000***	5768.0000***	15405.0000***
0000***					
0000	833.0000	365.0000	331.0000	490.0000	332.0000
0000	16865.0000*	68.0000	777.0000	34.0000	158.0000
0000					
0000	5215.0000	2255.0000	1905.0000	3045.0000	2100.0000
0000	13447.0000	472.0000	4908.0000	350.0000	945.0000
0000					
0000	3675.0000	1605.0000	1495.0000	2000.0000	1495.0000
0000	15780.0000*	316.0000	3460.0000	110.0000	505.0000
0000					
0000	6768.0000	3325.0000	3005.0000	3745.0000	2685.0000
0000	12773.0000	807.0000	6505.0000	320.0000	1060.0000
0000					
0000	2405.0000	1165.0000	1090.0000	1275.0000	930.0000
0000	12352.0000	121.0000	2287.0000	75.0000	345.0000
0000					
0000	2670.0000	1290.0000	1195.0000	1425.0000	1070.0000
0000	11254.0000*	312.0000	2488.0000	95.0000	355.0000
0000					
0000	4035.0000	1635.0000	1520.0000	1830.0000	1405.0000
0000	11576.0000*	391.0000	3844.0000	115.0000	425.0000
0000					
0000	9470.0000	4510.0000	3495.0000	6030.0000	4110.0000
0000	13895.0000	1170.0000	9223.0000	1015.0000	1920.0000
0000					
0000	4757.0000	2135.0000	1930.0000	2425.0000	1740.0000
0000	12111.0000*	464.0000	4617.0000	205.0000	685.0000
0000					
0000	926.0000	370.0000	340.0000	490.0000	380.0000
0000	13237.0000	40.0000	810.0000	30.0000	110.0000
0000					
* 0000	16590.0000	7540.0000	6030.0000	10710.0000	7445.0000
0000	14653.0000	1709.0000*	16162.0000	1510.0000	3265.0000
0000					
0000	4318.0000	1910.0000	1685.0000	2345.0000	1790.0000
0000	11752.0000*	422.0000	4072.0000	225.0000	555.0000
0000					
0000	4260.0000	1630.0000	1325.0000	2225.0000	1630.0000
0000	14477.0000	240.0000	3839.0000	305.0000	595.0000
0000					
0000	1250.0000	475.0000	455.0000	600.0000	470.0000
0000	13799.0000	60.0000	1026.0000	20.0000	130.0000
0000.					
0000	5176.0000	2235.0000	1965.0000	2890.0000	2060.0000
0000	12429.0000	464.0000	4765.0000	270.0000	830.0000
0000					
00	1315.0000	630.0000	502.0000	1015.0000	684.0000
0000	15918.0000*	75.0000	1309.0000	128.0000	331.0000
0000					
* 0000	17325.0000	8130.0000	6423.0000	12630.0000	8201.0000
00	13267.0000	1358.0000*	17134.0000	1707.0000	4429.0000
0000*					
0000	8465.0000	3700.0000	2445.0000	5115.0000	3390.0000
0000	13755.0000	1054.0000	8311.0000	1255.0000	1725.0000
00					
0000	1720.0000	730.0000	650.0000	690.0000	550.0000
0000	13616.0000	250.0000	1619.0000	80.0000	140.0000
0000					
0000	1075.0000	510.0000	480.0000	620.0000	460.0000
0000	13777.0000	204.0000	969.0000	30.0000	160.0000
0000					
0000	1315.0000	515.0000	490.0000	650.0000	470.0000
0000	13777.0000	122.0000	1173.0000	25.0000	180.0000
0000					
0000	5420.0000	2395.0000	2130.0000	3505.0000	2615.0000
0000	15289.0000	1156.0000	5083.0000	265.0000	890.0000
0000					

10f

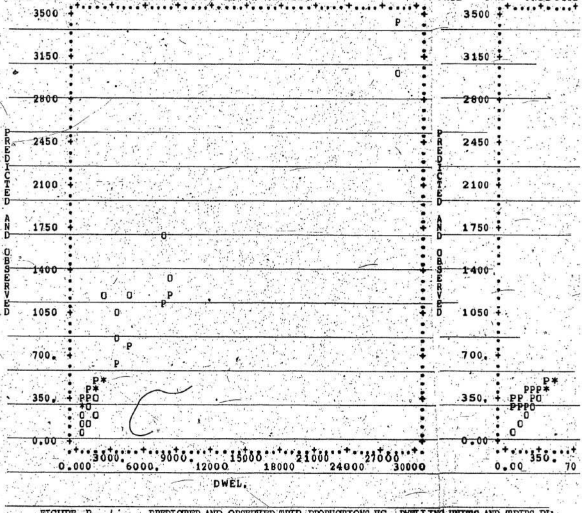
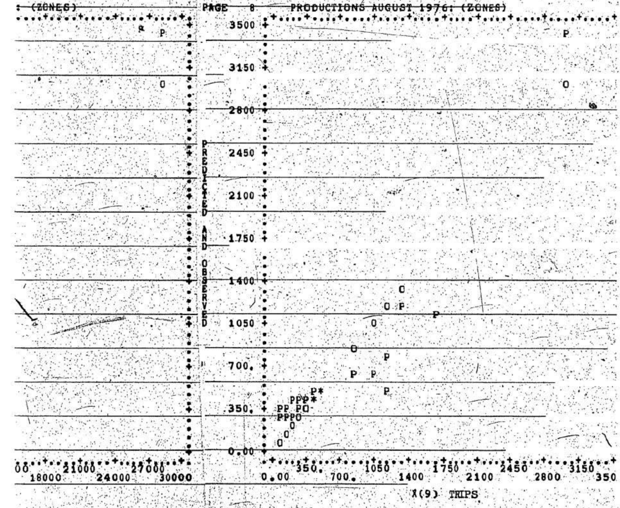


FIGURE B – 4 PREDICTED AND OBSERVED TRIP PRODUCTIONS VS. DWELLING UNITS AND TRIPS PH

2 of 2



TRIP PRODUCTIONS VS. DWELLING UNITS AND TRIPS PRODU

TABLE B - 9 ANALYSIS OF VARIANCE FOR TRIP ATTRACTIONS CASE 2 (ZONES)

PAGE 4 ATTRACTIONS AUGUST 1976: (ZONES)

REGRESSION TITLE. . . . . .ATTRACTIONS AUGUST 1976: (ZONES)
DEPENDENT VARIABLE. . . . . 9 X(9)
TOLERANCE 0.0100
ALL DATA CONSIDERED AS A SINGLE GROUP

MULTIPLE R 0.9065 STD. ERROR OF EST. 303.1238
MULTIPLE R-SQUARE 0.8217

ANALYSIS OF VARIANCE

	SUM OF SQUARES	DF	MEAN SQUARE	F RATIO	P(TAIL
REGRESSION	8893421.000	1	8893421.000	96.790	0.000(
RESIDUAL	1929566.000	21	91884.063		

VARIABLE		COEFFICIENT	STD. ERROR	STD. REG COEFF	T	P(2 TAIL)	TOLER
INTERCEPT		253.92432					
DWEL.	3	0.10982	0.011	0.906	9.838	0.000	1.0

VARIABLE	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION	MINIMUM	MAXIMUM
1 POP.	14647.98438	25343.57422	1.73017	1610.00000	123540.00000
2 POP.M.	7456.23828	12805.56250	1.71743	833.00000	6 5 . 00 [illegible]
3 DWEL.	3356.08105	5789.69922	1.72514	365.0000	
4 O. DWEL.	2750.12817	4573.88672	1.66315	331.00000	[illegible]
5 LAB.F.	5011.06641	10189.91797	2.03348	490.00000	49505.00000
6 LAB.FM.	3483.12451	6988.04688	2.00626	332.00000	34100.00000
7 EMPL.P.	4301.28516	9201.01953	2.13913	370.00000	4
8 AVE. HI.	13777.32422	1598.69263	0.11604	11254.00000	[illegible]
9 X(9)	622.47681	701.39429	1.12 7[illegible]	17.00000	2949. 0000
12 X(12)	7191.71875	12538.26953	1.74 4	777.0 000	61029.00000
13 X(13)	605.95532	1229.26611	2.02		
14 X(14)	1527.95483	3205.85962	2.09814	110.00000	15405.0000
15 X(15)	709.78149	1002.14233	1.41190	45.00000	4860.0000

TABLE B – 10 PREDICTED, OBSERVED AND RESIDUAL VALUES FOR TRIP ATTRACTIONS : CASE 2 (ZONES

PAGE 5 ATTRACTIONS AUGUST 1976: (ZONES)
LIST OF PREDICTED VALUES, RESIDUALS, AND VARIABLES
NOTE - NEGATIVE CASE NUMBER DENOTES A CASE WITH MISSING VALUES.
THE NUMBER OF STANDARD DEVIATIONS FROM THE MEAN IS DENOTED BY UP
OF EACH RESIDUAL OR VARIABLE.
MISSING VALUES ARE DENOTED BY MORE THAN THREE ASTERISKS.

CASE LABEL	NO.	RESIDUAL	PREDICTED VALUE	VARIABLES 1 POP. 7 EMPL.P. 15 X(15)	2 POP.M. 8 AVE. HI.	9 X(
ST.J	1	-394.6079 *	3343.6079	123540.0000 *** 44645.0000*** 4860.0000***	62511.0000*** 17080.0000**	28135.(2949.(
HOLY	2	-135.0071	294.0071	1610.0000 445.0000 45.0000	833.0000 16865.0000*	3 [illegible]
WHIT	3	-32.5601	501.5601	10123.0000 2385.0000 660.0000	5215.0000 13447.0000	2255.0 46 .
CBC	4	-64.1794	430.1794	7135.0000 1590.0000 410.0000	3675.0000 15780.0000*	1605.0 366.0
CVLE	5	280.9363	619.0637	13273.0000 2955.0000 790.0000	6768.0000 12773.0000	3325.0 900.0
PTBL	6	-295.8604	381.8604	4692.0000 940.0000 335.0000	2405.0000 12352.0000	1165. 86.0
GLWN	7	-141.5874	395.5874	5158.0000 1090.0000 335.0000	2670.0000 11254.0000*	129^.0
GMBO	8	-79.4739	433.4739	7879.0000 1335.0000 495.0000	4035.0000 11576.0000*	1635.0 354.0
GAND	9	524.8040 *	749.1960	18693.0000 5115.0000 915.0000	9470.0000 13895.0000	4510.0 1274.0
LWIS	10	5.6179	488.3821	9374.0000 1920.0000 505.0000	4757.0000 12111.0000*	213 . 494.0
NORA	11	-277.5562	294.5562	1736.0000 370.0000 120.0000	926.0000 13237.0000	370.0 17.0
GFAL	12	323.0603 *	1081.9397	32752.0000 9130.0000 1580.0000	16590.0000 14653.0000	7540.0 1405.0
SDLE	13	-110.6736	463.6736	8390.0000 1825.0000 520.0000	4318.0000 11752.0000*	1910.0 353.0
BAVE	14	-214.9248	432.9248	8099.0000 1840.0000 385.0000	4260.0000 14477.0000	1630.0 218.0
HAMP	15	-238.0869	306.0869	2276.0000 400.0000 200.0000	1250.0000 13799.0000	475.0 68.0
DELA	16	-14.3638	499.3638	9941.0000 2385.0000 505.0000	5176.0000 12429.0000	2235.0 485.0
PASA	17	-209.1084	323.1084	2624.0000 835.0000 180.0000	1315.0000 15918.0000*	6 1 4.
CBRK	18	575.2688 *	1146.7312	34459.0000 10910.0000 1720.0000*	17325.0000 13267.0000	8130. 1722.
SVLE	19	334.7551 *	660.2449	16776.0000 4195.0000 920.0000	8465.0000 13755.0000	3700.0 995.0
ST.G	20	-182.0901	334.0901	3339.0000 505.0000 185.0000	1720.0000 13616.0000	730.0 152.0
ROBS	21	-123.9307	309.9307	2044.0000 475.0000 145.0000	1075.0000 13777.0000	510.0 186.0
DOYS	22	-177.4797	310.4797	2488.0000 495.0000 155.0000	1315.0000 13777.0000	515.0 133.0
PAB	23	647.0657 **	516.9343	10503.0000 3145.0000 360.0000	5420.0000 15289.0000	2395.0 1164.0

10f

0 WITH MISSING VALUES.
OM THE MEAN IS DENOTED BY UP TO 3 ASTERISKS TO THE RIGHT

THAN THREE ASTERISKS.

	LES P. PL.P. 15)	2 POP.M. 8 AVE. HI.	3 DWEL. 9 X(9)	4 O. DWEL. 12 X(12)	5 LAB.F. 13 X(13)	6 LAB.FM. 14 X(14)
00	0000***	62511.0000***	28135.0000***	22367.0000***	49505.0000***	34100.0000***
00	0000***	17080.0000**	2949.0000***	61029.0000***	5768.0000***	15405.0000***
	0000***					
00	0000	833.0000	365.0000	331.0000	490.0000	332.0000
00	0000	16865.0000*	159.0000	777.0000	34.0000	158.0000
	0000					
00	0000	5215.0000	2255.0000	1905.0000	3045.0000	2100.0000
00	0000	13447.0000	469.0000	4908.0000	350.0000	945.0000
	0000					
00	0000	3675.0000	1605.0000	1495.0000	2000.0000	1495.0000
00	0000	15780.0000*	366.0000	3460.0000	110.0000	505.0000
	0000					
00	0000	6768.0000	3325.0000	3005.0000	3745.0000	2685.0000
00	0000	12773.0000	900.0000	6505.0000	320.0000	1060.0000
	0000					
00	0000	2405.0000	1165.0000	1090.0000	1275.0000	930.0000
00	0000	12352.0000	86.0000	2287.0000	75.0000	345.0000
	0000					
00	0000	2670.0000	1290.0000	1195.0000	1425.0000	1070.0000
00	0000	11254.0000*	254.0000	2488.0000	95.0000	355.0000
	0000					
00	0000	4035.0000	1635.0000	1520.0000	1830.0000	1405.0000
00	0000	11576.0000*	354.0000	3844.0000	115.0000	425.0000
	0000					
00	0000	9470.0000	4510.0000	3495.0000	6030.0000	4110.0000
00	0000	13895.0000	1274.0000	9223.0000	1015.0000	1920.0000
	0000					
00	0000	4757.0000	2135.0000	1930.0000	2425.0000	1740.0000
00	0000	12111.0000*	494.0000	4617.0000	205.0000	685.0000
	0000					
00	0000	926.0000	370.0000	340.0000	490.0000	380.0000
0	0000	13237.0000	17.0000	810.0000	30.0000	110.0000
	.0000					
00	0000	16590.0000	7540.0000	6030.0000	10710.0000	7445.0000
00	0000	14653.0000	1405.0000*	16162.0000	1510.0000	3265.0000
	0000					
00	0000	4318.0000	1910.0000	1685.0000	2345.0000	1790.0000
00	0000	11752.0000*	353.0000	4072.0000	225.0000	555.0000
	0000					
00	0000	4260.0000	1630.0000	1325.0000	2225.0000	1630.0000
00	0000	14477.0000	218.0000	3839.0000	305.0000	595.0000
	0000					
00	0000	1250.0000	475.0000	455.0000	600.0000	470.0000
00	0000	13799.0000	68.0000	1026.0000	20.0000	130.0000
	0000					
00	0000	5176.0000	2235.0000	1965.0000	2890.0000	2060.0000
00	.0000	12429.0000	485.0000	4765.0000	270.0000	830.0000
	0000					
00	.0000	1315.0000	630.0000	502.0000	1015.0000	684.0000
00	.0000	15918.0000*	114.0000	1309.0000	128.0000	331.0000
	.0000					
00	.0000	17325.0000	8130.0000	6423.0000	12630.0000	8201.0000
00	.0000	13267.0000	1722.0000*	17134.0000	1707.0000	4429.0000
	.0000*					
00	.0000	8465.0000	3700.0000	2445.0000	5115.0000	3390.0000
00	.0000	13755.0000	995.0000	8311.0000	1255.0000	1725.0000
	.0000					
00	.0000	1720.0000	730.0000	650.0000	690.0000	550.0000
00	.0000	13616.0000	152.0000	1619.0000	80.0000	140.0000
	.0000					
00	.0000	1075.0000	510.0000	480.0000	620.0000	460.0000
00	.0000	13777.0000	186.0000	969.0000	30.0000	160.0000
	0000					
00	.0000	1315.0000	515.0000	490.0000	650.0000	470.0000
00	.0000	13777.0000	133.0000	1173.0000	25.0000	180.0000
	0000					
00	.0000	5420.0000	2395.0000	2130.0000	3505.0000	2615.0000
00	.0000	15289.0000	1164.0000	5083.0000	265.0000	890.0000
	.0000					

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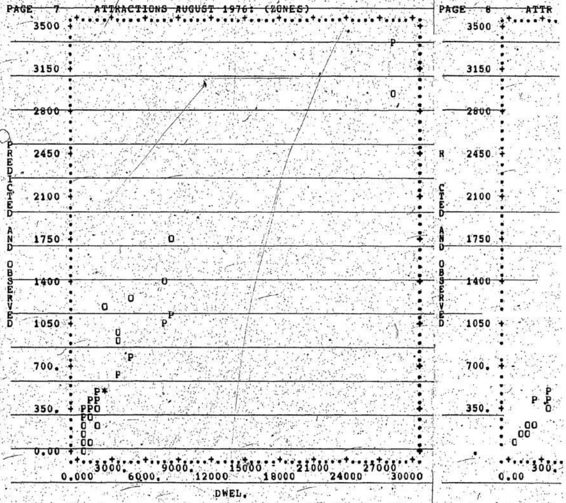

FIGURE B – 5 PREDICTED AND OBSERVED TRIP ATTRACTIONS VS. DWELLING UNITS AND TRIPS

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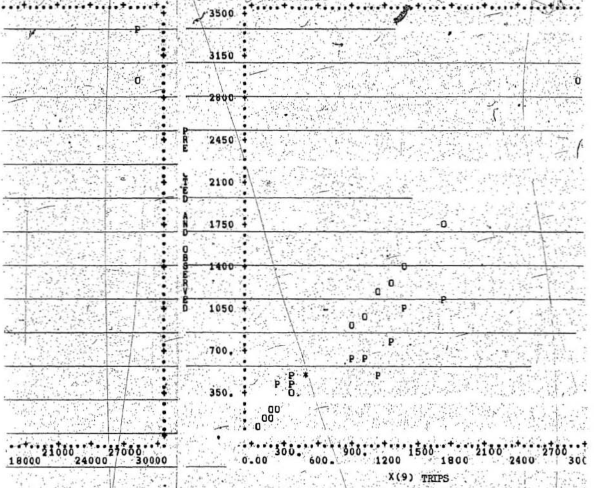
(ZONES) PAGE 8 ATTRACTIO



UNITS AND TRIPS ATTRACTED

TABLE B - 11 ANALYSIS OF VARIANCE FOR TRIP PRODUCTIONS CASE 3 (INCORPORATED COMMUNITIES)

PAGE 4 PRODUCTIONS AUGUST 1976: (INCORPORATED COMMUNITIES)

REGRESSION TITLE. . . . . .PRODUCTIONS AUGUST 1976: (INCORPORATED COMMUNITIES)
DEPENDENT VARIABLE. . . . . 8 TRIPS
TOLERANCE 0.0100
ALL DATA CONSIDERED AS A SINGLE GROUP

MULTIPLE R 0.9024 STD. ERROR OF EST. 311.3149
MULTIPLE R-SQUARE 0.8143

ANALYSIS OF VARIANCE

	SUM OF SQUARES	DF	MEAN SQUARE	F RATIO	P(TAIL)
REGRESSION	8926951.000	1	8926951.000	92.109	0.00000
RESIDUAL	2035257.000	21	96917.000		

VARIABLE		COEFFICIENT	STD. ERROR	STD. REG COEFF	T	P(2 TAIL)	TOLERANCE
INTERCEPT		289.79321					
DWEL.	2	0.10957	0.011	0.902	9.597	0.000	1.000000

VARIABLE	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION	MINIMUM	MAXIMUM
1 POP.	13260.41797	25459.50391	1.91996	1342.00000	123540.00000
2 DWEL.	3036.30005	5813.70313	1.91473	275.00000	28135.00000
3 O. DWEL.	2444.77954	4594.21484	1.87919	255.00000	22367.00000
4 LAB.F.	4635.19531	10234.16016	2.20792	270.00000	49505.00000
5 LAB.FM.	3213.64209	7014.11328	2.18260	305.00000	34100.00000
6 EMPL.P.	4041.93555	9221.90625	2.28156	300.00000	44645.00000
7 AVE. HI.	13777.32422	1598.69263	0.11604	11254.00000	17080.00000
8 TRIPS	622.47705	705.89111	1.13400	40.00000	3042.00000
11 X(11)	591.52075	1232.64014	2.08385	15.00000	5768.00000
12 X(12)	1421.56421	3225.02173	2.26864	-316.00000	15405.00000
13 X(13)	593.25952	1033.01123	1.74125	-465.00000	4860.00000

TABLE B-12 PREDICTED, OBSERVED AND RESIDUAL VALUES FOR TRIP PRODUCTIONS CASE 3 (IN

PAGE 5 PRODUCTIONS AUGUST 1976: (INCORPORATED COMMUNITIES)

LIST OF PREDICTED VALUES, RESIDUALS, AND VARIABLES.

NCTE - NEGATIVE CASE NUMBER DENOTES A CASE WITH MISSING VALUES.
THE NUMBER OF STANDARD DEVIATIONS FROM THE MEAN IS DENOTED BY UP
OF EACH RESIDUAL OR VARIABLE.
MISSING VALUES ARE DENOTED BY MORE THAN THREE ASTERISKS.

CASE LABEL	NC.	RESIDUAL	PREDICTED VALUE	VARIABLES 1 POP. / 7 AVE. HI.	2 DWEL. / 8 TRIPS	3 0. / 11 X(1
ST.J	1	-330.5139 *	3372.5139	123540.0000 ***	28135.000(	
				17080.0000**	3042.0000***	5768.0
HOLY	2	-261.7856	329.7856	1610.0000	365.0000	331.0
				16865.0000*	68.0000	3 .0
WHIT	3	-23.2349	495.2349	8466.0000	1875.000(	
				13447.0000	472.0000	3_0.0
CBC	4	-122.2590	438.2590	6054.0000	1355.0000	1265.0
				15780.0000*	316.0000	0.0
CVLE	5	361.0713 *	445.9287	5400.0000	1425.0000	11
				12773.0000	807.0000	23 .0
PTBL	6	-209.3335	330.3335	1456.0000	370.0000	335.0
				12352.0000	121.0000	35.00
GLWN	7	-107.6323	419.6323	4783.0000	1185.0000	1095.
				11254.0000*	312.0000	90.00
GMBO	8	-77.9382	468.9382	7879.0000	1635.0000	1520.00
				11576.0000*	391.0000	115.00
GAND	9	497.8115 *	672.1885	14088.0000	3490.0000	2520.0
				13895.0000	1170.0000	970.00
LWIS	10	-16.9907	480.9907	7651.0000	1745.0000	1560.00
				12111.0000*	464.0000	185.00
NORA	11	-279.9246	319.9246	1342.0000	275.0000	255.0
				13237.0000	40.0000	20.00
GFAL	12	682.9041 **	1026.0959	29140.0000	6720.0000	5210.00
				14653.0000	1709.0000*	1510.00
SDLE	13	-56.7993	478.7993	7562.0000	1725.0000	1505.0
				11752.0000*	422.0000	220.00
BAVE	14	-217.9814	457.9814	7571.0000	1535.0000	1240.00
				14477.0000	240.0000	295.00
HAMP	15	-269.2378	329.2378	1710.0000	360.0000	345.00
				13799.0000	60.0000	15.00
DELA	16	-42.7395	506.7395	8783.0000	1980.0000	1735.00
				12429.0000	464.0000	245.00
PASA	17	-274.5081	349.5081	2296.0000	545.0000	434.0(
				15918.0000*	75.0000	111.00
CBRK	18	187.2729	1170.7271	34002.0000	8040.0000	6333.00
				13267.0000	1358.0000*	1707.00
SVLE	19	380.1680 *	673.8320	15794.0000	3505.0000	2260.0(
				13755.0000	1054.0000	1245.00
ST.G	20	-84.7163	334.7163	1976.0000	410.0000	350.00
				13616.0000	250.0000	60.00
ROBS	21	-141.6733	345.6733	2044.0000	510.0000	48 .
				13777.0000	204.0000	30.00
DOYS	22	-224.2212	346.2212	2488.0000	515.0000	490.00
				13777.0000	122.0000	5.
PAB	23	632.2773 **	523.7227	9355.0000	2135.0000	
				15289.0000	1156.000(	255.00

2of2

R TRIP PRODUCTIONS CASE 3 (INCORPORATED

)MMUNITIES)

·ITH MISSING VALUES.
)M THE MEAN IS DENOTED BY UP TO 3 ASTERISKS TO THE RIGHT

HAN THREE ASTERISKS.

LES

P. / . HI.	2 DWEL. / 8 TRIPS	3 O. DWEL. / 11 X(11)	4 LAB.F. / 12 X(12)	5 LAB.FM. / 13 X(13)	6 EMPL.P.
OO ***	28135.0000***	22367.0000***	49505.0000***	34100.0000***	44645.0000***
0000**	3042.0000***	5768.0000***	15405.0000***	4860.0000***	
0000	365.0000	331.0000	490.0000	332.0000	445.0000
0000*	68.0000	34.0000	158.0000	45.0000	
0000	1875.0000	1525.0000	2550.0000	1760.0000	1955.0000
0000	472.0000	350.0000	790.0000	595.0000	
0000	1355.0000	1265.0000	1690.0000	1250.0000	1335.0000
0000*	316.0000	90.0000	440.0000	355.0000	
0000	1425.0000	1195.0000	1805.0000	1260.0000	1485.0000
0000	807.0000	230.0000	545.0000	320.0000	
0000	370.0000	335.0000	430.0000	325.0000	320.0000
0000	121.0000	35.0000	105.0000	110.0000	
0000	1185.0000	1095.0000	1285.0000	975.0000	995.0000
0000*	312.0000	90.0000	310.0000	290.0000	
0000	1635.0000	1520.0000	1830.0000	1405.0000	1335.0000
0000*	391.0000	115.0000	425.0000	495.0000	
0000	3490.0000	2520.0000	5140.0000	3410.0000	4445.0000
0000	1170.0000	970.0000	1730.0000	695.0000	
0000	1745.0000	1560.0000	2095.0000	1480.0000	1795.0000
0000*	464.0000	185.0000	615.0000	300.0000	
0000	275.0000	255.0000	395.0000	305.0000	300.0000
0000	40.0000	20.0000	90.0000	95.0000	
0000	6720.0000	5210.0000	9545.0000	6555.0000	8130.0000
0000	1709.0000*	1510.0000	2990.0000	1415.0000	
0000	1725.0000	1505.0000	2130.0000	1465.0000	1805.0000
0000*	422.0000	220.0000	665.0000	325.0000	
0000	1535.0000	1240.0000	2095.0000	1530.0000	1755.0000
0000	240.0000	295.0000	565.0000	340.0000	
0000	360.0000	345.0000	445.0000	360.0000	310.0000
0000	60.0000	15.0000	85.0000	135.0000	
0000	1980.0000	1735.0000	2640.0000	1875.0000	2205.0000
0000	464.0000	245.0000	765.0000	435.0000	
0000	545.0000	434.0000	270.0000	586.0000	735.0000
0000*	75.0000	111.0000	-316.0000	-465.0000*	
0000	8040.0000	6333.0000	12495.0000	8111.0000	10800.0000
0000	1358.0000*	1707.0000	4384.0000	1695.0000*	
0000	3505.0000	2260.0000	4925.0000	3250.0000	4055.0000
0000	1054.0000	1245.0000	1675.0000	870.0000	
0000	410.0000	350.0000	415.0000	315.0000	315.0000
0000	250.0000	60.0000	100.0000	100.0000	
0000	510.0000	480.0000	620.0000	460.0000	475.0000
0000	204.0000	30.0000	160.0000	145.0000	
0000	515.0000	490.0000	650.0000	470.0000	495.0000
0000	122.0000	25.0000	180.0000	155.0000	
0000	2135.0000	1880.0000	3165.0000	2335.0000	2830.0000
0000	1156.0000	255.0000	830.0000	335.0000	

169

PAGE 7 PRODUCTIONS AUGUST 1976: (INCORPORATED COMMUNITIES) PAGE 8 PROD

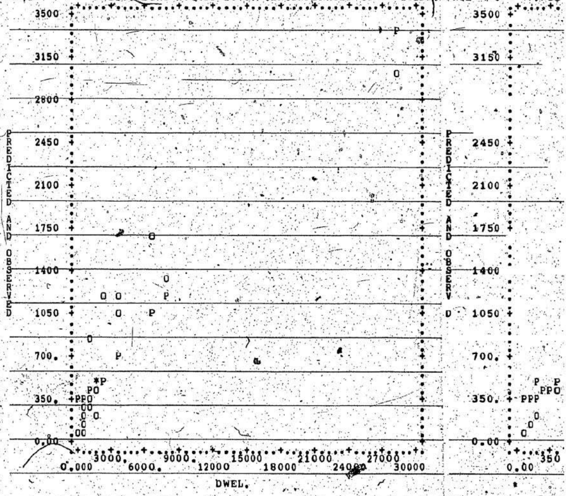
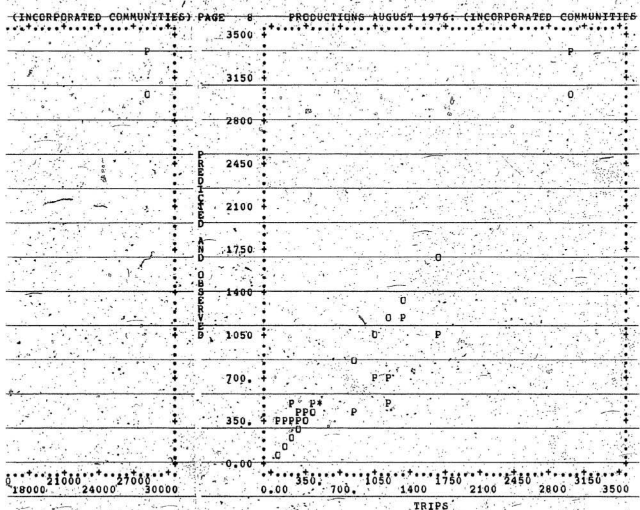


FIGURE B - 6 PREDICTED AND OBSERVED TRIP PRODUCTIONS VS. DWELLING UNITS AND TRIPS

2 of 2

(INCORPORATED COMMUNITIES) PAGE 8 PRODUCTIONS AUGUST 1976: (INCORPORATED COMMUNITIES



TRIP PRODUCTIONS VS. DWELLING UNITS AND TRIPS PRODUCED CASE 3 (INCORPORATED COMMUNITIES)

1of

TABLE B - 13 ANALYSIS OF VARIANCE FOR TRIP ATTRACTIONS CASE 3 (INCORPORATED COMMUNITIES)

PAGE 4 ATTRACTIONS AUGUST 1976: (INCORPORATED COMMUNITIES)

```
REGRESSION TITLE. . . . . . . . . . . . . . . . . .ATTRACTIONS AUGUST 1976: (INCORPORA
DEPENDENT VARIABLE. . . . . . . . . . . . . . . .     8 TRIPS
TOLERANCE . . . . . . . . . . . . . . . . . . .    0.0100
ALL DATA CONSIDERED AS A SINGLE GROUP

MULTIPLE R              0.8908          STD. ERROR OF EST.      326.1853
MULTIPLE R-SQUARE       0.7936
```

ANALYSIS OF VARIANCE

	SUM OF SQUARES	DF	MEAN SQUARE	F RATIO	P(TAIL)
REGRESSION	8588652.000	1	8588652.000	80.723	0.000
RESIDUAL	2234335.000	21	106396.875		

VARIABLE		COEFFICIENT	STD. ERROR	STD. REG COEFF	T	P(2 TAIL)	TOLERAN
INTERCEPT		296.15747					
DWEL.	2	0.10747	0.012	0.891	8.985	0.000	1.000

VARIABLE		MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION	MINIMUM	MAXIMUM
1	POP.	13260.41797	25459.50391	1.91996	1342.00000	123540.00000
2	DWEL.	3036.30005	5813.70313	1.91473	275.00000	28135.00000
3	O. DWEL.	2444.77954	4594.21484	1.87919	255.00000	22367.00000
4	LAB.F.	4635.19531	10234.16016	2.20792	270.00000	49505.00000
5	LAB.FM.	3213.64209	7014.11328	2.18260	305.00000	34100.00000
6	EMPL.7.	4041.93555	9221.90625	2.28156	300.00000	44645.00000
7	AVE. HI.	13777.24219	1598.83618	0.11605	11252.00000	17080.00000
8	TRIPS	622.47681	701.39429	1.12678	17.00000	2949.000[illegible]
11	X(11)	591.52075	1232.64014	2.08385	15.00000	5768.00000
12	X(12)	1421.56421	3225.02173	2.26864	-316.00000	15405.00000
13	X(13)	593.25952	1033.01123	1.74125	-465.00000	4860.00000

2 of 2

CASE 3 (INCORPORATED COMMUNITIES)

ITIES)

CTIONS AUGUST 1976: (INCORPORATED COMMUNITIES)
B TRIPS
100

EST. 326.1853

IUARE	F RATIO	P(TAIL)
	80.723	0.00000

. 5

G

	T	P(2 TAIL)	TOLERANCE
1	8.985	0.000	1.000000

ENT ATION	MINIMUM	MAXIMUM
96	1342.00000	123540.00000
73	275.00000	28 3 .00000
19	255.^0000	22 6 .000 0
6υ	05.00 0	.0 υ0
56	00.00000	44 4..00000
05	11.52.00000	17080.00000
78	17.00000	2949.00000
85	15.00000	5768.00000
64	-316.00000	15405.00000
125	-465.00000	4860.00000

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IDUAL VALUES FOR TRIP ATTRACTIONS

PAGE 5 ATTRACTIONS AUGUST 1976: (INCORPORATED COMMUNITIES)
LIST OF PREDICTED VALUES, RESIDUALS, AND VARIABLES
NOTE - NEGATIVE CASE NUMBER DENOTES A CASE WITH MISSING VALUES.
THE NUMBER OF STANDARD DEVIATIONS FROM THE MEAN IS DENOTED BY UP TO 3
OF EACH RESIDUAL OR VARIABLE.
MISSING VALUES ARE DENOTED BY MORE THAN THREE ASTERISKS.

CASE LABEL	NO.	RESIDUAL	PREDICTED VALUE	VARIABLES 1 POP. / 7 AVE. HI.	2 DWEL. / 8 TRIPS	3 O. DWEI / 11 X(11)
ST.J	1	-370.9023 *	3319.9023	123540.0000 ***	28135.0000***	22367.0000*
				17080.0000**	2949.0000***	5768.0000*
HOLY	2	-176.3850	335.3850	1610.0000	365.0000	331.0000
				16865.0000*	159.0000	34.0000
WHIT	3	-28.6687	497.6687	8466.0000	1875.0000	1525.0000
				13447.0000	469.0000	350.0000
CBC	4	-75.7830	441.7830	6054.0000	1355.0000	1265.0000
				15780.0000*	366.0000	90.0000
CVLE	5	450.6941 *	449.3059	5400.0000	1425.0000	1195.0000
				12773.0000	900.0000	230.0000
PTBL	6	-249.9224	335.9224	1456.0000	370.0000	335.0000
				12352.0000	86.0000	35.0000
GLWN	7	-169.5125	423.5125	4783.0000	1185.0000	1095.0000
				11252.0000*	254.0000	90.0000
GMBO	8	-117.8752	471.8752	7879.0000	1635.0000	1520.0000
				11576.0000*	354.0000	115.0000
GAND	9	602.7629 *	671.2371	14088.0000	3490.0000	2520.0000
				13895.0000	1274.0000	970.0000
LWIS	10	10.3027	483.6973	7651.0000	1745.0000	1560.0000
				12111.0000*	494.0000	185.0000
NORA	11	-308.7124	325.7124	1342.0000	275.0000	255.0000
				13237.0000	17.0000	20.0000
GFAL	12	386.6260 *	1018.3740	29140.0000	6720.0000	5210.0000
				14653.0000	1405.0000*	1510.0000
SDLE	13	-128.5479	481.5479	7562.0000	1725.0000	1505.0000
				11752.0000*	353.0000	220.0000
BAVE	14	-243.1279	461.1279	7571.0000	1535.0000	1240.0000
				14477.0000	218.0000	295.0000
HAMP	15	-266.8474	334.8474	1710.0000	360.0000	345.0000
				13799.0000	68.0000	15.0000
DELA	16	-23.9534	508.9534	8783.0000	1980.0000	1735.0000
				12429.0000	485.0000	245.0000
PASA	17	-240.7300	354.7300	2296.0000	545.0000	434.0000
				15918.0000*	114.0000	111.0000
CBRK	18	561.7620 *	1160.2380	34002.0000	8040.0000	6333.0000
				13267.0000	1722.0000*	1707.00 0
SVLE	19	322.1509	672.8491	15794.0000	3505.0000	2260.00
				13755.0000	995.0000	1245.0000
ST.G	20	-188.2212	340.2212	1976.0000	410.0000	350.0000
				13616.0000	152.0000	60.000
ROBS	21	-164.9685	350.9685	2044.0000	510.0000	480.0
				13777.0000	186.0000	30.0000
DOYS	22	-218.5059	351.5059	2488.0000	515.0000	490.0000
				13777.0000	133.0000	25.0000
PAB	23	638.3884 *	525.6116	9355.0000	2135.0000	1880.0000
				15289.0000	1164.0000	255.0000

2 of 2

FOR IP

)MMUNITIES)

ITH MISSING VALUES.
)M THE MEAN IS DENOTED BY UP TO 3 ASTERISKS TO THE RIGHT

IAN THREE ASTERISKS.

ES

. / .. HI.	2 DWEL. / 8 TRIPS	3 O. DWEL. / 11 X(11)	4 LAB.F. / 12 X(12)	5 LAB.FM. / 13 X(13)	6 EMPL.7.
O ***	28135.0000***	22367.0000***	49505.0000***	34100.0000***	44645.0000***
0000**	2949.0000***	5768.0000***	15405.0000***	4860.0000***	
0000	365.0000	331.0000	490.0000	332.0000	445.0000
0000*	159.0000	34.0000	158.0000	45.0000	
0000	1875.0000	1525.0000	2550.0000	1760.0000	1955.0000
0000	469.0000	350.0000	790.0000	595.0000	
0000	1355.0000	1265.0000	1690.0000	1250.0000	1335.0000
0000*	366.0000	90.0000	440.0000	355.0000	
0000	1425.0000	1195.0000	1805.0000	1260.0000	1485.0000
0000	900.0000	230.0000	545.0000	320.0000	
0000	370.0000	335.0000	430.0000	325.0000	320.0000
0000	86.0000	35.0000	105.0000	110.0000	
0000	1185.0000	1095.0000	1285.0000	975.0000	995.0000
0000*	254.0000	90.0000	310.0000	290.0000	
0000	1635.0000	1520.0000	1830.0000	1405.0000	1335.0000
0000*	354.0000	115.0000	425.0000	495.0000	
0000	3490.0000	2520.0000	5140.0000	3410.0000	4445.0000
0000	1274.0000	970.0000	1730.0000	695.0000	
0000	1745.0000	1560.0000	2095.0000	1480.0000	1795.0000
0000*	494.0000	185.0000	615.0000	300.0000	
0000	275.0000	255.0000	395.0000	305.0000	300.0000
0000	17.0000	20.0000	90.0000	95.0000	
0000	6720.0000	5210.0000	9545.0000	6555.0000	8130.0000
0000	1405.0000*	1510.0000	2990.0000	1415.0000	
0000	1725.0000	1505.0000	2130.0000	1465.0000	1805.0000
0000*	353.0000	220.0000	665.0000	325.0000	
0000	1535.0000	1240.0000	2095.0000	1530.0000	1755.0000
0000	218.0000	295.0000	565.0000	340.0000	
0000	360.0000	345.0000	445.0000	360.0000	310.0000
0000	68.0000	15.0000	85.0000	135.0000	
0000	1980.0000	1735.0000	2640.0000	1875.0000	2205.0000
0000	485.0000	245.0000	765.0000	435.0000	
0000	545.0000	434.0000	270.0000	586.0000	735.0000
0000*	114.0000	111.0000	-316.0000	-465.0000*	
0000	8040.0000	6333.0000	12495.0000	8111.0000	10800.0000
0000	1722.0000*	1707.0000	4384.0000	1695.0000*	
0000	3505.0000	2260.0000	4925.0000	3250.0000	4055.0000
0000	995.0000	1245.0000	1675.0000	870.0000	
0000	410.0000	350.0000	415.0000	315.0000	315.0000
0000	152.0000	60.0000	100.0000	100.0000	
0000	510.0000	480.0000	620.0000	460.0000	475.0000
0000	186.0000	30.0000	160.0000	145.0000	
0000	515.0000	490.0000	650.0000	470.0000	495.0000
0000	133.0000	25.0000	180.0000	155.0000	
0000	2135.0000	1880.0000	3165.0000	2335.0000	2830.0000
0000	1164.0000	255.0000	830.0000	335.0000	

1of

PAGE 7 ATTRACTIONS AUGUST 1976: (INCORPORATED COMMUNITIES) PAGE 8 ATTRAC

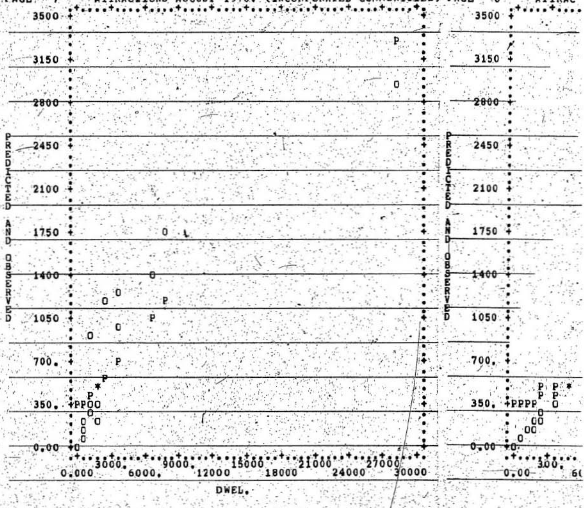
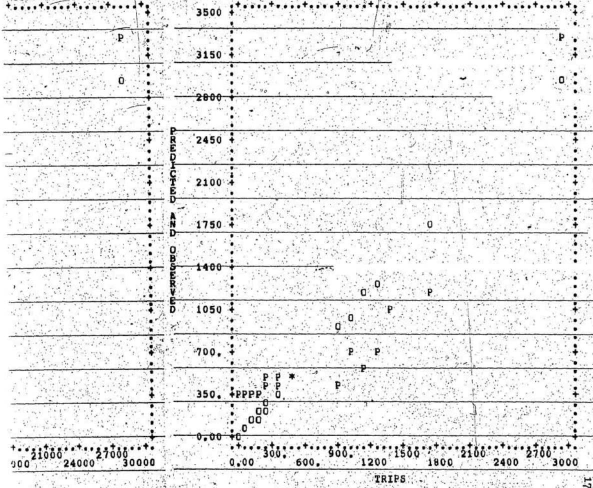


FIGURE B - 7 PREDICTED AND OBSERVED TRIP ATTRACTIONS VS. DWELLING UNITS AND TRIPS ATTRA

2 of 2

NCORPORATED COMMUNITIES) PAGE 8 ATTRACTIONS AUGUST 1976: (INCORPORATED COMMUNITIES)



TRIP ATTRACTIONS VS. DWELLING UNITS AND TRIPS ATTRACTED FOR CASE 3 (INCORPORATED COMMUNITIES)

TABLE B-18 FORMULAE AND CALCULATIONS, 95% CONFIDENCE INTERVAL FOR THE MEAN VALUES OF THE DEPENDENT VARIABLE ON THE REGRESSION LINE USING 23 ZONES

$$S^2_{\hat{Y}} = S^2_Y \left[\frac{1}{n} + \frac{(X - \bar{X})^2}{\Sigma (X - \bar{X})^2} \right]$$

$\bar{X} = 3356$

$S^2_Y = \frac{1724740}{23.2} = 82130.5$ $\qquad t_{.05,21} = 2.080$

ZONE NO.	$(X - \bar{X})^2$	$\hat{Y}$	$\frac{(X - \bar{X})^2}{\Sigma (X - \bar{X})^2} + \frac{1}{n}$	$S^2_{\hat{Y}}$	$S_{\hat{Y}}$	$\pm tS_{\hat{Y}}$	$\hat{Y} + tS_{\hat{Y}}$	$\hat{Y} - tS_{\hat{Y}}$
1	613998841	3396	0.876067552	71951.86611	268.2384501	557.9359762	3954	2838
2	8946081	288	0.055609247	4567.215247	67.58117524	140.5688445	729	147
3	1212201	499	0.045122019	3705.89399	60.87605432	126.622193	626	372
4	3066001	427	0.047635793	3912.351466	62.548793	130.10149	557	297
5	961	619	0.043479564	3570.998342	59.75782	124.29629	743	495
6	4800481	377	0.049987767	1105.520289	64.07433409	133.27461	510	244
7	4268356	391	0.049266199	4046.257594	63.61002039	132.30922	523	259
8	2961841	430	0.047494551	3900.75118	62.45599395	129.9084674	560	300
9	1331716	752	0.045284083	3719.204367	60.985280	126.84938	879	625
10	1490841	486	0.045499858	3736.926092	61.130402	127.15124	613	351
11	8916196	288	0.055568722	4563.886958	67.55654637	140.51761	429	148
12	17505856	1091	0.067216397	5520.516327	74.30017717	154.54437	1246	936
13	2090916	461	0.046313566	3803.756371	61.67460069	128.28317	589	333
14	2979076	429	0.047517921	3902.67064	62.47135856	129.94043	559	299
15	8300161	300	0.054733372	4495.279217	67.04684345	139.45743	439	161
16	1256641	497	0.04518228	3710.843267	60.91669121	126.70672	624	370
17	7431076	317	0.053554883	4398.489328	66.32110771	137.947904	455	179
18	22791076	1157	0.074383215	6109.130623	78.16092773	162.5747297	1320	994
19	118336	661	0.043638726	3584.070381	59.867106	124.52358	786	536
20	6895876	328	0.052829146	4338.88417	65.870207	137.01003	465	191
21	8099716	304	0.054461566	4472.955682	66.8801591	139.11073	443	165
22	8071281	304	0.054423008	4469.788879	66.85647971	139.0614778	443	165
23	923521	515	0.044730566	3673.743734	60.61141581	126.071745	641	389

TABLE B-16 DATA FOR NORMALITY TEST OF DEPENDENT VARIABLE

(a) Data by Zone

Zone No	Dwelling Units	Trips Produced	Zone No	Dwelling Units	Trips Produced
1	28135	3042	13	1910	422
2	365	68	14	1630	240
3	2255	472	15	475	60
4	1605	316	16	2235	464
5	3325	807	17	630	75
6	1165	121	18	8130	1358
7	1290	312	19	3700	1054
8	1635	391	20	730	250
9	4510	1170	21	510	204
10	2135	464	22	515	122
11	370	40	23	2395	1156
12	7540	1709			

(b) Data by Class

Dwelling Unit Class	Trip Class	No. of Trips/Zone No.	Frequency	Total Trips	Average Trips/ Zone
0-2000	0 - 100	68/2, 40/11, 60/5, 75/17	4	243	61
	101 - 200	121/6, 122/22	2	243	122
	201 - 300	250/20, 204/21, 240/14	3	694	231
	301 - 400	316/4, 312/7, 391/8	3	1019	340
	401 - 500	422/13	1	422	422
2000 +	501 - 1000	472/3, 807/5, 464/10 464/16	4	2207	552
	1001 - 2000	1170/9, 1709/12, 1358/18, 1054/19, 1156/23	5	6447	1289
	2001 - 3000	Nil	0	0	0
	3000 +	3042/1	1	3042	3042

D.U. Class 0 - 2000: $\Sigma Y = 2621$, $\bar{Y} = 202$ 2000 + : $\Sigma Y=11696$, $\bar{Y} = 1170$

FORMULAE FOR BARTLETT'S TEST FOR EQUALITY (HOMOGENITY) OF VARIANCES

Let $S_1^2, S_2^2 \ldots S_k^2$ be the variances of k independent samples having respectively $n_1, n_2 \ldots n_k$ degrees of freedom. Then under the hypothesis that $\sigma_1^2 = \sigma_2^2 = \ldots = \sigma_k^2 = \sigma^2$ the estimate of σ^2 obtained by pooling the variances of the k samples is:

$$S^2 = \frac{n_1 S_1^2 + n_2 S_2^2 + \ldots + n_k S_k^2}{n_1 + n_2 + \ldots\ldots + n_k} = \frac{\Sigma n_i S_i^2}{n} \quad \text{where } n = \Sigma n_i$$

The statistic:

$$B = \frac{2.3026}{C}\left[n(\log_{10} \sum_{i=1}^{k} n_i S_i^2 - \log_{10} n) - \sum_{i=1}^{k} n_i \log_{10} S_i^2 \right]$$

Where

$$C = 1 + \frac{1}{3(k-1)} \left[\sum_{i=1}^{k} \frac{1}{n_i} - \frac{1}{n} \right]$$

The statistic B has a chi-square distribution with k-1 degrees of freedom. If calculated B is less than the table chi-square value at a particular level of testing then the hypothesis of variance equality is accepted.

TABLE B-17 BARTLETT'S TEST FOR EQUALITY OF VARIANCES, ALL ZONES INCLUDED

	Dwelling Unit Class	n_i	$n_i S_i^2$	S_i^2	$\log_{10} S_i^2$	$n_i \log_{10} S_i^2$	$\frac{1}{n_i}$
1)	0 - 1599	8	72267	9033	3.96	31.68	.125
2)	1600 - 3199	7	552430	78919	4.90	34.30	.143
3)	3200 - 4799	2	68745	34373	4.54	9.08	.500
4)	4800 +	2	1578649	789324	5.90	11.80	.500
		19	2.27×10^6			86.86	1.268

B = 21.8 $\chi^2_{0.95,3} = 7.8$ $(\sigma_1^2 \neq \sigma_2^2 \neq \sigma_3^2 \neq \sigma_4^2$

$\chi^2_{0.99,3} = 11.3$

TABLE B-18 BARTLETT'S TEST FOR EQUALITY OF VARIANCES, ZONE 1 (ST. JOHN'S) DELETED

	Dwelling Unit Class	n_i	$n_i s_i^2$	s_i^2	$\log_{10} s_i^2$	$n_i \log_{10} s_i^2$	$\frac{1}{n_i}$
1)	0 - 1599	8	72267	9033	3.96	31.68	.125
2)	1600 - 3199	7	552430	78919	4.90	34.30	.143
3)	3200 - 4799	2	68745	34373	4.54	9.08	.500
4)	4800 - 8130	1	61601	61601	4.79	4.79	1.00
		18	755043			79.85	1.768

$B = 7.3$ $\quad \chi^2_{0.95,3} = 7.8$ $\quad \sigma_1^2 = \sigma_2^2 = \sigma_3^2 = \sigma_4^2$

$\chi^2_{0.99,3} = 11.3$

1of

TABLE B - 19 CORRELATION MATRICES FOR (22 - ONE MODEL)

PAGE 3 PRODUCTIONS AUGUST 1976: (ZONES)

CORRELATION MATRIX

		POP. 1	POP.M. 2	DWEL. 3	O. DWEL. 4	LAB.F. 5	LAB.FM. 6	E
POP.	1	1.0000						
POP.M.	2	0.9999	1.0000					
DWEL.	3	0.9986	0.9983	1.0000				
O. DWEL.	4	0.9920	0.9921	0.9953	1.0000			
LAB.F.	5	0.9936	0.9930	0.9941	0.9855	1.0000		
LAB.FM.	6	0.9962	0.9959	0.9961	0.9902	0.9987	1.0000	
EMPL.P.	7	0.9902	0.9895	0.9908	0.9819	0.9994	0.9977	
AVE. HI.	8	-0.0352	-0.0362	-0.0402	-0.0664	0.0070	0.0 20	
X(9)	9	0.9236	0.9244	0.9232	0.9168	0.905		
X(12)	12	0.9999	0.9997	0.9987	0.9918	0.9941	0.9963	
X(13)	13	0.9522	0.9507	0.9477	0.9121	0.9546	0.9480	
X(14)	14	0.9809	0.9796	0.9823	0.9689	0.9949	0.9883	
X(15)	15	0.9880	0.9877	0.9875	0.9812	0.9766	[illegible]	

		X(13) 13	X(14) 14	X(15) 15
X(13)	13	1.0000		
X(14)	14	0.9599	1.0000	
X(15)	15	0.9411	0.9671	1.0000

PAGE 3 ATTRACTIONS AUGUST 1976: (ZONES)

CORRELATION MATRIX

		POP. 1	POP.M. 2	DWEL. 3	O. DWEL. 4	LAB.F. 5	LAB.FM. 6	EM
POP.	1	1.0000						
POP.M.	2	0.9999	1.0000					
DWEL.	3	0.9986	0.9983	1.0000				
O. DWEL.	4	0.9920	0.9921	0.9953	1.000			
LAB.F.	5	0.9936	0.9930	0.9941	[illegible]	[illegible]		
LAB.FM.	6	0.9962	0.9959	0.9961	0.9902	0.99 7	1.0 00	
EMPL.P.	7	0.9902	0.9895	0.9908	0.9819	0.9994	0.9 77	
AVE. HI.	8	-0.0352	-0.0362	-0.0402	-0.0664	0.0070	[illegible]	
X(9)	9	0.9276	0.9275	0.9325	0.9273	0.9246	[illegible]	
X(12)	12	0.9999	0.9997	0.9987	0.9918	0.9941	0.9963	
X(13)	13	0.9522	0.9507	0.9477	0.9121	0.9546	0.9480	
X(14)	14	0.9809	0.9796	0.9823	0.9689	0.9949	[illegible]	
X(15)	15	0.9880	0.9877	0.9875	0.9812	0.9766	[illegible]	

		X(13) 13	X(14) 14	X(15) 15
X(13)	13	1.0000		
X(14)	14	0.9599	1.0000	
X(15)	15	0.9411	0.9671	1.0000

EL. 4	LAB.F. 5	LAB.FM. 6	EMPL.P. 7	AVE. HI. 8	X(9) 9	X(12) 12
000						
855	1.0000					
902	0.9987	1.0000				
819	0.9994	0.9977	1.0000			
664	0.0070	0.0020	0.0271	1.0000		
168	0.9056	0.9183	0.9047	0.0290	1.0000	
918	0.9941	0.9963	0.9907	-0.0341	0.9226	1.0000
121	0.95 6	0.9480	0.9526	0.0486	0.8817	0.9536
689	0. 9 9	0.9883	. 950	0.0166	0.8736	0.9822
				-0.1195	0.8862	0.9882

EL. 4	LAB.F. 5	LAB.FM. 6	EMPL.P. 7	AVE. HI. 8	X(9) 9	X(12) 12
000						
	1.0000					
902	0.9987	1.0000				
819	0.9994	0.9977	1.0000			
664	0.0070	0.0020	0.0271	1.0000		
273	0.9246	0.9290	0.9258	0.0486	1.0000	
918	0.9941	0.9963	0.9907	-0.0341	0.9276	1.0000
121	0.9546	0.9480	0.9526	0.0486	0.8864	0.9536
689	0.9949	0.9883	0.9950	0.0166	0.9088	0.9822
812	0.9766	0.9775	0.9686	-0.1195	0.8920	0.9882

TABLE B - 20 ANALYSIS OF VARIANCE TABLE FOR TRIP PRODUCTIONS (22 - ZONE MODEL)

PAGE 4 PRODUCTIONS AUGUST 1976: (ZONES)

REGRESSION TITLE. . . . . .PRODUCTIONS AUGUST 1976: (ZONES)
DEPENDENT VARIABLE. . . . . 9 X(9)
TOLERANCE 0.0100

ALL DATA CONSIDERED AS A SINGLE GROUP

MULTIPLE R 0.9232 STD. ERROR OF EST. 189.0960
MULTIPLE R-SQUARE 0.8523

ANALYSIS OF VARIANCE

	SUM OF SQUARES	DF	MEAN SQUARE	F RATIO	P(TAIL)
REGRESSION	4126888.000	1	4126888.000	115.414	0.00000
RESIDUAL	715145.813	20	35757.289		

VARIABLE		COEFFICIENT	STD. ERROR	STD. REG COEFF	T	P(2 TAIL)	TOLERANCE
INTERCEPT		49.10718					
DWEL.	3	0.20782	0.019	0.923	10.743	0.0	1.000000

VARIABLE	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION	MINIMUM	MAXIMUM
1 POP.	9698.34766	9087.23047	0.93699	1610.00000	34459.00000
2 POP.M.	4953.75391	4571.23438	0.92278	833.00000	17325.00000
3 DWEL.	2229.77173	2133.11255	0.95665	365.00000	8130.00000
4 O. DWEL.	1858.45337	1661.08271	0.89377	331.00000	6423.00000
5 LAB.F.	2988.63501	3197.20972	1.06979	490.00000	12630.00000
6 LAB.FM.	2091.45313	2119.33691	1.01333	332.00000	8201.00000
7 EMPL.P.	2467.49878	2768.01318	1.12179	370.00000	10910.00000
8 AVE. HI.	13627.21094	1460.99805	0.10721	11254.00000	16865.00000
9 X(9)	512.49878	480.18018	0.93694	40.00000	1709.00000
12 X(12)	4744.57422	4516.56641	0.95194	777.00000	17134.00000
13 X(13)	371.31738	506.45044	1.36393	20.00000	1707.00000
14 X(14)	897.18066	1086.28638	1.21078	110.00000	4429.00000
15 X(15)	521.13525	441.16943	0.84655	45.00000	1720.00000

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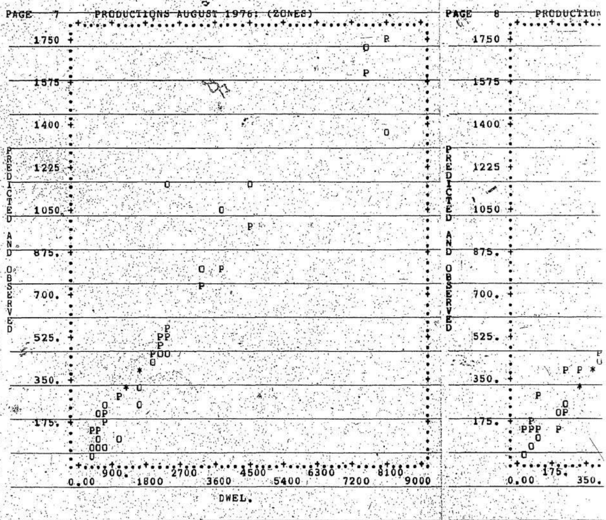
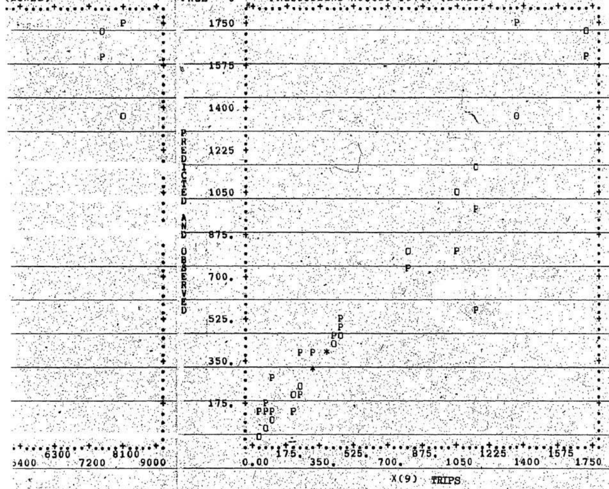


FIGURE B – 8 PREDICTED AND OBSERVED TRIP PRODUCTIONS VS. DWELLING UNITS AND TRIPS PRODUC

2 of 2

(ZONES) PAGE 8 PRODUCTIONS AUGUST 1976: (ZONES)



TRIP PRODUCTIONS VS. DWELLING UNITS AND TRIPS PRODUCED FOR (22 - ZONE MODEL)

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TABLE B - 21 PREDICTED OBSERVED AND RESIDI , VAL' , , TRIP PRODUCTIONS : 22 ZONE MODEI

PAGE 5 PRODUCTIONS AUGUST 1976: (ZONES)
LIST OF PREDICTED VALUES, RESIDUALS, AND VARIABLES
NOTE - NEGATIVE CASE NUMBER DENOTES A CASE WITH MISSING VALUES.
THE NUMBER OF STANDARD DEVIATIONS FROM THE MEAN IS DENOTED BY UP TC
OF EACH RESIDUAL OR VARIABLE.
MISSING VALUES ARE DENOTED BY MORE THAN THREE ASTERISKS.

CASE LABEL	NO.	RESIDUAL	PREDICTED VALUE	VARIABLES 1 POP. 7 EMPL.P. 15 X(15)	2 POP.M. 8 AVE. HI.	3 DWEL. 9 X(9)
HOLY	1	-56.9616	124.9616	1610.0000 445.0000 45.0000*	833.0000 16865.0000**	365.0000 68.0000
WHIT	2	-45.7419	517.7419	10123.0000 2385.0000 660.0000	5215.0000 13447.0000	2255.0000 472.0000
CBC	3	-66.6587	382.6587	7135.0000 1590.0000 410.0000	3675.0000 15780.0000*	1605.0000 316.0000
CVLE	4	66.8904	740.1096	13273.0000 2955.0000 790.0000	6768.0000 12773.0000	3325.0000 807.0000
PTBL	5	-170.2178	291.2178	4692.0000 940.0000 335.0000	2405.0000 12352.0000	1165.0000 121.0000
GLWN	6	-5.1953	317.1953	5158.0000 1090.0000 335.0000	2670.0000 11254.0000*	1290.0000 312.0000
GMBO	7	2.1067	388.8933	7879.0000 1335.0000 495.0000	4035.0000 11576.0000*	1635.0000 391.0000
GAND	8	183.6233	986.3767	18693.0000 5115.0000 915.0000	9470.0000 13895.0000	4510.0000 1170.0000
LWIS	9	-28.8035	492.8035	9374.0000 1920.0000 505.0000	4757.0000 12111.0000*	2135.0000 464.0000
NORA	10	-86.0007	126.0007	1736.0000 370.0000 120.0000	926.0000 13237.0000	370.0000 40.0000
GFAL	11	92.9280	1616.0720	32752.0000** 9130.0000** 1580.0000**	16590.0000** 14653.0000	7540.0000 1709.0000
SDALE	12	-24.0437	446.0437	8390.0000 1825.0000 520.0000	4318.0000 11752.0000*	1910.0000 422.0000
BAVE	13	-147.8542	387.8542	8099.0000 1840.0000 385.0000	4260.0000 14477.0000	1630.0000 240.0000
HAMP	14	-87.8218	147.8218	2276.0000 400.0000 200.0000	1250.0000 13799.0000	475.0000 60.0000
DELA	15	-49.5854	513.5854	9941.0000 2385.0000 505.0000	5176.0000 12429.0000	2235.0000 464.0000
PASA	16	-105.0340	180.0340	2624.0000 835.0000 180.0000	1315.0000 15918.0000*	630.0000 75.0000
CBRK	17	-380.6860 **	1738.6860	34459.0000** 10910.0000*** 1720.0000**	17325.0000** 13267.0000	 58.00 0
SVLE	18	235.9578 *	818.0422	16776.0000 4195.0000 920.0000	8465.0000 13755.0000	3700.0000 1054.0000
ST.G	19	49.1840	200.8160	3339.0000 505.0000 185.0000	1720.0000 13616.0000	730.0000 250.0000
ROBS	20	48.9045	155.0955	2044.0000 475.0000 145.0000	1075.0000 13777.0000	510.0000 204.0000
DOYS	21	-34.1346	156.1346	2488.0000 495.0000 155.0000	1315.0000 13777.0000	515.0000 122.0000
PAB	22	609.1633 ***	546.8367	10503.0000 3145.0000 360.0000	5420.0000 15289.0000*	2395.0000 1156.00

2of2

R TRIP PRODUCTIONS : (22 ZONE M(T.)

ITH MISSING VALUES.
M THE MEAN IS DENOTED BY UP TO 3 ASTERISKS TO THE RIGHT

AN THREE ASTERISKS.

ES

. L.P. 5)	2 POP.M. 8 AVE. HI.	3 DWEL. 9 X(9)	4 O. DWEL. 12 X(12)	5 LAB.F. 13 X(13)	6 LAB.FM. 14 X(14)
000	833.0000	365.0000	331.0000	490.0000	332.0000
000	16865.0000**	68.0000	777.0000	34.0000	158.0000
000*					
	5215.0000	2255.0000	1905.0000	3045.0000	2100.0000
000	13447.0000	472.0000	4908.0000	350.0000	945.0000
000					
000	3675.0000	1605.0000	1495.0000	2000.0000	1495.0000
	780.0000*	316.0000	1460.0000	110.0000	505.0000
000					
000	6768.0000	3325.0000	3005.0000	3745.0000	2685.0000
000	12773.0000	807.0000	6505.0000	320.0000	1060.0000
000	2405.0000	1165.0000	1090.0000	1275.0000	930.0000
000	12352.0000	121.0000	2287.0000	75.0000	345.0000
000					
000	2670.0000	1290.0000	1195.0000	1425.0000	1070.0000
000	11254.0000*	312.0000	2488.0000	95.0000	355.0000
000					
000	4035.0000	1635.0000	1520.0000	1830.0000	1405.0000
000	11576.0000*	391.0000	3844.0000	115.0000	425.0000
000					
000	9470.0000	4510.0000*	3495.0000	6030.0000	4110.0000
000	13895.0000	1170.0000*	9223.0000	1015.0000*	1920.0000
000					
000	4757.0000	2135.0000	1930.0000	2425.0000	1740.0000
000	12111.0000*	464.0000	4617.0000	205.0000	685.0000
000					
000	926.0000	370.0000	340.0000	490.0000	380.0000
000	13237.0000	40.0000	810.0000	30.0000	110.0000
000					
000**	16590.0000**	7540.0000**	6030.0000**	10710.0000**	7445.0000**
000**	14653.0000	1709.0000**	16162.0000**	1510.0000**	3265.0000**
000**					
000	4318.0000	1910.0000	1685.0000	2345.0000	1790.0000
000	11752.0000*	422.0000	4072.0000	225.0000	555.0000
000					
000	4260.0000	1630.0000	1325.0000	2225.0000	1630.0000
000	14477.0000	240.0000	3839.0000	305.0000	595.0000
000					
000	1250.0000	475.0000	455.0000	600.0000	470.0000
000	13799.0000	60.0000	1026.0000	20.0000	130.0000
000					
000	5176.0000	2235.0000	1965.0000	2890.0000	2060.0000
000	12429.0000	464.0000	4765.0000	270.0000	830.0000
000					
000	1315.0000	630.0000	502.0000	1015.0000	684.0000
000	15918.0000*	75.0000	1309.0000	128.0000	331.0000
000					
000**	17325.0000**	8130.0000**	6423.0000**	12630.0000***	8201.0000**
000***	13267.0000	1358.0000*	17134.0000**	1707.0000**	4429.0000***
000**					
000	8465.0000	3700.0000	2445.0000	5115.0000	3390.0000
000	13755.0000	1054.0000*	8311.0000	1255.0000*	1725.0000
000					
000	1720.0000	730.0000	650.0000	690.0000	550.0000
000	13616.0000	250.0000	1619.0000	80.0000	140.0000
000					
000	1075.0000	510.0000	480.0000	620.0000	460.0000
000	13777.0000	204.0000	969.0000	30.0000	160.0000
000					
000	1315.0000	515.0000	490.0000	650.0000	470.0000
000	13777.0000	122.0000	1173.0000	25.0000	180.0000
000					
000	5420.0000	2395.0000	2130.0000	3505.0000	2615.0000
000	15289.0000*	1156.0000*	5083.0000	265.0000	890.0000
000					

TABLE B - 22 ANALYSIS OF VARIANCE TABLE FOR TRIP ATTRACTIONS (22 - ZONE MODEL)

PAGE 4 ATTRACTIONS AUGUST 1976: (ZONES)

```
  REGRESSION TITLE. . . . . . . . . . . . . . . . . . .ATTRACTIONS AUGUST 1976: (ZONES)
  DEPENDENT VARIABLE. . . . . . . . . . . . . . . . .        9 X(9)
  TOLERANCE . . . . . . . . . . . . . . . . . . . .    0.0100
ALL DATA CONSIDERED AS A SINGLE GROUP

MULTIPLE R              0.9325          STD. ERROR OF EST.        183.4671
MULTIPLE R-SQUARE       0.8696
```

ANALYSIS OF VARIANCE

	SUM OF SQUARES	DF	MEAN SQUARE	F RATIO	P(TAIL)
REGRESSION	4491058.000	1	4491058.000	133.423	0.00000
RESIDUAL	673203.563	20	33660.176		

VARIABLE		COEFFICIENT	STD. ERROR	STD. REG COEFF	T	P(2 TAIL)	TOLERANCE
INTERCEPT		33.32080					
DWEL.	3	0.21680	0.019	0.933	11.551	0.0	1.000000

VARIABLE	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION	MINIMUM	MAXIMUM
1 POP.	9698.34766	9087.23047	0.93699	1610.00000	34459.00000
2 POP.M.	4953.75391	4571.23438	0.92278	833.00000	17325.00000
3 DWEL.	2229.77173	2133.11255	0.95665	365.00000	8130.00000
4 O. DWEL.	1858.45337	1661.03271	0.89377	331.00000	6423.00000
5 LAB.F.	2988.63501	3197.20972	1.06979	490.00000	12630.00000
6 LAB.FM.	2091.45313	2119.33691	1.01333	332.00000	8201.00000
7 EMPL.P.	2467.49878	2768.01318	1.12179	370.00000	10910.00000
8 AVE. HI.	13627.21094	1460.99805	0.10721	11254.00000	16865.00000
9 X(9)	516.72607	495.90039	0.95970	17.00000	1722.00000
12 X(12)	4744.57422	4516.56641	0.95194	777.00000	17134.00000
13 X(13)	371.31738	506.45044	1.36393	20.00000	1707.00000
14 X(14)	897.18066	1086.28638	1.21078	110.00000	4429.00000
15 X(15)	521.13525	441.16943	0.84655	45.00000	1720.00000

TABLE B – 23 PREDICTED OBSERVED AND RESIDUAL VALUES FOR TRIP ATTRACTIONS : (22 ZONE MODEL)

PAGE 5 ATTRACTIONS AUGUST 1976: (ZONES)
LIST OF PREDICTED VALUES, RESIDUALS, AND VARIABLES
NOTE - NEGATIVE CASE NUMBER DENOTES A CASE WITH MISSING VALUES.
THE NUMBER OF STANDARD DEVIATIONS FROM THE MEAN IS DENOTED BY UP TO
OF EACH RESIDUAL OR VARIABLE.
MISSING VALUES ARE DENOTED BY MORE THAN THREE ASTERISKS.

CASE LABEL	NO.	RESIDUAL	PREDICTED VALUE	1 POP.	2 POP.M.	3 DWEL.	7 EMPL.P.	8 AVE. HI.	9 X(9)	15 X(15)
HOLY	1	46.5487	112.4513	1610.0000	833.0000	365.0000	445.0000	16865.0000**	159.0000	45.0000*
WHIT	2	-53.1953	522.1953	10123.0000	5215.0000	2255.0000	2385.0000	13447.0000	469.0000	660.0000
CBC	3	-15.2781	381.2781	7135.0000	3675.0000	1605.0000	1590.0000	15780.0000*	366.0000	410.0000
CVLE	4	145.8330	754.1670	13273.0000	6768.0000	3325.0000	2955.0000	12773.0000	900.0000	790.0000
PTBL	5	-199.8879 *	285.8879	4692.0000	2405.0000	1165.0000	940.0000	12352.0000	86.0000	335.0000
GLWN	6	-58.9873	312.9873	5158.0000	2670.0000	1290.0000	1090.0000	11254.0000*	254.0000	335.0000
GMBO	7	-33.7820	387.7820	7879.0000	4035.0000	1635.0000	1335.0000	11576.0000*	354.0000	495.0000
GAND	8	262.9299 *	1011.0701	18693.0000	9470.0000	4510.0000*	5115.0000	13895.0000	1274.0000*	915.0000
LWIS	9	-2.1799	496.1799	9374.0000	4757.0000	2135.0000	1920.0000	12111.0000*	494.0000	505.0000
NORA	10	-96.5353	113.5353	1736.0000	926.0000	370.0000	370.0000	13237.0000	17.0000	120.0000
GFAL	11	-262.9614 *	1667.9614	32752.0000**	16590.0000**	7540.0000	9130.0000**	14653.0000	1405.0000	1580.0000**
SDLE	12	-94.4009	447.4009	8390.0000	4318.0000	1910.0000	1825.0000	11752.0000*	353.0000	520.0000
BAVE	13	-168.6980	386.6980	8099.0000	4260.0000	1630.0000	1840.0000	14477.0000	218.0000	385.0000
HAMP	14	-68.2988	136.2988	2276.0000	1250.0000	475.0000	400.0000	13799.0000	68.0000	200.0000
DELA	15	-32.8594	517.8594	9941.0000	5176.0000	2235.0000	2385.0000	12429.0000	485.0000	505.0000
PASA	16	-55.9022	169.9022	2624.0000	1315.0000	630.0000	835.0000	15918.0000*	114.0000	180.0000
CBRK	17	-73.8711	1795.8711	34459.0000**	173		10910.0000***	1326 .00	1 2 .(0	1720.0000**
SVLE	18	159.5347	835.4653	16776.0000	8465.0000	3700.0000	4195.0000	13755.0000	995.0000	920.0000
ST.G	19	-39.5818	191.5818	3339.0000	1720.0000	730.0000	505.0000	13616.0000	152.0000	185.0000
ROBS	20	42.1133	143.8867	2044.0000	1075.0000	510.0000	475.0000	13777.0000	186.0000	145.0000
DUYS	21	-11.9707	144.9707	2488.0000	1315.0000	515.0000	495.0000	13777.0000	133.0000	155.0000
PAB	22	611.4531 ***	552.5469	10503.0000	5420.0000	395.0000	3145.0000	15289.0000	[illegible]	360.0000

x 2

FOR TRIP ATTRACTIONS : (22 ZONE MODEL)

WITH MISSING VALUES.
OM THE MEAN IS DENOTED BY UP TO 3 ASTERISKS TO THE RIGHT

THAN THREE ASTERISKS.

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P. PL.P. (15)	2 POP.M. 8 AVE. HI.	3 DWEL. 9 X(9)	4 O. DWEL. 12 X(12)	5 LAB.F. 13 X(13)	6 LAB.FM. 14 X(14)
0000	833.0000	365.0000	331.0000	490.0000	332.0000
0000	16865.0000**	159.0000	777.0000	34.0000	158.0000
0000*					
0000	5215.0000	2255.0000	1905.0000	3045.0000	2100.0000
0000	13447.0000	469.0000	4908.0000	350.0000	945.0000
0000					
0000	3675.0000	1605.0000	1495.0000	2000.0000	1495.0000
.0000	15780.0000*	366.0000	3460.0000	110.0000	505.0000
0000					
0000	6768.0000	3325.0000	3005.0000	3745.0000	2685.0000
0000	12773.0000	900.0000	6505.0000	320.0000	1060.0000
0000					
0000	2405.0000	1165.0000	1090.0000	1275.0000	930.0000
0000	12352.0000	86.0000	2287.0000	75.0000	345.0000
0000					
0000	2670.0000	1290.0000	1195.0000	1425.0000	1070.0000
0000	11254.0000*	254.0000	2488.0000	95.0000	355.0000
0000					
0000	4035.0000	1635.0000	1520.0000	1830.0000	1405.0000
0000	11576.0000*	354.0000	3844.0000	115.0000	425.0000
0000					
0000	9470.0000	4510.0000*	3495.0000	6030.0000	4110.0000
0000	13895.0000	1274.0000*	9223.0000	1015.0000*	1920.0000
0000					
0000	4757.0000	2135.0000	1930.0000	2425.0000	1740.0000
0000	12111.0000*	494.0000	4617.0000	205.0000	685.0000
0000					
0000	926.0000	370.0000	340.0000	490.0000	380.0000
0000	13237.0000	17.0000*	810.0000	30.0000	110.0000
0000					
0000**	16590.0000**	7540.0000**	6030.0000**	10710.0000**	7445.0000**
0000**	14653.0000	1405.0000*	16162.0000**	1510.0000**	3265.0000**
0000**					
0000	4318.0000	1910.0000	1685.0000	2345.0000	1790.0000
0000	11752.0000*	353.0000	4072.0000	225.0000	555.0000
0000					
0000	4260.0000	1630.0000	1325.0000	2225.0000	1630.0000
0000	14477.0000	218.0000	3839.0000	305.0000	595.0000
0000					
0000	1250.0000	475.0000	455.0000	600.0000	470.0000
0000	13799.0000	68.0000	1026.0000	20.0000	130.0000
0000					
0000	5176.0000	2235.0000	1965.0000	2890.0000	2060.0000
0000	12429.0000	485.0000	4765.0000	270.0000	830.0000
0000					
0000	1315.0000	630.0000	502.0000	1015.0000	684.0000
0000	15918.0000*	114.0000	1309.0000	128.0000	331.0000
0000					
0000**	17325.0000**	8130.0000**	6423.0000**	12630.0000***	8201.0000**
0000***	13267.0000	1722.0000**	17134.0000**	1707.0000**	4429.0000***
0000**					
0000	8465.0000	3700.0000	2445.0000	5115.0000	3390.0000
0000	13755.0000	995.0000	8311.0000	1255.0000*	1725.0000
0000					
0000	1720.0000	730.0000	650.0000	690.0000	550.0000
0000	13616.0000	152.0000	1619.0000	80.0000	140.0000
0000					
0000	1075.0000	510.0000	480.0000	620.0000	460.0000
0000	13777.0000	186.0000	969.0000	30.0000	160.0000
0000					
0000	1315.0000	515.0000	490.0000	650.0000	470.0000
0000	13777.0000	133.0000	1173.0000	25.0000	180.0000
0000					
0000	5420.0000	2395.0000	2130.0000	3505.0000	2615.0000
0000	15289.0000*	1164.0000*	5083.0000	265.0000	890.0000
0000					

1of

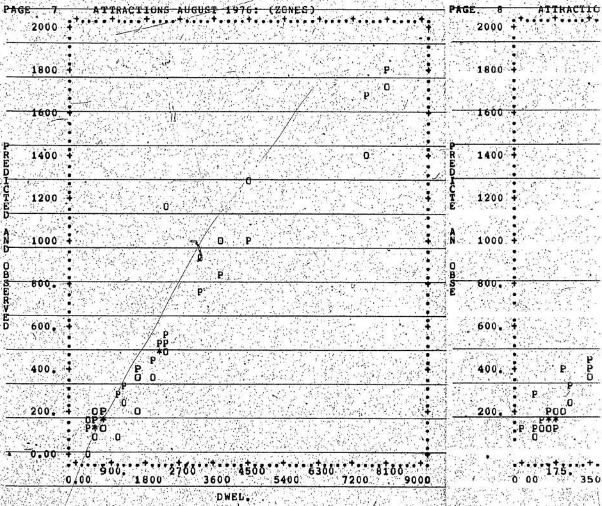
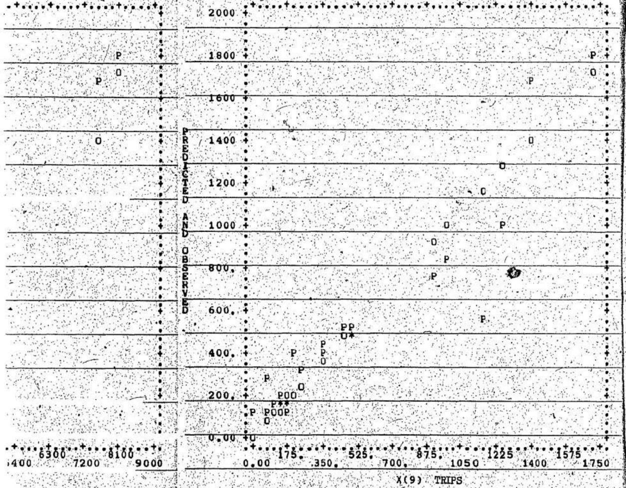


FIGURE B - 9 PREDICTED AND OBSERVED TRIP ATTRACTIONS VS. DWELLING UNITS FOR (22 - ZONE

2 of 2

PAGE 8 ATTRACTIONS AUGUST 1976: (ZONES)



TRIP ATTRACTIONS VS. DWELLING UNITS FOR (22 - ZONE MODEL)

400 - 419 ********************

TABLE B-24 95% CONFIDENCE INTERVAL CALCULATIONS FOR THE MEAN VALUES OF THE DEPENDENT VARIABLE ON THE REGRESSION LINE USING 22 ZONES

$\bar{X} = 2230 \qquad S^2_Y = 35757.3 \qquad t_{.05,20} = 2.086$

ZONE NO.	$(X - \bar{X})^2$	$\hat{Y}$	$\frac{(X - \bar{X})^2}{\Sigma(X - \bar{X})^2} + \frac{1}{n}$	$S^2_{\hat{Y}}$	$S_{\hat{Y}}$	$\pm tS_{\hat{Y}}$	$\hat{Y} + t S_{\hat{Y}}$	$\hat{Y} - t S_{\hat{Y}}$
1	3,478,225	126	0.07984	2854.897	53.4312	111.4576	236.4576	13.5424
2	625	518	0.04348	1554.899	39.4322	82.2556	600.2556	435.7444
3	590625	383	0.04756	1700.689	41.2394	86.0254	469.0254	296.9746
4	1199025	740	0.05602	2002.885	44.75360	93.3560	833.3560	646.6440
5	1134225	291	0.0553	1978.662	44.4821	92.7898	383.7897	198.2102
6	883600	317	0.05271	1884.9730	43.4163	90.5663	407.5663	226.4336
7	354025	389	0.04718	1678.0070	41.0732	85.6787	474.6787	303.3213
8	5198400	986	0.09782	3497.9334	59.1433	1123.3729	1109.3729	862.6270
9	9025	493	0.04357	1558.0390	39.4720	82.3386	575.3386	410.6614
10	3459600	126	0.0796	2847.9344	53.3660	111.3216	237.3216	14.6784
11	2,196,100	1616	0.03383	12094.9441	109.9770	229.4121	1845.4120	1386.5880
12	102400	446	0.04455	1592.9444	39.9117	83.2558	529.2558	362.7442
13	860000	328	0.0472	1689.2406	41.1004	85.7354	473.7354	302.2646
14	3180,025	148	0.07672	2743.4236	52.3777	109.2599	557.2599	38.7401
15	25	514	0.04348	1554.6746	39.4294	82.2496	596.2496	431.7503
16	4560000	180	0.07024	2511.6456	50.1163	104.5426	284.5426	75.4579
17	31,810,000	1739	0.40740	14567.3551	120.6952	251.7704	1990.7704	1487.2296
18	2,160,900	818	0.06607	2362.4538	48.9465	101.3901	919.3901	716.6098
19	2,250000	201	0.0670	2395.6712	51.5808	107.5975	303.1024	98.8976
20	2958400	155	0.07440	2660.5756	51.5185	107.4676	262.5975	47.4025
21	2941225	156	0.07423	2654.1553	39.5581	82.5182	263.4676	48.5324
22	27225	547	0.04376	1564.8425			629.5182	464.4818

APPENDIX 'C'

This appendix contains the tabular and graphical output of the trip distribution computer program. It consists of material regarding calibration of the gravity model on the basis of 1976 O-D passenger data. Included also are the results obtained through chi-square testing.

TABLE C-1 ROADCRUISER COMMUNITY STOPS ZONE NUMBERS AND ROUTE DISTANCE

COMMUNITY STOP (NODE)	ZONE NUMBER	WEST DIRECTION DISTANCE (KM)	EAST DIRECTION DISTANCE (KM)
ST JOHN'S	1	0	904
HOLYROOD	2	45	866
WHITBOURNE	3	84	798
COME BY CHANCE	4	148	762
CLARENVILLE	5	187	737
PORT BLANDFORD	6	217	687
GLOVERTOWN	7	275	661
GAMBO	8	293	639
GANDER	9	331	594
LEWISPORTE	10	378	542
NORRIS ARM	11	389	521
GRAND FALLS	12	428	428
SPRINGDALE	13	521	389
BAIE VERTE	14	542	378
HAMPDEN	15	594	331
DEER LAKE	16	639	293
PASADENA	17	661	275
CORNER BROOK	18	687	217
STEPHENVILLE	19	737	187
ST GEORGE'S	20	762	148
ROBINSONS	21	798	84
DOYLES	22	866	45
PORT AUX BASQUES	23	904	0

TABLE C - 2 DISTANCE IN KILOMETERS BETWEEN ZONE NODES: (SKIM TREE TABLE)

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
											KILOMETERS					
1	0	45	84	148	187	217	275	293	331	378	389	428	521	542	594	639
2	45	0	39	103	142	172	230	248	286	333	344	383	476	497	549	594
3	84	39	0	64	103	133	191	209	247	294	305	344	437	458	510	555
4	148	103	64	0	39	69	127	145	183	230	241	280	373	394	446	491
5	187	142	103	39	0	30	88	106	144	191	202	241	334	355	407	452
6	217	172	133	69	30	0	58	76	114	161	172	211	304	325	377	422
7	275	230	191	127	88	58	0	18	56	103	114	153	246	267	319	364
8	293	248	209	145	106	76	18	0	38	85	96	135	228	249	301	346
9	331	286	247	183	144	114	56	38	0	47	58	97	190	211	263	308
10	378	333	294	230	191	161	103	85	47	0	11	50	143	164	216	261
11	389	344	305	241	202	172	114	96	58	11	0	39	132	153	205	250
12	428	383	344	280	241	211	153	135	97	50	39	0	93	114	166	211
13	521	476	437	373	334	304	246	228	190	143	132	93	0	21	73	118
14	542	497	458	394	355	325	267	249	211	164	153	114	21	0	52	97
15	594	549	510	446	407	377	319	301	263	216	205	166	73	52	0	45
16	639	594	555	491	452	422	364	346	308	261	250	211	118	97	45	0
17	661	616	577	513	474	444	386	368	330	283	272	233	140	119	67	22
18	687	642	603	539	500	470	412	394	356	309	298	259	166	145	93	48
19	737	692	653	589	550	520	462	444	406	359	348	309	216	195	143	98
20	762	717	678	614	575	545	487	469	431	384	363	334	241	220	158	123
21	798	753	714	650	611	581	523	505	467	420	409	370	277	256	204	159
22	866	821	782	718	679	649	591	573	612	488	477	438	345	324	272	227
23	904	859	820	756	717	687	629	611	650	526	515	476	383	362	310	265

NODES: (SKIM TREE TABLE)

0	11	12	13	14	15	16	17	18	19	20	21	22	23
	KILOMETERS												
8	389	428	521	542	594	639	661	687	737	762	798	866	904
3	344	383	476	497	549	594	616	642	692	717	753	821	859
4	305	344	437	458	510	555	577	603	653	678	714	782	820
0	241	280	373	394	446	491	513	539	589	614	650	718	756
1	202	241	334	355	407	452	474	500	550	575	611	679	717
1	172	211	304	325	377	422	444	470	520	545	581	649	687
3	114	153	246	267	319	364	386	412	462	487	523	591	629
5	96	135	228	249	301	346	368	394	444	469	505	573	611
7	58	97	190	211	263	308	330	356	406	431	467	612	650
0	11	50	143	164	216	261	283	309	359	384	420	488	526
1	0	39	132	153	205	250	272	298	348	363	409	477	515
0	39	0	93	114	166	211	233	259	309	334	370	438	476
3	132	93	0	21	73	118	140	166	216	241	277	345	383
4	153	114	21	0	52	97	119	145	195	220	256	324	362
6	205	166	73	52	0	45	67	93	143	158	204	272	310
1	250	211	118	97	45	0	22	48	98	123	159	227	265
3	272	233	140	119	67	22	0	26	76	101	137	205	243
	298	259	166	145	93	48	26	0	50	75	111	179	217
	348	309	216	195	143	98	76	50	0	25	61	129	267
	363	334	241	220	158	123	101	75	25	0	36	104	142
	409	370	277	256	204	159	137	111	61	36	0	68	106
	477	438	345	324	272	227	205	179	129	104	68	0	38
	515	476	383	362	310	265	243	217	167	142	106	38	0

2of2

TABLE C - 3   ROADCRUISER PASSENGER OD SURVEY TRIP DATA FOR ZONES AUGUST 1976

TO ZONE / FROM ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
										NUMBER OF TRIPS						
1	0	0	115	115	360	45	124	116	330	153	1	459	60	87	8	101
2	5	0	1	1	3	11	35	1	18	1	0	19	2	0	0	8
3	111	1	0	4	0	14	6	9	79	2	26	38	15	9	8	9
4	154	3	0	0	12	3	3	15	39	15	0	23	10	6	3	8
5	367	1	15	17	0	12	14	23	95	16	0	87	21	5	4	22
6	34	0	6	3	6	0	0	5	12	4	0	8	2	0	0	1
7	119	1	19	6	6	0	0	10	19	2	0	29	1	4	0	6
8	130	0	19	17	15	5	31	0	50	6	0	18	8	7	2	11
9	390	15	53	26	118	18	38	81	0	37	1	174	25	8	2	50
10	171	3	21	13	18	0	13	9	44	0	0	29	25	14	1	28
11	1	0	0	0	2	0	0	0	0	0	0	6	0	1	0	0
12	478	18	44	22	76	6	12	28	136	34	7	0	71	42	10	48
13	77	0	11	16	18	0	2	1	33	11	0	94	0	4	0	18
14	62	0	8	3	2	0	0	11	10	16	1	46	3	0	5	10
15	15	0	6	2	3	0	3	4	0	11	0	10	1	0	0	6
16	97	5	29	9	24	0	7	24	51	27	0	89	25	9	0	0
17	7	1	11	0	2	3	0	16	12	10	0	19	6	0	0	7
18	326	5	61	24	95	1	16	18	114	54	0	232	78	21	4	64
19	262	14	24	1	0	3	6	10	41	40	0	80	44	7	12	44
20	12	0	4	2	0	0	0	0	1	0	1	8	0	0	0	2
21	7	0	1	0	2	0	0	0	3	0	0	5	1	0	0	0
22	10	0	1	4	2	0	0	2	0	0	0	12	1	0	0	3
23	207	1	23	31	43	0	2	8	83	25	3	224	23	16	1	18
TOTAL PROD.	3042	68	472	316	807	121	312	391	1170	464	40	1709	422	240	60	464

SUM SQS. = 2028899.   AVERAGE = 27.   VARIANCE = 3835.35   STD. DEV. =

10f

DATA FOR ZONES AUGUST 1976

0	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL ATTR.
UMBER OF TRIPS														
3	1	459	60	87	8	101	6	343	253	7	13	14	239	2949
1	0	19	2	0	0	8	3	30	15	0	0	0	6	159
2	26	38	15	9	8	9	4	4	87	7	1	1	34	469
15	0	23	10	6	3	8	3	18	19	0	0	5	27	366
16	0	87	21	5	4	22	3	106	47	0	6	0	39	900
4	0	8	2	0	0	1	0	5	0	0	0	0	0	86
2	0	29	1	4	0	6	11	17	4	0	0	0	0	254
6	0	18	8	7	2	11	0	23	1	0	0	3	8	354
37	1	174	25	8	2	50	3	121	55	2	0	0	57	1274
0	0	29	25	14	1	28	2	40	34	0	0	0	29	494
0	0	6	0	1	0	0	0	5	0	0	0	0	2	17
34	7	0	71	42	10	48	7	249	82	4	0	1	30	1405
11	0	94	0	4	0	18	5	34	13	0	3	1	12	353
16	1	46	3	0	5	10	3	15	5	11	2	0	5	218
11	0	10	1	0	0	6	0	6	0	0	1	0	0	68
27	0	89	25	9	0	0	4	17	28	3	1	3	33	485
10	0	19	6	0	0	7	0	7	1	0	0	3	9	114
54	0	232	78	21	4	64	5	0	69	53	37	39	406	1722
40	0	80	44	7	12	44	5	19	0	123	73	23	164	995
0	1	8	0	0	0	2	2	52	43	0	7	1	17	152
0	0	5	1	0	0	0	1	56	69	10	0	4	27	186
0	0	12	1	0	0	3	0	36	44	0	6	0	12	133
25	3	224	23	16	1	18	8	155	185	30	54	24	0	1164
64	40	1709	422	240	60	464	75	1358	1054	250	204	122	1156	14317

= 3835.35 STD. DEV. = 61.93 COEFFT. OF VARIATION = 2.29

2 of 2

190

PRINTED IN CANADA

R. L. CRAIN LIMITED

TABLE C-4 ROADCRUISER PASSENGER OD SURVEY TRIP DATA: EXPECTED CELL FREQUENCIES

TO ZONE/ FROM ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
										NUMBER OF TRIPS						
1	627.	14.	97.	65.	166.	25.	64.	81.	241.	96.	8.	352.	87.	49.	12.	96.
2	34.	1.	5.	4.	9.	1.	3.	4.	13.	5.	0.	19.	5.	3.	1.	5.
3	100.	2.	15.	10.	26.	4.	10.	13.	38.	15.	1.	56.	14.	8.	2.	15.
4	78.	2.	12.	8.	21.	3.	8.	10.	30.	12.	1.	44.	11.	6.	2.	12.
5	191.	4.	30.	20.	51.	8.	20.	25.	74.	29.	3.	107.	27.	15.	4.	29.
6	18.	0.	3.	2.	5.	1.	2.	2.	7.	3.	0.	10.	3.	1.	0.	3.
7	54.	1.	8.	6.	14.	2.	6.	7.	21.	8.	1.	30.	7.	4.	1.	8.
8	75.	2.	12.	8.	20.	3.	8.	10.	29.	11.	1.	42.	10.	6.	1.	11.
9	271.	6.	42.	28.	72.	11.	28.	35.	104.	41.	4.	152.	38.	21.	5.	41.
10	105.	2.	16.	11.	28.	4.	11.	13.	40.	16.	1.	59.	15.	8.	2.	16.
11	4.	0.	1.	0.	1.	0.	0.	0.	1.	1.	0.	2.	1.	0.	0.	1.
12	299.	7.	46.	31.	79.	12.	31.	38.	115.	46.	4.	168.	41.	24.	6.	46.
13	75.	2.	12.	8.	20.	3.	8.	10.	29.	11.	1.	42.	10.	6.	1.	11.
14	46.	1.	7.	5.	12.	2.	5.	6.	18.	7.	1.	26.	6.	4.	1.	7.
15	14.	0.	2.	2.	4.	1.	1.	2.	6.	2.	0.	8.	2.	1.	0.	2.
16	103.	2.	16.	11.	27.	4.	11.	13.	40.	16.	1.	58.	14.	8.	2.	16.
17	24.	1.	4.	3.	6.	1.	2.	3.	9.	4.	0.	14.	3.	2.	0.	4.
18	366.	8.	57.	38.	97.	15.	38.	47.	141.	56.	5.	206.	51.	29.	7.	56.
19	211.	5.	33.	22.	56.	8.	22.	27.	81.	32.	3.	119.	29.	17.	4.	32.
20	32.	1.	5.	3.	9.	1.	3.	4.	12.	5.	0.	18.	4.	3.	1.	5.
21	40.	1.	6.	4.	10.	2.	4.	5.	15.	6.	1.	22.	5.	3.	1.	6.
22	28.	1.	4.	3.	7.	1.	3.	4.	11.	4.	0.	16.	4.	2.	1.	4.
23	247.	6.	38.	26.	66.	10.	25.	32.	95.	38.	3.	139.	34.	20.	5.	38.
TOTAL	3042.	68.	472.	316.	807.	121.	312.	391.	1170.	464.	40.	1709.	422.	240.	60.	464.

DATA: EXPECTED CELL FREQUENCIES (CONTINGENCY TABLE)

0	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
UMBER OF TRIPS														
.	8.	352.	87.	49.	12.	96.	15.	280.	217.	51.	42.	25.	238.	2949.
.	0.	19.	5.	3.	1.	5.	1.	15.	12.	3.	2.	1.	13.	159.
.	1.	56.	14.	8.	2.	15.	2.	44.	35.	8.	7.	4.	38.	469.
.	1.	44.	11.	6.	2.	12.	2.	35.	27.	6.	5.	3.	30.	366.
.	3.	107.	27.	15.	4.	29.	5.	85.	66.	16.	13.	8.	73.	900.
.	0.	10.	3.	1.	0.	3.	0.	8.	6.	2.	1.	1.	7.	86.
.	1.	30.	7.	4.	1.	8.	1.	24.	19.	4.	4.	2.	21.	254.
.	1.	42.	10.	6.	1.	11.	2.	34.	26.	6.	5.	3.	29.	354.
.	4.	152.	38.	21.	5.	41.	7.	121.	94.	22.	18.	11.	103.	1274.
.	1.	59.	15.	8.	2.	16.	3.	47.	36.	9.	7.	4.	40.	494.
.	0.	2.	1.	0.	0.	1.	0.	2.	1.	0.	0.	0.	1.	17.
.	4.	168.	41.	24.	6.	46.	7.	133.	103.	25.	20.	12.	113.	1405.
.	1.	42.	10.	6.	1.	11.	2.	33.	26.	6.	5.	3.	29.	353.
.	1.	26.	6.	4.	1.	7.	1.	21.	16.	4.	3.	2.	18.	218.
.	0.	8.	2.	1.	0.	2.	0.	6.	5.	1.	1.	1.	5.	68.
.	1.	58.	14.	8.	2.	16.	3.	46.	36.	8.	7.	4.	39.	485.
.	0.	14.	3.	2.	0.	4.	1.	11.	8.	2.	2.	1.	9.	114.
.	5.	206.	51.	29.	7.	56.	9.	163.	127.	30.	25.	15.	139.	1722.
.	3.	119.	29.	17.	4.	32.	5.	94.	73.	17.	14.	9.	80.	995.
.	0.	18.	4.	3.	1.	5.	1.	14.	11.	3.	2.	1.	12.	152.
.	1.	22.	5.	3.	1.	6.	1.	18.	14.	3.	3.	2.	15.	186.
.	0.	16.	4.	2.	1.	4.	1.	13.	10.	2.	2.	1.	11.	133.
.	3.	139.	34.	20.	5.	38.	6.	110.	86.	20.	17.	10.	94.	1164.
.	40.	1709.	422.	240.	60.	464.	75.	1358.	1054.	250.	204.	122.	1156.	14317.

2 of 2

TABLE C - 5 ROADCRUISER PASSENGER OD TRIP DATA BY DISTANCE CLASSES

DISTANCE CLASS (KM)	NUMBER OF TRIPS	PERCENT OF TOTAL	DISTANCE CLASS (KM)	NU OF
0 - 19	41.	0.29	500 - 519	[illegible]
20 - 39	442.	3.09	520 - 539	2
40 - 59	387.	2.70	540 - 559	2
60 - 79	284.	1.98	560 - 579	
80 - 99	837.	5.85	580 - 599	
100 - 119	413.	2.88	600 - 619	[illegible]
120 - 139	148.	1.03	620 - 639	2
140 - 159	693.	4.84	640 - 659	2
160 - 179	437.	3.05	660 - 679	
180 - 199	921.	6.43	680 - 699	6
200 - 219	912.	6.37	700 - 719	
220 - 239	105.	0.73	720 - 739	5
240 - 259	817.	5.71	740 - 759	
260 - 279	523.	3.65	760 - 779	1
280 - 299	319.	2.23	780 - 799	
300 - 319	395.	2.76	800 - 819	
320 - 339	790.	5.52	820 - 839	
340 - 359	435.	3.04	840 - 859	
360 - 379	406.	2.84	860 - 879	
380 - 399	135.	0.94	880 - 899	
400 - 419	136.	0.95	900 - 919	4
420 - 439	980.	6.85	920 - 939	
440 - 459	82.	0.57	940 - 959	
460 - 479	280.	1.96	960 - 979	
480 - 499	17.	0.12	980 - 999	

1 of

BY DISTANCE CLASSES

DISTANCE CLASS (KM)	NUMBER OF T9IPS	PERCENT OF TOTAL
500 - 519	22.	0.15
520 - 539	233.	1.63
540 - 559	234.	1.63
560 - 579	20.	0.14
580 - 599	56.	0.39
600 - 619	95.	0.66
620 - 639	200.	1.40
640 - 659	286.	2.00
660 - 679	26.	0.18
680 - 699	698.	4.88
700 - 719	93.	0.65
720 - 739	515.	3.60
740 - 759	58.	0.41
760 - 779	19.	0.13
780 - 799	22.	0.15
800 - 819	0.	0.0
820 - 839	0.	0.0
840 - 859	7.	0.05
860 - 879	24.	0.17
880 - 899	0.	0.0
900 - 919	446.	3.12
920 - 939	0.	0.0
940 - 959	0.	0.0
960 - 979	0.	0.0
980 - 999	0.	0.0

2 of 2

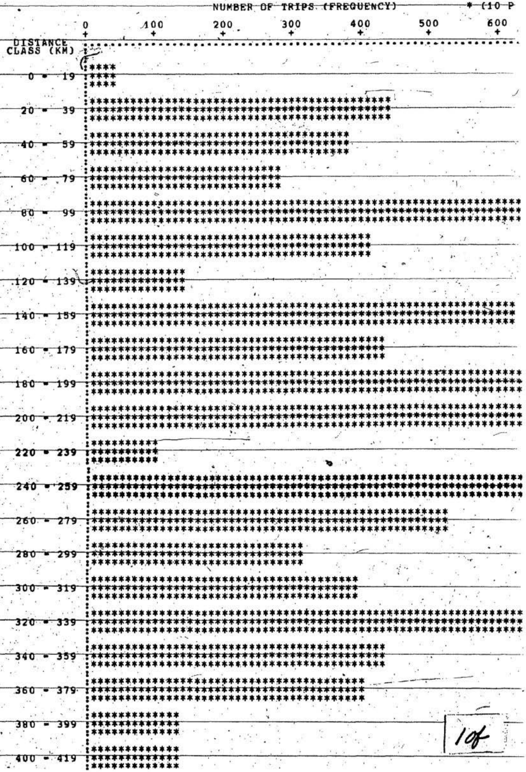


FIGURE G-1 TRIP LENGTH FREQUENCY DISTRIBUTION FOR O-D DATA

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R OF TRIPS (FREQUENCY)
* (10 PASSENGERS)
300
400
500
600
700
800
900
1000

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400 - 419 :*************
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440 - 459 :********
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460 - 479 :***************************
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480 - 499 :*
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500 - 519 :**
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520 - 539 :***********************
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540 - 559 :***********************
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560 - 579 :**
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580 - 599 :*****
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600 - 619 :*********
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620 - 639 :*******************
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640 - 659 :****************************
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660 - 679 :**
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680 - 699 :***************************************************************
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700 - 719 :*********
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720 - 739 :**************************************************
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780 - 799 :**
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800 - 819 :
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820 - 839 :
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840 - 859 :
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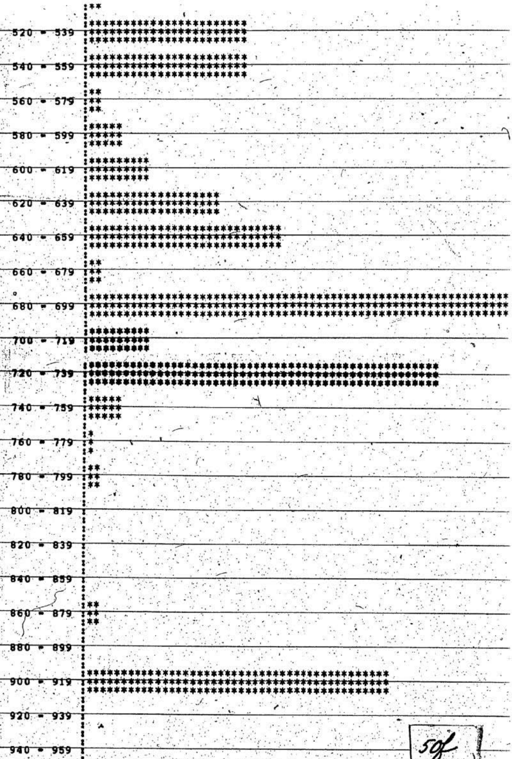

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6of6

TABLE C-6 ROADCRUISER PASSENGER OD SURVEY TRIP DATA (CONTINGENCY TABLE)

TO ZONE / FROM ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
										CELL VALUES CHI-SQUARE						
1	627.	14.**	3.	38.**	226.**	16.**	56.**	16.**	33.**	35.**	6.*	33.**	8.**	29.**	2.	0.
2	25.**	1.	3.	2.	4.*	~~69.~~	~~287.~~	3.	2.	3.	0.	0.	2.	3.	1.	2.
3	1.	1.	15.	4.*	26.**	~~25.~~	2.	1.	43.**	11.**	~~465.~~	6.*	0.	0.	~~19.~~	3.
4	75.**	1.	12.**	8.	4.*	0.	3.	3.	3.	1.	1.	10.**	0.	0.	1.	1.
5	162.**	3.	7.**	0.	51.	3.	2.	0.	6.*	6.*	3.	4.*	1.	7.**	0.	2.
6	14.**	0.	4.	1.	0.	1.	2.	3.	4.*	1.	0.	1.	0.	1.	0.	1.
7	78.**	0.	13.**	0.	5.*	2.	6.	1.	0.	5.*	1.	0.	6.*	0.	1.	1.
8	40.**	2.	5.*	11.**	1.	1.	70.**	10.	15.**	3.	1.	14.**	1.	0.	0.	0.
9	53.**	13.**	3.	0.	30.**	5.*	4.*	61.**	104.	0.	2.	3.	4.*	8.**	2.	2.
10	42.**	0.	1.	0.	3.	4.	0.	1.	0.	16.	1.	15.**	7.**	4.*	1.	9.**
11	2.	0.	1.	0.	1.	0.	0.	0.	1.	1.	0.	8.	1.	2.	0.	1.
12	108.**	19.**	0.	3.	0.	3.	11.**	3.	4.*	3.	2.	168.	21.**	14.**	3.	0.
13	0.	2.	0.	9.**	0.	3.	4.*	8.**	1.	0.	1.	64.**	10.	1.	1.	4.*
14	5.*	1.	0.	1.	9.**	2.	5.*	4.*	3.	11.**	0.	15.**	2.	4.	~~18.~~	1.
15	0.	0.	6.	0.	0.	1.	2.	2.	6.*	~~35.~~	0.	0.	1.	1.	0.	7.**
16	0.	3.	11.**	0.	0.	4.	1.	9.**	3.	8.**	1.	17.**	8.**	0.	2.	16.
17	12.**	0.	~~14.~~	3.	3.	4.	2.	~~53.~~	1.	~~11.~~	0.	2.	2.	2.	0.	3.
18	4.*	1.	0.	5.*	0.	13.**	12.**	18.**	5.*	0.	5.*	3.	15.**	2.	1.	1.
19	12.**	18.**	2.	20.**	56.**	3.	11.**	11.**	20.**	2.	3.	13.**	7.**	6.*	15.**	4.*
20	13.**	1.	0.	1.	9.**	1.	3.	4.	11.**	5.*	1.	6.*	4.	3.	1.	2.
21	27.**	1.	4.*	4.	7.**	2.	4.	5.*	10.**	6.*	1.	13.**	4.*	3.	1.	6.*
22	12.**	1.	3.	0.	4.*	1.	3.	1.	11.**	4.	0.	1.	2.	2.	1.	0.
23	7.**	4.*	6.*	1.	8.**	10.**	22.**	18.**	2.	4.*	0.	52.**	4.*	1.	3.	10.**
TOTAL	1317.	86.	115.	111.	447.	174.	512.	235.	287.	171.	496.	447.	110.	92.	73.	75. 1

$\chi^2_{0.99,484} = 584$ $\chi^2_{0.99,1} = 6.63$ $\chi^2_{0.95,1} = 3.84$

104

P DATA (CONTINGENCY TABLE)

0	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
L VALUES CHI-SQUARE														
.**	6.*	33.**	8.**	29.**	2.	0.	6.*	14.**	6.*	38.**	20.**	5.*	0.	1230.
,	0.	0.	2.	3.	1.	2.	6.	15.**	1.	3.	2.	1.	4.*	437.
.**	~~465.~~	6.*	0.	0.	~~19.~~	3.	1.	37.**	80.**	0.	5.*	2.	0.	748.
.	1.	10.**	0.	0.	1.	1.	1.	8.**	2.	6.*	5.*	1.	0.	146.
.*	3.	4.*	1.	7.**	0.	2.	1.	5.*	6.*	16.**	4.*	8.**	16.**	309.
.	0.	1.	0.	1.	0.	1.	0.	1.	6.*	2.	1.	1.	7.**	50.
.*	1.	0.	6.*	0.	1.	1.	~~70.~~	2.	12.**	4.	4.	2.	21.**	233.
.	1.	14.**	1.	0.	0.	0.	2.	3.	24.**	6.*	5.*	0.	15.**	229.
.	2.	3.	4.*	8.**	2.	2.	2.	0.	16.**	18.**	18.**	11.**	20.**	381.
.	1.	15.**	7.**	4.*	1.	9.**	0.	1.	0.	9.**	7.**	4.*	3.	131.
.	0.	8.	1.	2.	0.	1.	0.	2.	1.	0.	0.	0.	0.	27.
.	2.	168.	21.**	14.**	3.	0.	0.	101.**	4.*	17.**	20.**	10.**	61.**	576.
.	1.	64.**	10.	1.	1.	4.*	5.	0.	6.*	6.*	1.	1.	10.**	137.
.**	0.	15.**	2.	4.	18.	1.	3.	2.	8.*	14.	0.	2.	9.**	119.
	0.	0.	1.	1.	0.	7.**	0.	0.	5.*	1.	0.	1.	5.*	74.
.**	1.	17.**	8.**	0.	2.	16.	1.	18.**	2.	4.*	5.*	0.	1.	115.
.	0.	2.	2.	2.	0.	3.	1.	1.	7.**	2.	2.	4.	0.	130.
.	5.*	3.	15.**	2.	1.	1.	2.	163.	26.**	17.**	6.*	40.**	513.**	855.
.	3.	13.**	7.**	6.*	15.**	4.*	0.	60.**	73.	642.**	244.**	25.**	87.**	1335.
.*	1.	6.*	4.	3.	1.	2.	2.	98.**	90.**	3.	11.	0.	2.	268.
.*	1.	13.**	4.*	3.	1.	6.*	0.	83.**	223.**	14.	3.	4.	10.**	434.
.	0.	1.	2.	2.	1.	0.	1.	43.**	120.**	2.	9.	1.	0.	222.
.*	0.	52.**	4.*	1.	3.	10.**	1.	18.**	115.**	5.*	84.**	20.**	94.	487.
.	496.	447.	110.	92.	73.	75.	104.	682.	834.	830.	456.	144.	877.	8673.**

[illegible] 536.

$\chi^2_{0.95,1} = 3.84$

* (SIGNIFICANT AT 5% LEVEL)

** (SIGNIFICANT AT 1% LEVEL)

– (EXPECTED FREQUENCY < 5)

2 of 2

194

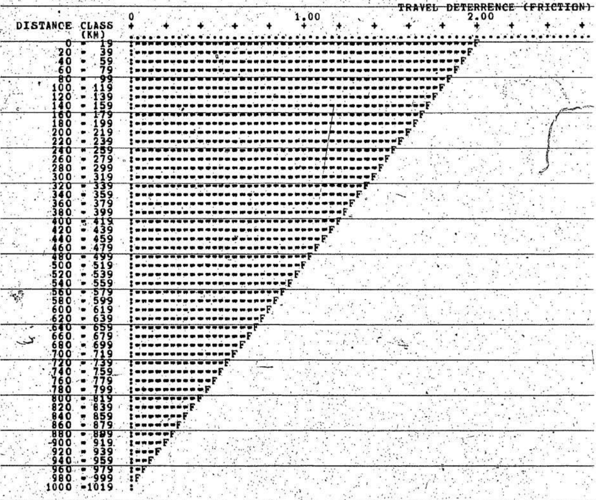
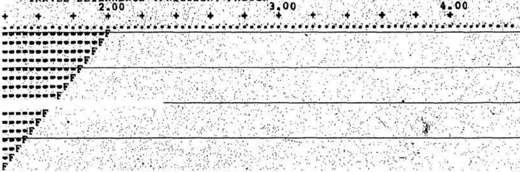


FIGURE C - 2 DISTANCE CLASS OVER TRAVEL DETERRENCE FACTOR (ITERATION NO. 1)

TRAVEL DETERRENCE (FRICTION) FACTOR



RENCE FACTOR (ITERATION NO. 1)

TABLE C - 7 TRIP DISTRIBUTION BY THE GRAVITY MODEL, ITERATION NO. 1

TO ZONE / FROM ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
										NUMBER OF TRIPS						
1	0.	22.	143.	84.	212.	28.	66.	81.	252.	86.	7.	315.	60.	32.	7.	56.
2	80.	0.	8.	5.	12.	2.	4.	5.	14.	5.	0.	18.	4.	2.	0.	3.
3	227.	3.	0.	15.	37.	5.	12.	14.	45.	15.	1.	57.	11.	6.	1.	11.
4	166.	3.	18.	0.	31.	4.	10.	12.	38.	13.	1.	50.	10.	5.	1.	9.
5	390.	6.	43.	29.	0.	10.	25.	31.	97.	33.	3.	125.	26.	14.	3.	25.
6	36.	1.	4.	3.	7.	0.	3.	3.	10.	3.	0.	13.	3.	1.	0.	2.
7	99.	2.	11.	7.	20.	3.	0.	10.	30.	10.	1.	40.	8.	4.	1.	8.
8	135.	2.	15.	10.	28.	4.	11.	0.	43.	15.	1.	57.	12.	6.	1.	11.
9	458.	7.	51.	35.	96.	14.	37.	48.	0.	55.	5.	214.	44.	24.	6.	44.
10	167.	3.	19.	13.	35.	5.	13.	17.	59.	0.	2.	87.	18.	10.	2.	18.
11	6.	0.	1.	0.	1.	0.	0.	1.	2.	1.	0.	3.	1.	0.	0.	1.
12	432.	7.	49.	34.	94.	13.	37.	47.	162.	61.	5.	0.	54.	30.	7.	55.
13	90.	1.	11.	8.	21.	3.	8.	11.	36.	14.	1.	59.	0.	8.	2.	16.
14	53.	1.	6.	4.	13.	2.	5.	6.	22.	8.	1.	36.	9.	0.	1.	10.
15	15.	0.	2.	1.	4.	1.	1.	2.	6.	2.	0.	10.	3.	2.	0.	3.
16	99.	2.	12.	8.	24.	3.	9.	12.	43.	16.	1.	71.	18.	11.	3.	0.
17	21.	0.	3.	2.	5.	1.	2.	3.	10.	4.	0.	16.	4.	2.	1.	5.
18	296.	5.	37.	28.	79.	11.	31.	41.	143.	55.	5.	240.	61.	35.	9.	81.
19	150.	2.	19.	14.	40.	6.	16.	21.	75.	30.	2.	128.	33.	19.	5.	45.
20	20.	0.	3.	2.	6.	1.	2.	3.	11.	4.	0.	19.	5.	3.	1.	7.
21	22.	0.	3.	2.	7.	1.	3.	4.	13.	5.	0.	22.	6.	3.	1.	8.
22	10.	0.	2.	1.	4.	1.	2.	2.	7.	3.	0.	14.	4.	2.	1.	5.
23	67.	1.	13.	10.	31.	4.	14.	18.	53.	25.	2.	116.	30.	18.	5.	42.
TOTAL	3042.	68.	472.	316.	807.	121.	312.	391.	1170.	464.	40.	1709.	422.	240.	60.	464.

SUM SQS. = 1495094. AVERAGE = 27. VARIANCE = 2826.26 STD. DEV. = 53.1

EL, ITERATION NO. 1

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
UMBER OF TRIPS														
.	7.	315.	60.	32.	7.	56.	8.	164.	108.	21.	16.	7.	62.	1835.
.	0.	18.	4.	2.	0.	3.	0.	10.	7.	1.	1.	0.	5.	187.
.	1.	57.	11.	6.	1.	11.	2.	32.	22.	5.	3.	2.	19.	546.
.	1.	50.	10.	5.	1.	9.	1.	30.	20.	4.	3.	2.	19.	451.
.	3.	125.	26.	14.	3.	25.	4.	80.	53.	11.	9.	5.	53.	1076.
.	0.	13.	3.	1.	0.	2.	0.	8.	6.	1.	1.	1.	5.	111.
.	1.	40.	8.	4.	1.	8.	1.	26.	18.	4.	3.	2.	19.	328.
.	1.	57.	12.	6.	1.	11.	2.	38.	25.	5.	4.	3.	28.	456.
.	5.	214.	44.	24.	6.	44.	7.	144.	98.	21.	17.	8.	90.	1521.
.	2.	87.	18.	10.	2.	18.	3.	59.	42.	9.	7.	4.	46.	638.
.	0.	3.	1.	0.	0.	1.	0.	2.	1.	0.	0.	0.	2.	23.
.	5.	0.	54.	30.	7.	55.	8.	182.	126.	27.	22.	13.	148.	1614.
.	1.	59.	0.	8.	2.	16.	2.	50.	36.	8.	6.	4.	43.	438.
.	1.	36.	9.	0.	1.	10.	2.	32.	23.	5.	4.	2.	27.	272.
.	0.	10.	3.	2.	0.	3.	0.	11.	7.	2.	1.	1.	9.	84.
.	1.	71.	18.	11.	3.	0.	4.	79.	57.	12.	10.	6.	70.	570.
.	0.	16.	4.	2.	1.	5.	0.	19.	14.	3.	2.	1.	17.	136.
.	5.	240.	61.	35.	9.	81.	13.	0.	211.	46.	38.	23.	267.	1753.
.	2.	128.	33.	19.	5.	45.	7.	162.	0.	28.	23.	14.	143.	985.
.	0.	19.	5.	3.	1.	7.	1.	24.	19.	0.	4.	2.	25.	163.
.	0.	22.	6.	3.	1.	8.	1.	28.	22.	5.	0.	3.	32.	192.
.	0.	14.	4.	2.	1.	5.	1.	19.	15.	3.	3.	0.	25.	124.
.	2.	116.	30.	18.	5.	42.	7.	159.	125.	28.	25.	18.	0.	813.
.	40.	1709.	422.	240.	60.	464.	75.	1358.	1054.	250.	204.	122.	1156.	14317.

= 2826.26 STD. DEV. = 53.16 COEFFT. OF VARIATION = 1.96

2 of 2

TABLE C - 8 DIFFERENCES BETWEEN OD TRIP DATA AND GRAVITY MODEL. ITERATION NO. 1

TO ZONE / FROM ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
									NUMBER OF TRIPS							
1	0.	-22.	-28.	31.	148.	17.	58.	35.	78.	67.	-6.	144.	0.	55.	1.	45.
2	-75.	0.	-7.	-4.	-9.	9.	31.	-4.	4.	-4.	-0.	1.	-2.	-2.	-0.	5.
3	-116.	-2.	0.	-11.	-37.	9.	-6.	-5.	34.	-13.	25.	-19.	4.	3.	7.	-2.
4	-12.	0.	-18.	0.	-19.	-1.	-7.	3.	1.	2.	-1.	-27.	0.	1.	2.	-1.
5	-23.	-5.	-28.	-12.	0.	2.	-11.	-8.	-2.	-17.	-3.	-38.	-5.	-9.	1.	-3.
6	-2.	-1.	2.	0.	-1.	0.	-3.	2.	2.	1.	-0.	-5.	-1.	-1.	-0.	-1.
7	20.	-1.	8.	-1.	-14.	-3.	0.	0.	-11.	-8.	-1.	-11.	-7.	-0.	-1.	-2.
8	-5.	-2.	4.	7.	-13.	1.	20.	0.	7.	-9.	-1.	-39.	-4.	1.	1.	-0.
9	-68.	8.	2.	-9.	22.	4.	1.	33.	0.	-18.	-4.	-40.	-19.	-16.	-4.	6.
10	4.	0.	2.	0.	-17.	-5.	-0.	-8.	-15.	0.	-2.	-58.	7.	4.	-1.	10.
11	-5.	-0.	-1.	-0.	1.	-0.	-0.	-1.	-2.	-1.	0.	3.	-1.	1.	-0.	-1.
12	46.	11.	-5.	-12.	-18.	-7.	-25.	-19.	-26.	-27.	2.	0.	17.	12.	3.	-7.
13	-13.	-1.	0.	8.	-3.	-3.	-6.	-10.	-3.	-3.	-1.	35.	0.	-4.	-2.	2.
14	9.	-1.	2.	-1.	-11.	-2.	-5.	5.	-12.	8.	0.	10.	-6.	0.	4.	0.
15	-0.	-0.	4.	1.	-1.	-1.	2.	2.	-6.	9.	-0.	-0.	-2.	-2.	0.	3.
16	-2.	3.	17.	1.	0.	-3.	-2.	12.	8.	11.	-1.	18.	7.	-2.	-3.	0.
17	-14.	1.	8.	-2.	-3.	2.	-2.	13.	2.	6.	-0.	3.	2.	-2.	-1.	2.
18	30.	0.	24.	-4.	16.	-10.	-15.	-23.	-29.	-1.	-5.	-8.	17.	-14.	-5.	-17.
19	112.	12.	5.	-13.	-40.	-3.	-10.	-11.	-34.	10.	-2.	-48.	11.	-12.	7.	-1.
20	-8.	-0.	1.	-0.	-6.	-1.	-2.	-3.	-10.	-4.	1.	-11.	-5.	-3.	-1.	-5.
21	-15.	-0.	-2.	-2.	-5.	-1.	-3.	-4.	-10.	-5.	-0.	-17.	-5.	-3.	-1.	-8.
22	-0.	-0.	-1.	3.	-2.	-1.	-2.	-0.	-7.	-3.	-0.	-2.	-3.	-2.	-1.	-2.
23	140.	-0.	10.	21.	12.	-4.	-12.	-10.	30.	-0.	1.	108.	-7.	-2.	-4.	-24.
TOTAL	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.

SUM SQS. = 392460. MEAN DIF. = -0. VARIANCE = 741.89 STD. DEV. = 27.24 M

D GRAVITY MODEL, ITERATION NO. 1

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
NUMBER OF TRIPS														
7.	-6.	144.	0.	55.	1.	45.	-2.	179.	145.	-14.	-3.	7.	177.	1114.
4.	-0.	1.	-2.	-2.	-0.	5.	3.	20.	8.	-1.	-1.	-0.	1.	-28.
3.	25.	-19.	4.	3.	7.	-2.	2.	-28.	65.	2.	-2.	-1.	15.	-77.
2.	-1.	-27.	0.	1.	2.	-1.	2.	-12.	-1.	-4.	-3.	3.	8.	-85.
.	-3.	-38.	-5.	-9.	1.	-3.	-1.	26.	-6.	-11.	-3.	-5.	-14.	-176.
1.	-0.	-5.	-1.	-1.	-0.	-1.	-0.	-3.	-6.	-1.	-1.	-1.	-5.	-25.
8.	-1.	-11.	-7.	-0.	-1.	-2.	10.	-9.	-14.	-4.	-3.	-2.	-19.	-74.
9.	-1.	-39.	-4.	1.	1.	-0.	-2.	-15.	-24.	-5.	-4.	0.	-20.	-102.
8.	-4.	-40.	-19.	-16.	-4.	6.	-4.	-23.	-43.	-19.	-17.	-8.	-33.	-247.
0.	-2.	-58.	7.	4.	-1.	10.	-1.	-19.	-8.	-9.	-7.	-4.	-17.	-144.
1.	0.	3.	-1.	1.	-0.	-1.	-0.	3.	-1.	-0.	-0.	-0.	0.	-6.
7.	2.	0.	17.	12.	3.	-7.	-1.	67.	-44.	-23.	-22.	-12.	-118.	-209.
3.	-1.	35.	0.	-4.	-2.	2.	3.	-16.	-23.	-8.	-3.	-3.	-31.	-85.
8.	0.	10.	-6.	0.	4.	0.	1.	-17.	-18.	6.	-2.	-2.	-22.	-54.
9.	-0.	-0.	-2.	-2.	0.	3.	-0.	-5.	-7.	-2.	-0.	-1.	-9.	-16.
1.	-1.	18.	7.	-2.	-3.	0.	0.	-62.	-29.	-9.	-9.	-3.	-37.	-85.
6.	-0.	3.	2.	-2.	-1.	2.	0.	-12.	-13.	-3.	-2.	2.	-8.	-22.
1.	-5.	-8.	17.	-14.	-5.	-17.	-8.	0.	-142.	7.	-1.	16.	139.	-31.
.	.	.	11.	-12.	7.	-1.	-2.	-143.	0.	95.	50.	9.	21.	10.
4.	1.	-11.	-5.	-3.	-1.	-5.	1.	28.	24.	0.	3.	-1.	-8.	-11.
.	-0.	-17.	-5.	-3.	-1.	-8.	-0.	28.	47.	5.	0.	1.	-5.	-6.
3.	-0.	-2.	-3.	-2.	-1.	-2.	-1.	17.	29.	-3.	3.	0.	-13.	9.
.	.	.	.	.	-4.	-24.	1.	-4.	60.	2.	29.	6.	0.	351.
).	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.

741.89 STD. DEV. = 27.24 M.S.E. = 810.87 ROOT M.S.E. = 28.48

2of2

TABLE C-9 CHI-SQUARE CELL VALUES BETWEEN THE OD TRIP DATA AND GRAVITY MODEL ITE

CHI-SQUARE VALUES

TO ZONE / FROM ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.	22.**	6.*	11.**	104.**	10.**	50.**	15.**	24.**	53.**	5.*	66.**	0.	92.**	0.	37.**
2	71.**	0.	6.*	3.	7.**	56.	259.	3.	1.	3.	0.	0.	1.	2.	0.	7.
3	60.**	2.	0.	8.**	37.**	17.**	3.	2.	26.**	12.**	502.	6.*	1.	1.	34.	0.
4	1.	0.	18.**	0.	12.**	0.	5.*	1.	0.	0.	1.	14.**	0.	0.	3.	0.
5	1.	4.*	18.**	5.*	0.	0.	5.*	2.	0.	9.**	3.	12.**	1.	6.*	0.	0.
6	0.	1.	1.	0.	0.	0.	3.	1.	1.	0.	0.	2.	0.	1.	0.	1.
7	4.*	0.	6.*	0.	10.**	3.	0.	0.	4.*	7.**	1.	3.	6.*	0.	1.	(
8	0.	2.	1.	5.*	6.*	0.	38.**	0.	1.	5.*	1.	27.**	1.	0.	0.	0.
9	10.**	9.**	0.	2.	5.*	1.	0.	24.**	0.	6.*	3.	8.**	8.**	11.**	2.	1.
10	0.	0.	0.	0.	9.**	5.*	0.	4.*	4.*	0.	2.	38.**	3.	2.	1.	6.*
11	4.*	0.	1.	0.	1.	0.	0.	1.	2.	1.	0.	3.	1.	1.	0.	1.
12	5.*	19.**	1.	5.*	3.	4.*	17.**	8.**	4.*	12.**	1.	0.	5.*	5.*	1.	1.
13	2.	1.	0.	10.**	0.	3.	5.*	9.**	0.	1.	1.	20.**	0.	2.	2.	0.
14	1.	1.	0.	0.	9.**	2.	5.*	3.	6.*	7.**	0.	3.	4.*	0.	11.	0.
15	0.	0.	10.	0.	0.	1.	2.	3.	6.*	30.	0.	0.	1.	2.	0.	2.
16	0.	8.	25.**	0.	0.	3.	1.	11.**	2.	7.**	1.	5.*	2.	0.	3.	0.
17	9.**	1.	26.	2.	2.	7.	2.	63.	1.	11.	0.	0.	1.	2.	1.	0.
18	3.	0.	16.**	0.	3.	9.**	8.**	13.**	6.*	0.	5.*	0.	5.*	6.*	3.	3.
19	83.**	54.	1.	12.**	40.**	1.	7.**	6.*	15.**	4.*	2.	18.**	3.	8.**	9.**	0.
20	3.	0.	1.	0.	6.*	1.	2.	3.	9.**	4.*	1.	6.*	5.*	3.	1.	3.
21	11.**	0.	1.	2.	3.	1.	3.	4.	7.**	5.*	0.	13.**	4.*	3.	1.	8.**
22	0.	0.	0.	5.	1.	1.	2.	0.	7.**	3.	0.	0.	2.	2.	1.	1.
23	295.**	0.	8.**	42.**	4.*	4.	10.**	6.*	17.**	0.	0.	101.**	2.	0.	3.	14.**
TOTAL	562.	125.	145.	114.	263.	130.	424.	179.	144.	179.	531.	346.	56.	149.	75.	87. 11

$\chi^2_{0.99,484}$ DEGREES=058/FREEDOM = ... $\chi^2_{0.99,1}$ = 6.63 ... $\chi^2_{0.95,1}$ = 3.84

10f

D TRIP DATA AND GRAVITY MODEL ITERATION NO. 1

HI-SQUARE VALUES

0	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
.			.		0.	37.**	0.	197.**	195.**	9.**	1.	7.**	503.**	1408.
3.	0.	0.	1.	2.	0.	7.	13.**	41.**	11.**	1.	1.	0.	0.	486.
.**	502.	6.*	1.	1.	24.	0.	4.	25.**	194.**	1.	2.	0.	12.**	944.
.	1.	14.**	0.	0.	3.	0.	2.	5.*	0.	4.	3.	6.	3.	79.
.**	3.	12.**	1.	6.*	0.	0.	0.	8.**	1.	11.**	1.	5.*	4.*	97.
.	0.	2.	0.	1.	0.	1.	0.	1.	6.*	1.	1.	1.	5.*	26.
.**	1.	3.	6.*	0.	1.	0.	70.	3.	11.**	4.	3.	2.	19.**	165.
.*	1.	27.**	1.	0.	0.	0.	2.	6.*	23.**	5.*	4.	0.	14.**	143.
.*	3.	8.**	8.**	11.**	2.	1.	2.	4.*	19.**	17.**	17.**	8.**	12.**	169.
0.	2.	38.**	3.	2.	1.	6.*	0.	6.*	1.	9.**	7.**	4.	7.**	108.
1.	0.	3.	1.	1.	0.	1.	0.	4.	1.	0.	0.	0.	0.	21.
2.**	1.	0.	5.*	5.*	1.	1.	0.	25.**	15.**	20.**	22.**	11.**	94.**	277.
1.	1.	20.**	0.	2.	2.	0.	3.	5.*	15.**	8.**	2.	2.	22.**	113.
7.**	0.	3.	4.*	0.	11.	0.	1.	9.**	14.**	7.	1.	2.	18.**	107.
	0.	0.	1.	2.	0.	2.	0.	2.	7.**	2.	0.	1.	9.**	78.
7.**	1.	5.*	2.	0.	3.	0.	0.	49.**	15.**	7.**	8.**	2.	19.**	167.
	0.	0.	1.	2.	1.	0.	0.	8.*	12.**	3.	2.	2.	4.*	158.
.	5.*	0.	5.*	6.*	3.	3.	5.*	0.	95.**	1.	0.	11.**	72.**	264.
4.*	2.	18.**	3.	6.**	9.**	0.	1.	127.**	0.	328.**	112.**	6.*	3.	840.
4.*	1.	6.*	5.*	3.	1.	3.	1.	32.**	30.**	0.	3.	1.	3.	118.
.*	0.	13.**	4.*	3.	1.	8.**	0.	27.**	98.**	5.*	0.	1.	1.	197.
3.	0.	0.	2.	2.	1.	1.	1.	15.**	57.**	3.	3.	0.	7.**	111.
0.	0.	101.**	2.	0.	3.	14.**	0.	0.	29.**	0.	32.**	2.	0.	569.
9.	531.	346.	56.	149.	75.	87.	114.	596.	849.	448.	225.	72.	832.	6645.**

$\chi^2_{0.95,1}$ VALUE = 3.84

* (SIGNIFICANT AT 5% LEVEL)
** (SIGNIFICANT AT 1% LEVEL)
– (EXPECTED FREQUENCY <5)

2 of 2

TABLE C—10 TRIPS BY DISTANCE CLASSES AND RELATED CHI-SQUARES (ITERATION NO. 1)

DISTANCE CLASS (KM)	NUMBER OF TRIPS OD SURVEY	MODEL	CHI-SQ.	PERCENT TOTAL TRIPS OD SURVEY	MODEL	CHI-SQ.
0 - 19	41.	23.	14.12	0.29	0.16	0.09
20 - 39	442.	346.	26.45	3.09	2.47	0.15
40 - 59	387.	985.	363.11	2.70	7.03	2.67
60 - 79	284.	194.	41.49	1.98	1.39	0.26
80 - 99	837.	1081.	55.22	5.85	7.72	0.46
100 - 119	413.	431.	0.76	2.88	3.08	0.01
120 - 139	148.	183.	6.80	1.03	1.31	0.06
140 - 159	693.	745.	3.70	4.84	5.32	0.04
160 - 179	437.	325.	38.93	3.05	2.32	0.23
180 - 199	921.	887.	1.30	6.43	6.33	0.00
200 - 219	912.	800.	15.59	6.37	5.71	0.08
220 - 239	105.	89.	2.87	0.73	0.64	0.02
240 - 259	817.	819.	0.00	5.71	5.85	0.00
260 - 279	523.	490.	2.23	3.65	3.50	0.01
280 - 299	319.	285.	4.18	2.23	2.03	0.02
300 - 319	395.	481.	15.29	2.76	3.43	0.13
320 - 339	790.	835.	2.40	5.52	5.96	0.03
340 - 359	435.	526.	15.75	3.04	3.76	0.14
360 - 379	406.	383.	1.43	2.84	2.73	0.00
380 - 399	135.	215.	29.67	0.94	1.53	0.23
400 - 419	136.	238.	43.83	0.95	1.70	0.33
420 - 439	980.	835.	25.34	6.85	5.96	0.13
440 - 459	82.	112.	7.99	0.57	0.80	0.06
460 - 479	280.	370.	21.76	1.96	2.64	0.18
480 - 499	17.	34.	8.61	0.12	0.24	0.06
500 - 519	22.	18.	0.75	0.15	0.13	0.00
520 - 539	233.	285.	9.63	1.63	2.04	0.08
540 - 559	234.	205.	4.14	1.63	1.46	0.02
560 - 579	20.	26.	1.54	0.14	0.19	0.01
580 - 599	56.	67.	1.72	0.39	0.48	0.02
600 - 619	95.	153.	21.74	0.66	1.09	0.17
620 - 639	200.	187.	0.93	1.40	1.33	0.00
640 - 659	286.	206.	31.09	2.00	1.47	0.19
660 - 679	26.	45.	8.11	0.18	0.32	0.06
680 - 699	698.	479.	100.12	4.88	3.42	0.62
700 - 719	93.	96.	0.10	0.65	0.69	0.00
720 - 739	515.	258.	254.93	3.60	1.84	1.66
740 - 759	58.	31.	24.46	0.41	0.22	0.16
760 - 779	19.	41.	11.43	0.13	0.29	0.08
780 - 799	22.	42.	9.45	0.15	0.30	0.07
800 - 819	0.	0.	0.0	0.0	0.0	0.0
820 - 839	0.	1.	0.67	0.0	0.00	[illegible]
840 - 859	7.	7.	0.02	0.05	0.05	[illegible]

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ATED CHI-SQUARES (ITERATION NO. 1)

PERCENT TOTAL OD SURVEY	TRIPS MODEL	CHI-SQ.	FRICTION FACTOR	CHI-SQ. MODEL TRIPS	CHI-SQ. MODEL PERCENT
0.29	0.16	0.09	2.02	0.0	0.0
3.09	2.47	0.15	1.98	0.0	0.0
2.70	7.03	2.67	1.94	0.0	0.0
1.98	1.39	0.26	1.90	0.0	0.0
5.85	7.72	0.46	1.86	0.0	0.0
2.88	3.08	0.01	1.82	0.0	0.0
1.03	1.31	0.06	1.78	0.0	0.0
4.84	5.32	0.04	1.74	0.0	0.0
3.05	2.32	0.23	1.70	0.0	0.0
6.43	6.33	0.00	1.66	0.0	0.0
6.37	5.71	0.08	1.62	0.0	0.0
0.73	0.64	0.02	1.58	0.0	0.0
5.71	5.85	0.00	1.54	0.0	0.0
3.65	3.50	0.01	1.50	0.0	0.0
2.23	2.03	0.02	1.46	0.0	0.0
2.76	3.43	0.13	1.42	0.0	0.0
5.52	5.96	0.03	1.38	0.0	0.0
3.04	3.76	0.14	1.34	0.0	0.0
2.84	2.73	0.00	1.30	0.0	0.0
0.94	1.53	0.23	1.26	0.0	0.0
0.95	1.70	0.33	1.22	0.0	0.0
6.85	5.96	0.13	1.18	0.0	0.0
0.57	0.80	0.06	1.14	0.0	0.0
1.96	2.64	0.18	1.10	0.0	0.0
0.12	0.24	0.06	1.06	0.0	0.0
0.15	0.13	0.00	1.02	0.0	0.0
1.63	2.04	0.08	0.98	0.0	0.0
1.63	1.46	0.02	0.94	0.0	0.0
0.14	0.19	0.01	0.90	0.0	0.0
0.39	0.48	0.02	0.86	0.0	0.0
0.66	1.09	0.17	0.82	0.0	0.0
1.40	1.33	0.00	0.78	0.0	0.0
2.00	1.47	0.19	0.74	0.0	0.0
0.18	0.32	0.06	0.70	0.0	0.0
4.88	3.42	0.62	0.66	0.0	0.0
0.65	0.69	0.00	0.62	0.0	0.0
3.60	1.84	1.66	0.58	0.0	0.0
0.41	0.22	0.16	0.54	0.0	0.0
0.13	0.29	0.08	0.50	0.0	0.0
0.15	0.30	0.07	0.46	0.0	0.0
0.0	0.0	0.0	0.42	0.0	0.0
0.0	0.00	0.00	0.38	0.0	0.0
0.05	0.05	0.00	0.34	0.0	0.0

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200 - 219	912.	800.	15..	.	..	.
220 - 239	105.	89.	2.87	0.73	0.64	0.02
240 - 259	817.	819.	0.00	5.71	5.85	0.00
260 - 279	523.	490.	2.23	3.65	3.50	0.01
280 - 299	319.	285.	4.18	2.23	2.03	0.02
300 - 319	395.	481.	15.29	2.76	3.43	0.13
320 - 339	790.	835.	2.40	5.52	5.96	0.03
340 - 359	435.	526.	15.75	3.04	3.76	0.14
360 - 379	406.	383.	1.43	2.84	2.73	0.00
380 - 399	135.	215.	29.67	0.94	1.53	0.23
400 - 419	136.	238.	43.83	0.95	1.70	0.33
420 - 439	980.	835.	25.34	6.85	5.96	0.13
440 - 459	82.	112.	7.99	0.57	0.80	0.06
460 - 479	280.	370.	21.76	1.96	2.64	0.18
480 - 499	17.	34.	8.61	0.12	0.24	0.06
500 - 519	22.	18.	0.75	0.15	0.13	0.00
520 - 539	233.	285.	9.63	1.63	2.04	0.08
540 - 559	234.	205.	4.14	1.63	1.46	0.02
560 - 579	20.	26.	1.54	0.14	0.19	0.01
580 - 599	56.	67.	1.72	0.39	0.48	0.02
600 - 619	95.	153.	21.74	0.66	1.09	0.17
620 - 639	200.	187.	0.93	1.40	1.33	0.00
640 - 659	286.	206.	31.09	2.00	1.47	0.19
660 - 679	26.	45.	8.11	0.18	0.32	0.06
680 - 699	698.	479.	100.12	4.88	3.42	0.62
700 - 719	93.	96.	0.10	0.65	0.69	0.00
720 - 739	515.	258.	254.93	3.60	1.84	1.66
740 - 759	58.	31.	24.46	0.41	0.22	0.16
760 - 779	19.	41.	11.43	0.13	0.29	0.08
780 - 799	22.	42.	9.45	0.15	0.30	0.07
800 - 819	0.	0.	0.0	0.0	0.0	0.0
820 - 839	0.	1.	0.67	0.0	0.00	0.00
840 - 859	7.	7.	0.02	0.05	0.05	0.00
860 - 879	24.	17.	2.46	0.17	0.12	0.01
880 - 899	0.	0.	0.0	0.0	0.0	0.0
900 - 919	446.	129.	779.82	3.12	0.92	5.23
920 - 939	0.	0.	0.0	0.0	0.0	0.0
940 - 959	0.	0.	0.0	0.0	0.0	0.0
960 - 979	0.	0.	0.0	0.0	0.0	0.0
980 - 999	0.	0.	0.0	0.0	0.0	0.0
1000 -1019	0.	0.	0.0	0.0	0.0	0.0
TOTAL CHI-SQUARE VALUES			2011.91			13.80

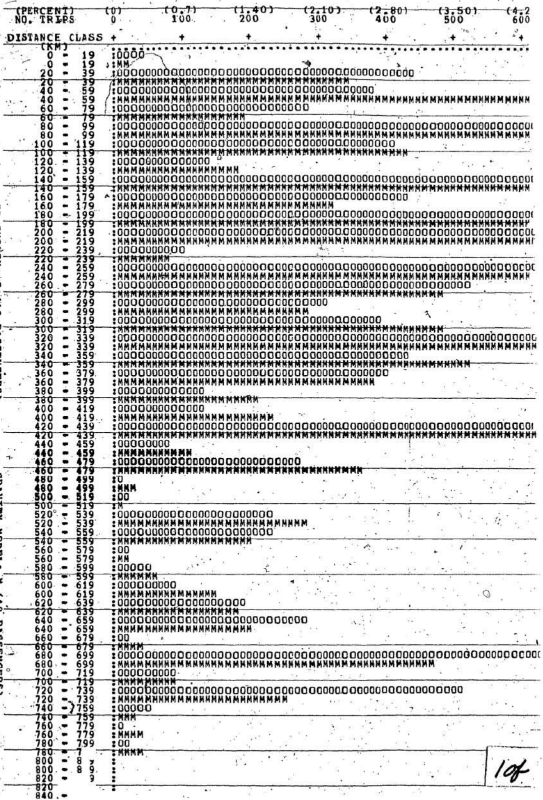
DEGREES OF FREEDOM = 45, CH. SQ. TABLE VALUE AT 5 PERCT. LEVEL = 61.63

3of

6.37	5.71	0.08	1.62	0.0	0.0
0.73	0.64	0.02	1.58	0.0	0.0
5.71	5.85	0.00	1.54	0.0	0.0
3.65	3.50	0.01	1.50	0.0	0.0
2.23	2.03	0.02	1.46	0.0	0.0
2.76	3.43	0.13	1.42	0.0	0.0
5.52	5.96	0.03	1.38	0.0	0.0
3.04	3.76	0.14	1.34	0.0	0.0
2.84	2.73	0.00	1.30	0.0	0.0
0.94	1.53	0.23	1.26	0.0	0.0
0.95	1.70	0.33	1.22	0.0	0.0
6.85	5.96	0.13	1.18	0.0	0.0
0.57	0.80	0.06	1.14	0.0	0.0
1.96	2.64	0.18	1.10	0.0	0.0
0.12	0.24	0.06	1.06	0.0	0.0
0.15	0.13	0.00	1.02	0.0	0.0
1.63	2.04	0.08	0.98	0.0	0.0
1.63	1.46	0.02	0.94	0.0	0.0
0.14	0.19	0.01	0.90	0.0	0.0
0.39	0.48	0.02	0.86	0.0	0.0
0.66	1.09	0.17	0.82	0.0	0.0
1.40	1.33	0.00	0.78	0.0	0.0
2.00	1.47	0.19	0.74	0.0	0.0
0.18	0.32	0.06	0.70	0.0	0.0
4.88	3.42	0.62	0.66	0.0	0.0
0.65	0.69	0.00	0.62	0.0	0.0
3.60	1.84	1.66	0.58	0.0	0.0
0.41	0.22	0.16	0.54	0.0	0.0
0.13	0.29	0.08	0.50	0.0	0.0
0.15	0.30	0.07	0.46	0.0	0.0
0.0	0.0	0.0	0.42	0.0	0.0
0.0	0.00	0.00	0.38	0.0	0.0
0.05	0.05	0.00	0.34	0.0	0.0
0.17	0.12	0.01	0.30	0.0	0.0
0.0	0.0	0.0	0.26	0.0	0.0
3.12	0.92	5.23	0.22	0.0	0.0
0.0	0.0	0.0	0.18	0.0	0.0
0.0	0.0	0.0	0.14	0.0	0.0
0.0	0.0	0.0	0.10	0.0	0.0
0.0	0.0	0.0	0.06	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
		------		------	------
		13.80		0.0	0.0

ERCT. LEVEL = 61.63

4 of 4



OD SURVEY: O (10 PASSENGERS)

GRAVITY MODEL: M (10 PASSENGERS)

FIGURE C - 3 TRIP LENGTH FREQUENCY DISTRIBUTION OF OD SURVEY AND GRAVITY MODEL ITERATION NO. 1

```
(2.80)   (3.50)   (4.20)   (4.90)   (5.60)   (6.30)   (7.00)
 400      500      600      700      800      900     1000
  +        +        +        +        +        +        +        +
.....................................................................

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   6.37     6.44     0.00     1.81     14.73     0.09
```

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I-3

TRIP LENGTH FREQUENCY DISTRIBUTION OF OD SURVEY AND GRAVITY MODEL ITERATION NO.1

OD SURVEY: O (10 PASSENGERS)   GRAVITY MODEL: M (10 PASSENGERS)

```
 80 -  99 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
 80 -  99 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
100 - 119 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
100 - 119 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
120 - 139 :OOOOOOOOOOOOOO
120 - 139 :MMMMMMMMMMMMMMMMMM
140 - 159 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
140 - 159 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
160 - 179 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
160 - 179 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
180 - 199 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
180 - 199 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
200 - 219 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
200 - 219 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
220 - 239 :OOOOOOOOOO
220 - 239 :MMMMMMMM
240 - 259 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
240 - 259 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
260 - 279 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
260 - 279 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
280 - 299 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
280 - 299 :MMMMMMMMMMMMMMMMMMMMMMMMMMMM
300 - 319 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
300 - 319 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
320 - 339 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
320 - 339 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
340 - 359 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
340 - 359 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
360 - 379 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
360 - 379 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
380 - 399 :OOOOOOOOOOOOO
380 - 399 :MMMMMMMMMMMMMMMMMMMMM
400 - 419 :OOOOOOOOOOOOO
400 - 419 :MMMMMMMMMMMMMMMMMMMMMMM
420 - 439 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
420 - 439 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
440 - 459 :OOOOOOOO
440 - 459 :MMMMMMMMMM
460 - 479 :OOOOOOOOOOOOOOOOOOOOOOOOOOO
460 - 479 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
480 - 499 :O
480 - 499 :MMM
500 - 519 :OO
500 - 519 :M
520 - 539 :OOOOOOOOOOOOOOOOOOOOOOO
520 - 539 :MMMMMMMMMMMMMMMMMMMMMMMMMMMM
540 - 559 :OOOOOOOOOOOOOOOOOOOOOOO
540 - 559 :MMMMMMMMMMMMMMMMMMMM
560 - 579 :OO
560 - 579 :MM
580 - 599 :OOOOO
580 - 599 :MMMMMM
600 - 619 :OOOOOOOOO
600 - 619 :MMMMMMMMMMMMMMMM
620 - 639 :OOOOOOOOOOOOOOOOOOO
620 - 639 :MMMMMMMMMMMMMMMMMM
640 - 659 :OOOOOOOOOOOOOOOOOOOOOOOOOOOO
640 - 659 :MMMMMMMMMMMMMMMMMMMM
660 - 679 :OO
660 - 679 :MMMM
680 - 699 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
680 - 699 :MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
700 - 719 :OOOOOOOOO
700 - 719 :MMMMMMMMM
720 - 739 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
720 - 739 :MMMMMMMMMMMMMMMMMMMMMMMMM
740 - 759 :OOOOO
740 - 759 :MMM
760 - 779 :O
760 - 779 :MMMM
780 - 799 :OO
780 - 799 :MMMM
800 - 819 :
800 - 819 :
820 - 839 :
820 - 839 :
840 - 859 :
840 - 859 :
860 - 879 :OO
860 - 879 :M
880 - 899 :
880 - 899 :
900 - 919 :OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
900 - 919 :MMMMMMMMMMMM
920 - 939 :
920 - 939 :
940 - 959 :
940 - 959 :
```

3of

OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
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MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
OOOOOOOOOOOOOOOO
MMMMMMMMMMMM

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MMMMMMMMMMM
OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
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OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
MMMMMMMMMMMM

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200

4 of 4

PRINTED IN CANADA

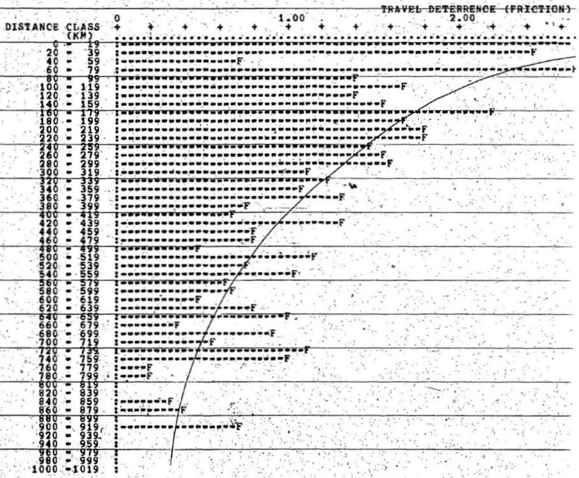
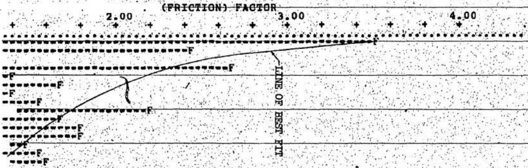


FIGURE C - 4 DISTANCE CLASS OVER TRAVEL DETERRENCE FACTOR (ITERATION NO. 2)



RRENCE FACTOR (ITERATION NO. 2)

2 of 2

MMMMM

TABLE C-11 TRIP DISTRIBUTION BY THE GRAVITY MODEL, ITERATION NO. 2

NUMBER OF TRIPS

TO ZONE / FROM ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.	10.	123.	76.	234.	29.	81.	93.	271.	111.	5.	397.	49.	37.	7.	70.
2	28.	0.	12.	4.	12.	2.	5.	5.	18.	6.	0.	12.	3.	1.	1.	3.
3	155.	5.	0.	21.	38.	4.	14.	17.	51.	21.	1.	50.	14.	5.	2.	14.
4	136.	3.	30.	0.	43.	5.	9.	11.	44.	19.	1.	57.	11.	3.	1.	5.
5	357.	7.	46.	36.	0.	12.	22.	30.	102.	42.	3.	134.	25.	12.	2.	21.
6	36.	1.	4.	4.	10.	0.	1.	5.	11.	5.	0.	15.	2.	1.	0.	3.
7	93.	2.	13.	6.	17.	1.	0.	18.	14.	12.	1.	40.	8.	5.	1.	10.
8	133.	2.	19.	9.	28.	5.	22.	0.	63.	14.	1.	49.	14.	6.	1.	11.
9	382.	10.	57.	35.	95.	12.	17.	62.	0.	26.	2.	178.	46.	27.	6.	42.
10	157.	3.	23.	15.	39.	6.	15.	14.	26.	0.	3.	37.	17.	13.	3.	22.
11	3.	0.	1.	0.	1.	0.	1.	0.	1.	2.	0.	4.	1.	0.	0.	1.
12	447.	5.	45.	36.	99.	14.	39.	39.	142.	29.	7.	0.	42.	28.	10.	73.
13	65.	1.	14.	8.	21.	2.	9.	13.	43.	16.	1.	49.	0.	10.	3.	17.
14	54.	1.	5.	3.	11.	2.	6.	6.	28.	14.	1.	37.	12.	0.	1.	9.
15	11.	0.	2.	1.	2.	1.	1.	2.	8.	3.	0.	15.	4.	1.	0.	1.
16	93.	2.	15.	4.	19.	4.	11.	10.	40.	21.	1.	87.	18.	8.	1.	0.
17	11.	0.	2.	2.	4.	1.	2.	3.	10.	5.	0.	21.	3.	2.	1.	8.
18	381.	8.	26.	22.	42.	8.	21.	26.	134.	55.	6.	257.	83.	32.	8.	37.
19	264.	4.	30.	11.	49.	7.	14.	16.	49.	30.	2.	113.	38.	20.	5.	40.
20	8.	0.	2.	1.	5.	1.	1.	2.	15.	3.	0.	19.	5.	3.	1.	6.
21	10.	1.	3.	3.	4.	1.	3.	4.	11.	4.	0.	25.	6.	3.	1.	8.
22	13.	0.	1.	1.	2.	1.	2.	2.	5.	2.	0.	18.	3.	2.	1.	7.
23	204.	2.	0.	19.	32.	6.	17.	11.	84.	25.	3.	94.	19.	19.	4.	53.
TOTAL	3042.	68.	472.	316.	807.	121.	312.	391.	1170.	464.	40.	1709.	422.	240.	60.	464.

SUM SQS. = 1617263. AVERAGE = 27. VARIANCE = 3057.21 STD. DEV. = 55.

10f

EL, ITERATION NO. 2

UMBER OF TRIPS

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1.	5.	397.	49.	37.	7.	70.	4.	264.	222.	10.	9.	9.	187.	2296.
.	0.	12.	3.	1.	1.	3.	0.	15.	10.	1.	2.	0.	5.	145.
1.	1.	50.	14.	5.	2.	14.	1.	22.	31.	3.	3.	1.	0.	472.
.	1.	57.	11.	3.	1.	5.	2.	27.	17.	3.	5.	2.	31.	464.
.	3.	134.	25.	12.	2.	21.	3.	44.	63.	8.	6.	3.	45.	1023.
.	0.	15.	2.	1.	0.	3.	0.	7.	7.	1.	1.	1.	7.	123.
.	1.	40.	8.	5.	1.	10.	1.	16.	14.	2.	3.	1.	18.	294.
.	1.	49.	14.	6.	1.	11.	2.	26.	19.	4.	5.	2.	15.	452.
.	2.	178.	46.	27.	6.	42.	6.	131.	58.	24.	13.	5.	109.	1344.
).	3.	37.	17.	13.	3.	22.	3.	54.	36.	5.	4.	2.	33.	530.
.	0.	4.	1.	0.	0.	1.	0.	3.	1.	0.	0.	0.	2.	21.
).	7.	0.	42.	28.	10.	73.	10.	201.	107.	25.	24.	15.	98.	1535.
.	1.	49.	0.	10.	3.	17.	2.	75.	42.	7.	7.	3.	23.	433.
.	1.	37.	12.	0.	1.	9.	1.	33.	24.	6.	4.	2.	25.	283.
3.	0.	15.	4.	1.	0.	1.	1.	9.	7.	2.	2.	1.	7.	80.
1.	1.	87.	18.	8.	1.	0.	4.	34.	45.	10.	10.	7.	65.	509.
).	0.	21.	3.	2.	1.	8.	0.	27.	21.	3.	2.	2.	15.	145.
.	6.	257.	83.	32.	8.	37.	16.	0.	85.	66.	37.	30.	265.	1642.
.	2.	113.	38.	20.	5.	40.	10.	71.	0.	35.	34.	11.	133.	986.
.	0.	19.	5.	3.	1.	6.	1.	39.	25.	0.	5.	2.	20.	166.
.	0.	25.	6.	3.	1.	8.	1.	30.	34.	6.	0.	4.	27.	190.
.	0.	18.	3.	2.	1.	7.	1.	28.	12.	3.	5.	0.	28.	136.
.	3.	94.	19.	19.	4.	53.	6.	200.	173.	26.	25.	22.	0.	1045.
.	40.	1709.	422.	240.	60.	464.	75.	1358.	1054.	250.	204.	122.	1156.	14317.

E = 3057.21 STD. DEV. = 55.29 COEFFT. OF VARIATION = 2.04

2 of 2

TABLE C - 12   DIFFERENCES BETWEEN OD TRIP DATA AND GRAVITY MODEL, ITERATION NO. 2

NUMBER OF TRIPS

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.	-10.	-8.	39.	126.	16.	43.	23.	59.	42.	-4.	62.	11.	50.	1.	31.
2	-23.	0.	-11.	-3.	-9.	9.	30.	-4.	-0.	-5.	-0.	7.	-1.	-1.	-1.	5.
3	-44.	-4.	0.	-17.	-38.	10.	-8.	-8.	28.	-19.	25.	-12.	1.	4.	6.	-5.
4	18.	0.	-30.	0.	-31.	-2.	-6.	4.	-5.	-4.	-1.	-34.	-1.	3.	2.	3.
5	10.	-6.	-31.	-19.	0.	-0.	-8.	-7.	-7.	-26.	-3.	-47.	-4.	-7.	2.	1.
6	-2.	-1.	2.	-1.	-4.	0.	-1.	0.	1.	-1.	-0.	-7.	-0.	-1.	-0.	-2.
7	26.	-1.	6.	0.	-11.	-1.	0.	-8.	5.	-10.	-1.	-11.	-7.	-1.	-1.	-4.
8	-3.	-2.	0.	8.	-13.	-0.	9.	0.	-13.	-8.	-1.	-31.	-6.	1.	1.	-0.
9	8.	5.	-4.	-9.	23.	6.	21.	19.	0.	11.	-1.	-4.	-21.	-19.	-4.	8.
10	14.	0.	-2.	-2.	-21.	-6.	-2.	-5.	18.	0.	-3.	-8.	8.	1.	-2.	6.
11	-2.	-0.	-1.	-0.	1.	-0.	-1.	-0.	-1.	-2.	0.	2.	-1.	1.	-0.	-1.
12	31.	13.	-1.	-14.	-23.	-8.	-27.	-11.	-6.	5.	0.	0.	29.	14.	-0.	-25.
13	12.	-1.	-3.	8.	-3.	-2.	-7.	-12.	-10.	-5.	-1.	45.	0.	-6.	-3.	1.
14	8.	-1.	3.	0.	-9.	-2.	-6.	5.	-18.	2.	0.	9.	-9.	0.	4.	1.
15	4.	-0.	4.	1.	1.	-1.	2.	2.	-8.	8.	-0.	-5.	-3.	-1.	0.	5.
16	4.	3.	14.	5.	5.	-4.	-4.	14.	11.	6.	-1.	2.	7.	1.	-1.	0.
17	-4.	1.	9.	-2.	-2.	2.	-2.	13.	2.	5.	-0.	-2.	3.	-2.	-1.	-1.
18	-55.	-3.	35.	2.	53.	-7.	-5.	-8.	-20.	-1.	-6.	-25.	-5.	-11.	-4.	27.
19	-2.	10.	-6.	-10.	-49.	-4.	-8.	-6.	-8.	10.	-2.	-33.	6.	-13.	7.	4.
20	4.	-0.	2.	1.	-5.	-1.	-1.	-2.	-14.	-3.	1.	-11.	-5.	-3.	-1.	-4.
21	-3.	-1.	-2.	-3.	-2.	-1.	-3.	-4.	-8.	-4.	-0.	-20.	-5.	-3.	-1.	-8.
22	-3.	0.	0.	3.	-0.	-1.	-2.	0.	-5.	-2.	-0.	-6.	-2.	-2.	-1.	-4.
23	3.	-1.	23.	12.	11.	-6.	-15.	-3.	-1.	-0.	0.	130.	4.	-3.	-3.	-35.
TOTAL	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.

SUM SQS. = 178129.   MEAN DIF. = -0.   VARIANCE = 336.73   STD. DEV. = 18.35

10f

GRAVITY MODEL, ITERATION NO. 2

UMBER OF TRIPS

0	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
.	-4.	62.	11.	50.	1.	31.	2.	79.	31.	-3.	4.	5.	52.	653.
.	-0.	7.	-1.	-1.	-1.	5.	3.	15.	5.	-1.	-2.	0.	1.	14.
.	25.	-12.	1.	4.	6.	-5.	3.	-18.	56.	4.	-2.	0.	34.	-3.
.	-1.	-34.	-1.	3.	2.	3.	1.	-9.	2.	-3.	-5.	3.	-4.	-98.
.	-3.	-47.	-4.	-7.	2.	1.	0.	62.	-16.	-8.	0.	-3.	-6.	-123.
.	-0.	-7.	-0.	-1.	-0.	-2.	-0.	-2.	-7.	-1.	-1.	-1.	-7.	-37.
.	-1.	-11.	-7.	-1.	-1.	-4.	10.	1.	-10.	-2.	-3.	-1.	-18.	-40.
.	-1.	-31.	-6.	1.	1.	-0.	-2.	-3.	-18.	-4.	-5.	1.	-7.	-98.
.	-1.	-4.	-21.	-19.	-4.	8.	-3.	-10.	-3.	-22.	-13.	-5.	-52.	-70.
.	-3.	-8.	8.	1.	-2.	6.	-1.	-14.	-2.	-5.	-4.	-2.	-4.	-36.
.	0.	2.	-1.	1.	-0.	-1.	-0.	2.	-1.	-0.	-0.	-0.	0.	-4.
.	0.	0.	29.	14.	-0.	-25.	-3.	48.	-25.	-21.	-24.	-14.	-68.	-130.
.	-1.	45.	0.	-6.	-3.	1.	3.	-41.	-29.	-7.	-4.	-2.	-11.	-80.
2.	0.	9.	-9.	0.	4.	1.	2.	-18.	-19.	5.	-2.	-2.	-20.	-65.
.	-0.	-5.	-3.	-1.	0.	5.	-1.	-3.	-7.	-2.	-1.	-1.	-7.	-12.
.	-1.	2.	7.	1.	-1.	0.	-0.	-17.	-17.	-7.	-9.	-4.	-32.	-24.
.	-0.	-2.	3.	-2.	-1.	-1.	0.	-20.	-20.	-3.	-2.	1.	-6.	-31.
1.	-6.	-25.	-5.	-11.	-4.	27.	-11.	0.	-16.	-13.	0.	9.	141.	80.
.	-2.	-33.	6.	-13.	7.	4.	-5.	-52.	0.	88.	39.	12.	31.	9.
3.	1.	-11.	-5.	-3.	-1.	-4.	1.	13.	18.	0.	2.	-1.	-3.	-14.
.	-0.	-20.	-5.	-3.	-1.	-8.	0.	26.	35.	4.	0.	0.	-0.	-4.
2.	-0.	-6.	-2.	-2.	-1.	-4.	-1.	8.	32.	-3.	1.	0.	-16.	-3.
0.	0.	130.	4.	-3.	-3.	-35.	2.	-45.	12.	-4.	29.	2.	0.	119.
0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.

336.73 STD. DEV. = 18.35 M.S.E. = 368.03 ROOT M.S.E. = 19.18

2 of 2

TABLE C-13 CHI-SQUARE CELL VALUES BETWEEN THE OD TRIP DATA AND GRAVITY MODEL IT

CHI-SQUARE VALUES

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.	10.**	1.	21.**	68.**	9.**	23.**	6.*	13.**	16.**	3.	10.**	2.	68.**	0.	14.**
2	19.**	0.	10.**	3.	7.**	42.	176.**	3.	0.	4.*	0.	4.*	0.	1.	1.	7.
3	13.**	4.*	0.	13.**	38.**	30.	4.*	4.*	16.**	17.**	500.	3.	0.	4.*	21.	2.
4	2.	0.	30.**	0.	22.**	1.	4.*	1.	1.	1.	1.	20.**	0.	2.	4.	1.
5	0.	5.*	21.**	10.**	0.	0.	3.	2.	1.	16.**	3.	17.**	1.	4.*	2.	0.
6	0.	1.	2.	0.	2.	0.	1.	0.	0.	0.	0.	4.*	0.	1.	0.	2.
	**				**					**			*			
8	0.	2.	0.	7.**	6.*	0.	4.*	0.	3.	4.*	1.	20.**	2.	0.	0.	0.
9	0.	3.	0.	2.	6.*	3.	27.**	6.*	0.	4.*	0.	0.	10.**	14.**	3.	2.
10	1.	0.	0.	0.	11.**	6.*	0.	2.	12.**	0.	3.	2.	4.*	0.	1.	1.
11	1.	0.	1.	0.	0.	0.	1.	0.	1.	2.	0.	1.	1.	1.	0.	1.
12	2.	33.**	0.	5.*	5.*	4.*	19.**	3.	0.	1.	0.	0.	19.**	6.*	0.	9.**
13	2.	1.	1.	9.**	0.	2.	6.*	11.**	2.	1.	1.	40.**	0.	4.*	3.	0.
14	1.	1.	1.	0.	7.**	2.	6.*	3.	12.**	0.	0.	2.	6.*	0.	38.	0.
15	1.	0.	5.	1.	0.	1.	2.	4.	8.**	17.	0.	2.	2.	1.	0.	14.
16	0.	7.	13.**	6.	2.	4.	2.	18.**	3.	2.	1.	0.	3.	0.	1.	0.
17	1.	2.	34.	2.	1.	12.	2.	55.	0.	5.*	0.	0.	2.	2.	1.	0.
18	8.**	1.	49.**	0.	68.**	6.*	1.	3.	3.	0.	6.*	2.	0.	4.*	2.	20.**
19	0.	21.	1.	9.**	49.**	2.	5.*	2.	1.	3.	2.	10.**	1.	8.**	9.**	0.
20	2.	0.	3.	0.	5.*	1.	1.	2.	13.**	3.	1.	7.**	5.*	3.	1.	3.
21	1.	1.	2.	3.	1.	1.	3.	4.	6.*	4.	0.	16.**	4.*	3.	1.	8.**
22	1.	0.	0.	6.	0.	1.	2.	0.	5.*	2.	0.	2.	1.	2.	1.	2.
23	0.	0.	0.	8.**	4.*	6.*	13.**	1.	0.	0.	0.	179.**	1.	0.	3.	23.**
TOTAL	64.	94.	175.	107.	310.	133.	303.	133.	100.	111.	606.	342.	71.	131.	94.	111.

DEGREES OF FREEDOM = 484 $\chi^2_{0.99,484}$ = 584 $\chi^2_{0.99,1}$ = 6.63. SQ TABLE VALUE $\chi^2_{0.95,1}$ AT = 3.84 PCT LEVEL

10f

D TRIP DATA AND GRAVITY MODEL ITERATION NO. 2

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
:HI-SQUARE VALUES														
.**	3.	10.**	2.	68.**	0.	14.**	1.	24.**	4.*	1.	2.	3.	14.**	312.
4.*	0.	4.*	0.	1.	1.	7.	25.	14.**	3.	1.	2.	0.	0.	321.
7.**	500.	3.	0.	4.*	21.	2.	7.	15.**	98.**	7.	2.	0.	0.	879.
1.	1.	20.**	0.	2.	4.	1.	1.	3.	0.	3.	5.*	7.	1.	109.
6.**	3.	17.**	1.	4.*	2.	0.	0.	86.**	4.*	8.**	0.	3.	1.	186.
0.	0.	4.*	0.	1.	0.	2.	0.	0.	7.**	1.	1.	1.	7.**	31.
8.**	1.	3.	6.*	0.	1.	2.	144.	0.	7.**	2.	3.	1.	18.**	220.
4.*	1.	20.**	2.	0.	0.	0.	2.	0.	17.**	4.	5.*	1.	3.	83.
4.*	0.	0.	10.**	14.**	3.	2.	2.	1.	0.	20.**	13.**	5.*	25.**	146.
0.	3.	2.	4.*	0.	1.	1.	0.	3.	0.	5.*	4.*	2.	0.	60.
2.	0.	1.	1.	1.	0.	1.	0.	2.	1.	0.	0.	0.	0.	14.
1.	0.	0.	19.**	6.*	0.	9.**	1.	11.**	6.*	18.**	24.**	13.**	47.**	226.
1.	1.	40.**	0.	4.*	3.	0.	5.	23.**	20.**	7.**	2.	1.	5.*	149.
0.	0.	2.	6.*	0.	30.	0.	2.	10.**	15.**	5.*	1.	2.	16.**	132.
.*	0.	2.	2.	1.	0.	14.	1.	1.	7.**	2.	0.	1.	7.**	76.
2.	1.	0.	3.	0.	1.	0.	0.	9.**	7.**	5.*	8.**	2.	16.**	107.
*		0.	2.	2.	1.	0.	0.	15.**	19.**	3.	2.	1.	2.	162.
0.	6.*	2.	0.	4.*	2.	20.**	7.**	0.	3.	3.	0.	3.	75.**	264.
3.	2.	10.**	1.	8.**	9.**	0.	3.	38.**	0.	225.**	45.**	14.**	7.**	457.
3.	1.	7.**	5.*	3.	1.	3.	1.	4.*	13.**	0.	1.	0.	1.	71.
4.	0.	16.**	4.*	3.	1.	8.**	0.	22.**	37.**	2.	0.	0.	0.	119.
2.	0.	2.	1.	2.	1.	2.	1.	2.	80.**	3.	0.	0.	9.**	120.
0.	0.	179.**	1.	0.	3.	23.**	0.	10.**	1.	1.	34.**	0.	0.	283.
1.	606.	342.	71.	131.	94.	111.	203.	294.	351.	327.	154.	60.	254.	4529.**

E VALUE AT=3.84PCT. LEV

$\chi^2_{0.95,1}$

* (SIGNIFICANT AT 5% LEVEL)

** (SIGNIFICANT AT 1% LEVEL)

– (EXPECTED FREQUENCY <5)

2 of 2

204

TABLE C - 14 TRIPS BY DISTANCE CLASSES AND RELATED CHI-SQUARES (ITERATION NO. 2)

DISTANCE CLASS (KM)	NUMBER OF TRIPS OD SURVEY	MODEL	CHI-SQ.	PERCENT TOTAL TRIPS OD SURVEY	MODEL	CHI-SQ.
0 - 19	41.	45.	0.31	0.29	0.32	0.00
20 - 39	442.	452.	0.22	3.09	3.20	0.00
40 - 59	387.	423.	3.10	2.70	3.00	0.03
60 - 79	284.	290.	0.12	1.98	2.06	0.00
80 - 99	837.	879.	1.97	5.85	6.23	0.02
100 - 119	413.	432.	0.84	2.88	3.06	0.01
120 - 139	148.	154.	0.22	1.03	1.09	0.00
140 - 159	693.	704.	0.18	4.84	4.99	0.00
160 - 179	437.	456.	0.78	3.05	3.23	0.01
180 - 199	921.	910.	0.12	6.43	6.46	0.00
200 - 219	912.	909.	0.01	6.37	6.44	0.00
220 - 239	105.	111.	0.31	0.73	0.79	0.00
240 - 259	817.	881.	4.64	5.71	6.25	0.05
260 - 279	523.	508.	0.44	3.65	3.60	0.00
280 - 299	319.	315.	0.06	2.23	2.23	0.00
300 - 319	395.	432.	3.09	2.76	3.06	0.03
320 - 339	790.	776.	0.26	5.52	5.50	0.00
340 - 359	435.	481.	4.39	3.04	3.41	0.04
360 - 379	406.	406.	0.00	2.84	2.88	0.00
380 - 399	135.	137.	0.03	0.94	0.97	0.00
400 - 419	136.	148.	0.99	0.95	1.05	0.01
420 - 439	980.	951.	0.91	6.85	6.74	0.00
440 - 459	82.	88.	0.36	0.57	0.62	0.00
460 - 479	280.	276.	0.06	1.96	1.96	0.00
480 - 499	17.	18.	0.07	0.12	0.13	0.00
500 - 519	22.	22.	0.01	0.15	0.16	0.00
520 - 539	233.	227.	0.17	1.63	1.61	0.00
540 - 559	234.	235.	0.00	1.63	1.67	0.00
560 - 579	20.	20.	0.00	0.14	0.14	0.00
580 - 599	56.	56.	0.00	0.39	0.40	0.00
600 - 619	95.	98.	0.12	0.66	0.70	0.00
620 - 639	200.	197.	0.05	1.40	1.40	0.00
640 - 659	286.	287.	0.00	2.00	2.03	0.00
660 - 679	26.	24.	0.10	0.18	0.17	0.00
680 - 699	698.	672.	1.01	4.88	4.76	0.00
700 - 719	93.	88.	0.23	0.65	0.63	0.00
720 - 739	515.	486.	1.70	3.60	3.45	0.01
740 - 759	58.	53.	0.49	0.41	0.38	0.00
760 - 779	19.	18.	0.09	0.13	0.13	0.00
780 - 799	22.	21.	0.06	0.15	0.15	0.00
800 - 819	0.	0.	0.0	0.0	0.0	
820 - 839	0.	0.	0.0	0.0	0.0	
840 - 859	7.	7.	0.02	0.05	0.05	0.00

1of

PERCENT TOTAL TRIPS OD SURVEY	MODEL	CHI-SQ.	FRICTION FACTOR	CHI-SQ. MODEL TRIPS	CHI-SQ. MODEL PERCENT
0.29	0.32	0.00	3.52	23.48	0.14
3.09	3.20	0.00	2.47	32.47	0.22
2.70	3.00	0.03	0.75	320.43	2.31
1.98	2.06	0.00	2.72	47.44	0.32
5.85	6.23	0.02	1.41	37.90	0.29
2.88	3.06	0.01	1.71	0.00	0.00
1.03	1.09	0.00	1.41	4.65	0.04
4.84	4.99	0.00	1.58	2.23	0.02
3.05	3.23	0.01	2.24	53.64	0.36
6.43	6.46	0.00	1.69	0.62	0.00
6.37	6.44	0.00	1.81	14.73	0.09
0.73	0.79	0.00	1.82	5.37	0.04
5.71	6.25	0.05	1.50	4.84	0.03
3.65	3.60	0.00	1.57	0.74	0.00
2.23	2.23	0.00	1.60	3.35	0.02
2.76	3.06	0.03	1.14	4.90	0.04
5.52	5.50	0.00	1.28	4.06	0.04
3.04	3.41	0.04	1.08	3.86	0.03
2.84	2.88	0.00	1.35	1.50	0.01
0.94	0.97	0.00	0.77	27.67	0.21
0.95	1.05	0.01	0.68	33.94	0.25
6.85	6.74	0.00	1.36	16.31	0.10
0.57	0.62	0.00	0.82	4.92	0.04
1.96	1.96	0.00	0.81	23.44	0.18
0.12	0.13	0.00	0.52	7.44	0.05
0.15	0.16	0.00	1.20	1.06	0.01
1.63	1.61	0.00	0.78	11.90	0.09
1.63	1.67	0.00	1.05	4.68	0.03
0.14	0.14	0.00	0.67	1.29	0.01
0.39	0.40	0.00	0.71	1.53	0.01
0.66	0.70	0.00	0.50	18.90	0.14
1.40	1.40	0.00	0.82	0.65	0.00
2.00	2.03	0.00	1.01	32.43	0.21
0.18	0.17	0.00	0.39	9.38	0.07
4.88	4.76	0.00	0.94	77.69	0.53
0.65	0.63	0.00	0.59	0.59	0.00
3.60	3.45	0.01	1.13	201.87	1.39
0.41	0.38	0.00	1.00	17.50	0.11
0.13	0.13	0.00	0.23	12.42	0.09
0.15	0.15	0.00	0.24	9.88	0.08
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.00
0.05	0.05	0.00	0.35	0.06	0.00

2f

200 - 219	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
220 - 239	105.	111.	0.31	0.73	0.79	0.00
240 - 259	817.	881.	4.64	5.71	6.25	0.05
260 - 279	523.	508.	0.44	3.65	3.60	0.00
280 - 299	319.	315.	0.06	2.23	2.23	0.00
300 - 319	395.	432.	3.09	2.76	3.06	0.03
320 - 339	790.	776.	0.26	5.52	5.50	0.00
340 - 359	435.	481.	4.39	3.04	3.41	0.04
360 - 379	406.	406.	0.00	2.84	2.88	0.00
380 - 399	135.	137.	0.03	0.94	0.97	0.00
400 - 419	136.	148.	0.99	0.95	1.05	0.01
420 - 439	980.	951.	0.91	6.85	6.74	0.00
440 - 459	82.	88.	0.36	0.57	0.62	0.00
460 - 479	280.	276.	0.06	1.96	1.96	0.00
480 - 499	17.	18.	0.07	0.12	0.13	0.00
500 - 519	22.	22.	0.01	0.15	0.16	0.00
520 - 539	233.	227.	0.17	1.63	1.61	0.00
540 - 559	234.	235.	0.00	1.63	1.67	0.00
560 - 579	20.	20.	0.00	0.14	0.14	0.00
580 - 599	56.	56.	0.00	0.39	0.40	0.00
600 - 619	95.	98.	0.12	0.66	0.70	0.00
620 - 639	200.	197.	0.05	1.40	1.40	0.00
640 - 659	286.	287.	0.00	2.00	2.03	0.00
660 - 679	26.	24.	0.10	0.18	0.17	0.00
680 - 699	698.	672.	1.01	4.88	4.76	0.00
700 - 719	93.	88.	0.23	0.65	0.63	0.00
720 - 739	515.	486.	1.70	3.60	3.45	0.01
740 - 759	58.	53.	0.49	0.41	0.38	0.00
760 - 779	19.	18.	0.09	0.13	0.13	0.00
780 - 799	22.	21.	0.06	0.15	0.15	0.00
800 - 819	0.	0.	0.0	0.0	0.0	0.0
820 - 839	0.	0.	0.0	0.0	0.0	0.0
840 - 859	7.	7.	0.02	0.05	0.05	0.00
860 - 879	24.	22.	0.24	0.17	0.15	0.00
880 - 899	0.	0.	0.0	0.0	0.0	0.0
900 - 919	446.	391.	7.86	3.12	2.77	0.04
920 - 939	0.	0.	0.0	0.0	0.0	0.0
940 - 959	0.	0.	0.0	0.0	0.0	0.0
960 - 979	0.	0.	0.0	0.0	0.0	0.0
980 - 999	0.	0.	0.0	0.0	0.0	0.0
1000 -1019	0.	0.	0.0	0.0	0.0	0.0
TOTAL CHI-SQUARE VALUES			35.62			0.29

DEGREES OF FREEDOM = 45 CH. SQ. TABLE VALUE AT 5 PERCT. LEVEL = 61.63

39f

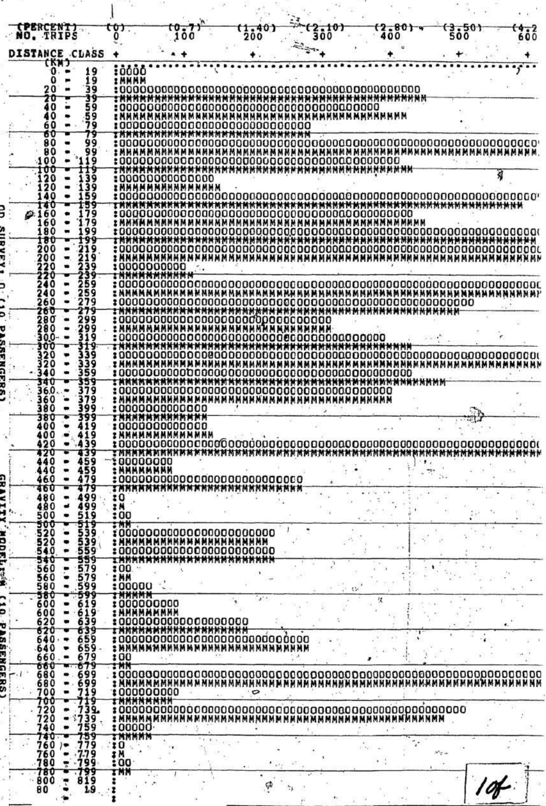
6.37	6.44	0.00	1.81	14.73	0.09
0.73	0.79	0.00	1.82	5.37	0.04
5.71	6.25	0.05	1.50	4.84	0.03
3.65	3.60	0.00	1.57	0.74	0.00
2.23	2.23	0.00	1.60	3.35	0.02
2.76	3.06	0.03	1.14	4.90	0.04
5.52	5.50	0.00	1.28	4.06	0.04
3.04	3.41	0.04	1.08	3.86	0.03
2.84	2.88	0.00	1.35	1.50	0.01
0.94	0.97	0.00	0.77	27.67	0.21
0.95	1.05	0.01	0.68	33.94	0.25
6.85	6.74	0.00	1.36	16.31	0.10
0.57	0.62	0.00	0.82	4.92	0.04
1.96	1.96	0.00	0.81	23.44	0.18
0.12	0.13	0.00	0.52	7.44	0.05
0.15	0.16	0.00	1.20	1.06	0.01
1.63	1.61	0.00	0.78	11.90	0.09
1.63	1.67	0.00	1.05	4.68	0.03
0.14	0.14	0.00	0.67	1.29	0.01
0.39	0.40	0.00	0.71	1.53	0.01
0.66	0.70	0.00	0.50	18.90	0.14
1.40	1.40	0.00	0.82	0.65	0.00
2.00	2.03	0.00	1.01	32.43	0.21
0.18	0.17	0.00	0.39	9.38	0.07
4.88	4.76	0.00	0.94	77.69	0.53
0.65	0.63	0.00	0.59	0.59	0.00
3.60	3.45	0.01	1.13	201.87	1.39
0.41	0.38	0.00	1.00	17.50	0.11
0.13	0.13	0.00	0.23	12.42	0.09
0.15	0.15	0.00	0.24	9.88	0.08
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.00
0.05	0.05	0.00	0.35	0.06	0.00
0.17	0.15	0.00	0.40	1.32	0.01
0.0	0.0	0.0	0.0	0.0	0.0
3.12	2.77	0.04	0.74	538.72	3.71
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
		0.29		1621.80	11.33

RCT. LEVEL = 61.63

4 of 4

FIGURE C - 5 TRIP LENGTH FREQUENCY DISTRIBUTION OF OD SURVEY AND GRAVITY MODEL ITERATION NO. 2

OD SURVEY: O (10 PASSENGERS) GRAVITY MODEL: M (10 PASSENGERS)



1of

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 (2.80)   (3.50)   (4.20)   (4.90)   (5.60)   (6.30)   (7.00)
  400      500      600      700      800      900      1000
   +        +        +        +        +        +        +        +
.............................................................................

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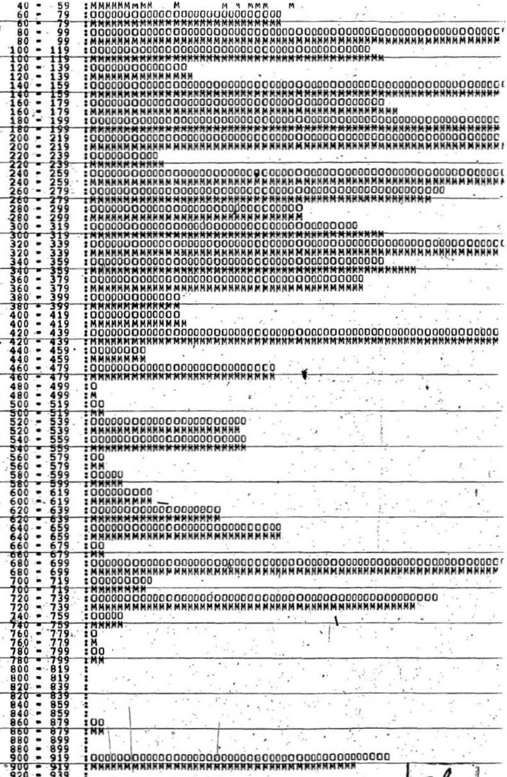
2 of

C-5 TRIP LENGTH FREQUENCY DISTRIBUTION OF OD SURVEY AND GRAVITY MODEL ITERATION NO. 2

OD SURVEY: O (10 PASSENGERS) GRAVITY MODEL: M (10 PASSENGERS)



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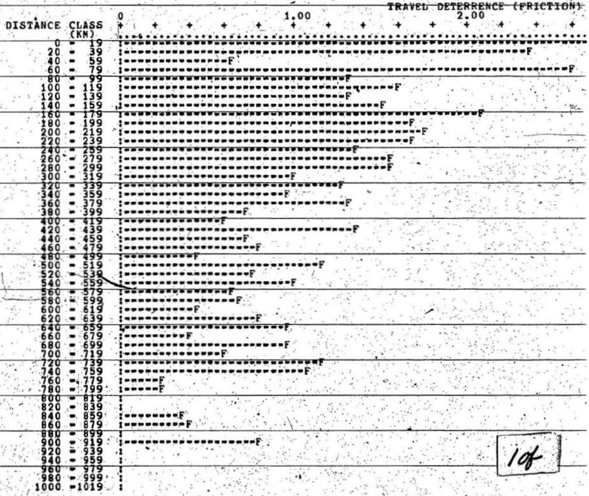

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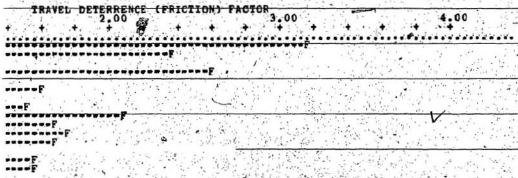
FIGURE C - 6 DISTANCE CLASS OVER TRAVEL DETERRENCE FACTOR (ITERATION NO. 3)



2 of 2

207

RRENCE FACTOR (ITERATION NO. 3)

TABLE C - 15 TRIP DISTRIBUTION BY THE GRAVITY MODEL, ITERATION NO. 3

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
										NUMBER OF TRIPS						
1	0.	10.	122.	74.	240.	29.	85.	97.	283.	114.	5.	420.	52.	37.	7.	72.
2	25.	0.	12.	4.	12.	2.	5.	4.	19.	6.	0.	12.	3.	1.	1.	3.
3	144.	5.	0.	20.	37.	3.	14.	17.	48.	22.	1.	47.	14.	4.	2.	14.
4	130.	3.	30.	0.	42.	5.	9.	12.	46.	18.	1.	60.	11.	3.	1.	5.
5	351.	7.	45.	35.	0.	12.	22.	30.	103.	44.	3.	128.	25.	11.	2.	20.
6	36.	1.	4.	4.	10.	0.	1.	5.	10.	5.	0.	16.	2.	1.	0.	4.
7	94.	2.	13.	6.	16.	1.	0.	17.	13.	12.	1.	40.	8.	5.	1.	10.
8	131.	2.	20.	9.	28.	5.	20.	0.	63.	14.	1.	49.	13.	6.	1.	10.
9	379.	10.	55.	35.	95.	11.	16.	62.	0.	25.	2.	174.	47.	28.	7.	39.
10	152.	3.	25.	14.	40.	6.	14.	13.	25.	0.	3.	34.	17.	13.	3.	24.
11	3.	0.	1.	0.	1.	0.	0.	0.	1.	2.	0.	4.	0.	0.	0.	1.
12	449.	5.	42.	37.	94.	14.	39.	39.	139.	27.	7.	0.	41.	28.	10.	75.
13	65.	1.	15.	8.	22.	2.	9.	12.	44.	16.	1.	48.	0.	10.	3.	17.
14	52.	1.	5.	3.	10.	2.	6.	6.	29.	13.	1.	36.	11.	0.	0.	9.
15	11.	0.	2.	1.	2.	1.	1.	1.	8.	4.	0.	15.	4.	1.	0.	1.
16	92.	2.	16.	4.	18.	4.	12.	10.	37.	22.	1.	90.	17.	8.	1.	0.
17	11.	0.	2.	2.	5.	0.	2.	3.	11.	5.	0.	20.	3.	2.	1.	8.
18	385.	8.	26.	22.	40.	8.	19.	27.	125.	52.	6.	245.	80.	33.	8.	35.
19	273.	5.	31.	11.	50.	6.	15.	15.	46.	28.	2.	106.	39.	21.	5.	39.
20	9.	0.	2.	1.	5.	1.	1.	3.	16.	3.	0.	20.	5.	3.	1.	6.
21	11.	1.	4.	3.	4.	1.	3.	4.	11.	3.	0.	26.	7.	3.	1.	9.
22	14.	0.	1.	1.	3.	1.	2.	2.	5.	2.	0.	19.	3.	2.	1.	7.
23	226.	2.	0.	21.	34.	6.	17.	11.	86.	27.	3.	98.	19.	19.	4.	55.
TOTAL	3042.	68.	472.	316.	807.	121.	312.	391.	1170.	464.	40.	1709.	422.	240.	60.	464.

SUM SQS. = 1653477. AVERAGE = 27. VARIANCE = 3125.67 STD. DEV. = 55.

10f

L, ITERATION NO. 3

0	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
UMBER OF TRIPS														
.	5.	420.	52.	37.	7.	72.	5.	283.	240.	10.	9.	10.	207.	2413.
.	0.	12.	3.	1.	1.	3.	0.	16.	11.	1.	2.	0.	5.	144.
.	1.	47.	14.	4.	2.	14.	1.	22.	32.	3.	4.	1.	0.	457.
.	1.	60.	11.	3.	1.	5.	2.	29.	18.	3.	5.	2.	33.	467.
.	3.	128.	25.	11.	2.	20.	3.	43.	64.	8.	6.	3.	46.	1011.
.	0.	16.	2.	1.	0.	4.	0.	7.	7.	1.	1.	1.	7.	122.
.	1.	40.	8.	5.	1.	10.	1.	16.	14.	2.	3.	1.	17.	292.
.	1.	49.	13.	6.	1.	10.	2.	27.	18.	4.	5.	2.	14.	445.
.	2.	174.	47.	28.	7.	39.	6.	123.	54.	25.	13.	5.	105.	1318.
.	3.	34.	17.	13.	3.	24.	3.	51.	33.	5.	4.	2.	33.	517.
.	0.	4.	0.	0.	0.	1.	0.	3.	1.	0.	0.	0.	2.	21.
.	7.	0.	41.	28.	10.	75.	9.	192.	100.	26.	24.	16.	96.	1509.
.	1.	48.	0.	10.	3.	17.	2.	74.	44.	7.	7.	3.	22.	433.
.	1.	36.	11.	0.	0.	9.	1.	33.	25.	6.	4.	2.	24.	281.
.	0.	15.	4.	1.	0.	1.	1.	9.	7.	2.	2.	1.	6.	79.
.	1.	90.	17.	8.	1.	0.	4.	32.	44.	9.	10.	6.	65.	504.
.	0.	20.	3.	2.	1.	8.	0.	27.	21.	3.	2.	2.	13.	144.
.	6.	245.	80.	33.	8.	35.	16.	0.	80.	65.	36.	29.	258.	1600.
.	2.	106.	39.	21.	5.	39.	10.	67.	0.	34.	34.	10.	132.	980.
.	0.	20.	5.	3.	1.	6.	1.	40.	25.	0.	5.	2.	20.	168.
.	0.	26.	7.	3.	1.	9.	1.	30.	34.	6.	0.	4.	25.	190.
.	0.	19.	3.	2.	1.	7.	1.	28.	12.	3.	5.	0.	27.	136.
.	3.	98.	19.	19.	4.	55.	6.	207.	170.	26.	24.	22.	0.	1085.
.	40.	1709.	422.	240.	60.	464.	75.	1358.	1054.	250.	204.	122.	1166.	14317.

E = 3125.67 STD. DEV. = 55.91 COEFFT. OF VARIATION = 2.07

2 of 2

TABLE C - 16 DIFFERENCES BETWEEN OD TRIP DATA AND GRAVITY MODEL. ITERATION NO. 3

NUMBER OF TRIPS

TO ZONE / FROM ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.	-10.	-7.	41.	120.	16.	39.	-19.	47.	39.	-4.	39.	8.	50.	1.	29.
2	-20.	0.	-11.	-3.	-9.	9.	30.	-3.	-1.	-5.	-0.	7.	-1.	-1.	-1.	5.
3	-33.	-4.	0.	-16.	-37.	11.	-8.	-8.	31.	-20.	25.	-9.	1.	5.	6.	-5.
4	24.	0.	-30.	0.	-30.	-2.	-6.	3.	-7.	-3.	-1.	-37.	-1.	3.	2.	3.
5	16.	-6.	-30.	-18.	0.	0.	-8.	-7.	-8.	-28.	-3.	-41.	-4.	-6.	2.	2.
6	-2.	-1.	2.	-1.	-4.	0.	-1.	0.	2.	-1.	-0.	-8.	0.	-1.	-0.	-3.
7	25.	-1.	6.	0.	-10.	-1.	0.	-7.	6.	-10.	-1.	-11.	-7.	-1.	-1.	-4.
8	-1.	-2.	-1.	8.	-13.	-0.	11.	0.	-13.	-8.	-1.	-31.	-5.	1.	1.	1.
9	11.	5.	-2.	-9.	23.	7.	22.	19.	0.	12.	-1.	-0.	-22.	-20.	-5.	11.
10	19.	-0.	-4.	-1.	-22.	-6.	-1.	-4.	19.	0.	-3.	-5.	8.	1.	-2.	4.
11	-2.	-0.	-1.	-0.	1.	-0.	-0.	-0.	-1.	-2.	0.	2.	-0.	1.	-0.	-1.
12	29.	13.	2.	-15.	-18.	-8.	-27.	-11.	-3.	7.	-0.	0.	30.	14.	-0.	-27.
13	12.	-1.	-4.	8.	-4.	-2.	-7.	-11.	-11.	-5.	-1.	46.	0.	-6.	-3.	1.
14	10.	-1.	3.	0.	-8.	-2.	-6.	5.	-19.	3.	0.	10.	-8.	0.	5.	1.
15	4.	-0.	4.	1.	1.	-1.	2.	3.	-8.	7.	-0.	-5.	-3.	-1.	0.	.
16	5.	3.	13.	5.	6.	-4.	-5.	14.	14.	5.	-1.	-1.	8.	1.	-1.	0.
17	-4.	1.	9.	-2.	-3.	3.	-2.	13.	1.	5.	-0.	-1.	3.	-2.	-1.	-1.
18	-59.	-3.	35.	2.	55.	-7.	-3.	-9.	-11.	2.	-6.	-13.	-2.	-12.	-4.	29.
19	-11.	9.	-7.	-10.	-50.	-3.	-9.	-5.	-5.	12.	-2.	-26.	5.	-14.	7.	5.
20	3.	-0.	2.	1.	-5.	-1.	-1.	-3.	-15.	-3.	1.	-12.	-5.	-3.	-1.	-4.
21	-4.	-1.	-3.	-3.	-2.	-1.	-3.	-4.	-8.	-3.	-0.	-21.	-6.	-3.	-1.	-9.
22	-4.	0.	-0.	3.	-1.	-1.	-2.	0.	-5.	-2.	-0.	-7.	-2.	-2.	-1.	-4.
23	-19.	-1.	23.	10.	9.	-6.	-15.	-3.	-3.	-2.	0.	126.	4.	-3.	-3.	-37.
TOTAL	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.

SUM SQS. = 168318. MEAN DIF. = -0. VARIANCE = 318.18 STD. DEV. = 17.84

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GRAVITY MODEL. ITERATION NO. 3

0	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
UMBER OF TRIPS														
.	-4.	39.	8.	50.	1.	29.	1.	60.	13.	-3.	4.	4.	32.	536.
.	-0.	7.	-1.	-1.	-1.	5.	3.	14.	4.	-1.	-2.	0.	1.	15.
.	25.	-9.	1.	5.	6.	-5.	3.	-18.	55.	4.	-3.	0.	34.	12.
.	-1.	-37.	-1.	3.	2.	3.	1.	-11.	1.	-3.	-5.	3.	-6.	-101.
.	-3.	-41.	-4.	-6.	2.	2.	-0.	63.	-17.	-8.	0.	-3.	-7.	-111.
.	-0.	-8.	0.	-1.	-0.	-3.	-0.	-2.	-7.	-1.	-1.	-1.	-7.	-36.
.	-1.	-11.	-7.	-1.	-1.	-4.	10.	1.	-10.	-2.	-3.	-1.	-17.	-38.
.	-1.	-31.	-5.	1.	1.	1.	-2.	-4.	-17.	-4.	-5.	1.	-6.	-91.
.	-1.	-0.	-22.	-20.	-5.	11.	-3.	-2.	1.	-23.	-13.	-5.	-48.	-44.
.	-3.	-5.	8.	1.	-2.	4.	-1.	-11.	1.	-5.	-4.	-2.	-4.	-23.
.	0.	2.	-0.	1.	-0.	-1.	-0.	2.	-1.	-0.	-0.	-0.	0.	-4.
.	-0.	0.	30.	14.	-0.	-27.	-2.	57.	-18.	-22.	-24.	-14.	-66.	-104.
.	-1.	46.	0.	-6.	-3.	1.	3.	-40.	-31.	-7.	-4.	-2.	-10.	-80.
.	0.	10.	-8.	0.	5.	1.	2.	-18.	-20.	5.	-2.	-2.	-19.	-63.
.	-0.	-5.	-3.	-1.	0.	5.	-1.	-3.	-7.	-2.	-1.	-1.	-6.	-11.
.	-1.	-1.	8.	1.	-1.	0.	-0.	-15.	-16.	-6.	-9.	-3.	-32.	-19.
.	-0.	-1.	3.	-2.	-1.	-1.	0.	-20.	-20.	-3.	-2.	1.	-4.	-30.
.	-6.	-13.	-2.	-12.	-4.	29.	-11.	0.	-11.	-12.	1.	10.	148.	122.
.	-2.	-26.	5.	-14.	7.	5.	-5.	-48.	0.	89.	39.	13.	32.	15.
.	1.	-12.	-5.	-3.	-1.	-4.	1.	12.	18.	0.	2.	-1.	-3.	-16.
.	-0.	-21.	-6.	-3.	-1.	-9.	0.	26.	35.	4.	0.	0.	2.	-4.
.	-0.	-7.	-2.	-2.	-1.	-4.	-1.	8.	32.	-3.	1.	0.	-15.	-3.
.	0.	126.	4.	-3.	-3.	-37.	2.	-52.	15.	4.	30.	2.	0.	79.
.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.

318.18 STD. DEV. * 17.84 M.S.E. = 347.77 ROOT M.S.E. = 18.65

2 of 2

TABLE C - 17 CHI-SQUARE CELL VALUES BETWEEN THE OD TRIP DATA AND GRAVITY MODEL IT

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
										CHI-SQUARE VALUES						
1	0.	10.**	0.	22.**	60.**	8.**	18.**	4.*	8.**	13.**	3.	4.*	1.	66.**	0.	12.**
2	16.**	0.	10.**	2.	7.**	44.	185.**	3.	0.	4.*	0.	4.*	0.	1.	1.	1.
3	8.**	4.*	0.	13.**	37.**	32.	5.*	4.*	20.**	18.**	616.	2.	0.	5.*	21.	2.
4	4.*	0.	30.**	0.	22.**	1.	4.*	1.	1.	1.	1.	23.**	0.	2.	5.	1.
5	1.	5.*	20.**	9.**	0.	0.	3.	2.	1.	18.**	3.	13.**	1.	3.	2.	0.
6	0.	1.	2.	0.	2.	0.	1.	0.	0.	0.	0.	4.*	0.	1.	0.	2.
7	7.**	1.	2.	0.	6.*	1.	0.	3.	3.	8.**	1.	3.	6.*	0.	1.	2.
8	0.	2.	0.	7.**	6.*	0.	5.*	0.	3.	4.*	1.	19.**	2.	0.	0.	0.
9	0.	3.	0.	2.	6.*	4.*	33.**	6.*	0.	6.*	0.	0.	10.**	14.**	3	
10	2.	0.	1.	0.	12.**	6.*	0.	1.	15.**	0.	3.	1.	4.*	0.	1.	1.
11	1.	0.	1.	0.	0.	0.	0.	0.	1.	2.	0.	1.	0.	1.	0.	1.
12	2.	33.**	0.	6.*	3.	5.*	19.**	3.	0.	2.	0.	0.	22.**	7.**	0.	10.**
13	2.	1.	1.	9.**	1.	2.	5.*	10.**	3.	1.	1.	43.**	0.	4.*	3.	
14	2.	1.	2.	0.	7.**	2.	6.*	4.*	13.**	0.	0.	3.	6.*	0.	41.	0.
15	1.	0.	5.	2.	0.	1.	2.	5.	8.**	16.	0.	2.	2.	1.	0.	16.
16	0.	7.	11.**	7.	2.	4.	2.	21.**	5.*	1.	1.	0.	4.*	0.	1.	0.
17	1.	2.	32.	2.	1.	13.	2.	53.	0.	4.*	0.	0.	.	.		
18	9.**	1.	49.**	0.	76.**	6.*	1.	3.	1.	0.	6.*	1.	0.	4.*	2.	25.**
19	0.	19.**	1.	9.**	50.**	2.	5.*	2.	1.	5.*	2.	6.*	1.	9.**	9.**	1.
20	1.	0.	2.	1.	5.*	1.	1.	3.	14.**	3.	1.	7.**	5.*	3.	1.	3.
21	1.	1.	2.	3.	1.	1.	3.	4.	6.*	3.	0.	17.**	5.*	3.	1.	9.**
22	1.	0.	0.	5.	0.	1.	2.	0.	5.*	2.	0.	3.	1.	2.	1.	2.
23	2.	1.	0.	5.*	2.	6.*	13.**	1.	0.	0.	0.	161.**	1.	0.	2.	25.**
TOTAL	63.	91.	172.	107.	305.	138.	315.	132.	106.	112.	642.	315.	73.	130.	97.	120.

$\chi^2_{0.99,484}$ =0584 = 484 $\chi^2_{0.99,1}$ = 6.63 $\chi^2_{0.95,1}$ =3584

1of

D TRIP DATA AND GRAVITY MODEL ITERATION NO. 3

HI-SQUARE VALUES

0	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
.**	3.	4.*	1.	66.**	0.	12.**	0.	13.**	1.	1.	1.	1.	5.*	250.
.*	0.	4.*	0.	1.	1.	7.	25.	13.**	2.	1.	2.	0.	0.	327.
.		2.	0.	5.*	21.	2.	7.	15.**	94.**	6.	2.	0.	0.	909.
.	1.	23.**	0.	2.	5.	1.	1.	4.*	0.	3.	5.*	6.	1.	115.
.	3.	13.**	1.	3.	2.	0.	0.	93.**	5.*	8.**	0.	3.	1.	191.
.	0.	4.*	0.	1.	0.	2.	0.	1.	7.**	1.	1.	1.	7.**	31.
.**	1.	3.	6.*	0.	1.	2.	144.	0.	7.**	2.	3.	1.	17.**	218.
.*	1.	19.**	2.	0.	0.	0.	2.	0.	16.**	4.	5.*	1.	3.	83.
.*	0.	0.	10.**	14.**	3.	3.	2.	0.	0.	21.**	13.**	5.*	22.**	154.
.	3.	1.	4.*	0.	1.	1.	0.	2.	0.	5.*	4.	2.	0.	62.
.	0.	1.	0.	1.	0.	1.	0.	2.	1.	0.	0.	0.	0.	13.
.	0.	0.	22.**	7.**	0.	10.**	1.	17.**	3.	19.**	24.**	13.**	45.**	233.
.	1.	43.**	0.	4.*	3.	0.	4.	22.**	21.**	7.**	3.	1.	5.*	152.
.	0.	3.	6.*	0.	41.	0.	2.	10.**	16.**	5.*	1.	2.	15.**	137.
	0.	2.	2.	1.	0.	46.	1.	1.	7.**	2.	0.	1.	6.*	78.
.	1.	0.	4.*	0.	1.	0.	0.	7.**	6.*	4.*	8.**	2.	15.**	110.
.*	0.	0.	2.	2.	1.	0.	0.	15.**	19.**	3.	2.	1.	1.	158.
.	6.*	1.	0.	4.*	2.	25.**	7.**	0.	1.	2.	0.	4.*	85.**	283.
.*	2.	6.*	1.	9.**	9.**	1.	3.	34.**	0.	231.**	45.**	15.**	8.**	458.
.	1.	7.**	5.*	3.	1.	3.	1.	4.*	13.**	0.	1.	0.	0.	71.
.	0.	17.**	5.*	3.	1.	9.**	0.	23.**	37.**	2.	0.	0.	0.	122.
.	0.	3.	1.	2.	1.	2.	1.	2.	82.**	3.	0.	0.	8.**	121.
.	0.	161.**	1.	0.	2.	25.**	1.	13.**	1.	1.	36.**	0.	0.	273.
.	642.	315.	73.	130.	97.	120.	203.	291.	342.	332.	157.	60.	246.	4550. **

χ^2 [illegible] = 3584 [illegible]

$\chi^2_{0.95,1}$

* (SIGNIFICANT AT 5% LEVEL)

** (SIGNIFICANT AT 1% LEVEL)

-- (EXPECTED FREQUENCY <5)

2 of 2

210

TABLE C - 18 TRIPS BY DISTANCE CLASSES AND RELATED CHI-SQUARES (ITERATION NO. 3)

DISTANCE CLASS (KM)	NUMBER OF TRIPS OD SURVEY	NUMBER OF TRIPS MODEL	NUMBER OF TRIPS CHI-SQ.	PERCENT TOTAL TRIPS OD SURVEY	PERCENT TOTAL TRIPS MODEL	PERCENT TOTAL TRIPS CHI-SQ.
0 - 19	41.	42.	0.02	0.29	0.30	0.00
20 - 39	442.	449.	0.12	3.09	3.19	0.00
40 - 59	387.	396.	0.21	2.70	2.81	0.00
60 - 79	284.	289.	0.10	1.98	2.05	0.00
80 - 99	837.	852.	0.26	5.85	6.04	0.01
100 - 119	413.	421.	0.15	2.88	2.99	0.00
120 - 139	148.	151.	0.07	1.03	1.07	0.00
140 - 159	693.	699.	0.05	4.84	4.96	0.00
160 - 179	437.	447.	0.23	3.05	3.17	0.00
180 - 199	921.	922.	0.00	6.43	6.54	0.00
200 - 219	912.	919.	0.05	6.37	6.51	0.00
220 - 239	105.	107.	0.04	0.73	0.76	0.00
240 - 259	817.	839.	0.56	5.71	5.95	0.01
260 - 279	523.	519.	0.03	3.65	3.68	0.00
280 - 299	319.	321.	0.01	2.23	2.27	0.00
300 - 319	395.	405.	0.26	2.76	2.87	0.00
320 - 339	790.	789.	0.00	5.52	5.60	0.00
340 - 359	435.	447.	0.35	3.04	3.17	0.01
360 - 379	406.	407.	0.00	2.84	2.88	0.00
380 - 399	135.	137.	0.02	0.94	0.97	0.00
400 - 419	136.	139.	0.08	0.95	0.99	0.00
420 - 439	980.	981.	0.00	6.85	6.96	0.00
440 - 459	82.	84.	0.04	0.57	0.59	0.00
460 - 479	280.	281.	0.01	1.96	1.99	0.00
480 - 499	17.	17.	0.00	0.12	0.12	0.00
500 - 519	22.	22.	0.01	0.15	0.16	0.00
520 - 539	233.	233.	0.00	1.63	1.65	0.00
540 - 559	234.	237.	0.03	1.63	1.68	0.00
560 - 579	20.	20.	0.01	0.14	0.14	0.00
580 - 599	56.	56.	0.00	0.39	0.40	0.00
600 - 619	95.	97.	0.04	0.66	0.69	0.00
620 - 639	200.	199.	0.01	1.40	1.41	0.00
640 - 659	286.	287.	0.01	2.00	2.04	0.00
660 - 679	26.	26.	0.00	0.18	0.18	0.00
680 - 699	698.	696.	0.00	4.88	4.94	0.00
700 - 719	93.	92.	0.00	0.65	0.65	0.00
720 - 739	515.	513.	0.01	3.60	3.64	0.00
740 - 759	58.	57.	0.02	0.41	0.40	0.00
760 - 779	19.	19.	0.00	0.13	0.13	0.00
780 - 799	22.	22.	0.00	0.15	0.16	0.00
800 - 819	0.	0.	0.0	0.0	0.0	
820 - 839	0.	0.	0.0	0.0	0.0	

PERCENT OD SURVEY	TOTAL MODEL	TRIPS CHI-SQ.	FRICTION FACTOR	CHI-SQ. MODEL TRIPS	CHI-SQ. MODEL PERCENT
0.29	0.30	0.00	3.18	0.10	0.00
3.09	3.19	0.00	2.38	0.01	0.00
2.70	2.81	0.00	0.67	1.72	0.01
1.98	2.05	0.00	2.62	0.00	0.00
5.85	6.04	0.01	1.32	0.77	0.01
2.88	2.99	0.00	1.61	0.28	0.00
1.03	1.07	0.00	1.33	0.02	0.00
4.84	4.96	0.00	1.53	0.04	0.00
3.05	3.17	0.00	2.11	0.14	0.00
6.43	6.54	0.00	1.68	0.17	0.00
6.37	6.51	0.00	1.79	0.12	0.00
0.73	0.76	0.00	1.70	0.08	0.00
5.71	5.95	0.01	1.37	1.95	0.01
3.65	3.68	0.00	1.59	0.24	0.00
2.23	2.27	0.00	1.60	0.14	0.00
2.76	2.87	0.00	1.03	1.55	0.01
5.52	5.60	0.00	1.28	0.26	0.00
3.04	3.17	0.01	0.97	2.20	0.02
2.84	2.88	0.00	1.33	0.01	0.00
0.94	0.97	0.00	0.75	0.00	0.00
0.95	0.99	0.00	0.62	0.51	0.00
6.85	6.96	0.00	1.38	1.03	0.01
0.57	0.59	0.00	0.75	0.11	0.00
1.96	1.99	0.00	0.81	0.14	0.00
0.12	0.12	0.00	0.48	0.03	0.00
0.15	0.16	0.00	1.16	0.01	0.00
1.63	1.65	0.00	0.79	0.20	0.00
1.63	1.68	0.00	1.03	0.03	0.00
0.14	0.14	0.00	0.65	0.01	0.00
0.39	0.40	0.00	0.70	0.04	0.00
0.66	0.69	0.00	0.47	0.01	0.00
1.40	1.41	0.00	0.82	0.04	0.00
2.00	2.04	0.00	0.99	0.01	0.00
0.18	0.18	0.00	0.41	0.16	0.00
4.88	4.94	0.00	0.96	0.96	0.01
0.65	0.65	0.00	0.61	0.22	0.00
3.60	3.64	0.00	1.18	1.49	0.01
0.41	0.40	0.00	1.08	0.48	0.00
0.13	0.13	0.00	0.24	0.20	0.00
0.15	0.16	0.00	0.25	0.18	0.00
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.05	0.05	0.00	0.36	0.13	0.00

2 of

[illegible]	[illegible]	919.	[illegible]	6.	[illegible]	[illegible]
220 - 239	105.	107.	0.04	0.73	0.76	0.00
240 - 259	817.	839.	0.56	5.71	5.95	0.01
260 - 279	523.	519.	0.03	3.65	3.68	0.00
280 - 299	319.	321.	0.01	2.23	2.27	0.00
300 - 319	395.	405.	0.26	2.76	2.87	0.00
320 - 339	790.	789.	0.00	5.52	5.60	0.00
340 - 359	435.	447.	0.35	3.04	3.17	0.01
360 - 379	406.	407.	0.00	2.84	2.88	0.00
380 - 399	135.	137.	0.02	0.94	0.97	0.00
400 - 419	136.	139.	0.08	0.95	0.99	0.00
420 - 439	980.	981.	0.00	6.85	6.96	0.00
440 - 459	82.	84.	0.04	0.57	0.59	0.00
460 - 479	280.	281.	0.01	1.96	1.99	0.00
480 - 499	17.	17.	0.00	0.12	0.12	0.00
500 - 519	22.	22.	0.01	0.15	0.16	0.00
520 - 539	233.	233.	0.00	1.63	1.65	0.00
540 - 559	234.	237.	0.03	1.63	1.68	0.00
560 - 579	20.	20.	0.01	0.14	0.14	0.00
580 - 599	56.	56.	0.00	0.39	0.40	0.00
600 - 619	95.	97.	0.04	0.66	0.69	0.00
620 - 639	200.	199.	0.01	1.40	1.41	0.00
640 - 659	286.	287.	0.01	2.00	2.04	0.00
660 - 679	26.	26.	0.00	0.18	0.18	0.00
680 - 699	698.	696.	0.00	4.88	4.94	0.00
700 - 719	93.	92.	0.00	0.65	0.65	0.00
720 - 739	515.	513.	0.01	3.60	3.64	0.00
740 - 759	58.	57.	0.02	0.41	0.40	0.00
760 - 779	19.	19.	0.00	0.13	0.13	0.00
780 - 799	22.	22.	0.00	0.15	0.16	0.00
800 - 819	0.	0.	0.0	0.0	0.0	0.0
820 - 839	0.	0.	0.0	0.0	0.0	0.0
840 - 859	7.	7.	0.00	0.05	0.05	0.00
860 - 879	24.	24.	0.00	0.17	0.17	0.00
880 - 899	0.	0.	0.0	0.0	0.0	0.0
900 - 919	446.	433.	0.38	3.12	3.07	0.00
920 - 939	0.	0.	0.0	0.0	0.0	0.0
940 - 959	0.	0.	0.0	0.0	0.0	0.0
960 - 979	0.	0.	0.0	0.0	0.0	0.0
980 - 999	0.	0.	0.0	0.0	0.0	0.0
1000 -1019	0.	0.	0.0	0.0	0.0	0.0
TOTAL CHI-SQUARE VALUES			3.18			0.07

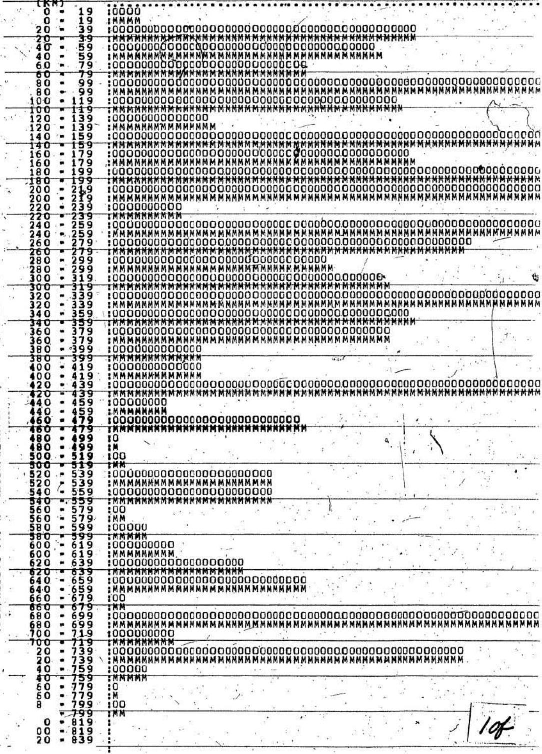
DEGREES OF FREEDOM = 45, CH. SQ. TABLE VALUE AT 5 PERCT. LEVEL = 61.63

3 of

6.37	6.51	0.0	1.79	[illegible]	[illegible]
0.73	0.76	0.00	1.70	0.08	0.00
5.71	5.95	0.01	1.37	1.95	0.01
3.65	3.68	0.00	1.59	0.24	0.00
2.23	2.27	0.00	1.60	0.14	0.00
2.76	2.87	0.00	1.03	1.55	0.01
5.52	5.60	0.00	1.28	0.26	0.00
3.04	3.17	0.01	0.97	2.20	0.02
2.84	2.88	0.00	1.33	0.01	0.00
0.94	0.97	0.00	0.75	0.00	0.00
0.95	0.99	0.00	0.62	0.51	0.00
6.85	6.96	0.00	1.38	1.03	0.01
0.57	0.59	0.00	0.75	0.11	0.00
1.96	1.99	0.00	0.81	0.14	0.00
0.12	0.12	0.00	0.48	0.03	0.00
0.15	0.16	0.00	1.16	0.01	0.00
1.63	1.65	0.00	0.79	0.20	0.00
1.63	1.68	0.00	1.03	0.03	0.00
0.14	0.14	0.00	0.65	0.01	0.00
0.39	0.40	0.00	0.70	0.04	0.00
0.66	0.69	0.00	0.47	0.01	0.00
1.40	1.41	0.00	0.82	0.04	0.00
2.00	2.04	0.00	0.99	0.01	0.00
0.18	0.18	0.00	0.41	0.16	0.00
4.88	4.94	0.00	0.96	0.96	0.01
0.65	0.65	0.00	0.61	0.22	0.00
3.60	3.64	0.00	1.18	1.49	0.01
0.41	0.40	0.00	1.08	0.48	0.00
0.13	0.13	0.00	0.24	0.20	0.00
0.15	0.16	0.00	0.25	0.18	0.00
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.05	0.05	0.00	0.36	0.13	0.00
0.17	0.17	0.00	0.44	0.36	0.00
0.0	0.0	0.0	0.0	0.0	0.0
3.12	3.07	0.00	0.84	4.79	0.03
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
		0.07		20.91	0.14

ERCT. LEVEL = 61163

4 of 4



OD SURVEY: O (10 PASSENGERS)

GRAVITY MODEL: M (10 PASSENGERS)

FIGURE C-7 TRIP LENGTH FREQUENCY DISTRIBUTION OF OD SURVEY AND GRAVITY MODEL ITERATION NO. 3

1of

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 (2.80)    (3.50)    (4.20)    (4.90)    (5.60)    (6.30)    (7.00)
  400       500       600       700       800       900      1000
    +         +         +         +         +         +         +         +
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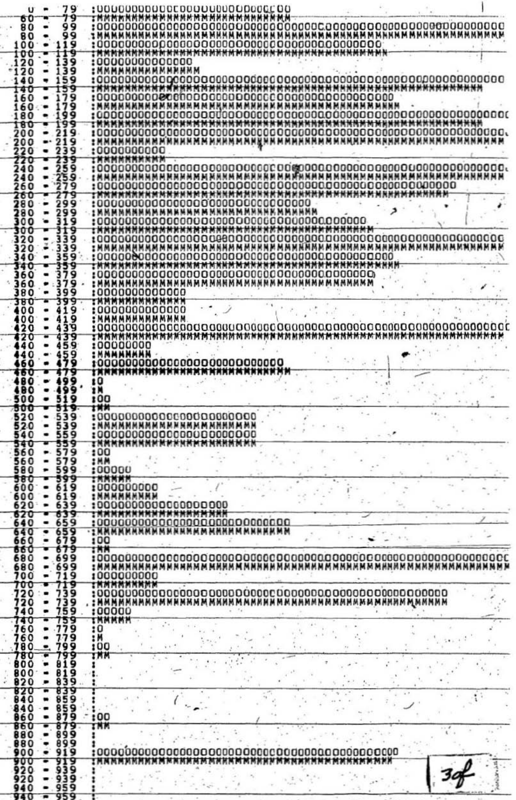
TRIP LENGTH FREQUENCY DISTRIBUTION OF OD SURVEY AND GRAVITY MODEL ITERATION NO. 3

OD SURVEY: O (10 PASSENGERS)   GRAVITY MODEL: M (10 PASSENGERS)

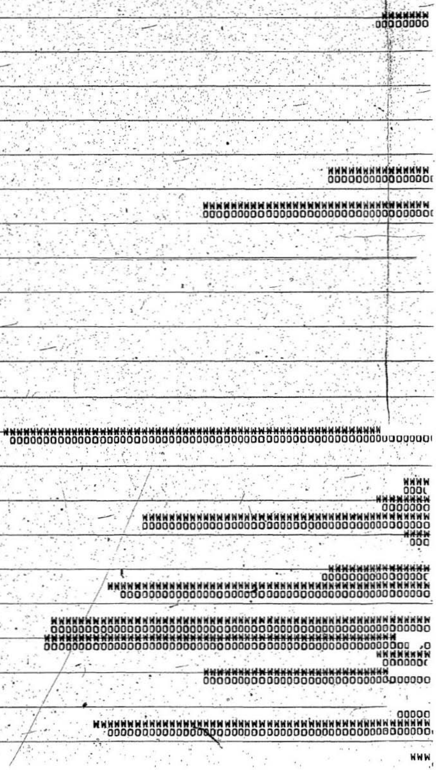


3of

4 of 4

212

PRINTED IN CANADA



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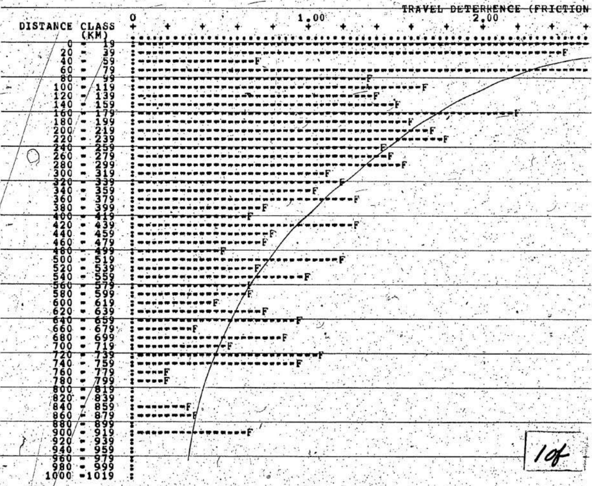
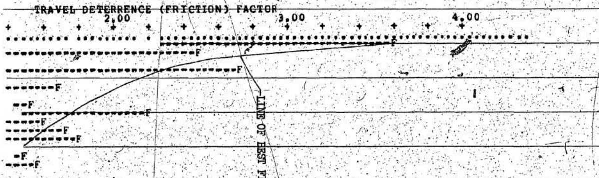


FIGURE C - 8 DISTANCE CLASS OVER TRAVEL DETERRENCE FACTOR (USING POINTS FROM TH



2 of 2

ERRENCE FACTOR (USING POINTS FROM THE LINE OF BEST FIT)

APPENDIX 'D'

This appendix contains the computer program output relative to eath model test year from 1977 to 1980 inclusive. Such is presented in tabular and graphical form similar to Appendix C. The material includes comparisons between predicted and observed data for each test year as well as comparison of observed data between test years.

TABLE D-1 DWELLING UNITS BY ZONE

ZONE NO	ACTUAL 1971	1976	ESTIMATED 1977	1978	1979	1980
1	24700	28135	28918	29722	30549	31400
2	260	365	394	425	459	496
3	2090	2255	2291	2327	2364	2402
4	1150	1605	1732	1869	2017	2177
5	3115	3325	3370	3415	3461	3508
6	1030	1165	1196	1227	1259	1292
7	1145	1290	1323	1357	1391	1426
8	1580	1635	1646	1669	1692	1715
9	4060	4510	4610	4712	4816	4922
10	1745	2135	2230	2330	2434	2543
11	330	370	379	388	397	406
12	6485	7540	7785	8038	8300	8570
13	1805	1910	1932	1955	1978	2001
14	1475	1630	1664	1699	1735	1772
15	355	475	507	541	578	618
16	1915	2235	2310	2387	2467	2550
17	545	630	650	670	691	713
18	7690	8130	8223	8317	8412	8600
19	3225	3700	3809	3921	4037	4156
20	640	730	751	772	794	817
21	435	510	528	546	565	585
22	440	515	533	551	570	590
23	2055	2395	2474	2556	2641	2729

TABLE D-2 ESTIMATED TRIP PRODUCTIONS AND ATTRACTIONS BY YEAR

ZONE NO.	YR: 1977 PROD.	ATTR.	YR: 1978 PROD.	ATTR.	YR: 1979 PROD.	ATTR.	YR: 1980 PROD.	ATTR.
1	3484	3379	3573	3456	3666	3538	3804	3665
2	131	119	137	125	145	133	152	141
3	525	530	532	538	540	546	548	554
4	409	409	438	439	468	471	502	505
5	749	764	759	774	768	784	778	793
6	298	293	304	299	311	306	317	313
7	324	320	331	328	338	335	345	342
8	391	390	396	395	401	400	406	405
9	1007	1033	1028	1055	1050	1077	1072	1100
10	513	517	533	538	555	561	578	585
11	128	115	130	117	132	119	133	121
12	1667	1721	1720	1776	1774	1833	1830	1891
13	451	452	455	457	460	462	465	467
14	395	394	402	402	410	410	417	417
15	154	143	162	151	169	159	178	167
16	529	534	545	551	562	568	579	586
17	184	174	188	179	193	183	197	188
18	1758	1816	1778	1836	1797	1857	1836	1898
19	841	859	864	883	888	908	913	934
20	205	196	210	201	214	205	219	210
21	159	148	163	152	167	156	171	160
22	160	149	164	153	168	157	172	161
23	563	570	580	587	598	606	616	625
Total	15025	15025	15392	15392	15774	15774	16228	16228

TABLE D-3 ROADCRUISER PASSENGER OD SURVEY TRIP DATA FOR ZONES AUGUST 1977

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
										NUMBER OF TRIPS					
1	0	1	72	101	187	16	110	90	396	176	7	444	71	41	10
2	2	0	2	7	4	0	8	9	6	6	0	19	0	4	0
3	66	0	0	6	12	6	20	6	76	54	3	80	10	3	0
4	123	0	11	0	9	0	4	5	29	8	0	35	10	9	5
5	203	5	14	9	0	6	18	38	112	11	1	70	19	9	0
6	18	0	2	0	9	0	1	0	12	7	0	15	0	0	0
7	142	6	9	5	9	0	0	16	26	4	0	28	3	6	0
8	155	4	13	13	28	0	13	0	35	4	0	38	8	4	2
9	358	9	63	44	92	11	31	58	0	27	2	133	23	13	7
10	170	2	20	15	12	2	2	4	18	0	0	26	15	15	0
11	6	2	1	0	2	0	0	0	0	0	0	5	0	1	0
12	505	29	73	27	53	15	40	27	81	10	6	0	47	27	6
13	81	0	6	8	7	0	4	6	29	19	0	49	0	1	0
14	67	5	3	6	5	0	0	4	20	10	0	39	4	0	0
15	16	04	5	2	4	0	5	1	6	4	0	11	4	2	0
16	117	10	23	11	27	0	8	22	59	46	0	53	27	4	0
17	47	0	0	2	10	0	1	2	10	5	0	11	2	0	0
18	295	12	47	23	75	8	24	18	65	40	0	155	53	13	0
19	113	8	28	16	11	0	3	8	48	18	0	78	20	5	13
20	12	0	5	4	0	0	1	2	2	0	0	6	0	0	0
21	2	0	1	0	1	0	0	0	0	0	0	1	0	0	0
22	13	0	3	0	0	0	0	0	2	2	0	10	0	1	0
23	353	11	50	51	57	4	13	10	105	43	0	192	35	9	0
TOTAL PROD.	2864	104	451	350	614	68	306	326	1137	494	19	1498	351	167	

SUM SQS. = 1923918. AVERAGE = 26. VARIANCE = 3636.90 STD. DEV

10f

IP DATA FOR ZONES AUGUST 1977

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL ATTR.
NUMBER OF TRIPS														
176	7	444	71	41	10	98	15	295	122	8	5	8	375	2648
6	0	19	0	4	0	8	6	13	7	0	0	1	4	106
54	3	80	10	3	0	10	7	70	25	6	2	2	57	521
8	0	35	10	9	5	19	6	23	17	2	0	2	56	373
11	1	70	19	9	0	34	5	76	26	0	0	0	59	715
7	0	15	0	0	0	1	0	12	0	0	0	0	1	78
4	0	28	3	6	0	8	5	22	6	2	0	0	9	306
4	0	38	8	4	2	18	1	18	8	0	0	0	10	372
27	2	133	23	13	7	54	3	73	23	5	0	0	89	1118
0	0	26	15	15	0	30	0	57	16	0	0	5	29	438
0	0	5	0	1	0	0	0	0	0	0	0	0	5	22
10	6	0	47	27	6	46	11	143	83	5	4	10	146	1394
19	0	49	0	1	0	17	6	59	20	0	0	0	53	365
10	0	39	4	0	0	4	0	8	8	0	1	1	13	198
4	0	11	4	2	0	0	0	3	0	0	0	0	1	64
46	0	53	27	4	0	0	11	39	20	0	5	3	61	546
5	0	11	2	0	0	21	0	8	9	1	0	0	10	139
40	0	155	53	13	0	43	1	0	57	23	36	22	394	1404
18	0	78	20	5	13	37	5	81	0	80	53	47	174	846
0	0	6	0	0	0	0	0	30	72	0	8	4	15	161
0	0	1	0	0	0	10	1	53	74	8	0	1	20	172
2	0	10	0	1	0	6	2	39	35	2	4	0	17	136
43	0	192	35	9	0	62	21	418	192	21	18	11	0	1676
494	19	1498	351	167	43	526	106	1540	820	163	136	117	1598	13798

NCE = 3636.90 STD. DEV. = 60.31 COEFFT. OF VARIATION = 2.31

2 of 2

TABLE D - 4 ROADCRUISER PASSENGER OD SURVEY TRIP DATA FOR ZONES AUGUST 1978

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
										NUMBER OF TRIPS					
1	0	3	80	72	226	10	87	117	252	149	0	424	63	59	0
2	0	0	0	3	2	4	2	1	14	6	0	13	0	7	0
3	75	0	0	5	11	1	11	16	44	21	0	84	17	28	0
4	89	2	9	0	6	0	9	26	12	7	0	39	19	2	0
5	253	7	10	6	0	5	8	10	95	29	0	91	17	4	0
6	23	1	2	1	9	0	1	0	9	6	0	7	1	0	0
7	115	1	11	4	12	0	0	4	21	9	0	24	3	0	0
8	128	0	7	13	8	0	5	0	40	2	0	24	6	2	0
9	276	11	59	23	117	5	31	43	0	22	0	79	19	0	2
10	175	4	23	12	22	4	14	6	15	0	0	27	21	12	1
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	468	8	68	31	83	9	22	15	78	21	0	0	25	20	
13	66	0	18	10	16	0	1	4	17	11	0	34	0	2	0
14	66	5	10	0	17	1	0	8	10	0	0	63	3	0	
15	2	1	5	0	2	1	0	1	3	0	0	7	0	3	0
16	113	5	38	11	19	1	0	13	40	23	0	43	20	1.	
17	37	0	10	3	4	0	0	1	2	6	0	13	2	0	0
18	283	2	55	31	57	0	1	29	84	40	0	192	46	9	
19	94	6	33	8	6	0	0	5	30	17	0	76	10	13	3
20	3	0	6	0	0	0	0	0	10	0	0	7	0	0	1
21	11	0	3	3	0	0	0	2	0	2	0	1	1	0	0
22	10	0	2	3	5	0	0	0	4	0	0	8	3	2	0
23	179	0	19	16	43	1	0	34	46	30	0	185	53	18	0
TOTAL PROD.	2466	56	468	255	665	42	192	335	826	401	0	1441	329	196	12 3

SUM SQS. = 1406503. AVERAGE = 22. VARIANCE = 2658.80 STD.

1of

RIP DATA FOR ZONES AUGUST 1978

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL ATTR.
NUMBER OF TRIPS														
149	0	424	63	59	0	86	32	260	80	10	15	6	149	2180
6	0	13	0	7	0	7	3	17	3	2	0	0	9	93
21	0	84	17	28	0	34	5	59	21	8	1	1	18	460
7	0	39	19	2	0	7	4	41	14	2	0	7	21	316
29	0	91	17	4	0	22	3	55	10	1	0	2	30	658
6	0	7	1	0	0	0	0	2	0	0	0	0	4	66
9	0	24	3	0	0	4	4	15	5	0	0	0	9	241
2	0	24	6	2	0	3	3	51	4	0	0	1	7	304
22	0	79	19	0	2	38	2	68	46	1	3	7	33	885
0	0	27	21	12	1	17	7	48	13	0	2	0	20	443
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	25	20	4	45	19	172	54	5	8	17	103	1275
11	0	34	0	2	0	7	1	43	17	0	2	2	17	268
0	0	63	3	0	1	7	3	4	18	0	0	0	2	218
0	0	7	0	3	0	0	0	3	1	0	0	0	5	34
23	0	43	20	15	0	0	6	41	21	1	3	3	34	450
6	0	13	2	0	0	4	0	6	4	0	0	0	25	117
40	0	192	46	9	0	24	15	0	74	25	27	45	241	1280
17	0	76	10	13	3	21	4	88	0	95	45	53	199	806
0	0	7	0	0	1	1	0	34	80	0	2	1	21	166
2	0	1	1	0	0	2	3	34	44	2	0	3	13	124
0	0	8	3	2	0	1	1	37	48	4	8	0	14	150
30	0	185	53	18	0	40	12	364	246	27	17	11	0	1341
401	0	1441	329	196	12	370	127	1442	803	183	133	159	974	11875

ANCE = 2658.80 STD. DEV. = 51.56 COEFFT. OF VARIATION = 2.30

2 of 2

218

TABLE D – 5 ROADCRUISER PASSENGER OD SURVEY TRIP DATA FOR ZONES AUGUST 1979

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
										NUMBER OF TRIPS					
1	0	2	98	68	225	17	92	120	298	168	0	399	104	57	7
2	1	0	0	4	5	0	3	1	13	1	0	20	4	1	0
3	73	0	0	1	22	3	4	17	63	39	0	76	17	22	1
4	99	3	6	0	11	3	5	9	27	9	0	29	5	5	0
5	250	5	13	1	0	5	6	17	104	37	0	74	5	7	1
6	28	1	5	2	3	0	0	0	13	5	0	4	1	0	0
7	117	1	18	0	17	1	0	11	41	1	0	23	4	3	1
8	141	0	21	4	18	1	2	0	30	8	0	23	9	9	1
9	250	14	57	15	98	18	39	73	0	17	0	128	26	9	1
10	183	1	34	9	24	3	1	10	14	0	0	34	13	20	0
11	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0
12	469	18	69	15	58	5	12	43	77	17	0	0	48	20	0
13	80	1	15	9	11	0	3	7	20	13	0	40	0	1	1
14	65	7	15	3	5	0	0	3	25	22	0	39	3	0	1
15	15	0	4	1	0	0	0	3	1	4	0	7	0	1	0
16	110	6	30	11	26	1	4	13	36	25	0	66	16	5	0
17	18	0	6	13	5	0	0	1	10	3	0	18	2	0	3
18	337	14	63	16	39	4	9	18	71	34	0	148	40	14	5
19	119	9	18	30	13	0	1	11	77	25	0	64	17	9	1
20	13	1	4	0	0	0	0	0	3	0	0	5	0	1	0
21	9	1	5	1	1	0	0	0	4	4	0	4	1	0	0
22	11	1	3	0	0	0	0	1	4	0	0	7	0	2	0
23	236	7	16	16	20	1	13	17	50	32	0	160	27	10	4
TOTAL PROD.	2624	92	501	219	601	62	194	375	981	464	0	1369	342	196	27 4

SUM SQS. = 1566795. AVERAGE = 24. VARIANCE = 2961.81 STD. DEV.

10f

P DATA FOR ZONES AUGUST 1979

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL ATTR.
NUMBER OF TRIPS														
68	0	399	104	57	7	96	22	328	82	18	10	12	211	2434
1	0	20	4	1	0	5	1	23	5	0	1	0	8	96
39	0	76	17	22	1	34	5	73	18	4	1	1	29	503
9	0	29	5	5	0	8	11	32	11	1	2	1	21	298
37	0	74	5	7	1	17	9	39	13	0	1	1	36	641
5	0	4	1	0	0	1	1	5	1	0	0	0	1	71
1	0	23	4	3	1	4	1	13	2	0	0	0	9	267
8	0	23	9	9	1	13	1	34	8	0	1	1	13	338
17	0	128	26	9	1	39	15	78	40	1	3	5	37	963
0	0	34	13	20	0	27	1	37	28	0	2	0	22	463
0	0	1	0	0	0	0	0	0	0	0	0	0	2	4
17	0	0	48	20	0	58	18	149	73	5	1	7	108	1270
13	0	40	0	1	1	17	12	39	11	0	1	1	15	297
22	0	39	3	0	1	5	0	12	16	0	1	1	18	241
4	0	7	0	1	0	1	0	1	2	0	0	0	0	40
25	0	66	16	5	0	0	12	118	36	1	7	2	34	559
3	0	18	2	0	3	10	0	13	4	1	0	1	13	121
34	0	148	40	14	5	29	6	0	64	18	57	48	326	1360
25	0	64	17	9	1	34	7	93	0	86	63	39	198	914
0	0	5	0	1	0	5	0	30	48	0	8	1	27	146
4	0	4	1	0	0	1	1	34	55	4	0	0	37	162
0	0	7	0	2	0	4	0	51	42	3	3	0	9	141
32	0	160	27	10	4	39	11	391	223	25	27	37	0	1362
64	0	1369	342	196	27	447	134	1593	782	167	189	158	1174	12691

CE = 2961.81 STD. DEV. = 54.42 COEFFT. OF VARIATION = 2.27

2 of 2

TABLE D-6 ROADCRUISER PASSENGER OD SURVEY TRIP DATA FOR ZONES AUGUST 1980

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
										NUMBER OF TRIPS					
1	0	5	85	85	292	14	104	110	348	169	0	422	93	61	23
2	3	0	0	0	5	1	1	5	13	8	0	15	4	5	0
3	83	0	0	7	12	2	7	15	78	36	0	97	28	11	3
4	117	1	15	0	12	1	3	8	29	16	0	37	11	10	4
5	364	9	13	5	0	2	16	7	102	21	0	74	10	7	1
6	29	1	5	0	3	0	1	0	19	2	15	9	0	1	0
7	125	5	9	3	23	1	0	8	36	11	22	19	9	2	0
8	153	1	17	5	9	0	5	0	44	2	17	19	3	5	3
9	361	20	29	28	107	15	34	52	0	22	21	95	19	19	9
10	198	3	26	14	21	2	12	2	17	0	0	15	25	6	3
11	1	0	0	0	0	15	22	17	23	0	0	0	0	0	0
12	514	13	79	27	63	13	25	15	81	14	0	0	42	17	12
13	100	5	9	9	8	3	6	5	27	19	0	57	0	0	0
14	68	3	13	7	8	0	3	5	11	19	0	38	5	0	1
15	28	0	6	3	2	1	0	3	10	0	0	9	1	0	0
16	109	9	27	5	31	1	9	23	39	37	0	54	29	7	0
17	19	2	6	10	4	0	2	1	9	2	0	17	1	0	0
18	310	9	78	31	41	0	24	31	87	27	0	114	29	8	7
19	103	10	22	22	13	0	3	0	28	26	0	61	15	5	1
20	13	0	3	1	0	0	1	0	2	0	0	9	0	1	0
21	5	2	3	1	1	0	0	0	1	1	0	5	9	0	0
22	17	0	2	2	4	0	2	1	5	1	0	4	0	0	0
23	149	1	25	15	29	7	4	7	74	33	0	18	12	14	2
TOTAL PROD.	2869	99	472	280	688	78	284	315	1083	466	75	1188	345	179	69 4

SUM SQS. = 1727958. AVERAGE = 25. VARIANCE = 3266.46 STD. DEV

10f

P DATA FOR ZONES AUGUST 1980

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL ATTR.
NUMBER OF TRIPS														
69	0	422	93	61	23	97	21	327	111	8	10	11	190	2586
8	0	15	4	5	0	4	2	7	9	0	2	0	3	87
36	0	97	28	11	3	29	5	63	29	5	3	3	20	536
16	0	37	11	10	4	18	9	32	14	1	1	1	36	376
21	0	74	10	7	1	24	8	53	12	0	1	1	21	751
2	15	9	0	1	0	2	0	4	0	0	0	0	7	98
11	22	19	9	2	0	7	1	7	3	0	0	0	6	297
2	17	19	3	5	3	11	2	39	9	0	0	0	7	351
22	21	95	19	19	9	53	11	87	21	3	3	7	39	1055
0	0	15	25	6	3	10	3	35	30	0	5	1	33	461
0	0	0	0	0	0	22	0	0	0	0	0	0	0	100
14	0	0	42	17	12	43	17	146	69	8	7	6	129	1340
19	0	57	0	0	0	17	1	43	13	0	1	1	16	340
19	0	38	5	0	1	19	0	20	7	1	1	0	17	246
0	0	9	1	0	0	7	1	9	3	0	1	1	2	87
37	0	54	29	7	0	0	5	32	27	1	5	2	33	485
2	0	17	1	0	0	5	0	2	5	3	0	0	12	100
27	0	114	29	8	7	2	3	0	64	16	36	49	333	1299
26	0	61	15	5	1	37	2	64	0	85	61	34	195	787
0	0	9	0	1	0	3	2	15	41	0	7	2	34	134
1	0	5	9	0	0	3	1	53	58	9	0	1	33	186
1	0	4	0	0	0	3	0	48	48	3	2	0	17	159
33	0	18	12	14	2	47	13	383	211	25	18	18	0	1105
466	75	1188	345	179	69	463	107	1469	784	168	164	138	1183	12966

NCE = 3266.46 STD. DEV. = 57.15 COEFFT. OF VARIATION = 2.33

2 of 2

220

PRINTED IN CANADA

TABLE D-7 TRIP DISTRIBUTION BY THE GRAVITY MODEL FOR TEST YEAR 1977

NUMBER OF TRIPS

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1	0.	20.	143.	104.	231.	79.	93.	102.	253.	130.	16.	438.	60.	68.	19.	9
2	20.	0.	9.	4.	7.	3.	4.	3.	11.	4.	1.	8.	2.	1.	1.	
3	180.	11.	0.	28.	35.	9.	15.	18.	43.	25.	3.	48.	16.	8.	5.	1
4	161.	6.	34.	0.	40.	14.	9.	12.	40.	20.	3.	61.	12.	6.	.	
5	329.	10.	39.	37.	0.	24.	18.	23.	68.	37.	9.	98.	22.	15.	4.	1
6	135.	5.	13.	15.	28.	0.	3.	15.	28.	18.	4.	49.	7.	7.	3.	1
7	131.	5.	17.	9.	17.	3.	0.	19.	13.	15.	3.	46.	10.	10.	3.	1
8	160.	5.	22.	12.	26.	13.	22.	0.	54.	15.	3.	49.	15.	10.	3.	1
9	339.	14.	45.	35.	64.	22.	12.	47.	0.	20.	4.	128.	39.	36.	13.	3
10	176.	6.	27.	18.	35.	14.	14.	13.	20.	0.	10.	33.	18.	21.	8.	2
11	22.	1.	4.	3.	8.	3.	3.	3.	5.	11.	0.	26.	3.	3.	2.	
12	610.	11.	54.	55.	96.	40.	46.	43.	133.	33.	26.	0.	51.	54.	30.	10
13	92.	3.	20.	12.	24.	6.	11.	15.	44.	20.	4.	56.	0.	21.	10.	2
14	104.	2.	9.	6.	16.	7.	11.	10.	41.	24.	4.	60.	21.	0.	.	
15	26.	1.	5.	2.	4.	2.	3.	3.	13.	7.	2.	28.	8.	2.	0.	
16	112.	3.	18.	5.	16.	10.	12.	10.	32.	25.	5.	90.	19.	14.	3.	
17	18.	1.	4.	4.	6.	2.	2.	4.	13.	8.	2.	28.	5.	5.	4.	1
18	447.	16.	27.	29.	35.	19.	20.	26.	103.	54.	18.	234.	85.	54.	20.	4
19	260.	7.	27.	12.	36.	13.	12.	12.	31.	24.	5.	83.	34.	28.	11.	3
20	12.	1.	3.	2.	5.	3.	2.	3.	16.	4.	2.	24.	6.	7.	.	
21	9.	1.	3.	3.	3.	1.	2.	3.	7.	3.	1.	18.	5.	4.	2.	
22	17.	0.	1.	2.	2.	2.	2.	2.	4.	2.	1.	19.	3.	4.	2.	
23	123.	2.	0.	12.	14.	7.	8.	5.	33.	13.	4.	43.	10.	15.	5.	2
TOTAL	3484.	131.	525.	409.	749.	298.	324.	391.	1007.	513.	128.	1667.	451.	395.	154.	52

SUM SQS. = 1768833. AVERAGE = 28. VARIANCE = 3343.73 STD. DEV. =

10

ODEL FOR TEST YEAR 1977

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
NUMBER OF TRIPS														
130.	16.	438.	60.	68.	19.	90.	13.	399.	210.	9.	8.	15.	106.	2609.
4.	1.	8.	2.	1.	1.	3.	1.	14.	6.	1.	1.	0.	2.	107.
25.	3.	48.	16.	8.	5.	18.	3.	31.	28.	3.	3.	1.	0.	530.
20.	3.	61.	12.	6.	3.	6.	4.	40.	15.	2.	4.	3.	16.	512.
37.	9.	98.	22.	15.	4.	19.	6.	45.	42.	6.	4.	3.	17.	874.
18.	4.	49.	7.	7.	3.	13.	2.	29.	10.	4.	2.	3.	11.	412.
15.	3.	46.	10.	10.	3.	14.	2.	24.	14.	2.	3.	2.	10.	370.
15.	3.	49.	15.	10.	3.	12.	5.	36.	15.	4.	4.	3.	7.	496.
20.	4.	128.	39.	36.	13.	35.	12.	123.	34.	17.	8.	5.	38.	1092.
0.	10.	33.	18.	21.	8.	27.	8.	66.	26.	5.	3.	3.	15.	565.
11.	0.	26.	3.	3.	2.	5.	2.	23.	6.	2.	1.	1.	5.	141.
33.	26.	0.	51.	54.	30.	100.	27.	290.	94.	26.	23.	24.	52.	1917.
20.	4.	56.	0.	21.	10.	24.	5.	117.	43.	7.	7.	5.	13.	558.
24.	4.	60.	21.	0.	2.	17.	6.	74.	35.	8.	5.	5.	20.	487.
7.	2.	28.	8.	2.	0.	3.	3.	23.	12.	3.	3.	2.	5.	161.
25.	5.	90.	19.	14.	3.	0.	12.	44.	37.	8.	8.	9.	32.	524.
8.	2.	28.	5.	5.	4.	13.	0.	51.	24.	3.	2.	3.	9.	212.
54.	18.	234.	85.	54.	20.	40.	40.	0.	64.	56.	29.	39.	121.	1577.
24.	5.	83.	34.	28.	11.	37.	21.	71.	0.	24.	22.	12.	51.	834.
4.	2.	24.	6.	7.	2.	8.	3.	63.	25.	0.	5.	3.	11.	209.
3.	1.	18.	5.	4.	2.	7.	2.	29.	20.	4.	0.	4.	9.	142.
2.	1.	19.	3.	4.	2.	8.	2.	39.	10.	3.	4.	0.	13.	143.
13.	4.	43.	10.	15.	5.	29.	7.	126.	63.	10.	9.	14.	0.	553.
13.	128.	1667.	451.	395.	154.	529.	184.	1758.	841.	205.	159.	160.	563.	15025.

= 3343.73 STD. DEV. = 57.82 COEFFT. OF VARIATION = 2.04

2 of 2

TABLE D-8 TRIP DISTRIBUTION BY THE GRAVITY MODEL FOR TEST YEAR 1978

TO / ZONE /	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
										NUMBER OF TRIPS					
1	0.	21.	144.	112.	233.	81.	95.	104.	258.	135.	16.	452.	60.	69.	20.
2	22.	0.	9.	4.	8.	3.	4.	3.	12.	5.	1.	9.	2.	1.	
3	182.	11.	0.	30.	35.	9.	16.	18.	43.	25.	3.	49.	16.	8.	5.
4	172.	6.	36.	0.	42.	15.	10.	13.	43.	22.	4.	66.	1.	.	
5	334.	11.	39.	39.	0.	24.	18.	23.	69.	38.	9.	100.	22.	15.	4.
6	137.	6.	13.	17.	29.	0.	3.	15.	28.	19.	4.	51.	7.	7.	3.
7	134.	5.	17.	9.	17.	3.	0.	20.	13.	16.	3.	48.	10.	10.	3.
8	162.	5.	22.	13.	26.	14.	22.	0.	55.	15.	3.	50.	15.	11.	3.
9	347.	15.	46.	37.	65.	22.	12.	47.	0.	21.	4.	132.	39.	37.	14.
10	184.	6.	27.	19.	36.	15.	15.	13.	21.	0.	11.	34.	18.	22.	8.
11	23.	1.	4.	3.	8.	3.	3.	3.	5.	11.	0.	26.	3.	3.	2.
12	629.	12.	55.	60.	98.	41.	47.	44.	137.	35.	26.	0.	52.	56.	32.
13	93.	3.	20.	13.	24.	6.	11.	15.	45.	21.	4.	57.	0.	21.	10.
14	106.	2.	10.	6.	16.	7.	11.	10.	42.	25.	4.	61.	21.	0.	
15	27.	1.	6.	2.	4.	3.	3.	3.	14.	8.	2.	30.	9.	2.	0.
16	116.	3.	18.	6.	17.	10.	13.	10.	33.	26.	5.	93.	19.	.	.
17	19.	1.	4.	4.	6.	2.	2.	4.	13.	8.	2.	29.	5.	6.	4.
18	453.	16.	27.	31.	35.	19.	20.	26.	104.	56.	18.	2	.	.	.
19	268.	8.	28.	13.	37.	13.	12.	12.	32.	25.	5.	86.	35.	29.	11.
20	12.	1.	3.	2.	5.	3.	2.	3.	16.	4.	2.	24.	.	.	.
21	10.	1.	3.	3.	3.	1.	2.	3.	7.	3.	1.	19.	5.	4.	2.
22	17.	0.	1.	2.	3.	2.	2.	2.	4.	2.	1.	20.	3.	4.	.
23	127.	2.	0.	13.	14.	7.	8.	5.	34.	14.	4.	45.	10.	15.	5.
TOTAL	3573.	137.	532.	438.	759.	304.	331.	396.	1028.	533.	130.	1720.	455.	402.	162. 5

SUM SQS. = 1849049. AVERAGE = 29. VARIANCE = 3495.37 STD. DEV. =

10f

ODEL FOR TEST YEAR 1978

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
NUMBER OF TRIPS														
35.	16.	452.	60.	69.	20.	93.	13.	402.	216.	10.	9.	16.	109.	2667.
5.	1.	9.	2.	1.	1.	3.	1.	15.	6.	1.	1.	0.	2.	112.
25.	3.	49.	16.	8.	5.	18.	3.	31.	28.	3.	3.	1.	0.	539.
22.	4.	66.	13.	6.	3.	7.	5.	42.	16.	2.	4.	3.	18.	549.
38.	9.	100.	22.	15.	4.	19.	6.	45.	42.	6.	4.	3.	18.	887.
19.	4.	51.	7.	7.	3.	13.	2.	29.	18.	4.	2.	3.	11.	420.
16.	3.	48.	10.	10.	3.	14.	2.	25.	14.	2.	3.	2.	10.	379.
15.	3.	50.	15.	11.	3.	13.	5.	36.	16.	4.	5.	3.	7.	502.
21.	4.	132.	39.	37.	14.	36.	12.	124.	35.	17.	8.	5.	39.	1114.
0.	11.	34.	16.	22.	8.	28.	8.	67.	28.	5.	3.	3.	16.	587.
11.	0.	26.	3.	3.	2.	5.	2.	23.	6.	2.	1.	1.	5.	143.
35.	26.	0.	52.	56.	32.	104.	28.	295.	97.	27.	23.	25.	54.	1975.
21.	4.	57.	0.	21.	10.	24.	6.	117.	43.	7.	7.	5.	13.	563.
25.	4.	61.	21.	0.	2.	17.	6.	75.	36.	8.	5.	5.	20.	496.
8.	2.	30.	9.	2.	0.	3.	4.	24.	12.	3.	3.	2.	6.	170.
26.	5.	93.	19.	14.	3.	0.	12.	45.	38.	9.	8.	10.	33.	541.
8.	2.	29.	5.	6.	4.	14.	0.	52.	25.	3.	2.	3.	9.	218.
56.	18.	238.	85.	55.	20.	40.	40.	0.	65.	56.	29.	40.	123.	1597.
25.	5.	86.	35.	29.	11.	38.	21.	72.	0.	25.	23.	12.	58.	857.
4.	2.	24.	6.	7.	3.	9.	3.	64.	25.	0.	5.	9.	12.	214.
3.	1.	19.	5.	4.	2.	8.	2.	30.	21.	4.	0.	4.	9.	146.
2.	1.	20.	3.	4.	2.	9.	2.	39.	11.	3.	4.	0.	14.	146.
14.	4.	45.	10.	15.	5.	31.	7.	127.	66.	11.	9.	14.	0.	569.
33.	130.	1720.	455.	402.	162.	545.	188.	1778.	864.	210.	163.	164.	580.	15392.

NCE = 3495.37 STD. DEV. = 59.12 COEFFT. OF VARIATION = 2.03

2 of 2

TABLE D - 9 TRIP DISTRIBUTION BY THE GRAVITY AND GRAVITY MODEL FOR TEST YEAR

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
										NUMBER OF TRIPS						
1	0.	22.	146.	119.	235.	82.	97.	105.	263.	141.	16.	466.	61.	71.	21.	9
2	23.	0.	10.	5.	8.	4.	4.	3.	12.	5.	1.	10.	2.	1.	1.	
3	185.	12.	0.	32.	35.	9.	16.	18.	44.	26.	3.	51.	16.	8.	5.	1
4	185.	7.	39.	0.	44.	16.	11.	13.	46.	24.	4.	71.	14.	7.	3.	
5	338.	11.	39.	41.	0.	24.	18.	23.	70.	39.	9.	102.	22.	15.	4.	1
6	141.	6.	13.	18.	29.	0.	4.	15.	29.	19.	4.	52.	7.	8.	.	
7	137.	5.	18.	10.	18.	3.	0.	20.	13.	16.	3.	49.	10.	10.	3.	1
8	164.	5.	22.	13.	25.	14.	22.	0.	55.	16.	3.	51.	15.	11.		
9	354.	16.	46.	40.	65.	23.	12.	47.	0.	22.	4.	136.	39.	37.	15.	3
10	192.	7.	28.	21.	37.	15.	16.	14.	22.	0.	11.	36.	19.	23.	.	
11	23.	1.	4.	4.	8.	3.	3.	3.	5.	11.	0.	27.	3.	4.	2.	
12	650.	13.	56.	64.	99.	43.	48.	45.	141.	37.	27.	0.	52.	.	.	
13	94.	3.	20.	14.	23.	6.	11.	15.	45.	21.	4.	58.	0.	21.	10.	2
14	108.	2.	10.	7.	16.	7.	11.	10.	43.	26.	4.	63.	21.	.	.	
15	29.	2.	6.	3.	4.	3.	3.	3.	15.	9.	2.	32.	9.	2.	0.	
16	120.	4.	18.	6.	17.	10.	13.	10.	34.	27.	5.	97.	20.	15.	3.	
17	19.	1.	4.	5.	6.	2.	2.	5.	14.	9.	2.	30.	5.	6.	4.	1
18	458.	17.	27.	32.	35.	20.	20.	26.	105.	57.	18.	248.	85.	55.	21.	4
19	275.	8.	28.	14.	37.	14.	13.	13.	33.	26.	5.	89.	35.	30.	12.	3
20	13.	1.	3.	2.	5.	3.	2.	3.	16.	5.	2.	25.	6.	7.	3.	
21	10.	2.	3.	3.	3.	1.	2.	3.	7.	3.	1.	20.	5.	4.	2.	
22	18.	0.	1.	2.	3.	2.	2.	2.	4.	2.	1.	21.	3.	4.	2.	
23	131.	2.	0.	14.	15.	8.	9.	5.	35.	14.	4.	47.	10.	16.	5.	3
TOTAL	3666.	145.	540.	468.	768.	311.	338.	401.	1050.	555.	132.	1774.	460.	410.	169.	56

SUM SQS. = 1935051. AVERAGE = 30. VARIANCE = 3657.9

10f

D GRAVITY MODEL FOR TEST YEAR 1979

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
NUMBER OF TRIPS														
1.	16.	466.	61.	71.	21.	95.	13.	405.	221.	10.	9.	16.	112.	2728.
5.	1.	10.	2.	1.	1.	3.	1.	16.	7.	1.	1.	0.	2.	119.
6.	3.	51.	16.	8.	5.	19.	3.	31.	29.	3.	3.	1.	0.	548.
4.	4.	71.	14.	7.	3.	7.	5.	44.	17.	3.	5.	3.	19.	588.
9.	9.	102.	22.	15.	4.	19.	6.	45.	43.	6.	4.	3.	18.	900.
9.	4.	52.	7.	8.	3.	14.	2.	30.	19.	4.	2.	3.	11.	431.
6.	3.	49.	10.	10.	3.	15.	2.	25.	14.	2.	3.	2.	10.	388.
6.	3.	51.	15.	11.	4.	13.	5.	36.	16.	4.	5.	3.	7.	508.
2.	4.	136.	39.	37.	15.	36.	13.	125.	35.	17.	9.	5.	40.	1137.
0.	11.	36.	19.	23.	9.	29.	8.	69.	29.	5.	3.	3.	17.	611.
1.	0.	27.	3.	4.	2.	5.	2.	23.	6.	2.	1.	1.	5.	146.
.	.	.	.	57.	33.	108.	28.	300.	100.	27.	24.	26.	56.	2035.
1.	4.	58.	0.	21.	10.	24.	6.	116.	44.	7.	7.	5.	13.	568.
6.	4.	63.	21.	0.	2.	18.	6.	75.	37.	9.	6.	5.	21.	505.
9.	2.	32.	9.	2.	0.	4.	4.	25.	13.	3.	3.	3.	6.	179.
7.	5.	97.	20.	15.	3.	0.	12.	45.	40.	9.	9.	10.	34.	557.
9.	2.	30.	5.	6.	4.	14.	0.	52.	25.	3.	2.	3.	9.	222.
7.	18.	243.	85.	55.	21.	41.	40.	0.	66.	57.	30.	40.	126.	1619.
6.	5.	89.	35.	30.	12.	39.	22.	73.	0.	25.	24.	12.	55.	881.
5.	2.	25.	6.	7.	3.	9.	3.	64.	26.	0.	5.	3.	12.	217.
3.	1.	20.	5.	4.	2.	8.	2.	30.	22.	4.	0.	4.	9.	150.
2.	1.	21.	3.	4.	2.	9.	3.	40.	11.	3.	4.	0.	14.	150.
4.	4.	47.	10.	16.	5.	32.	8.	129.	68.	11.	10.	15.	0.	586.
5.	132.	1774.	460.	410.	169.	562.	193.	1797.	888.	214.	167.	168.	598.	15774.

E = 3657.94 STD. DEV. = 60.48 COEFFT. OF VARIATION = 2.03

2of2

TABLE D - 10 TRIP DISTRIBUTION BY THE GRAVITY MODEL FOR TEST YEAR 1980

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
	NUMBER OF TRIPS															
1	0.	23.	149.	129.	239.	84.	100.	107.	271.	148.	16.	484.	62.	72.	23.	9
2	25.	0.	10.	5.	8.	4.	4.	4.	13.	5.	1.	10.	2.	1.	1.	
3	190.	12.	0.	33.	35.	9.	16.	18.	44.	27.	3.	51.	16.	8.	6.	
4	201.	8.	41.	0.	47.	17.	11.	14.	49.	26.	4.	77.	14.			
5	346.	11.	39.	43.	0.	24.	18.	23.	70.	40.	8.	104.	22.	15.	4.	
6	145.	6.	13.	19.	29.	0.	4.	15.	29.	20.	4					
7	141.	5.	18.	10.	18.	3.	0.	20.	13.	17.	3.	50.	10.	10.	3.	
8	168.	5.	22.	14.	25.	14.	22.	0.	56.	16.	3.	5				
9	366.	17.	46.	43.	65.	23.	13.	48.	0.	22.	4.	139.	39.	38.	15.	
10	202.	7.	29.	23.	38.	16.	16.	14.	23.	0.	11.	38.				
11	24.	1.	4.	4.	8.	3.	3.	3.	5.	12.	0.	28.	3.	4.	2.	
12	677.	13.	56.	69.	101.	44.	50.	46.	144.	38.	27.	0.	53.	58.	35.	1
13	96.	4.	20.	14.	23.	6.	11.	14.	45.	22.	4.	59.	0.	21.	11.	
14	112.	2.	10.	7.	16.	7.	11.	10.	43.	27.	4.	64.	21.	0.	2.	
15	30.	2.	6.	3.	4.	3.	3.	3.	15.	9.	2.	34.	9.	2.	0.	
16	125.	4.	19.	6.	17.	10.	13.	10.	35.	28.	5.	100.	20.	15.	3.	
17	20.	1.	4.	5.	6.	2.	2.	5.	14.	9.	2.	31.	5.	6.	4.	
18	473.	18.	27.	34.	35.	20.	20.	26.	106.	59.	18.	249.	85.	56.	22.	
19	286.	8.	28.	15.	37.	14.	13.	13.	33.	27.	5.	92.	36.	30.	13.	
20	13.	1.	3.	2.	5.	3.	2.	3.	17.	5.	2.	26.	6.	7.	3	
21	10.	2.	3.	4.	3.	1.	2.	3.	7.	3.	1.	20.	5.	4.	3.	
22	18.	0.	1.	2.	3.	2.	2.	2.	4.	2.	1.	21.				
23	136.	2.	0.	16.	15.	8.	9.	5.	36.	15.	4.	48.	10.	16.	6.	
TOTAL	3804.	152.	548.	502.	778.	317.	345.	406.	1072.	578.	133.	1830.	465.	417.	178.	5

SUM SQS. = 2069003. AVERAGE = 31. V

10

EL FOR TEST YEAR 1980

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
.	16.	484.	62.	72.	23.	99.	14.	417.	229.	10.	9.	17.	117.	2818.
.	1.	10.	2.	1.	1.	3.	1.	17.	7.	1.	2.	0.	2.	126.
7.	3.	51.	16.	8.	6.	19.	3.	31.	29.	3.	3.	1.	0.	559.
.	4.	77.	14.	7.	3.	8.	5.	47.	19.	3.	5.	3.	21.	630.
0.	8.	104.	22.	15.	4.	20.	6.	45.	43.	6.	4.	3.	18.	914.
0.	4.	54.	7.	8.	4.	14.	2.	30.	19.	4.	2.	3.	11.	442.
7.	3.	50.	10.	10.	3.	15.	2.	25.	15.	2.	3.	2.	11.	397.
6.	3.	52.	15.	11.	4.	13.	5.	36.	16.	4.	5.	3.	7.	515.
2.	4.	139.	39.	38.	15.	37.	13.	126.	36.	18.	9.	5.	41.	1163.
0.	11.	38.	19.	24.	9.	31.	8.	71.	30.	5.	4.	3.	18.	638.
2.	0.	28.	3.	4.	2.	5.	2.	23.	6.	2.	1.	1.	5.	148.
.	.				5.	112.	29.	307.	103.	28.	25.	27.	58.	2101.
2.	4.	59.	0.	21.	11.	25.	6.	117.	44.	7.	7.	5.	13.	574.
7.	4.	64.	21.	0.	2.	18.	6.	76.	37.	9.	6.	5.	21.	514.
9.	2.	34.	9.	2.	0.	4.	4.	26.	14.	3.	3.	3.	7.	188.
8.	5.	100.	20.	15.	3.	0.	13.	47.	41.	9.	9.	10.	35.	575.
9.	2.	31.	5.	6.	4.	15.	0.	53.	26.	4.	2.	3.	10.	228.
9.	18.	249.	85.	56.	22.	42.	41.	0.	67.	58.	30.	41.	129.	1658.
7.	5.	92.	36.	30.	13.	41.	22.	74.	0.	26.	24.	13.	56.	908.
5.	2.	26.	6.	7.	3.	9.	3.	65.	27.	0.	5.	3.	12.	222.
3.	1.	20.	5.	4.	3.	8.	2.	31.	22.	4.	0.	4.	10.	153.
2.	1.	21.	3.	4.	2.	9.	3.	40.	11.	3.	4.	0.	15.	154.
5.	4.	48.	10.	16.	6.	33.	8.	133.	70.	11.	10.	15.	0.	605.
8.	133.	1830.	465.	417.	178.	579.	197.	1836.	913.	219.	171.	172.	616.	16228.

V. = 62.5 COEFFT. OF VARIATION = 2.04

2of2

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TABLE D-11 DIFFERENCES BETWEEN OD TRIP DATA AND GRAVITY MODEL FOR TEST YEAR 19

TO / ZONE /	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
											NUMBER OF TRIPS					
1	0.	-19.	-71.	-3.	-44.	-63.	17.	-12.	143.	46.	-9.	6.	11.	-27.	-9.	8.
2	-18.	0.	-7.	3.	-3.	-3.	4.	6.	-5.	2.	-1.	11.	-2.	3.	-1.	5.
3	-114.	-11.	0.	-22.	-23.	-3.	5.	-12.	33.	29.	-0.	32.	-6.	-5.	-5.	-8.
4	-38.	-6.	-23.	0.	-31.	-14.	-5.	-7.	-11.	-12.	-3.	-26.	-2.	3.	2.	13.
5	-126.	-5.	-25.	-28.	0.	-18.	0.	15.	44.	-26.	-8.	-28.	-3.	-6.	-4.	15.
6	-117.	-5.	-11.	-15.	-19.	0.	-2.	-15.	-16.	-11.	-4.	-34.	-7.	-7.	-3.	-12.
7	11.	1.	-8.	-4.	-8.	-3.	0.	-3.	13.	-11.	-3.	-18.	-7.	-4.	-3.	-6.
8	-5.	-1.	-9.	1.	2.	-13.	-9.	0.	-19.	-11.	-3.	-11.	-7.	-6.	-1.	6.
9	19.	-5.	18.	9.	28.	-11.	19.	11.	0.	7.	-2.	5.	-16.	-23.	-6.	19.
10	-6.	-4.	-7.	-3.	-23.	-12.	-12.	-9.	-2.	0.	-10.	-7.	-3.	-6.	-8.	3.
11	-16.	1.	-3.	-3.	-6.	-3.	-3.	-3.	-5.	-11.	0.	-21.	-3.	-2.	-2.	-5.
12	-105.	18.	19.	-28.	-43.	-25.	-6.	-16.	-52.	-23.	-20.	0.	-4.	-27.	-24.	-54.
13	-11.	-3.	-14.	-4.	-17.	-6.	-7.	-9.	-15.	-1.	-4.	-7.	0.	-20.	-10.	-7.
14	-37.	3.	-6.	0.	-11.	-7.	-11.	-6.	-21.	-14.	-4.	-21.	-17.	0.	-2.	-13.
15	-10.	-1.	-0.	-0.	0.	-2.	2.	-2.	-7.	-3.	-2.	-17.	-4.	0.	0.	-3.
16	5.	7.	5.	6.	11.	-10.	-4.	12.	27.	21.	-5.	-37.	8.	-10.	-3.	0.
17	29.	-1.	-4.	-2.	4.	-2.	-1.	-2.	-3.	-3.	-2.	-17.	-3.	-5.	-4.	8.
18	-152.	-4.	20.	-6.	40.	-11.	4.	-8.	-38.	-14.	-18.	-79.	-32.	-41.	-20.	3.
19	-147.	1.	1.	4.	-25.	-13.	-9.	-4.	17.	-6.	-5.	-5.	-14.	-23.	2.	0.
20	-0.	-1.	2.	2.	-5.	-3.	-1.	-1.	-14.	-4.	-2.	-18.	-6.	-7.	-2.	-8.
21	-7.	-1.	-2.	-3.	-2.	-1.	-2.	-3.	-7.	-3.	-1.	-17.	-5.	-4.	-2.	3.
22	-4.	0.	2.	-2.	-2.	-2.	-2.	-2.	-2.	-0.	-1.	-9.	-3.	-3.	-2.	-2.
23	230.	9.	50.	39.	43.	-3.	5.	5.	72.	30.	-4.	149.	25.	-6.	-5.	33.
TOTAL	-620.	-27.	-74.	-59.	-135.	-230.	-18.	-65.	130.	-19.	-109.	-169.	-100.	-228.	-111.	-3.

SUM SQS. = 650964. MEAN DIF. = -2. VARIANCE = 1225.18 STD. DEV. = 35.00

1of

GRAVITY MODEL FOR TEST YEAR 1977

0	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
UMBER OF TRIPS														
.	-9.	6.	11.	-27.	-9.	8.	2.	-104.	-88.	-1.	-3.	-7.	269.	39.
.	-1.	11.	-2.	3.	-1.	5.	5.	-1.	1.	-1.	-1.	1.	2.	-1.
.	-0.	32.	-6.	-5.	-5.	-8.	4.	39.	-3.	3.	-1.	1.	57.	-9.
.	-3.	-26.	-2.	3.	2.	13.	2.	-17.	2.	-0.	-4.	-1.	40.	-139.
.	-8.	-28.	-3.	-6.	-4.	15.	-1.	31.	-16.	-6.	-4.	-3.	42.	-159.
.	-4.	-34.	-7.	-7.	-3.	-12.	-2.	-17.	-18.	-4.	-2.	-3.	-10.	-334.
.	-3.	-18.	-7.	-4.	-3.	-6.	3.	-2.	-8.	0.	-3.	-2.	-1.	-64.
.	-3.	-11.	-7.	-6.	-1.	6.	-4.	-18.	-7.	-4.	-4.	-3.	3.	-124.
.	-2.	5.	-16.	-23.	-6.	19.	-9.	-50.	-11.	-12.	-8.	-5.	51.	26.
.	-10.	-7.	-3.	-6.	-8.	3.	-8.	-9.	-10.	-5.	-3.	2.	14.	-127.
.	0.	-21.	-3.	-2.	-2.	-5.	-2.	-23.	-6.	-2.	-1.	-1.	0.	-119.
.	-20.	0.	-4.	-27.	-24.	-54.	-16.	-147.	-11.	-21.	-19.	-14.	94.	-523.
.	-4.	-7.	0.	-20.	-10.	-7.	1.	-58.	-23.	-7.	-7.	-5.	40.	-193.
.	-4.	-21.	-17.	0.	-2.	-13.	-6.	-66.	-27.	-8.	-4.	-4.	-7.	-289.
.	-2.	-17.	-4.	0.	0.	-3.	-3.	-20.	-12.	-3.	-3.	-2.	-4.	-97.
.	-5.	-37.	8.	-10.	-3.	0.	-1.	-5.	-17.	-8.	-3.	-6.	29.	22.
3.	-2.	-17.	-3.	-5.	-4.	8.	0.	-43.	-15.	-2.	-2.	-3.	1.	-73.
1.	-18.	-79.	-32.	-41.	-20.	3.	-39.	0.	-7.	-33.	7.	-17.	273.	-173.
).	-5.	-5.	-14.	-23.	2.	0.	-16.	10.	0.	56.	31.	35.	123.	12.
.	-2.	-18.	-6.	-7.	-2.	-8.	-3.	-33.	47.	0.	3.	1.	4.	-48.
3.	-1.	-17.	-5.	-4.	-2.	3.	-1.	24.	54.	4.	0.	-3.	11.	30.
).	-1.	-9.	-3.	-3.	-2.	-2.	-0.	0.	25.	-1.	0.	0.	4.	-7.
).	-4.	149.	25.	-6.	-5.	33.	14.	292.	129.	11.	9.	-3.	0.	1123.
).	-109.	-169.	-100.	-228.	-111.	-3.	-78.	-218.	-21.	-42.	-23.	-43.	1035.	-1227.

1225.18 STD. DEV. = 35.00 M.S.E. = 1344.97 ROOT M.S.E. = 36.67

2of2

TABLE D – 12 DIFFERENCES BETWEEN OD TRIP DATA AND GRAVITY MODEL FOR TEST YEAR

TO ZONE / FROM ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
											NUMBER OF TRIPS					
1	0.	-18.	-64.	-40.	-7.	-71.	-8.	13.	-6.	14.	-16.	-28.	3.	-10.	-20.	-
2	-22.	0.	-9.	-1.	-6.	1.	-2.	-2.	2.	1.	-1.	4.	-2.	6.	-1.	
3	-107.	-11.	0.	-25.	-24.	-8.	-5.	-2.	1.	-4.	-3.	35.	1.	20.	-5.	1
4	-83.	-4.	-27.	0.	-36.	-15.	-1.	13.	-31.	-15.	-4.	-27.	6.	-4.	-3.	
5	-81.	-4.	-29.	-33.	0.	-19.	-10.	-13.	26.	-9.	-9.	-9.	-5.	-11.	-4.	
6	-114.	-5.	-11.	-16.	-20.	0.	-2.	-15.	-19.	-13.	-4.	-44.	-6.	-7.	-3.	-1
7	-19.	-4.	-6.	-5.	-5.	-3.	0.	-16.	8.	-7.	-3.	-24.	-7.	-10.	-3.	-1
8	-34.	-5.	-15.	0.	-18.	-14.	-17.	0.	-15.	-13.	-3.	-26.	-9.	-9.	-3.	-1
9	-71.	-4.	13.	-14.	52.	-17.	19.	-4.	0.	1.	-4.	-53.	-20.	-37.	-12.	
10	-9.	-2.	-4.	-7.	-14.	-11.	-1.	-7.	-6.	0.	-11.	-7.	3.	-10.	-7.	-11
11	-23.	-1.	-4.	-3.	-8.	-3.	-3.	-3.	-5.	-11.	0.	-26.	-3.	-3.	-2.	-
12	-161.	-4.	13.	-29.	-15.	-32.	-25.	-29.	-59.	-14.	-26.	0.	-27.	-36.	-28.	-5
13	-27.	-3.	-2.	-3.	-8.	-6.	-10.	-11.	-28.	-10.	-4.	-23.	0.	-19.	-10.	-1
14	-40.	3.	0.	-6.	1.	-6.	-11.	-2.	-32.	-25.	-4.	2.	-18.	0.	-1.	-1
15	-25.	-0.	-1.	-2.	-2.	-2.	-3.	-2.	-11.	-8.	-2.	-23.	-9.	1.	0.	-
16	-3.	2.	20.	5.	2.	-9.	-13.	3.	7.	-3.	-5.	-50.	1.	1.	-3.	
17	18.	-1.	6.	-1.	-2.	-2.	-2.	-3.	-11.	-2.	-2.	-16.	-3.	-6.	-4.	-1
18	-170.	-14.	28.	0.	22.	-19.	-19.	3.	-20.	-16.	-18.	-46.	-39.	-46.	-20.	-1
19	-174.	-2.	5.	-5.	-31.	-13.	-12.	-7.	-2.	-8.	-5.	-10.	-25.	-16.	-8.	-17
20	-9.	-1.	3.	-2.	-5.	-3.	-2.	-3.	-6.	-4.	-2.	-17.	-6.	-7.	-2.	-8
21	1.	-1.	0.	-0.	-3.	-1.	-2.	-1.	-7.	-1.	-1.	-18.	-4.	-4.	-2.	-6
22	-7.	0.	1.	1.	2.	-2.	-2.	-2.	-0.	-2.	-1.	-12.	-0.	-2.	-2.	-8
23	52.	-2.	19.	3.	29.	-6.	-8.	29.	12.	16.	-4.	140.	43.	3.	-5.	9
TOTAL	-1108.	-81.	-64.	-183.	-94.	-262.	-139.	-61.	-202.	-132.	-130.	-279.	-126.	-206.	-150.	-175

SUM SQS. = 466814. MEAN DIF. = -7. VARIANCE = 838.25 STD. DEV. = 28.95

10f

:D GRAVITY MODEL FOR TEST YEAR 1978

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
NUMBER OF TRIPS														
14.	-16.	-28.	3.	-10.	-20.	-7.	19.	-142.	-136.	0.	6.	-10.	40.	-487.
1.	-1.	4.	-2.	6.	-1.	4.	2.	2.	-3.	1.	-1.	0.	7.	-19.
4.	-3.	35.	1.	20.	-5.	16.	2.	28.	-7.	5.	-2.	-0.	18.	-79.
15.	-4.	-27.	6.	-4.	-3.	0.	-1.	-1.	-2.	-0.	-4.	4.	3.	-233.
9.	-9.	-9.	-5.	-11.	-4.	3.	-3.	10.	-32.	-5.	-4.	-1.	12.	-229.
13.	-4.	-44.	-6.	-7.	-3.	-13.	-2.	-27.	-18.	-4.	-2.	-3.	-7.	-354.
-7.	-3.	-24.	-7.	-10.	-3.	-10.	2.	-10.	-9.	-2.	-3.	-2.	-1.	-138.
13.	-3.	-26.	-9.	-9.	-3.	-10.	-2.	15.	-12.	-4.	-5.	-2.	0.	-198.
1.	-4.	-53.	-20.	-37.	-12.	2.	-10.	-56.	11.	-16.	-5.	2.	-6.	-229.
0.	-11.	-7.	3.	-10.	-7.	-11.	-1.	-19.	-15.	-5.	-1.	-3.	4.	-144.
11.	0.	-26.	-3.	-3.	-2.	-5.	-2.	-23.	-6.	-2.	-1.	-1.	-5.	-143.
14.	-26.	0.	-27.	-36.	-28.	-59.	-9.	-123.	-43.	-22.	-15.	-8.	49.	-700.
10.	-4.	-23.	0.	-19.	-10.	-17.	-5.	-74.	-26.	-7.	-5.	-3.	4.	-295.
25.	-4.	2.	-18.	0.	-1.	-10.	-3.	-71.	-18.	-8.	-5.	-5.	-18.	-278.
-8.	-2.	-23.	-9.	1.	0.	-3.	-4.	-21.	-11.	-3.	-3.	-2.	-1.	-136.
-3.	-5.	-50.	1.	1.	-3.	0.	-6.	-4.	-17.	-8.	-5.	-7.	1.	-91.
-2.	-2.	-16.	-3.	-6.	-4.	-10.	0.	-46.	-21.	-3.	-2.	-3.	16.	-101.
16.	-18.	-46.	-39.	-46.	-20.	-16.	-25.	0.	9.	-31.	-2.	5.	118.	-317.
-8.	-5.	-10.	-25.	-16.	-8.	-17.	-17.	16.	0.	70.	22.	41.	146.	-51.
-4.	-2.	-17.	-6.	-7.	-2.	-8.	-3.	-30.	55.	0.	-3.	-2.	9.	-48.
-1.	-1.	-18.	-4.	-4.	-2.	-6.	1.	4.	23.	-2.	0.	-1.	4.	-22.
-2.	-1.	-12.	-0.	-2.	-2.	-8.	-1.	-2.	37.	1.	4.	0.	0.	4.
16.	-4.	140.	43.	3.	-5.	9.	5.	-237.	180.	16.	8.	-3.	0.	772.
32.	-130.	-279.	-126.	-206.	-150.	-175.	-61.	-336.	-61.	-27.	-30.	-5.	394.	-3517.

838.25 STD. DEV. = 28.95 M.S.E. = 964.49 ROOT M.S.E. = 31.06

2of2

TABLE D - 13 DIFFERENCES BETWEEN OD TRIP DATA AND GRAVITY MODEL FOR TEST YEAR 1

TO / ZONE/ FROM ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1
										NUMBER OF TRIPS						
1	0.	-20.	-48.	-51.	-10.	-65.	-5.	15.	35.	27.	-16.	-67.	43.	-14.	-14.	1
2	-22.	0.	-10.	-1.	-3.	-4.	-1.	-2.	1.	-4.	-1.	10.	2.	-0.	-1.	2
3	-112.	-12.	0.	-31.	-13.	-6.	-12.	-1.	19.	13.	-3.	25.	1.	14.	-4.	15
4	-86.	-4.	-33.	0.	-33.	-13.	-6.	-4.	-19.	-15.	-4.	-42.	-9.	-2.	-3.	1
5	-88.	-6.	-26.	-40.	0.	-19.	-12.	-6.	34.	-2.	-9.	-28.	-17.	-8.	-3.	-2
6	-113.	-5.	-8.	-16.	-26.	0.	-4.	-15.	-16.	-14.	-4.	-48.	-6.	-8.	-3.	-13
7	-20.	-4.	0.	-10.	-1.	-2.	0.	-9.	28.	-15.	-3.	-26.	-6.	-7.	-2.	-11
8	-23.	-5.	-1.	-9.	-7.	-13.	-20.	0.	-25.	-8.	-3.	-28.	-6.	-2.	-3.	-0
9	-104.	-2.	11.	-25.	33.	-5.	27.	26.	0.	-5.	-4.	-8.	-13.	-28.	-14.	3
10	-9.	-6.	6.	-12.	-13.	-12.	-15.	-4.	-8.	0.	-11.	-2.	-6.	-3.	-9.	-2
11	-23.	-1.	-3.	-4.	-8.	-3.	-3.	-3.	-5.	-11.	0.	-26.	-3.	-4.	-2.	-5
12	-181.	5.	13.	-49.	-41.	-38.	-36.	-2.	-64.	-20.	-27.	0.	-4.	-37.	-33.	-50
13	-14.	-2.	-5.	-5.	-12.	-6.	-8.	-8.	-25.	-8.	-4.	-18.	0.	-20.	-9.	-7
14	-43.	5.	5.	-4.	-11.	-7.	-11.	-7.	-18.	-4.	-4.	-24.	-18.	0.	-1.	-13
15	-14.	-2.	-2.	-2.	-4.	-3.	-3.	-0.	-14.	-5.	-2.	-25.	-9.	-1.	0.	-3
16	-10.	2.	12.	5.	9.	-9.	-9.	3.	2.	-2.	-5.	-31.	-4.	-10.	-3.	0
17	-1.	-1.	2.	8.	-1.	-2.	-2.	-4.	-4.	-6.	-2.	-12.	-3.	-6.	-1.	-4
18	-121.	-3.	36.	-16.	4.	-16.	-11.	-8.	-34.	-23.	-18.	-95.	-45.	-41.	-16.	-12
19	-156.	1.	-10.	16.	-24.	-14.	-12.	-2.	44.	-1.	-5.	-25.	-18.	-21.	-11.	-5
20	0.	-0.	1.	-2.	-5.	-3.	-2.	-3.	-13.	-5.	-2.	-20.	-6.	-6.	-3.	-4
21	-1.	-1.	2.	-2.	-2.	-1.	-2.	-3.	-3.	1.	-1.	-16.	-4.	-4.	-2.	-7
22	-7.	1.	2.	-2.	-3.	-2.	-2.	-1.	-0.	-2.	-1.	-14.	-3.	-2.	-2.	-5.
23	105.	5.	16.	2.	5.	-7.	4.	12.	15.	18.	-4.	113.	17.	-6.	-1.	7
TOTAL	-1043.	-53.	-39.	-249.	-167.	-249.	-144.	-26.	-69.	-91.	-132.	-405.	-118.	-214.	-142.	-115.

SUM SQS. = 509826. MEAN DIF. = -6. VARIANCE = 929.79 STD. DEV. = 30.49

10f

D GRAVITY MODEL FOR TEST YEAR 1979

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
NUMBER OF TRIPS														
7.	-16.	-67.	43.	-14.	-14.	1.	9.	-77.	-139.	8.	1.	-4.	99.	-294.
4.	-1.	10.	2.	-0.	-1.	2.	0.	7.	-2.	-1.	-0.	0.	6.	-23.
3.	-3.	25.	1.	14.	-4.	15.	2.	42.	-11.	1.	-2.	-0.	29.	-45.
5.	-4.	-42.	-9.	-2.	-3.	1.	6.	-12.	-6.	-2.	-3.	-2.	2.	-290.
2.	-9.	-28.	-17.	-8.	-3.	-2.	3.	-6.	-30.	-6.	-3.	-2.	18.	-259.
4.	-4.	-48.	-6.	-8.	-3.	-13.	-1.	-25.	-18.	-4.	-2.	-3.	-10.	-360.
5.	-3.	-26.	-6.	-7.	-2.	-11.	-1.	-12.	-12.	-2.	-3.	-2.	-1.	-121.
8.	-3.	-28.	-6.	-2.	-3.	0.	-4.	-2.	-8.	-4.	-4.	-2.	6.	-170.
5.	-4.	-8.	-13.	-28.	-14.	3.	2.	-47.	5.	-16.	-6.	-0.	-3.	-174.
0.	-11.	-2.	-6.	-3.	-9.	-2.	-7.	-32.	-1.	-5.	-1.	-3.	5.	-148.
1.	0.	-26.	-3.	-4.	-2.	-5.	-2.	-23.	-6.	-2.	-1.	-1.	-3.	-142.
0.	-27.	0.	-4.	-37.	-33.	-50.	-10.	-151.	-27.	-22.	-23.	-19.	52.	-765.
8.	-4.	-18.	0.	-20.	-9.	-7.	6.	-77.	-33.	-7.	-6.	-4.	2.	-271.
4.	-4.	-24.	-18.	0.	-1.	-13.	-6.	-63.	-21.	-9.	-5.	-4.	-3.	-264.
5.	-2.	-25.	-9.	-1.	0.	-3.	-4.	-24.	-11.	-3.	-3.	-3.	-6.	-139.
2.	-5.	-31.	-4.	-10.	-3.	0.	-0.	73.	-4.	-8.	-2.	-8.	-0.	2.
6.	-2.	-12.	-3.	-6.	-1.	-4.	0.	-39.	-21.	-2.	-2.	-2.	4.	-101.
3.	-18.	-95.	-45.	-41.	-16.	-12.	-34.	0.	-2.	-39.	27.	8.	200.	-259.
1.	-5.	-25.	-18.	-21.	-11.	-5.	-15.	20.	0.	61.	39.	27.	143.	33.
5.	-2.	-20.	-6.	-6.	-3.	-4.	-3.	-34.	22.	0.	3.	-2.	15.	-71.
1.	-1.	-16.	-4.	-4.	-2.	-7.	-1.	4.	33.	-0.	0.	-4.	28.	12.
2.	-1.	-14.	-3.	-2.	-2.	-5.	-3.	11.	31.	0.	-1.	0.	-5.	-9.
18.	-4.	113.	17.	-6.	-1.	7.	3.	262.	155.	14.	17.	22.	0.	776.
)1.	-132.	-405.	-118.	-214.	-142.	-115.	-59.	-204.	-106.	-47.	22.	-10.	576.	-3083.

929.79 STD. DEV. = 30.49 M.S.E. = 1053.36 ROOT M.S.E. = 32.46

2of2

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TABLE D - 14   DIFFERENCES BETWEEN OD TRIP DATA AND GRAVITY MODEL FOR TEST YEAR

TO / ZONE / FROM ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
										NUMBER OF TRIPS						
1	0.	-18.	-64.	-44.	53.	-70.	4.	3.	77.	21.	-16.	-62.	31.	-11.	0.	-
2	-22.	0.	-10.	-5.	-3.	-3.	-3.	1.	-0.	3.	-1.	5.	2.	4.	-1.	
3	-107.	-12.	0.	-26.	-23.	-7.	-9.	-3.	34.	9.	-3.	46.	12.	3.	-3.	1
4	-84.	-7.	-26.	0.	-35.	-16.	-8.	-6.	-20.	-10.	-4.	-40.	-3.	3.	1.	1
5	18.	-2.	-26.	-38.	0.	-22.	-2.	-16.	32.	-19.	-8.	-30.	-12.	-8.	-3.	
6	-116.	-5.	-8.	-19.	-26.	0.	-3.	-15.	-10.	-18.	11.	-45.	-7.	-7.	-4.	-1
7	-16.	-0.	-9.	-7.	5.	-2.	0.	-12.	23.	-6.	19.	-31.	-1.	-8.	-3.	-
8	-15.	-4.	-5.	-9.	-16.	-14.	-17.	0.	-12.	-14.	14.	-33.	-12.	-6.	-1.	-
9	-5.	3.	-17.	-15.	42.	-8.	21.	4.	0.	-0.	17.	-44.	-20.	-19.	-6.	1
10	-4.	-4.	-3.	-9.	-17.	-14.	-4.	-12.	-6.	0.	-11.	-23.	6.	-18.	-6.	-2
11	-23.	-1.	-4.	-4.	-8.	12.	19.	14.	18.	-12.	0.	-28.	-3.	-4.	-2.	1
12	-163.	-0.	23.	-42.	-38.	-31.	-25.	-31.	-63.	-24.	-27.	0.	-11.	-41.	-23.	-6
13	4.	1.	-11.	-5.	-15.	-3.	-5.	-9.	-18.	-3.	-4.	-2.	0.	-21.	-11.	-
14	-44.	1.	3.	-0.	-8.	-7.	-8.	-5.	-32.	-8.	-4.	-26.	-16.	0.	-1.	
15	-2.	-2.	0.	0.	-2.	-2.	-3.	-0.	-5.	-9.	-2.	-25.	-8.	-2.	0.	
16	-16.	5.	8.	-1.	14.	-9.	-4.	13.	4.	9.	-5.	-46.	9.	-8.	-3.	
17	-1.	1.	2.	5.	-2.	-2.	-0.	-4.	-5.	-7.	-2.	-14.	-4.	-6.	-4.	-1
18	-163.	-9.	51.	-3.	6.	-20.	4.	5.	-19.	-32.	-18.	-135.	-56.	-48.	-15.	-4
19	-183.	2.	-6.	7.	-24.	-14.	-10.	-13.	-5.	-1.	-5.	-31.	-21.	-25.	-12.	-
20	-0.	-1.	0.	-1.	-5.	-3.	-1.	-3.	-15.	-5.	-2.	-17.	-6.	-6.	-3.	-
21	-5.	0.	-0.	-3.	-2.	-1.	-2.	-3.	-6.	-2.	-1.	-15.	4.	-4.	-3.	-
22	-1.	0.	1.	-0.	1.	-2.	0.	-1.	1.	-1.	-1.	-17.	-3.	-4.	-2.	-
23	13.	-1.	25.	-1.	14.	-1.	-5.	2.	-38.	18.	-4.	-30.	2.	-2.	-4.	1
TOTAL	-935.	-53.	-76.	-222.	-90.	-239.	-61.	-91.	11.	-112.	-58.	-642.	-120.	-238.	-109.	-11

SUM SQS. = 494332.   MEAN DIF. = -6.   VARIANCE = 896.44   STD. DEV. = 29.94

1of

D GRAVITY MODEL FOR TEST YEAR 1980

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
NUMBER OF TRIPS														
1.	-16.	-62.	31.	-11.	0.	-2.	7.	-90.	-118.	-2.	1.	-6.	73.	-232.
3.	-1.	5.	2.	4.	-1.	1.	1.	-10.	2.	-1.	0.	0.	1.	-39.
9.	-3.	46.	12.	3.	-3.	10.	2.	32.	-0.	2.	-0.	2.	20.	-23.
0.	-4.	-40.	-3.	3.	1.	10.	4.	-15.	-5.	-2.	-4.	-2.	15.	-254.
9.	-8.	-30.	-12.	-8.	-3.	4.	2.	8.	-31.	-6.	-3.	-2.	3.	-163.
8.	11.	-45.	-7.	-7.	-4.	-12.	-2.	-26.	-19.	-4.	-2.	-3.	-4.	-344.
6.	19.	-31.	-1.	-8.	-3.	-8.	-1.	-18.	-12.	-2.	-3.	-2.	-5.	-100.
4.	14.	-33.	-12.	-6.	-1.	-2.	-3.	3.	-7.	-4.	-5.	-3.	-0.	-164.
0.	17.	-44.	-20.	-19.	-6.	16.	-2.	-39.	-15.	-15.	-6.	2.	-2.	-108.
0.	-11.	-23.	6.	-18.	-6.	-21.	-5.	-36.	-0.	-5.	1.	-2.	15.	-177.
2.	0.	-28.	-3.	-4.	-2.	17.	-2.	-23.	-6.	-2.	-1.	-1.	-5.	-48.
4.	-27.	0.	-11.	-41.	-23.	-69.	-12.	-161.	-34.	-20.	-18.	-21.	71.	-761.
3.	-4.	-2.	0.	-21.	-11.	-8.	-5.	-74.	-31.	-7.	-6.	-4.	3.	-234.
8.	-4.	-26.	-16.	0.	-1.	1.	-6.	-56.	-30.	-8.	-5.	-5.	-4.	-268.
9.	-2.	-25.	-8.	-2.	0.	3.	-3.	-17.	-11.	-3.	-2.	-2.	-5.	-101.
9.	-5.	-46.	9.	-8.	-3.	0.	-8.	-15.	-14.	-8.	-4.	-8.	-2.	-90.
7.	-2.	-14.	-4.	-6.	-4.	-10.	0.	-51.	-21.	-1.	-2.	-3.	2.	-128.
2.	-18.	-135.	-56.	-48.	-15.	-40.	-38.	0.	-3.	-42.	6.	8.	204.	-359.
1.	-5.	-31.	-21.	-25.	-12.	-4.	-20.	-10.	0.	59.	37.	21.	139.	-121.
5.	-2.	-17.	-6.	-6.	-3.	-6.	-1.	-50.	14.	0.	2.	-1.	22.	-88.
2.	-1.	-15.	4.	-4.	-3.	-5.	-1.	-22.	36.	5.	0.	-3.	23.	33.
1.	-1.	-17.	-3.	-4.	-2.	-6.	-3.	-8.	37.	-0.	-2.	0.	2.	5.
8.	-4.	-30.	2.	-2.	-4.	14.	5.	250.	141.	14.	8.	3.	0.	500.
2.	-58.	-642.	-120.	-238.	-109.	-116.	-90.	-367.	-129.	-51.	-7.	-34.	567.	-3262.

896.44 STD. DEV. = 29.94 M.S.E. = 1021.35 ROOT M.S.E. = 31.96

228

2 of 2

TABLE . D – 15 CHI-SQUARE CELL VALUES BETWEEN THE OD TRIP DATA AND GRAVITY MOD

CHI-SQUARE VALUES

TO / ZONE /	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1	0.	18.**	35.**	0.	8.**	51.**	3.	1.	80.**	16.**	5.*	0.	2.	11.**	5.*	
2	17.**	0.	6.*	3.	2.	3.	~~6.~~	~~11.~~	2.	1.	1.	13.**	2.	7.	1.	
3	72.**	11.**	0.	17.**	15.**	1.	1.	8.**	26.**	35.**	0.	21.**	2.	3.	5.*	
4	9.**	6.*	16.**	0.	24.**	14.**	3.	4.*	3.	7.**	3.	11.**	0.	1.	2.	
5	49.**	3.	16.**	21.**	0.	13.**	0.	9.**	28.**	18.**	7.**	8.**	0.	2.	4.	
6	101.**	5.*	9.**	15.**	13.**	0.	2.	15.**	9.**	7.**	4.	24.**	7.**	7.**	3.	
7	1.	0.	4.*	1.	4.*	3.	0.	1.	14.**	8.**	3.	7.**	5.*	2.	3.	
8	0.	0.	4.*	0.	0.	13.**	3.	0.	7.**	8.**	3.	2.	3.	4.*	1.	
9	1.	2.	7.**	2.	12.**	5.*	30.**	3.	0.	2.	1.	0.	6.*	15.**	3.	
10	0.	2.	2.	0.	15.**	11.**	11.**	6.*	0.	0.	10.**	1.	0.	2.	8.**	
11	12.**	1.	2.	3.	5.*	3.	3.	3.	5.*	11.**	0.	17.**	3.	2.	2.	
12	18.**	28.**	7.**	14.**	19.**	16.**	1.	6.*	20.**	16.**	15.**	0.	0.	14.**	19.**	
13	1.	3.	10.**	1.	12.**	6.*	4.*	5.*	5.*	0.	4.	1.	0.	19.**	10.**	
14	13.**	7.	4.*	0.	7.**	7.**	11.**	4.*	11.**	8.**	4.	7.**	14.**	0.	2.	
15	4.*	1.	0.	0.	0.	2.	2.	1.	4.*	2.	2.	11.**	2.	0.	0.	
16	0.	14.	2.	7.**	7.**	10.**	2.	15.**	22.**	19.**	5.*	15.**	3.	7.**	3.	
17	45.**	1.	4.	1.	3.	2.	1.	1.	1.	1.	2.	10.**	2.	5.*	4.	
18	52.**	1.	14.**	1.	44.**	7.**	1.	2.	14.**	4.*	18.**	26.**	12.**	32.**	20.**	
19	83.**	0.	0.	1.	17.**	13.**	7.**	1.	9.**	2.	5.*	0.	6.*	19.**	0.	
20	0.	1.	2.	2.	5.*	3.	0.	0.	12.**	4.*	2.	13.**	6.*	7.**	2.	
21	6.*	1.	1.	3.	1.	1.	2.	3.	7.**	3.	1.	17.**	5.*	4.	2.	
22	1.	0.	3.	2.	2.	2.	2.	2.	1.	0.	1.	4.*	3.	2.	2.	
23	431.**	47.	0.	120.**	130.**	1.	3.	5.*	157.**	69.**	4.	510.**	68.**	2.	5.*	
TOTAL	915.	153.	147.	217.	346.	188.	97.	108.	438.	240.	98.	719.	154.	167.	105.	1

$\chi^2_{0.00,484} = 584$ $\chi^2_{0.99,1} = 6.63$ $\chi^2_{0.95,1} = 3.84$

10f

OD TRIP DATA AND GRAVITY MODEL FOR TEST YEAR 1977

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
CHI-SQUARE VALUES														
16.**	5.*	0.	2.	11.**	5.*	1.	0.	27.**	37.**	0.	1.	3.	683.**	989.
1.	1.	13.**	2.	7.	1.	10.	50.	0.	0.	1.	1.	0.	4.	150.
5.**	0.	21.**	2.	3.	5.*	3.	5.	50.**	0.	5.	0.	0.	0.	283.
7.**	3.	11.**	0.	1.	2.	25.**	1.	7.**	0.	0.	4.	0.	95.**	236.
8.**	7.**	8.**	0.	2.	4.	13.**	0.	21.**	6.*	6.*	4.	3.	99.**	330.
7.**	4.	24.**	7.**	7.**	3.	11.**	2.	10.**	18.**	4.	2.	3.	9.**	279.
8.**	3.	7.**	5.*	2.	3.	2.	4.*	0.	4.*	0.	3.	2.	0.	71.
8.**	3.	2.	3.	4.*	1.	3.	3.	9.**	4.*	4.	4.	3.	1.	80.
2.	1.	0.	6.*	15.**	3.	11.**	7.**	21.**	3.	8.**	8.**	5.*	68.**	221.
0.	10.**	1.	0.	2.	8.**	0.	8.	1.	4.*	5.*	3.	2.	12.**	105.
1.**	0.	17.**	3.	2.	2.	5.*	2.	23.**	6.*	2.	1.	1.	0.	110.
6.**	15.**	0.	0.	14.**	19.**	29.**	9.**	75.**	1.	17.**	15.**	8.**	170.**	519.
0.	4.	1.	0.	19.**	10.**	2.	0.	29.**	12.**	7.**	7.**	5.*	129.**	272.
8.**	4.	7.**	14.**	0.	2.	10.**	6.	59.**	21.**	8.**	4.*	3.	2.	212.
7.	2.	11.**	2.	0.	0.	3.	3.	18.**	12.**	3.	3.	2.	4.*	78.
9.**	5.*	15.**	3.	7.**	3.	0.	0.	1.	8.**	8.**	1.	4.*	27.**	179.
1.	2.	10.**	2.	5.*	4.	4.*	0.	36.**	9.**	2.	2.	3.	0.	139.
4.*	18.**	26.**	12.**	32.**	20.**	0.	38.**	0.	1.	19.**	2.	8.**	613.**	928.
2.	5.*	0.	6.*	19.**	0.	0.	12.**	1.	0.	132.**	42.**	106.**	297.**	755.
4.*	2.	13.**	6.*	7.**	2.	8.**	3.	17.**	91.**	0.	2.	0.	1.	185.
3.	1.	17.**	5.*	4.	2.	1.	0.	19.**	140.**	4.	0.	2.	14.**	238.
0.	1.	4.*	3.	2.	2.	1.	0.	0.	58.**	0.	0.	0.	1.	87.
9.**	4.	510.**	68.**	2.	5.*	36.**	27.**	681.**	260.**	11.**	9.**	1.	0.	2576.
0.	98.	719.	154.	167.	105.	179.	188.	1106.	696.	244.	119.	166.	2228.	9020.**

[illegible]

$\chi^2_{0.95,1} = 3.84$

* (SIGNIFICANT AT 5% LEVEL)

** (SIGNIFICANT AT 1% LEVEL)

\- (EXPECTED FREQUENCY <5)

2 of 2

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329

TABLE D-16 CHI-SQUARE CELL VALUES BETWEEN THE OD TRIP DATA AND GRAVITY MODEL

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
										CHI-SQUARE VALUES						
1	0.	15.**	29.**	14.**	0.	62.**	1.	2.	0.	1.	16.**	2.	0.	2.	20.**	
2	22.**	0.	9.**	0.	4.*	0.	1.	2.	0.	0.	1.	2.	2.	~~20.~~	1.	
3	63.**	11.**	0.	21.**	16.**	7.**	1.	0.	0.	1.	3.	24.**	0.	52.**	5.*	1
4	40.**	3.	21.**	0.	31.**	15.**	0.	14.**	22.**	10.**	~~4.~~	1.	3.	3.	3.	
5	20.**	1.	22.**	28.**	0.	15.**	5.*	8.**	10.**	2.	9.**	1.	1.	8.**	~~4.~~	
6	95.**	4.*	9.**	15.**	13.**	0.	2.	15.**	13.**	8.**	~~4.~~	38.**	5.*	7.**	3.	1
7	3.	3.	2.	3.	2.	3.	0.	12.**	5.*	3.	3.	12.**	5.*	10.**	3.	
8	7.**	5.*	11.**	0.	12.**	14.**	13.**	0.	4.*	12.**	3.	13.**	5.*	7.**	3.	
9	14.**	1.	4.*	6.*	42.**	13.	29.	0.	0.	0.	4.	21.**	10.**	37.**	10.**	
10	0.	1.	1.	3.	6.*	8.**	0.	4.*	2.	0.	11.**	1.	0.	5.*	6.*	
11	23.**	1.	~~4.~~	3.	8.**	3.	3.	3.	5.*	11.**	0.	26.**	3.	3.	2.	
12	41.**	1.	3.	14.**	2.	25.**	13.**	19.**	25.**	6.*	26.**	0.	14.**	23.**	24.**	3
13	8.**	3.	0.	1.	2.	6.*	9.**	8.**	17.**	4.*	~~4.~~	9.**	0.	17.**	10.**	1
14	15.**	~~6.~~	0.	6.*	0.	5.*	11.**	1.	24.**	25.**	4.*	0.	15.**	0.	1.	
15	23.**	0.	0.	2.	1.	1.	3.	1.	9.**	8.**	2.	18.**	9.**	1.	0.	
16	0.	1.	22.**	5.*	0.	8.**	13.**	1.	1.	0.	5.*	27.**	0.	0.	3.	
17	17.**	1.	~~11.~~	0.	1.	2.	2.	3.	10.**	1.	2.	9.**	2.	6.*	~~4.~~	
18	64.**	12.**	28.**	0.	13.**	19.**	18.**	0.	4.*	4.*	18.**	9.**	18.**	38.**	20.	
19	113.**	0.	1.	2.	26.**	13.**	12.**	4.*	0.	3.	5.*	1.	18.**	9.**	6.*	
20	7.**	1.	~~4.~~	2.	5.*	3.	2.	3.	2.	~~4.~~	2.	12.**	6.*	7.**	1.	7
21	0.	1.	0	0.	3.	1	2.	1.	7.**	0.	1.	17.**	3.	~~4.~~	2.	
22	3.	0.	1.	1.	2.	2.	2.	2.	0.	2.	1.	7.**	0.	1.	2.	7
23	22.**	2.	0.	1.	57.**	5.*	8.**	161.**	4.*	20.**	~~4.~~	435.**	194.**	1.	5.*	3
TOTAL	600.	75.	182.	126.	247.	232.	150.	263.	166.	126.	130.	697.	314.	268.	141.	156

$\chi^2_{0.99,484} = 584$ $\chi^2_{0.99,1} = 6.63$ $\chi^2_{0.95,1} = 3.84$

OD TRIP DATA AND GRAVITY MODEL FOR TEST YEAR 197[illegible]

CHI-SQUARE VALUES

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
1.	16.**	2.	0.	2.	20.**	0.	28.**	50.**	85.**	0.	5.*	6.*	15.**	354.
0.	1.	2.	2.	~~20.~~	1.	~~6.~~	11.**	0.	2.	1.	1.	0.	32.**	127.
1.	3.	24.**	0.	52.**	5.*	14.**	1.	26.**	2.	~~11.~~	2.	0.	0.	262.
10.**	~~4.~~	11.**	3.	3.	3.	0.	0.	0.	0.	0.	~~4.~~	~~7.~~	1.	192.
2.	9.**	1.	1.	8.**	~~4.~~	0.	1.	2.	25.**	4.*	~~4.~~	0.	8.**	178.
8.**	~~4.~~	38.**	5.*	7.**	3.	13.**	2.	26.**	18.**	~~4.~~	2.	3.	4.*	304.
3.	3.	12.**	5.*	10.**	3.	7.**	1.	4.*	6.*	2.	3.	2.	0.	94.
12.**	3.	13.**	5.*	7.**	3.	7.**	1.	6.*	9.**	~~4.~~	5.*	1.	0.	141.
0.	4.	21.**	10.**	37.**	10.**	0.	9.**	25.**	4.*	15.**	4.*	1.	1.	250.
0.	11.**	1.	0.	5.*	6.*	4.*	0.	5.*	8.**	5.*	1.	3.	1.	74.
11.**	0.	26.**	3.	3.	2.	5.*	2.	23.**	6.*	2.	1.	1.	5.*	143.
6.*	26.**	0.	14.**	23.**	24.**	33.**	3.	51.**	19.**	18.**	10.**	3.	44.**	419.
4.*	~~4.~~	9.**	0.	17.**	10.**	12.**	4.*	47.**	16.**	7.**	4.*	1.	1.	192.
25.**	4.*	0.	15.**	0.	1.	6.*	1.	67.**	9.**	8.**	5.*	5.*	16.**	233.
8.**	2.	18.**	9.**	1.	0.	3.	~~4.~~	19.**	10.**	3.	3.	2.	0.	121.
0.	5.*	27.**	0.	0.	3.	0.	3.	0.	8.**	7.**	3.	5.*	0.	113.
1.	2.	9.**	2.	6.*	~~4.~~	7.**	0.	40.**	17.**	3.	2.	3.	27.**	170.
4.*	18.**	9.**	18.**	38.**	20.**	7.**	15.**	0.	1.	17.**	0.	1.	112.**	420.
3.	5.*	1.	18.**	9.**	6.*	8.**	14.**	4.*	0.	201.**	21.**	139.**	406.**	1005.
~~4.~~	2.	12.**	6.*	7.**	1.	7.**	3.	14.**	118.**	0.	2.	2.	8.**	215.
0.	1.	17.**	3.	~~4.~~	2.	4.*	1.	1.	25.**	1.	0.	0.	2.	77.
2.	1.	7.**	0.	1.	2.	7.**	1.	0.	129.**	0.	~~4.~~	0.	0.	166.
20.**	~~4.~~	435.**	194.**	1.	5.*	3.	3.	439.**	497.**	26.**	6.*	1.	0.	1894.
26.	130.	697.	314.	268.	141.	156.	108.	850.	1014.	340.	91.	186.	683.	7143.**

[illegible] VALUE AT 5 PERC[illegible] = [illegible]36

$\chi^2_{0.95,1} = 3.84$

* (SIGNIFICANT AT 5% LEVEL)

** (SIGNIFICANT AT 1% LEVEL)

– (EXPECTED FREQUENCY <5)

2 of 2

TABLE B - 17 CHI-SQUARE CELL VALUES BETWEEN THE OD TRIP DATA AND GRAVITY MODEL

TO ZONE / FROM ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
										CHI-SQUARE VALUES						
1	0.	18.**	16.**	22.**	0.	52.**	0.	2.	5.*	5.*	16.**	10.**	31.**	3.	10.**	
2	21.**	0.	10.**	0.	1.	4.	0.	2.	0.	3.	1.	12.**	1.	0.	1.	
3	68.**	12.**	0.	30.**	5.*	4.*	9.**	0.	9.**	6.*	3.	13.**	0.	25.**	4.*	1
4	40.**	2.	28.**	0.	25.**	11.**	3.	1.	8.**	9.**	4.	28.**	5.*	0.	3.	
5	23.**	3.	18.**	39.**	0.	15.**	8.**	2.	17.**	0.	9.**	8.**	13.**	4.*	2.	
6	90.**	4.*	5.*	14.**	23.**	0.	4.	15.**	9.**	11.**	4.	45.**	5.*	8.**	3.	1
7	3.	3.	0.	10.**	0.	1.	0.	4.*	60.**	14.**	3.	14.**	4.*	5.*	1.	
8	3.	5.*	0.	7.**	2.	12.**	18.**	0.	12.**	4.*	3.	15.**	2.	0.	2.	
9	31.**	0.	3.	15.**	16.**	1.	57.**	14.**	0.	1.	4.	0.	4.*	22.**	13.**	
10	0.	5.*	1.	7.**	5.*	10.**	14.**	1.	3.	0.	11.**	0.	2.	0.	9.**	
11	23.**	1.	2.	4.	8.**	3.	3.	3.	5.*	11.**	0.	25.**	3.	4.	2.	
12	50.**	2.	3.	38.**	17.**	33.**	27.**	0.	29.**	11.**	27.**	0.	0.	24.**	33.**	2
13	2.	2.	1.	2.	7.**	6.*	6.*	4.*	14.**	3.	4.	6.*	0.	19.**	8.**	
14	17.**	~~15.~~	3.	2.	7.**	7.**	11.**	5.*	7.**	1.	4.	9.**	16.**	0.	1.	
15	6.*	2.	1.	1.	4.	3.	3.	0.	13.**	2.	2.	20.**	9.**	1.	0.	
16	1.	2.	7.**	4.*	5.*	8.**	6.*	1.	0.	0.	5.*	10.**	1.	6.*	3.	
17	0.	1.	1.	15.**	0.	2.	2.	3.	1.	4.*	2.	5.*	2.	6.*	0.	
18	32.**	1.	47.**	8.**	0.	12.**	6.*	2.	11.**	9.**	18.**	37.**	24.**	31.**	12.**	
9	89**	0	4*	18**	16.**	14.**	11.**	0.	60.**	0.	5.*	7.**	9.**	14.**	10.**	
20	0.	0.	1.	2.	5.*	3.	2.	3.	11.**	5.*	2.	16.**	6.*	5.*	3.	
	0	0		2	1	1	2	3.	2.	0.	1.	13.**	4.*	4.	2.	
22	3.	0.	3.	2.	3.	2.	2.	0.	0.	2.	1.	9.**	3.	1.	2.	
	**			0	-	6*	2	26**	7.**	22.**	4.	274.**	30.**	2.	0.	
TOTAL	587.	90.	154.	241.	154.	210.	196.	92.	279.	125.	132.	570.	175.	184.	125.	9

$\chi^2_{0.99,484} = 584$ $\chi^2_{0.99,1} = 6.63$ $\chi^2_{0.95,1} = 3.84$

TRIP DATA AND GRAVITY MODEL FOR TEST YEAR 1979

11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
I-SQUARE VALUES													
16.**	10.**	31.**	3.	10.**	0.	6.*	15.**	88.**	7.**	0.	1.	86.**	392.
1.	12.**	1.	0.	1.	1.	0.	3.	0.	1.	0.	0.	21.**	83.
3.	13.**	0.	25.**	4.*	13.**	1.	59.**	4.*	1.	2.	0.	0.	266.
4.	28.**	5.*	0.	3.	8.	7.**	3.	2.	1.	1.	1.	0.	182.
9.**	8.**	13.**	4.*	2.	0.	2.	1.	21.**	6.*	2.	2.	18.**	212.
4.	45.**	5.*	8.**	3.	12.**	1.	20.**	17.**	4.	2.	3.	9.**	306.
3.	14.**	4.*	5.*	1.	8.**	1.	6.*	11.**	2.	3.	2.	0.	154.
3.	15.**	2.	0.	2.	0.	3.	0.	4.*	4.	3.	1.	5.*	105.
4.	0.	4.*	22.**	13.**	0.	0.	17.**	1.	15.**	4.*	0.	0.	219.
11.**	0.	2.	0.	9.**	0.	6.*	15.**	0.	5.*	1.	3.	2.	98.
0.	25.**	3.	4.	2.	5.*	2.	23.**	6.*	2.	1.	1.	2.	139.
27.**	0.	0.	24.**	33.**	23.**	4.*	76.**	7.**	18.**	22.**	14.**	48.**	508.
4.	6.*	0.	19.**	8.**	2.	7.**	51.**	25.**	7.**	5.*	3.	0.	185.
4.	9.**	16.**	0.	1.	9.**	6.*	53.**	12.**	9.**	4.*	4.*	0.	201.
2.	20.**	9.**	1.	0.	2.	4.	23.**	9.**	3.	3.	3.	6.*	117.
5.*	10.**	1.	6.*	3.	0.	0.	116.**	0.	7.**	0.	6.*	0.	189.
2.	5.*	2.	6.*	0.	1.	0.	29.**	18.**	2.	2.	2.	1.	99.
18.**	37.**	24.**	31.**	12.**	3.	29.**	0.	0.	26.**	25.**	1.	319.**	655.
5.*	7.**	9.**	14.**	10.**	1.	10.**	6.*	0.	146.**	66.**	57.**	377.**	919.
2.	16.**	6.*	5.*	3.	2.	3.	18.**	19.**	0.	2.	2.	19.**	128.
1.	13.**	4.*	4.	2.	6.*	0.	1.	51.**	0.	0.	4.	80.**	179.
1.	9.**	3.	1.	2.	3.	3.	3.	86.**	0.	0.	0.	2.	130.
4.	274.**	30.**	2.	0.	2.	2.	528.**	355.**	19.**	31.**	33.**	0.	1441.
132.	570.	175.	184.	125.	94.	97.	1066.	736.	284.	179.	143.	996.	6908.**

$\chi^2 = 3.84$

* (SIGNIFICANT AT 5% LEVEL)

** (SIGNIFICANT AT 1% LEVEL)

\- (EXPECTED FREQUENCY <5)

2 of 2

TABLE D - 18 CHI-SQUARE CELL VALUES BETWEEN THE OD TRIP DATA AND GRAVITY MODEL

TO / ZONE / FROM ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1
										CHI-SQUARE VALUES						
1	0.	14.**	27.**	15.**	12.**	59.**	0.	0.	22.**	3.	16.**	8.**	16.**	2.	0.	0
2	19.**	0.	10.**	5.*	1.	2.	2.	1.	0.	1.	1.	2.	1.	11.**	1.	0
3	60.**	12.**	0.	21.**	15.**	6.*	5.*	1.	27.**	3.	3.	40.**	8.**	1.	1.	6
4	35.**	6.*	16.**	0.	26.**	15.**	6.*	3.	8.**	4.*	~~4.~~	21.**	1.	1.	0.	13
5	1.	1.	18.**	34.**	0.	20.**	0.	11.**	15.**	9.**	8.**	9.**	6.*	4.*	3.	1
6	93.**	4.*	5.*	19.**	23.**	0.	2.	15.**	3.	16.**	31.**	37.**	7.**	6.*	~~4.~~	11
7	2.	0.	4.*	5.*	2.	1.	0.	7.**	39.**	2.	~~106.~~	19.**	0.	7.**	3.	4
8	1.	3.	1.	6.*	11.**	14.**	13.**	0.	2.	12.**	~~60.~~	21.**	9.**	3.	0.	0
9	0.	1.	7.**	5.*	26.**	3.	36.**	0.	0.	0.	~~62.~~	14.**	11.**	9.**	3.	7
10	0.	2.	0.	3.	8.**	12.**	1.	10.**	1.	0.	11.**	14.**	2.	13.**	4.*	14
11	22.**	1.	~~4.~~	~~4.~~	8.**	~~42.~~	~~105.~~	~~68.~~	72.**	12.**	0.	28.**	3.	~~4.~~	2.	50
12	39.**	0.	9.**	26.**	14.**	21.**	12.**	21.**	28.**	15.**	27.**	0.	2.	29.**	15.**	42*
13	0.	1.	6.*	2.	10.**	2.	2.	6.*	7.**	0.	~~4.~~	0.	0.	21.**	11.**	2
14	17.**	1.	1.	0.	4.*	7.**	6.*	3.	24.**	2.	~~4.~~	11.**	12.**	0.	1.	0
15	0.	2.	0.	0.	1.	1.	3.	0.	2.	9.**	2.	18.**	7.**	2.	0.	3
16	2.	~~7.~~	4.*	0.	11.**	9.**	1.	15.**	0.	3.	5.*	21.**	4.*	4.*	3.	0.
17	0.	2.	1.	5.*	1.	2.	0.	3.	2.	6.*	2.	6.*	4.*	6.*	~~4.~~	6.*
18	56.**	4.*	93.**	0.	1.	20.**	1.	1.	3.	18.**	18.**	73.**	37.**	41.**	10.**	38.*
19	117.**	0.	1.	3.	16.**	14.**	8.**	13.**	1.	0.	5.*	10.**	12.**	21.**	11.**	0.
20	0.	1.	0.	1.	5.*	3.	0.	3.	13.**	5.*	2.	11.**	6.*	5.*	3.	4.
21	3.	0.	0.	2.	1.	1.	2.	3.	6.*	1.	1.	12.**	2.	~~4.~~	3.	3.
22	0.	0.	0.	0.	1.	2.	0.	0.	0.	1.	1.	14.**	3.	~~4.~~	2.	4.
23	1.	1.	0.	0.	14.**	0.	3.	1.	41.**	22.**	~~4.~~	19.**	0.	0.	2.	6.
TOTAL	469.	63.	209.	157.	210.	255.	209.	185.	317.	144.	378.	407.	155.	199.	86.	215.

DEGREES OF FREEDO[illegible] = 484 CH. SQ. TABLE VALUE AT 5 PERC[illegible] 5

$\chi^2_{0.99,484} = 584$ $\chi^2_{0.99,1} = 6.63$ $\chi^2_{0.95,1} = 3.84$

10f

TRIP DATA AND GRAVITY MODEL FOR TEST YEAR 1980

I-SQUARE VALUES

	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
.	16.**	8.**	16.**	2.	0.	0.	4.*	19.**	61.**	0.	0.	2.	46.**	327.
.	1.	2.	1.	11.**	1.	0.	3.	6.*	0.	1.	0.	0.	1.	69.
.	3.	40.**	8.**	1.	1.	6.*	1.	34.**	0.	2.	0.	2.	0.	248.
.	4.	21.**	1.	1.	0.	13.**	3.	5.*	1.	1.	3.	1.	11.**	184.
.*	8.**	9.**	6.*	4.*	3.	1.	1.	1.	23.**	6.*	2.	2.	0.	175.
.**	31.**	37.**	7.**	6.*	4.	11.**	2.	23.**	19.**	4.	2.	3.	2.	331.
.	~~106.~~	19.**	0.	7.**	3.	4.*	1.	13.**	9.**	2.	3.	2.	2.	235.
.**	~~60.~~	21.**	9.**	3.	0.	0.	2.	0.	3.	4.	5.*	3.	0.	173.
.	~~62.~~	14.**	11.**	9.**	3.	7.**	0.	12.**	6.*	12.**	4.*	1.	0.	219.
.	11.**	14.**	2.	13.**	4.*	14.**	4.*	19.**	0.	5.*	1.	1.	14.**	139.
.	0.	28.**	3.	4.	2.	50.**	2.	23.**	6.*	2.	1.	1.	5.*	463.
.	27.**	0.	2.	29.**	15.**	42.**	5.*	84.**	11.**	14.**	13.**	16.**	87.**	533.
	4.	0.	0.	21.**	11.**	2.	4.*	47.**	22.**	7.**	5.*	3.	1.	164.
.	4.	11.**	12.**	0.	1.	0.	6.*	41.**	24.**	7.**	4.*	5.*	1.	181.
**	2.	18.**	7.**	2.	0.	3.	2.	11.**	8.**	3.	1.	1.	3.	80.
.	5.*	21.**	4.*	4.*	3.	0.	5.*	5.*	5.	7.**	2.	7.**	0.	120.
.*	2.	6.*	4.*	6.*	4.	6.*	0.	49.**	17.**	0.	2.	3.	1.	121.
.**	18.**	73.**	37.**	41.**	10.**	38.**	35.**	0.	0.	30.**	1.	2.	324.**	808.
.	5.*	10.**	12.**	21.**	11.**	0.	18.**	1.	0.	135.**	56.**	36.**	342.**	822.
.*	2.	11.**	6.*	5.*	3.	4.*	0.	39.**	8.**	0.	1.	1.	39.**	150.
.	1.	12.**	2.	4.	3.	3.	0.	17.**	58.**	5.	0.	3.	55.**	182.
.	1.	14.**	3.	4.	2.	4.*	3.	1.	118.**	0.	1.	0.	0.	157.
.**	4.	19.**	0.	0.	2.	6.*	4.*	473.**	285.**	17.**	6.*	0.	0.	900.
.	378.	407.	155.	199.	86.	215.	104.	922.	686.	266.	113.	94.	935.	6779.**

[illegible]-VALUE AT 5 PERC[illegible] 536

$\chi^2_{.05} = 3.84$

* (SIGNIFICANT AT 5% LEVEL)

** (SIGNIFICANT AT 1% LEVEL)

\- (EXPECTED FREQUENCY <5)

2 of 2

232

TABLE D - 19 TRIPS BY DISTANCE CLASSES AND RELATED CHI-SQUARES (1977)

DISTANCE CLASS (KM)	NUMBER OF TRIPS OD SURVEY	MODEL	CHI-SQ.	FRICTION FACTOR	DISTANCE CLASS (KM)
0 - 19	29.	62.	17.31	3.18	520 - 539
20 - 39	381.	543.	48.19	2.38	540 - 559
40 - 59	366.	415.	5.76	0.67	560 - 579
60 - 79	220.	359.	53.95	2.62	580 - 599
80 - 99	551.	907.	139.64	1.32	600 - 619
100 - 119	372.	475.	22.15	1.61	620 - 639
120 - 139	165.	182.	1.60	1.33	640 - 659
140 - 159	643.	768.	20.49	1.53	660 - 679
160 - 179	416.	496.	12.87	2.11	680 - 699
180 - 199	580.	887.	106.47	1.68	700 - 719
200 - 219	1076.	981.	9.19	1.79	720 - 739
220 - 239	82.	148.	29.11	1.70	740 - 759
240 - 259	620.	910.	92.39	1.37	760 - 779
260 - 279	644.	455.	78.27	1.59	780 - 799
280 - 299	339.	396.	8.09	1.60	800 - 819
300 - 319	384.	405.	1.08	1.03	820 - 839
320 - 339	814.	746.	6.28	1.28	840 - 859
340 - 359	381.	452.	11.05	0.97	860 - 879
360 - 379	410.	451.	3.73	1.33	880 - 899
380 - 399	206.	167.	9.24	0.75	900 - 919
400 - 419	121.	118.	0.09	0.62	920 - 939
420 - 439	993.	1183.	30.46	1.38	940 - 959
440 - 459	90.	88.	0.03	0.75	960 - 979
460 - 479	384.	210.	143.78	0.81	980 - 999
480 - 499	49.	22.	31.70	0.48	1000 - 1019
500 - 519	18.	36.	8.71	1.16	

TOTAL CHI-SQUAR

DEGREES OF FREE

1of

IED CHI-SQUARES (1977)

FRICTION FACTOR	DISTANCE CLASS (KM)	NUMBER OF TRIPS OD SURVEY	MODEL	CHI-SQ.	FRICTION FACTOR
3.18	520 - 539	270.	253.	1.19	0.79
2.38	540 - 559	178.	294.	45.60	1.03
0.67	560 - 579	7.	22.	10.42	0.65
2.62	580 - 599	77.	86.	0.90	0.70
.	600 - 619	152.	91.	41.29	0.47
1.61	620 - 639	237.	220.	1.24	0.82
1.33	640 - 659	272.	168.	63.95	0.99
1.53	660 - 679	73.	42.	23.29	0.41
2.11	680 - 699	610.	878.	81.58	0.96
1.68	700 - 719	121.	44.	135.10	0.61
1.79	720 - 739	235.	471.	117.90	1.18
1.70	740 - 759	107.	32.	180.36	1.08
1.37	760 - 779	20.	22.	0.11	0.24
1.59	780 - 799	12.	20.	3.49	0.25
1.60	800 - 819	0.	0.	0.0	0.0
1.03	820 - 839	1.	0.	0.0	0.0
1.28	840 - 859	15.	3.	39.81	0.36
0.97	860 - 879	21.	32.	3.84	0.44
1.33	880 - 899	0.	0.	0.0	0.0
0.75	900 - 919	728.	229.	1088.75	0.84
0.62	920 - 939	0.	0.	0.0	0.0
1.38	940 - 959	0.	0.	0.0	0.0
0.75	960 - 979	0.	0.	0.0	0.0
0.81	980 - 999	0.	0.	0.0	0.0
0.48	1000 - 1019	0.	0.	0.0	0.0
1.16	TOTAL CHI-SQUARE VALUE			2730.45	

DEGREES OF FREEDOM = 45; CH. SQ. TABLE VALUE AT 5 PERCT. LEVEL = 61.63

2 of 2

TABLE D - 20 TRIPS BY DISTANCE CLASSES AND RELATED CHI-SQUARES (1978)

DISTANCE CLASS (KM)	NUMBER OF TRIPS OD SURVEY	MODEL	CHI-SQ.	FRICTION FACTOR	DISTANCE CLASS (KM)
0 - 19	9.	63.	46.08	3.18	520 - 539
20 - 39	349.	555.	76.54	2.38	540 - 559
40 - 59	372.	426.	6.82	0.67	560 - 579
60 - 79	182.	370.	95.86	2.62	580 - 599
80 - 99	466.	927.	228.96	1.32	600 - 619
100 - 119	290.	483.	77.24	1.61	620 - 639
120 - 139	161.	187.	3.55	1.33	640 - 659
140 - 159	570.	798.	65.25	1.53	660 - 679
160 - 179	455.	505.	4.93	2.11	680 - 699
180 - 199	654.	904.	68.94	1.68	700 - 719
200 - 219	804.	1003.	39.46	1.79	720 - 739
220 - 239	68.	154.	47.75	1.70	740 - 759
240 - 259	693.	926.	58.69	1.37	760 - 779
260 - 279	523.	469.	6.23	1.59	780 - 799
280 - 299	327.	402.	14.04	1.60	800 - 819
300 - 319	303.	417.	31.31	1.03	820 - 839
320 - 339	590.	761.	38.41	1.28	840 - 859
340 - 359	376.	458.	14.83	0.97	860 - 879
360 - 379	391.	468.	12.70	1.33	880 - 899
380 - 399	177.	170.	0.29	0.75	900 - 919
400 - 419	94.	120.	5.65	0.62	920 - 939
420 - 439	964.	1219.	53.32	1.38	940 - 959
440 - 459	88.	90.	0.05	0.75	960 - 979
460 - 479	305.	216.	37.11	0.81	980 - 999
480 - 499	30.	24.	1.68	0.48	1000 - 1019
500 - 519	14.	37.	14.28	1.16	

TOTAL CHI-SQUARE

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ED CHI-SQUARES (1978)

FRICTION FACTOR	DISTANCE CLASS (KM)	NUMBER OF TRIPS OD SURVEY	NUMBER OF TRIPS MODEL	CHI-SQ.	FRICTION FACTOR
3.18	520 - 539	251.	260.	0.28	0.79
2.38	540 - 559	214.	299.	24.26	1.03
0.67	560 - 579	17.	23.	1.35	0.65
2.62	580 - 599	36.	91.	33.07	0.70
1.32	600 - 619	171.	92.	68.83	0.47
1.61	620 - 639	208.	227.	1.61	0.82
1.33	640 - 659	155.	173.	1.82	0.99
1.53	660 - 679	90.	43.	52.26	0.41
2.11	680 - 699	557.	887.	122.70	0.96
1.68	700 - 719	89.	45.	42.94	0.61
1.79	720 - 739	174.	483.	197.90	1.18
1.70	740 - 759	37.	34.	0.27	1.08
1.37	760 - 779	13.	22.	3.75	0.24
1.59	780 - 799	29.	21.	3.10	0.25
1.60	800 - 819	0.	0.	0.0	0.0
1.03	820 - 839	0.	0.	0.0	0.0
1.28	840 - 859	9.	4.	8.25	0.36
0.97	860 - 879	16.	33.	8.70	0.44
1.33	880 - 899	0.	0.	0.0	0.0
0.75	900 - 919	328.	236.	36.20	0.84
0.62	920 - 939	0.	0.	0.0	0.0
1.38	940 - 959	0.	0.	0.0	0.0
0.75	960 - 979	0.	0.	0.0	0.0
0.81	980 - 999	0.	0.	0.0	0.0
0.48	1000 -1019	0.	0.	0.0	0.0
1.16					

TOTAL CHI-SQUARE VALUE 1657.25

DEGREES OF FREEDOM =45; CH. SQ. TABLE VALUE AT 5 PERCT. LEVEL = 61.63

2 of 2

TABLE D - 21 TRIPS BY DISTANCE CLASSES AND RELATED CHI-SQUARES (1979)

DISTANCE CLASS (KM)	NUMBER OF TRIPS OD SURVEY	MODEL	CHI-SQ.	FRICTION FACTOR	DISTANCE CLASS (KM)
0 - 19	13.	64.	40.51	3.18	520 - 539
20 - 39	361.	568.	75.19	2.38	540 - 559
40 - 59	473.	438.	2.81	0.67	560 - 579
60 - 79	197.	381.	89.06	2.62	580 - 599
80 - 99	591.	947.	133.68	1.32	600 - 619
100 - 119	362.	492.	34.44	1.61	620 - 639
120 - 139	167.	191.	3.11	1.33	640 - 659
140 - 159	542.	829.	99.39	1.53	660 - 679
160 - 179	459.	515.	5.99	2.11	680 - 699
180 - 199	671.	920.	67.41	1.68	700 - 719
200 - 219	1000.	1027.	0.69	1.79	720 - 739
220 - 239	80.	160.	40.15	1.70	740 - 759
240 - 259	594.	942.	128.65	1.37	760 - 779
260 - 279	539.	483.	6.59	1.59	780 - 799
280 - 299	365.	409.	4.80	1.60	800 - 819
300 - 319	294.	430.	43.15	1.03	820 - 839
320 - 339	604.	777.	38.40	1.28	840 - 859
340 - 359	386.	466.	13.58	0.97	860 - 879
360 - 379	408.	487.	12.69	1.33	880 - 899
380 - 399	141.	174.	6.12	0.78	900 - 919
400 - 419	140.	122.	2.58	0.62	920 - 939
420 - 439	920.	1256.	90.06	1.38	940 - 959
440 - 459	101.	92.	0.92	0.75	960 - 979
460 - 479	306.	221.	32.42	0.81	980 - 999
480 - 499	27.	25.	0.15	0.48	1000 -1019
500 - 519	32.	38.	1.05	1.16	

TOTAL CHI-SQUARE VAI

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TED CHI-SQUARES (1979)

FRICTION FACTOR	DISTANCE CLASS (KM)	NUMBER OF TRIPS OD SURVEY	MODEL	CHI-SQ.	FRICTION FACTOR
3.18	520 - 539	286.	267.	1.36	0.79
2.38	540 - 559	212.	305.	28.29	1.03
		.	.	.	0.65
2.62	580 - 599	74.	96.	5.00	0.70
.		.	.	81.06	0.47
1.61	620 - 639	228.	234.	0.16	0.82
1.33	640 - 659	163.	178.	1.23	0.99
1.53	660 - 679	49.	44.	0.66	0.41
2.11	680 - 699	681.	897.	51.96	0.96
1.68	700 - 719	64.	46.	6.89	0.61
1.79	720 - 739	201.	497.	176.05	1.18
1.70	740 - 759	39.	37.	0.15	1.08
1.37	760 - 779	31.	23.	3.17	0.24
1.59	780 - 799	23.	21.	0.11	0.25
1.60	800 - 819	0.	0.	0.0	0.0
1.03	820 - 839	1.	0.	0.0	0.0
.28	840 - 859	15.	4.	32.75	0.36
0.97	860 - 879	23.	34.	3.43	0.44
1.33	880 - 899	0.	0.	0.0	0.0
0.75	900 - 919	447.	243.	170.86	0.84
0.62	920 - 939	0.	0.	0.0	0.0
1.38	940 - 959	0.	0.	0.0	0.0
0.75	960 - 979	0.	0.	0.0	0.0
0.81	980 - 999	0.	0.	0.0	0.0
0.48	1000 -1019	0.	0.	0.0	0.0
1.16	TOTAL CHI-SQUARE VALUE			1540.91	

242

TABLE D - 22. TRIPS BY DISTANCE CLASSES AND RELATED CHI-SQUARES (1980)

DISTANCE CLASS (KM)	NUMBER OF TRIPS OD SURVEY	MODEL	CHI-SQ.	FRICTION FACTOR	DISTANCE CLASS (KM)
0 - 19	13.	65.	41.23	3.18	520 - 539
20 - 39	315.	579.	120.49	2.38	540 - 559
40 - 59	362.	452.	17.78	0.67	560 - 579
60 - 79	185.	393.	110.29	2.62	580 - 599
80 - 99	626.	968.	121.12	1.32	600 - 619
100 - 119	394.	500.	22.35	1.61	620 - 639
120 - 139	134.	195.	19.34	1.33	640 - 659
140 - 159	625.	864.	66.20	1.53	660 - 679
160 - 179	462.	526.	7.70	2.11	680 - 699
180 - 199	829.	941.	13.26	1.68	700 - 719
200 - 219	972.	1052.	6.05	1.79	720 - 739
220 - 239	83.	167.	41.91	1.70	740 - 759
240 - 259	583.	960.	148.32	1.37	760 - 779
260 - 279	586.	498.	15.61	1.59	780 - 799
280 - 299	363.	419.	7.45	1.60	800 - 819
300 - 319	297.	443.	48.36	1.03	820 - 839
320 - 339	776.	798.	0.61	1.28	840 - 859
340 - 359	456.	473.	0.64	0.97	860 - 879
360 - 379	450.	508.	6.69	1.33	880 - 899
380 - 399	147.	178.	5.29	0.75	900 - 919
400 - 419	83.	125.	13.84	0.62	920 - 939
420 - 439	991.	1305.	75.39	1.38	940 - 959
440 - 459	95.	93.	0.03	0.75	960 - 979
460 - 479	182.	227.	8.79	0.81	980 - 999
480 - 499	34.	26.	2.13	0.48	1000 - 1019
500 - 519	28.	40.	3.41	1.16	TOTAL CHI-SQUARE

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ATED CHI-SQUARES (1980)

FRICTION FACTOR	DISTANCE CLASS (KM)	NUMBER OF TRIPS OD SURVEY	MODEL	CHI-SQ.	FRICTION FACTOR
3.18	520 - 539	322.	277.	7.46	0.79
2.38	540 - 559	210.	311.	33.03	1.03
0.67	560 - 579	12.	23.	5.21	0.65
2.62	580 - 599	102.	102.	0.00	0.70
1.32	600 - 619	175.	94.	70.80	0.47
1.61	620 - 639	216.	243.	3.05	0.82
1.33	640 - 659	182.	182.	0.00	0.99
1.53	660 - 679	53.	45.	1.49	0.41
2.11	680 - 699	670.	925.	70.10	0.96
1.68	700 - 719	59.	47.	3.00	0.61
1.79	720 - 739	214.	515.	176.29	1.18
1.70	740 - 759	55.	39.	6.26	1.08
1.37	760 - 779	21.	23.	0.23	0.24
1.59	780 - 799	20.	22.	0.20	0.25
1.60	800 - 819	0.	0.	0.0	0.0
1.03	820 - 839	0.	0.	0.0	0.0
1.28	840 - 859	4.	4.	0.00	0.36
0.97	860 - 879	28.	35.	1.37	0.44
1.33	880 - 899	0.	0.	0.0	0.0
0.75	900 - 919	339.	253.	29.31	0.84
0.62	920 - 939	0.	0.	0.0	0.0
1.38	940 - 959	0.	0.	0.0	0.0
0.75	960 - 979	0.	0.	0.0	0.0
0.81	980 - 999	0.	0.	0.0	0.0
0.48	1000 -1019	0.	0.	0.0	0.0
1.16					
	TOTAL CHI-SQUARE VALUE			[illegible]	

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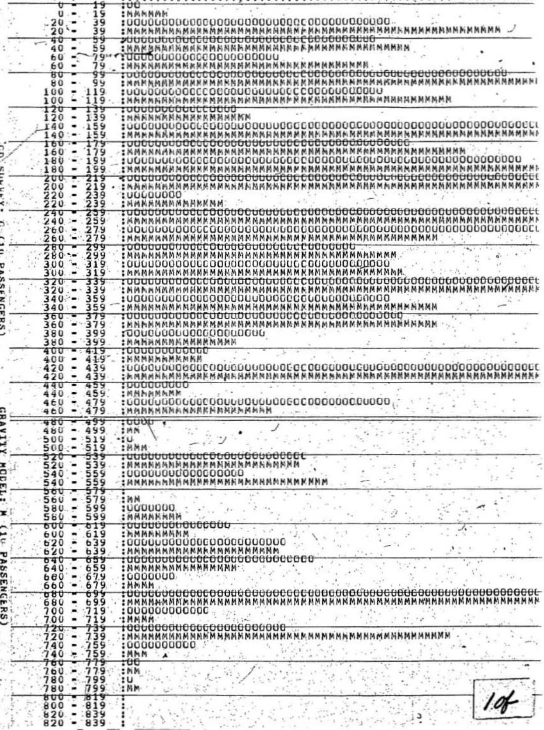
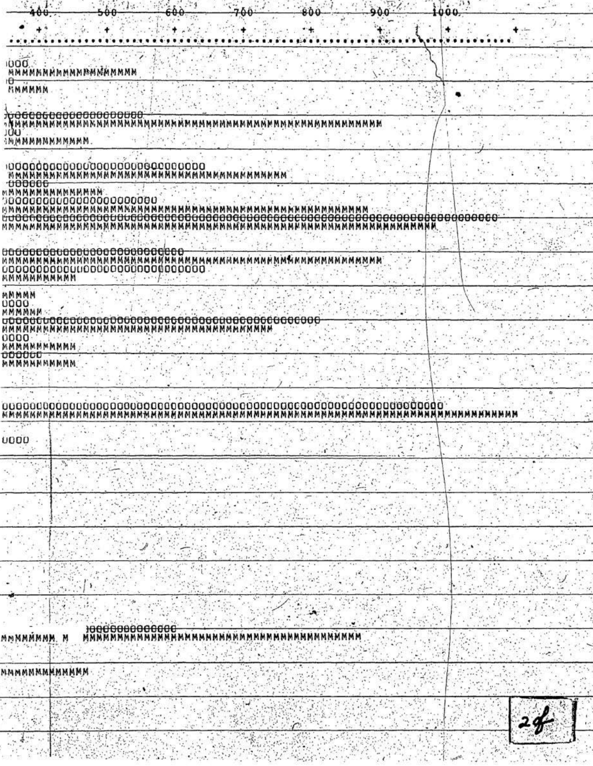


FIGURE D-1 TRIP LENGTH FREQUENCY DISTRIBUTION OF CD SURVEY AND GRAVITY MODEL FOR TEST YEAR 1977

CD SURVEY: G (10 PASSENGERS) GRAVITY MODEL: M (10 PASSENGERS)



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D-1 TRIP LENGTH FREQUENCY DISTRIBUTION OF CD SURVEY AND GRAVITY MODEL FOR TEST YEAR 1977

CD SURVEY: C (10 PASSENGERS)

GRAVITY MODEL: M (10 PASSENGERS)

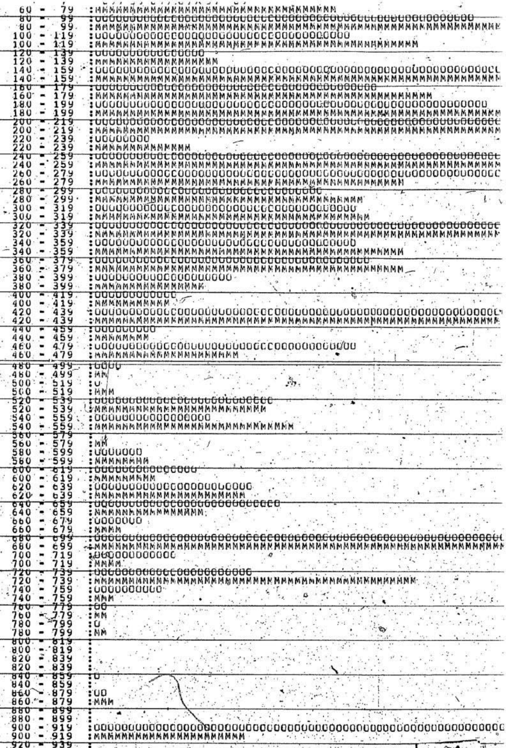

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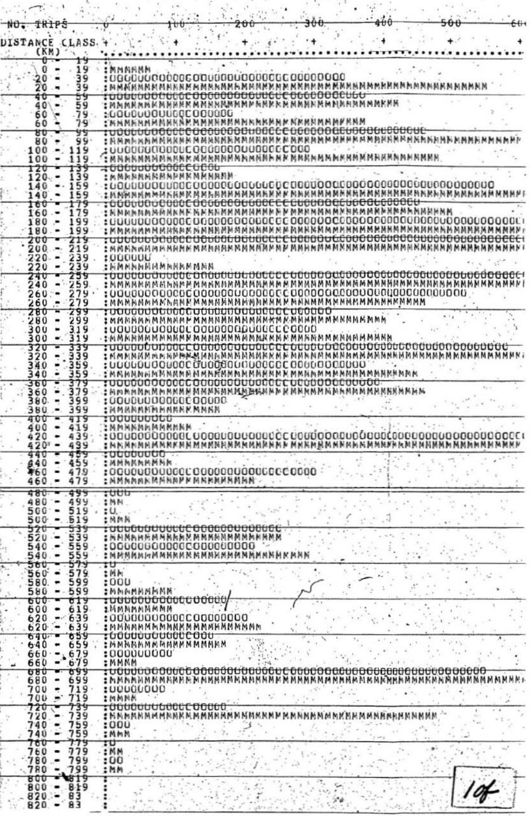
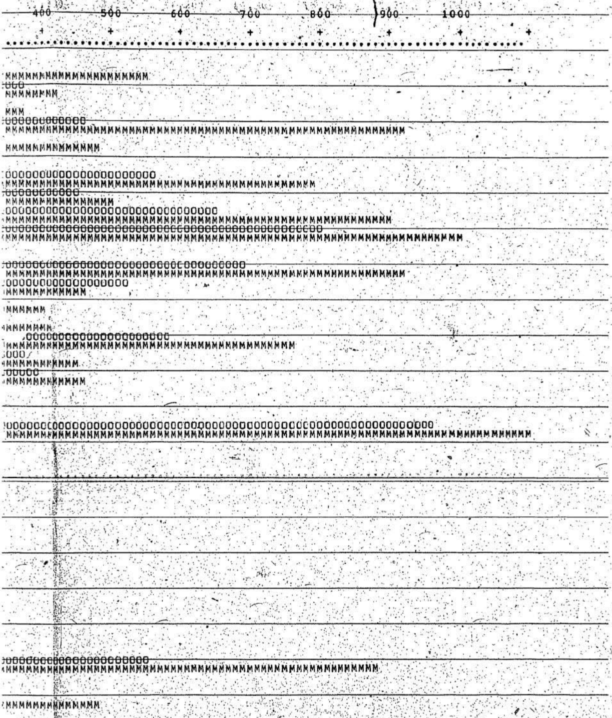
FIGURE D-2 TRIP LENGTH FREQUENCY DISTRIBUT

CU SURVEY: C (10 PASSENGERS)

GRAVITY MODEL: M (10 PASSENGERS)





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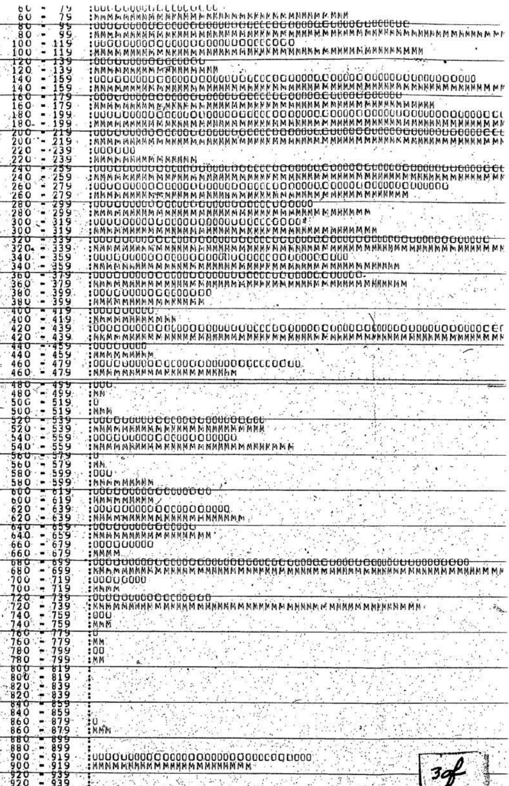
D-2 TRIP LENGTH FREQUENCY DISTRIBUTION OF OD SURVEY AND GRAVITY MODEL FOR TEST YEAR 1978

OD SURVEY: O (10 PASSENGERS)

GRAVITY MODEL: M (10 PASSENGERS)



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4 of 4

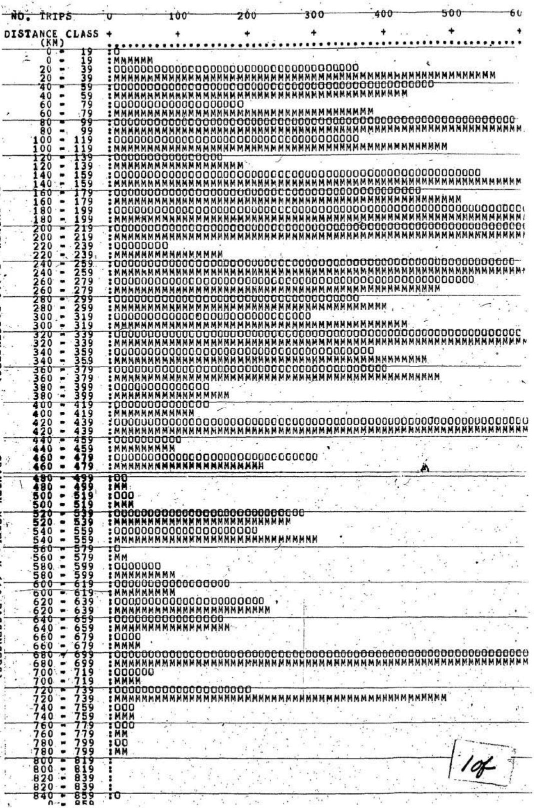

FIGURE D-3 TRIP LENGTH FREQUENCY DISTRIBUTION OF OD SURVEY AND GRAVITY MODEL FOR TEST YEAR 1979

OD SURVEY: O (10 PASSENGERS)

GRAVITY MODEL: M (10 PASSENGERS)

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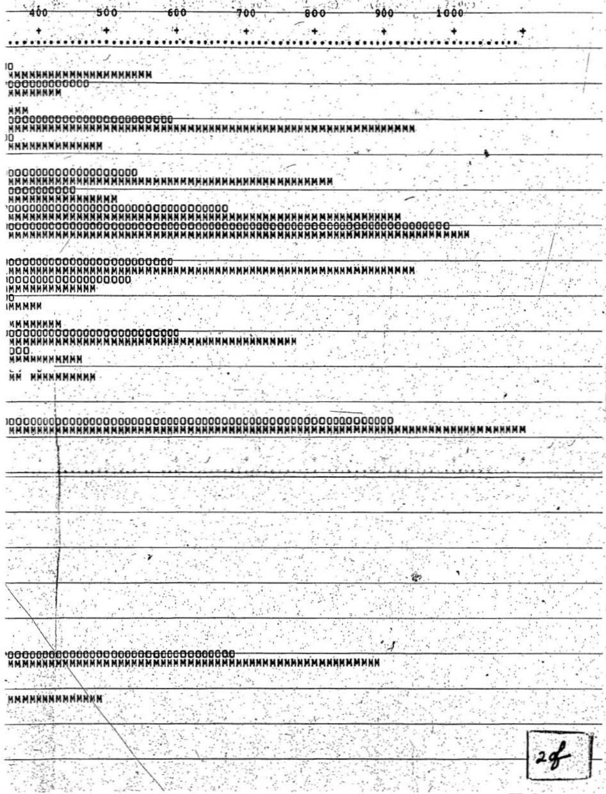

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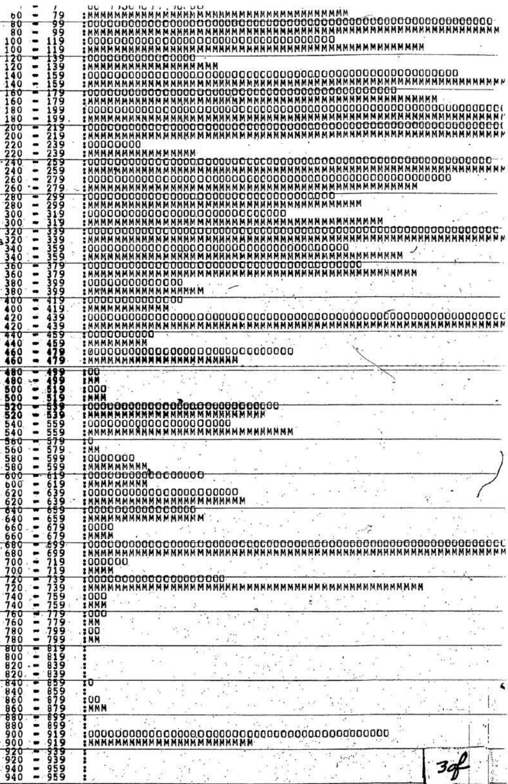
D-3 TRIP LENGTH FREQUENCY DISTRIBUTION OF OD SURVEY AND GRAVITY MODEL FOR TEST YEAR 1979

OD SURVEY: O (10 PASSENGERS) GRAVITY MODEL: M (10 PASSENGERS)



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4 of 4

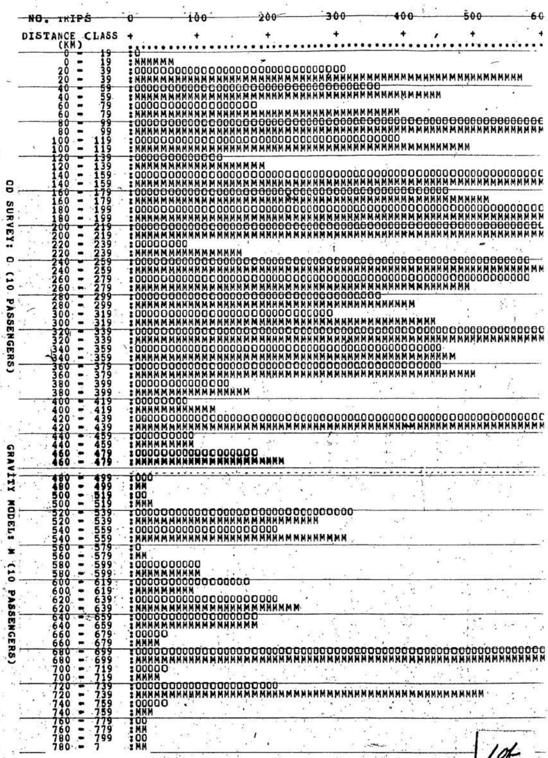


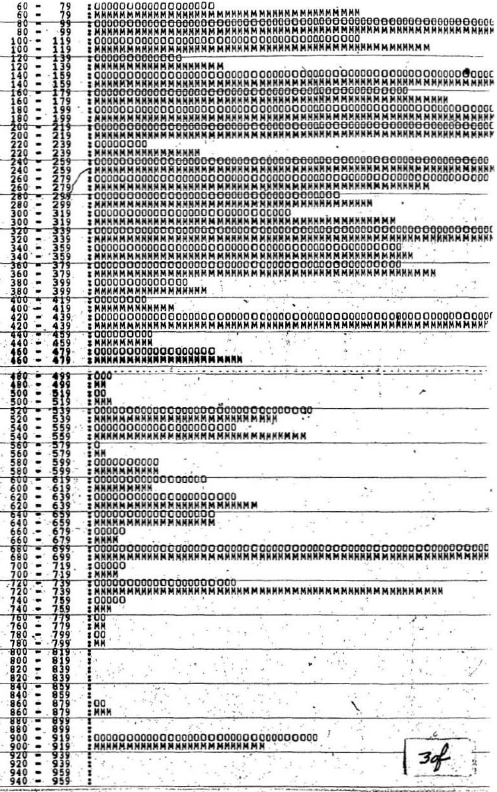
FIGURE D - 4 TRIP LENGTH FREQUENCY DISTRIBUTION OF OD SURVEY AND GRAVITY MODEL FOR TEST YEAR 1980

2 of

TRIP LENGTH FREQUENCY DISTRIBUTION OF OD SURVEY AND GRAVITY MODEL FOR BASE YEAR 1980

OD SURVEY: O (10 PASSENGERS)

GRAVITY MODEL: M (10 PASSENGERS)



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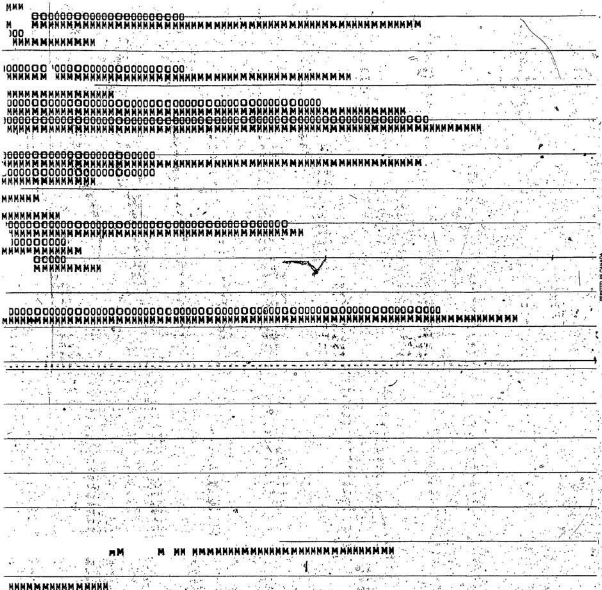

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4 of 4

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TABLE D – 23 DIFFERENCES BETWEEN OD TRIP DATA FOR 1976 AND 1977

TO / ZONE /	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1
										NUMBER	OF TRIPS					
1	0.	-1.	-43.	14.	173.	29.	14.	26.	-66.	-23.	-6.	15.	-11.	46.	-2.	3
2	3.	0.	-1.	-6.	-1.	11.	27.	-8.	12.	-5.	0.	0.	2.	-4.	0.	0
3	45.	1.	0.	-2.	-12.	8.	-14.	3.	3.	-52.	23.	-42.	5.	6.	8.	-
4	31.	3.	-11.	0.	3.	3.	-1.	10.	10.	7.	0.	-12.	0.	-3.	-2.	-11
5	164.	-4.	1.	8.	0.	6.	-4.	-15.	-17.	5.	-1.	17.	2.	-4.	4.	-12
6	16.	0.	4.	3.	-3.	0.	-1.	5.	0.	-3.	0.	-7.	2.	0.	0.	0
7	-23.	-5.	10.	1.	-3.	0.	0.	-6.	-7.	-2.	0.	1.	-2.	-2.	0.	-2
8	-25.	-4.	6.	4.	-13.	5.	18.	0.	15.	2.	0.	-20.	0.	3.	0.	-7
9	32.	6.	-10.	-18.	26.	7.	7.	23.	0.	10.	-1.	41.	2.	-5.	-5.	-4
10	1.	1.	1.	-2.	6.	-2.	11.	5.	26.	0.	0.	3.	10.	-1.	1.	-2
11	-5.	-2.	-1.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0
12	-27.	-11.	-29.	-5.	23.	-9.	-28.	1.	55.	24.	1.	0.	24.	15.	4.	2
13	-4.	0.	5.	8.	11.	0.	-2.	-5.	4.	-8.	0.	45.	0.	3.	0.	1
14	-5.	-5.	5.	-3.	-3.	0.	0.	7.	-10.	6.	1.	7.	-1.	0.	5.	6
15	-1.	0.	1.	0.	-1.	0.	-2.	3.	-6.	7.	0.	-1.	-3.	-2.	0.	6
16	-20.	-5.	6.	-2.	-3.	0.	-1.	2.	-8.	-19.	0.	36.	-2.	5.	0.	0
17	-40.	1.	11.	-2.	-8.	3.	-1.	14.	2.	5.	0.	8.	4.	0.	0.	-14
18	31.	-7.	14.	1.	20.	-7.	-8.	0.	49.	14.	0.	77.	25.	8.	4.	21
19	149.	6.	-4.	-15.	-11.	3.	3.	2.	-7.	22.	0.	2.	24.	2.	-1.	7
20	0.	0.	-1.	-2.	0.	0.	-1.	-2.	-1.	0.	1.	2.	0.	0.	0.	2
21	5.	0.	0.	0.	1.	0.	0.	0.	3.	0.	0.	4.	1.	0.	0.	-10
22	-3.	0.	-2.	4.	2.	0.	0.	2.	-2.	-2.	0.	2.	1.	-1.	0.	-3
23	-146.	-10.	-27.	-20.	-14.	-4.	-11.	-2.	-22.	-18.	3.	32.	-12.	7.	1.	-44
TOTAL	178.	-36.	21.	-34.	193.	53.	6.	65.	33.	-30.	21.	211.	71.	73.	17.	-62

SUM SQS. = 330351. MEAN DIF. = 1. VARIANCE = 623.52 STD. DEV. = 24.97

1of

1976 AND 1977

MBER OF TRIPS

	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
-6.	15.	-11.	46.	-2.	3.	-9.	48.	131.	-1.	8.	6.	-136.	301.
0.	0.	2.	-4.	0.	0.	-3.	17.	8.	0.	0.	-1.	2.	53.
23.	-42.	5.	6.	8.	-1.	-3.	-66.	62.	1.	-1.	-1.	-23.	-52.
0.	-12.	0.	-3.	-2.	-11.	-3.	-5.	2.	-2.	0.	3.	-29.	-7.
-1.	17.	2.	-4.	4.	-12.	-2.	30.	21.	0.	6.	0.	-20.	185.
0.	-7.	2.	0.	0.	0.	0.	-7.	0.	0.	0.	0.	-1.	8.
0.	1.	-2.	-2.	0.	-2.	6.	-5.	-2.	-2.	0.	0.	-9.	-52.
0.	-20.	0.	3.	0.	-7.	-1.	5.	-7.	0.	0.	3.	-2.	-18.
-1.	41.	2.	-5.	-5.	-4.	0.	48.	32.	-3.	0.	0.	-32.	156.
0.	3.	10.	-1.	1.	-2.	2.	-17.	18.	0.	0.	-5.	0.	56.
0.	1.	0.	0.	0.	0.	0.	5.	0.	0.	0.	0.	-3.	-5.
1.	0.	24.	15.	4.	2.	-4.	106.	-1.	-1.	-4.	-9.	-116.	11.
0.	45.	0.	3.	0.	1.	-1.	-25.	-7.	0.	3.	1.	-41.	-12.
1.	7.	-1.	0.	5.	6.	3.	7.	-3.	11.	1.	-1.	-8.	20.
0.	-1.	-3.	-2.	0.	6.	0.	3.	0.	0.	1.	0.	-1.	4.
0.	36.	-2.	5.	0.	0.	-7.	-22.	8.	3.	-4.	0.	-28.	-61.
0.	8.	4.	0.	0.	-14.	0.	-1.	-8.	-1.	0.	3.	-1.	-25.
0.	77.	25.	8.	4.	21.	4.	0.	12.	30.	1.	17.	12.	318.
0.	2.	24.	2.	-1.	7.	0.	-62.	0.	43.	20.	-24.	-10.	149.
1.	2.	0.	0.	0.	2.	2.	22.	-29.	0.	-1.	-3.	2.	-9.
0.	4.	1.	0.	0.	-10.	0.	3.	-5.	2.	0.	3.	7.	14.
0.	2.	1.	-1.	0.	-3.	-2.	-3.	9.	-2.	2.	0.	-5.	-3.
3.	32.	-12.	7.	1.	-44.	-13.	-263.	-7.	9.	36.	13.	0.	-512.
			73.	17.	-62.	-31.	-102.	234.	87.	68.	5.	-442.	519.

623 52 STD. DEV. = 24.97 M.S.E. = 682.54 ROOT M.S.E. = 26.13

2of2

TABLE D - 24 TRIPS BY DISTANCE CLASSES AND RELAT

DISTANCE CLASS (KM)	NUMBER OF TRIPS YR: 197	197	CHI-SQ.	DISTANCE CLASS
0 - 19	41.	29.	4.97	520 - 539
20 - 39	442.	381.	9.77	540 - 559
40 - 59	387.	366.	1.20	560 - 579
60 - 79	284.	220.	18.62	580 - 599
80 - 99	837.	551.	148.45	600 - 619
100 - 119	413.	372.	4.52	620 - 639
120 - 139	148.	165.	1.75	640 - 659
140 - 159	693.	643.	3.89	660 - 679
160 - 179	437.	416.	1.06	680 - 699
180 - 199	921.	580.	200.48	700 - 719
200 - 219	912.	1076.	25.00	720 - 739
220 - 239	105.	82.	6.45	740 - 759
240 - 259	817.	620.	62.60	760 - 779
260 - 279	523.	644.	22.73	780 - 799
280 - 299	319.	339.	1.18	800 - 819
300 - 319	395.	384.	0.32	820 - 839
320 - 339	790.	814.	0.71	840 - 859
340 - 359	435.	381.	7.65	860 - 879
360 - 379	406.	410.	0.04	880 - 899
380 - 399	135.	206.	24.47	900 - 919
400 - 419	136.	121.	1.86	920 - 939
420 - 439	980.	993.	0.17	940 - 959
440 - 459	82.	90.	0.71	960 - 979
460 - 479	288.	384.	28.17	980 - 999
480 - 499	17.	49.	20.90	1000 - 1019
500 - 519	22.	18.	0.89	

1of

TOTAL CHI-SQUARE VALUE

DEGREES OF FREEDOM = 45;

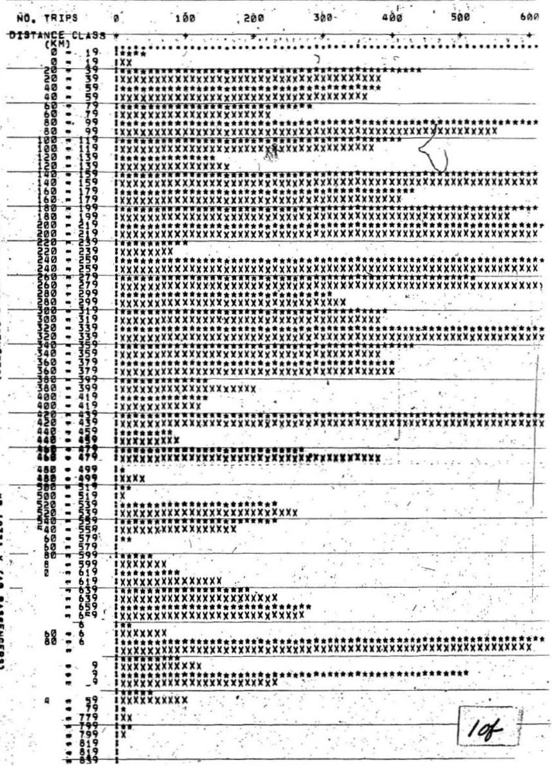
ATED CHI-SQUARES (OBSERVED 1976 AND 1977)

DISTANCE CLASS (KM)	NUMBER OF TRIPS YR: 1978	1979	CHI-SQ.
520 - 539	233.	270.	5.07
540 - 559	234.	178.	17.62
560 - 579	20.	7.	24.14
580 - 599	56.	77.	5.73
600 - 619	95.	152.	21.38
620 - 639	200.	237.	5.78
640 - 659	286.	272.	0.72
660 - 679	26.	73.	30.26
680 - 699	698.	610.	12.70
700 - 719	93.	121.	6.48
720 - 739	515.	235.	333.62
740 - 759	58.	107.	22.44
760 - 779	19.	20.	0.05
780 - 799	22.	12.	8.33
800 - 819	0.	0.	0.0
820 - 839	0.	1.	1.00
840 - 859	7.	15.	4.27
860 - 879	24.	21.	0.43
880 - 899	0.	0.	0.0
900 - 919	446.	728.	109.24
920 - 939	0.	0.	0.0
940 - 959	0.	0.	0.0
960 - 979	0.	0.	0.0
980 - 999	0.	0.	0.0
1000 - 1019	0.	0.	0.0

2 of 2

TOTAL CHI-SQUARE VALUE 1

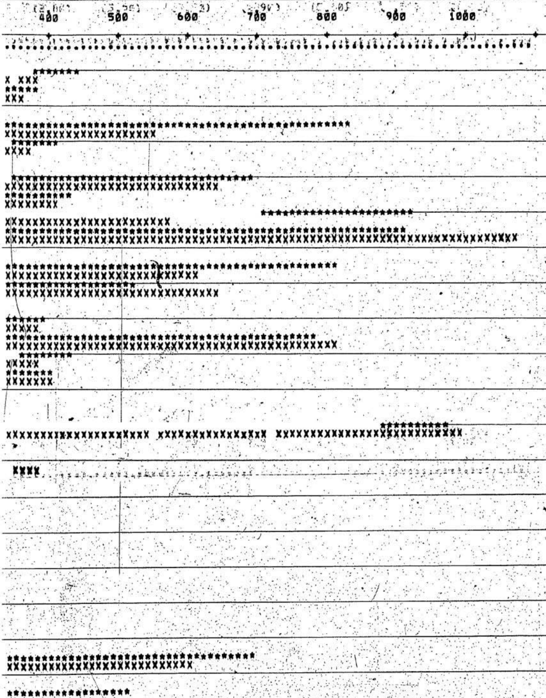
DEGREES OF FREEDOM = 45? CH. SQ. TABLE VALUE AT 5 PERCT. LEVEL = 61.68



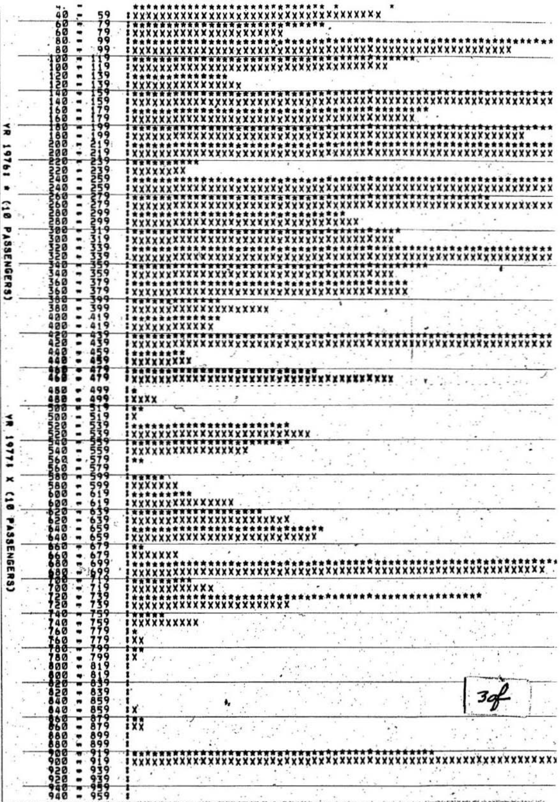
YR 1976: * (10 PASSENGERS)

YR 1977: X (10 PASSENGERS)

FIGURE D-5 TRIP LENGTH FREQUENCY DISTRIBUTION OF OD DATA FOR 1976 AND 1977



2 of



E D-5 TRIP LENGTH FREQUENCY DISTRIBUTION OF OD DATA FOR 1976 AND 1977

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4 of 4

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TABLE D - 25 . DIFFERENCES BETWEEN OD TRIP DATA FOR 1977 AND 1978

TO / ZONE /	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1
										NUMBER OF TRIPS						
1	0.	-2.	-8.	29.	-39.	6.	23.	-27.	144.	27.	7.	20.	8.	-18.	10.	12.
2	2.	0.	2.	4.	2.	-4.	6.	8.	-8.	0.	0.	6.	0.	-3.	0.	1.
3	-9.	0.	0.	1.	1.	5.	9.	-10.	32.	33.	3.	-4.	-7.	-25.	0.	-24
4	34.	-2.	2.	0.	3.	0.	-5.	-21.	17.	1.	0.	-4.	-9.	7.	5.	12.
5	-50.	-2.	4.	3.	0.	1.	10.	28.	17.	-18.	1.	-21.	2.	5.	0.	12.
6	-5.	-1.	0.	-1.	0.	0.	0.	0.	3.	1.	0.	8.	-1.	0.	0.	1.
7	27.	5.	-2.	1.	-3.	0.	0.	12.	5.	-5.	0.	4.	0.	6.	0.	4.
8	27.	4.	6.	0.	20.	0.	8.	0.	-5.	2.	0.	14.	2.	2.	2.	15.
9	82.	-2.	4.	21.	-25.	6.	0.	15.	0.	5.	2.	54.	4.	13.	5.	16.
10	-5.	-2.	-3.	3.	-10.	-2.	-12.	-2.	3.	0.	0.	-1.	-6.	3.	-1.	13.
11	6.	2.	1.	0.	2.	0.	0.	0.	0.	0.	0.	5.	0.	1.	0.	0.
12	37.	21.	5.	-4.	-30.	6.	18.	12.	3.	-11.	6.	0.	22.	7.	2.	1.
13	15.	0.	-12.	-2.	-9.	0.	3.	2.	12.	8.	0.	15.	0.	-1.	0.	10.
14	1.	0.	-7.	6.	-12.	-1.	0.	-4.	10.	10.	0.	-24.	1.	0.	-1.	-3.
15	14.	-1.	0.	2.	2.	-1.	5.	0.	3.	4.	0.	4.	4.	-1.	0.	0.
16	4.	5.	-15.	0.	8.	-1.	8.	9.	19.	23.	0.	10.	7.	-11.	0.	0.
17	10.	0.	-10.	-1.	6.	0.	1.	1.	8.	-1.	0.	-2.	0.	0.	0.	17.
18	12.	10.	-8.	-8.	18.	8.	23.	-11.	-19.	0.	0.	-37.	7.	4.	0.	19.
19	19.	2.	-5.	8.	5.	0.	3.	3.	18.	1.	0.	2.	10.	-8.	10.	16.
20	9.	0.	-1.	4.	0.	0.	1.	2.	-8.	0.	0.	-1.	0.	0.	-1.	-1.
21	-9.	0.	-2.	-3.	1.	0.	0.	-2.	0.	-2.	0.	0.	-1.	0.	0.	8.
22	3.	0.	1.	-3.	-5.	0.	0.	0.	-2.	2.	0.	2.	-3.	-1.	0.	5.
23	174.	11.	31.	35.	14.	3.	13.	-24.	59.	13.	0.	7.	-18.	-9.	0.	22.
TOTAL	398.	48.	-17.	95.	-51.	26.	114.	-9.	311.	93.	19.	57.	22.	-29.	31.	156.

SUM SQS. = 208353. MEAN DIF. = 4. VARIANCE = 380.65 STD. DEV. = 19.51

1of

OR 1977 AND 1978

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
NUMBER OF TRIPS														
27.	7.	20.	8.	-18.	10.	12.	-17.	35.	42.	-2.	-10.	2.	226.	468.
0.	0.	6.	0.	-3.	0.	1.	3.	-4.	4.	-2.	0.	1.	-5.	13.
33.	3.	-4.	-7.	-25.	0.	-24.	2.	11.	4.	-2.	1.	1.	39.	61.
1.	0.	-4.	-9.	7.	5.	12.	2.	-18.	3.	0.	0.	-5.	35.	57.
-18.	1.	-21.	2.	5.	0.	12.	2.	21.	16.	-1.	0.	-2.	29.	57.
1.	0.	8.	-1.	0.	0.	1.	0.	10.	0.	0.	0.	0.	-3.	12.
-5.	0.	4.	0.	6.	0.	4.	1.	7.	1.	2.	0.	0.	0.	65.
2.	0.	14.	2.	2.	2.	15.	-2.	-33.	4.	0.	0.	-1.	3.	68.
5.	2.	54.	4.	13.	5.	16.	1.	5.	-23.	4.	-3.	-7.	56.	233.
0.	0.	-1.	-6.	3.	-1.	13.	-7.	9.	3.	0.	-2.	5.	9.	-5.
0.	0.	5.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	5.	22.
-11.	6.	0.	22.	7.	2.	1.	-8.	-29.	29.	0.	-4.	-7.	43.	119.
8.	0.	15.	0.	-1.	0.	10.	5.	16.	3.	0.	-2.	-2.	36.	97.
10.	0.	-24.	1.	0.	-1.	-3.	-3.	4.	-10.	0.	1.	1.	11.	-20.
4.	0.	4.	4.	-1.	0.	0.	0.	0.	-1.	0.	0.	0.	-4.	30.
23.	0.	10.	7.	-11.	0.	0.	5.	-2.	-1.	-1.	2.	0.	27.	96.
-1.	0.	-2.	0.	0.	0.	17.	0.	2.	5.	1.	0.	0.	-15.	22.
0.	0.	-37.	7.	4.	0.	19.	-14.	0.	-17.	-2.	9.	-23.	153.	124.
1.	0.	2.	10.	-8.	10.	16.	1.	-7.	0.	-15.	8.	-6.	-25.	40.
0.	0.	-1.	0.	0.	-1.	-1.	0.	-4.	-8.	0.	6.	3.	-6.	-5.
-2.	0.	0.	-1.	0.	0.	8.	-2.	19.	30.	6.	0.	-2.	7.	48.
2.	0.	2.	-3.	-1.	0.	5.	1.	2.	-13.	-2.	-4.	0.	3.	-14.
13.	0.	7.	-18.	-9.	0.	22.	9.	54.	-54.	-6.	1.	0.	0.	335.
93.	19.	57.	22.	-29.	31.	156.	-21.	98.	17.	-20.	3.	-42.	624.	1923.

= 38[illegible]65 STD. DEV. = 19.51 M.S.E. = 430.48 ROOT M.S.E. = 20.75

2 of 2

TABLE D - 26 TRIPS BY DISTANCE CLASSES AND RELATED CHI-SQUARES ~~(OBSERVED 1977~~

DISTANCE CLASS (KM)	NUMBER OF TRIPS YR: 1977	1978	CHI-SQ.
0 - 19	29.	9.	44.44
20 - 39	381.	349.	2.93
40 - 59	366.	372.	0.10
60 - 79	220.	182.	7.93
80 - 99	551.	466.	15.50
100 - 119	372.	290.	23.19
120 - 139	165.	161.	0.10
140 - 159	643.	570.	9.35
160 - 179	416.	455.	3.34
180 - 199	580.	654.	8.37
200 - 219	1076.	804.	92.02
220 - 239	82.	68.	2.88
240 - 259	620.	693.	7.69
260 - 279	644.	523.	27.99
280 - 299	339.	327.	0.44
300 - 319	384.	303.	21.65
320 - 339	814.	590.	85.04
340 - 359	381.	376.	0.07
360 - 379	410.	391.	0.92
380 - 399	206.	177.	4.75
400 - 419	121.	94.	7.76
420 - 439	993.	964.	0.87
440 - 459	90.	88.	0.05
460 - 479	384.	305.	20.46
480 - 499	49.	30.	12.03
500 - 519	18.	14.	1.14

DISTANCE CLASS (KM)	YI
520 - 539	
540 - 559	
560 - 579	
580 - 599	
600 - 619	
620 - 639	
640 - 659	
660 - 679	
680 - 699	
700 - 719	
720 - 739	
740 - 759	
760 - 779	
780 - 799	
800 - 819	
820 - 839	
840 - 859	
860 - 879	
880 - 899	
900 - 919	
920 - 939	
940 - 959	
960 - 979	
980 - 999	
1000 -1019	

1of

TOTAL CHI-SQUARE VALUE

DEGREES OF FREEDOM = 45

ATED CHI-SQUARES (OBSERVED 1977 and 1978)

DISTANCE CLASS (KM)	NUMBER OF TRIPS YR: 1977	1978	CHI-SQ.
520 - 539	270.	251.	1.44
540 - 559	178.	214.	6.06
560 - 579	7.	17.	5.88
580 - 599	77.	30.	46.69
600 - 619	152.	171.	2.11
620 - 639	237.	208.	4.04
640 - 659	272.	155.	88.32
660 - 679	73.	90.	3.21
680 - 699	610.	557.	5.04
700 - 719	121.	89.	11.51
720 - 739	235.	174.	21.39
740 - 759	107.	37.	132.43
760 - 779	20.	13.	3.77
780 - 799	12.	29.	9.97
800 - 819	0.	0.	0.0
820 - 839	1.	0.	0.0
840 - 859	15.	9.	4.00
860 - 879	21.	16.	1.56
880 - 899	0.	0.	0.0
900 - 919	728.	328.	407.80
920 - 939	0.	0.	0.0
940 - 959	0.	0.	0.0
960 - 979	0.	0.	0.0
980 - 999	0.	0.	0.0
1000 - 1019	0.	0.	0.0

TOTAL CHI-SQUARE VALUE 1236.26

DEGREES OF FREEDOM = 45 CH. SQ. TABLE VALUE AT 5 PERCT. LEVEL = 61.63

2 of 2

245

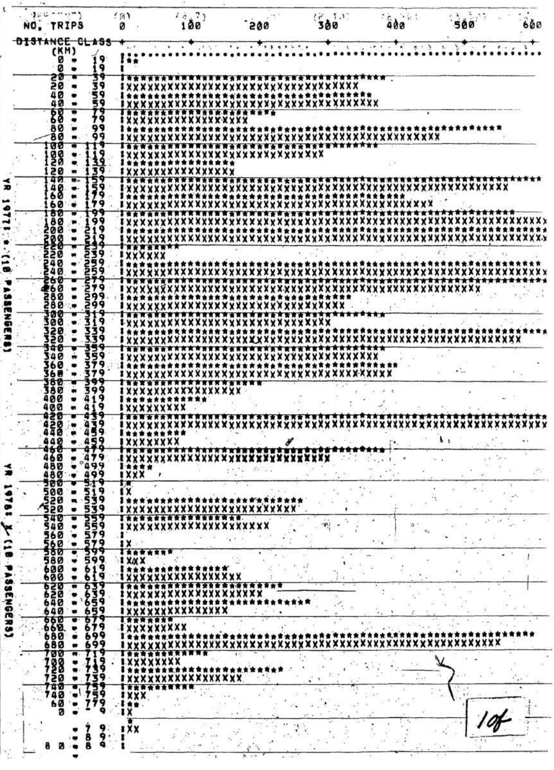
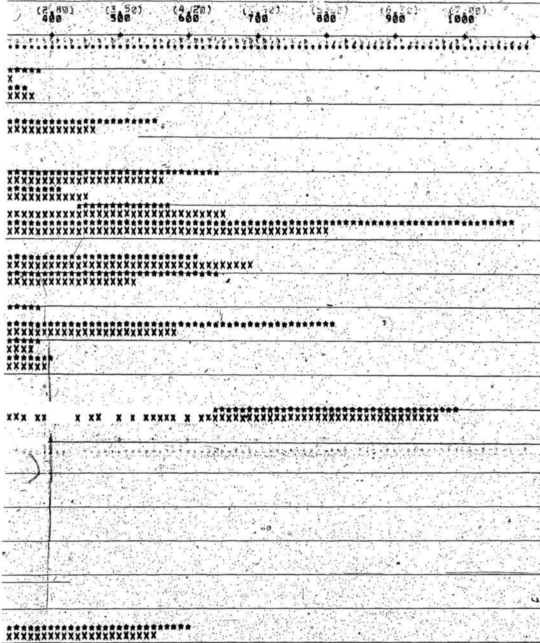


FIGURE D - 6 TRIP LENGTH FREQUENCY DISTRIBUTION OF OD DATA FOR 1977 AND 1978



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TRIP LENGTH FREQUENCY DISTRIBUTION OF OD DATA FOR 1977 AND 1978

YR 1977: * (10 PASSENGERS)

YR 1978: X (10 PASSENGERS)

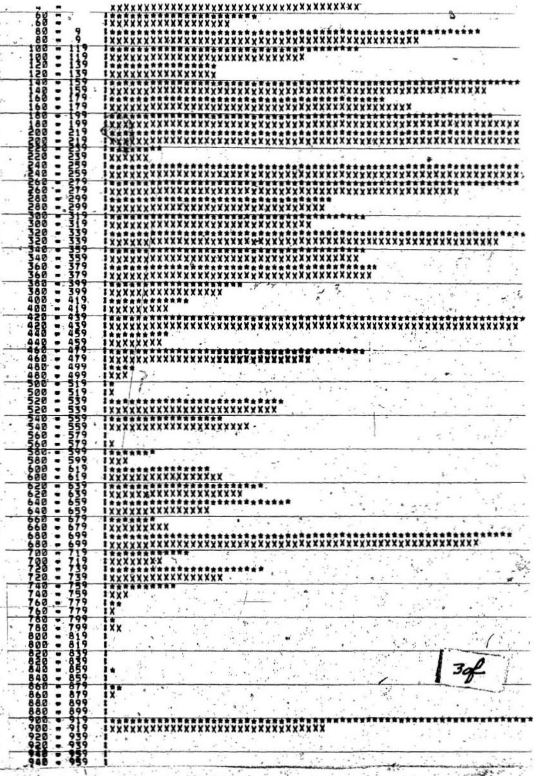

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TABLE D - 27 DIFFERENCES BETWEEN OD TRIP DATA FOR 1978 AND 1979

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
										NUMBER OF TRIPS						
1	0.	1.	-18.	4.	1.	-7.	-5.	-3.	-46.	-19.	0.	25.	-41.	2.	-7.	-10.
2	-1.	0.	0.	-1.	-3.	4.	-1.	0.	1.	5.	0.	-7.	-4.	6.	0.	2.
3	2.	0.	0.	4.	-11.	-2.	7.	-1.	-19.	-18.	0.	8.	0.	6.	-1.	0
4	-10.	-1.	3.	0.	-5.	-3.	4.	17.	-15.	-2.	0.	10.	14.	-3.	0.	-1.
5	3.	2.	-3.	5.	0.	0.	2.	-7.	-9.	-8.	0.	17.	12.	-3.	-1.	5.
6	-5.	0.	-3.	-1.	6.	0.	1.	0.	-4.	1.	0.	3.	0.	0.	0.	-1.
7	-2.	0.	-7.	4.	-5.	-1.	0.	-7.	-20.	8.	0.	1.	-1.	-3.	-1.	0.
8	-13.	0.	-14.	9.	-10.	-1.	3.	0.	10.	-6.	0.	1.	-3.	-7.	-1.	-10.
9	26.	-3.	2.	8.	19.	-13.	-8.	-30.	0.	5.	0.	-49.	-7.	-9.	1.	-1.
10	-8.	3.	-11.	3.	-2.	1.	13.	-4.	1.	0.	0.	-7.	8.	-8.	1.	-10.
11	0.	0.	-1.	0.	0.	0.	0.	0.	0.	0.	0.	-1.	0.	0.	0.	0.
12	-1.	-10.	-1.	16.	25.	4.	10.	-28.	1.	4.	0.	0.	-23.	0.	4.	-13.
13	-14.	-1.	3.	1.	5.	0.	-2.	-3.	-3.	-2.	0.	-6.	0.	1.	-1.	-10.
14	1.	-2.	-5.	-3.	12.	1.	0.	5.	-15.	-22.	0.	24.	0.	0.	0.	2.
15	-13.	1.	1.	-1.	2.	1.	0.	-2.	2.	-4.	0.	0.	0.	2.	0.	-1.
16	3.	-1.	8.	0.	-7.	0.	-4.	0.	4.	-2.	0.	-23.	4.	10.	0.	0.
17	19.	0.	4.	-10.	-1.	0.	0.	0.	-8.	3.	0.	-5.	0.	0.	-3.	-6.
18	-54.	-12.	-8.	15.	18.	-4.	-8.	11.	13.	6.	0.	44.	6.	-5.	-5.	-5.
19	-25.	-3.	15.	-22.	-7.	0.	-1.	-6.	-47.	-8.	0.	12.	-7.	4.	2.	-13.
20	-10.	-1.	2.	0.	0.	0.	0.	0.	7.	0.	0.	2.	0.	-1.	1.	-4.
21	2.	-1.	-2.	2.	-1.	0.	0.	2.	-4.	-2.	0.	-3.	0.	0.	0.	1.
22	-1.	-1.	-1.	3.	5.	0.	0.	-1.	0.	0.	0.	1.	3.	0.	0.	-3.
23	-57.	-7.	3.	0.	23.	0.	-13.	17.	-4.	-2.	0.	25.	26.	8.	-4.	1.
TOTAL	-158.	-36.	-33.	36.	64.	+20.	-2.	-40.	-155.	-63.	0.	72.	-13.	0.	-15.	-77.

SUM SQS. = 69446. MEAN DIF. = -2. VARIANCE = 128.90 STD. DEV. = 11.35

1of

1978 AND 1979

0	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
UMBER OF TRIPS														
.	0.	25.	-41.	2.	-7.	-10.	10.	-68.	-2.	-8.	5.	-6.	-62.	-254.
.	0.	-7.	-4.	6.	0.	2.	2.	-6.	-2.	2.	-1.	0.	1.	-3.
.	0.	8.	0.	6.	-1.	0.	0.	-14.	3.	4.	0.	0.	-11.	-43.
.	0.	10.	14.	-3.	0.	-1.	-7.	9.	3.	1.	-2.	6.	0.	18.
.	0.	17.	12.	-3.	-1.	5.	-6.	16.	-3.	1.	-1.	1.	-6.	17.
.	0.	3.	0.	0.	0.	-1.	-1.	-3.	-1.	0.	0.	0.	3.	-5.
.	0.	1.	-1.	-3.	-1.	0.	3.	2.	3.	0.	0.	0.	0.	-26.
.	0.	1.	-3.	-7.	-1.	-10.	2.	17.	-4.	0.	-1.	0.	-6.	-34.
.	0.	-49.	-7.	-9.	1.	-1.	-13.	-10.	6.	0.	0.	2.	-4.	-78.
.	0.	-7.	8.	-8.	1.	-10.	6.	11.	-15.	0.	0.	0.	-2.	-20.
.	0.	-1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	-2.	-4.
.	0.	0.	-23.	0.	4.	-13.	1.	23.	-19.	0.	7.	10.	-5.	5.
.	0.	-6.	0.	1.	-1.	-10.	-11.	4.	6.	0.	1.	1.	2.	-29.
.	0.	24.	0.	0.	0.	2.	3.	-8.	2.	0.	-1.	-1.	-16.	-23.
.	0.	0.	0.	2.	0.	-1.	0.	2.	-1.	0.	0.	0.	5.	-6.
.	0.	-23.	4.	10.	0.	0.	-6.	-77.	-15.	0.	-4.	1.	0.	-109.
.	0.	-5.	0.	0.	-3.	-6.	0.	-7.	0.	-1.	0.	-1.	12.	-4.
.	0.	44.	6.	-5.	-5.	-5.	9.	0.	10.	7.	-30.	-3.	-85.	-80.
.	0.	12.	-7.	4.	2.	-13.	-3.	-5.	0.	9.	-18.	14.	1.	-108.
).	0.	2.	0.	-1.	1.	-4.	0.	4.	32.	0.	-6.	0.	-6.	20.
.	0.	-3.	0.	0.	0.	1.	2.	0.	-11.	-2.	0.	3.	-24.	-38.
).	0.	1.	3.	0.	0.	-3.	1.	-14.	6.	1.	5.	0.	5.	9.
.	0.	25.	26.	8.	-4.	1.	1.	-27.	23.	2.	-10.	-26.	0.	-21.
.	0.	72.	-13.	0.	-15.	-77.	-7.	-151.	21.	16.	-56.	1.	-200.	-816.

128.90 STD. DEV. = 11.35 M.S.E. = 143.48 ROOT M.S.E. = 11.98

2 of 2

217

TABLE D - 28 TRIPS BY DISTANCE CLASSES AND RELATED CHI-SQUARES (OBSERVED 1978

DISTANCE CLASS (KM)	NUMBER OF TRIPS YR: 1978	1979	CHI-SQ.	DISTANCE CLASS (KM)	N YR: 19
0 - 19	9.	13.	1.23	520 - 539	251.
20 - 39	349.	361.	0.40	540 - 559	214.
40 - 59	372.	473.	21.57	560 - 579	17.
60 - 79	182.	197.	1.14	580 - 599	36.
80 - 99	466.	591.	26.44	600 - 619	171.
100 - 119	290.	362.	14.32	620 - 639	208.
120 - 139	161.	167.	0.22	640 - 659	155.
140 - 159	570.	542.	1.45	660 - 679	90.
160 - 179	465.	459.	0.03	680 - 699	557.
180 - 199	654.	671.	0.43	700 - 719	89.
200 - 219	804.	1000.	38.42	720 - 739	174.
220 - 239	68.	80.	1.80	740 - 759	37.
240 - 259	693.	594.	16.50	760 - 779	13.
260 - 279	523.	539.	0.47	780 - 799	29.
280 - 299	327.	365.	3.96	800 - 819	0.
300 - 319	303.	294.	0.28	820 - 839	0.
320 - 339	590.	604.	0.32	840 - 859	9.
340 - 359	376.	386.	0.26	860 - 879	16.
360 - 379	391.	408.	0.71	880 - 899	0.
380 - 399	177.	141.	9.19	900 - 919	328.
400 - 419	94.	140.	15.11	920 - 939	0.
420 - 439	964.	920.	2.10	940 - 959	0.
440 - 459	88.	101.	1.67	960 - 979	0.
460 - 479	305.	306.	0.00	980 - 999	0.
480 - 499	30.	27.	0.33	1000 - 1019	0.
500 - 519	14.	32.	10.13	TOTAL CHI-SQUARE VALUE	

1of

TED CHI-SQUARES (OBSERVED 1978 AND 1979)

DISTANCE CLASS (KM)	NUMBER YR: 1978	OF 1979	TRIPS CHI-SQ.
520 - 539	251.	286.	4.28
540 - 559	214.	212.	0.02
560 - 579	17.	13.	1.23
580 - 599	36.	74.	19.51
600 - 619	171.	179.	0.36
620 - 639	208.	228.	1.75
640 - 659	155.	163.	0.39
660 - 679	90.	49.	34.31
680 - 699	557.	681.	22.58
700 - 719	89.	64.	9.77
720 - 739	174.	201.	3.63
740 - 759	37.	39.	0.10
760 - 779	13.	31.	10.48
780 - 799	29.	23.	1.57
800 - 819	0.	0.	0.0
820 - 839	0.	1.	1.00
840 - 859	9.	15.	2.40
860 - 879	16.	23.	2.13
880 - 899	0.	0.	0.0
900 - 919	328.	447.	31.68
920 - 939	0.	0.	0.0
940 - 959	0.	0.	0.0
960 - 979	0.	0.	0.0
980 - 999	0.	0.	0.0
1000 -1019	0.	0.	0.0

---TOTAL CHI-SQUARE VALUE------- 315.64

278

2 of 2

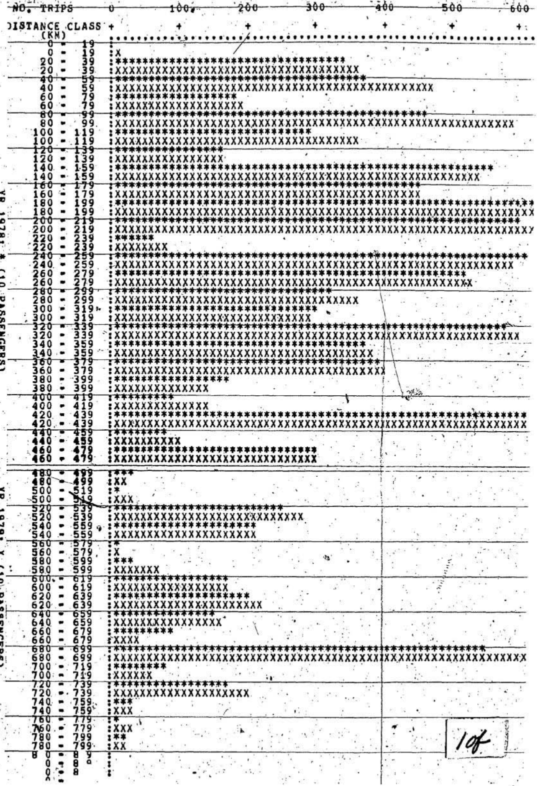
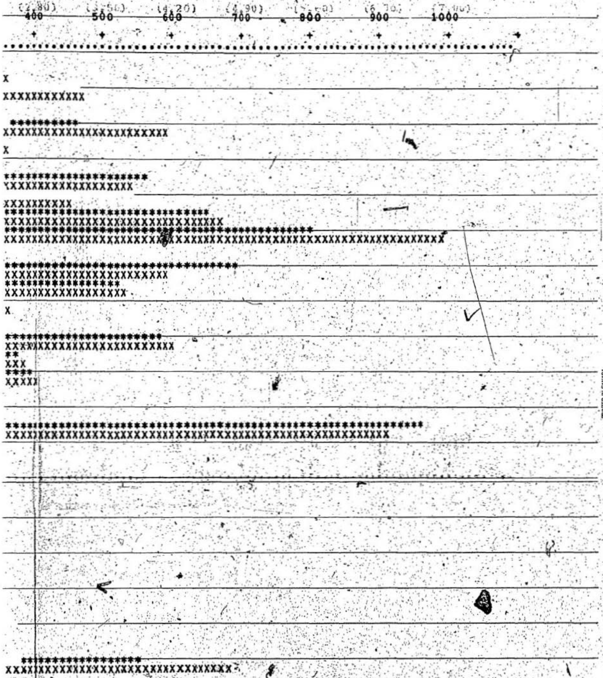


FIGURE D-7 TRIP LENGTH FREQUENCY DISTRIBUTION OF OD DATA FOR 1978 AND 1979

YR 1978: * (10 PASSENGERS)

YR 1979: X (10 PASSENGERS)



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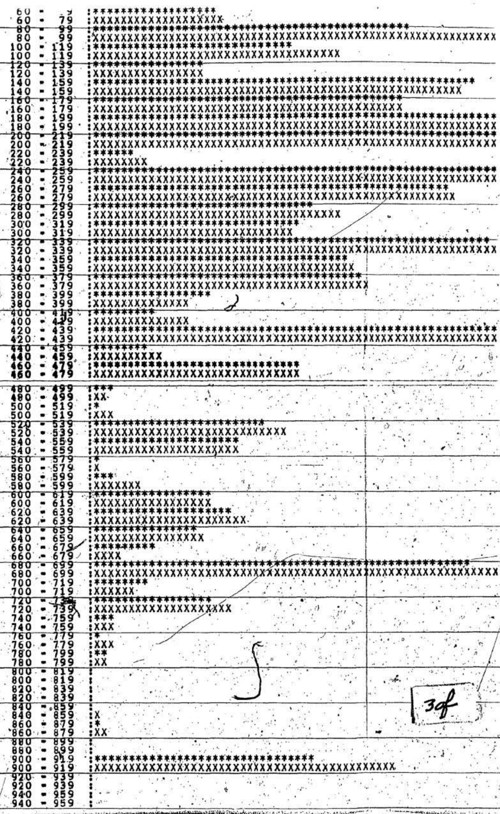
TRIP LENGTH FREQUENCY DISTRIBUTION OF OD DATA FOR 1978 AND 1979

YR 1978: * (10 PASSENGERS)

YR 1979: X (10 PASSENGERS)



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4 of 4

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TABLE D-29 DIFFERENCES BETWEEN OD TRIP DATA FOR 1979 AND 1980

NUMBER OF TRIPS

TO / ZONE/	FROM ZONE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1
1	0.	-3.	13.	-17.	-67.	3.	-12.	10.	-50.	-1.	0.	-23.	11.	-4.	-16.	-1
2	-2.	0.	0.	4.	0.	-1.	2.	-4.	0.	-7.	0.	5.	0.	-4.	0.	-1
3	-10.	0.	0.	-6.	10.	1.	-3.	2.	-15.	3.	0.	-21.	-11.	11.	-2.	5
4	-18.	2.	-9.	0.	-1.	2.	2.	1.	-2.	-7.	0.	-8.	-6.	-5.	-4.	-10
5	-114.	-4.	0.	-4.	0.	3.	-10.	10.	2.	16.	0.	0.	-5.	0.	0.	-7
6	-1.	0.	0.	2.	0.	0.	-1.	0.	-6.	3.	-15.	-5.	1.	-1.	0.	-1
7	-8.	-4.	9.	-3.	-6.	0.	0.	3.	5.	-10.	-22.	4.	-5.	1.	1.	-3
8	-12.	-1.	4.	-1.	9.	1.	-3.	0.	-14.	6.	-17.	4.	6.	4.	-2.	2
9	-111.	-6.	28.	-13.	-9.	3.	5.	21.	0.	-5.	-21.	33.	7.	-10.	-8.	-14
10	-15.	-2.	8.	-5.	3.	1.	-11.	8.	-3.	0.	0.	19.	-12.	14.	-3.	17
11	-1.	0.	1.	0.	0.	-15.	-22.	-17.	-23.	0.	0.	1.	0.	0.	0.	-22
12	-45.	5.	-10.	-12.	-5.	-8.	-13.	28.	-4.	3.	0.	0.	6.	3.	-12.	15
13	-20.	-4.	6.	0.	3.	-3.	-3.	2.	-7.	-6.	0.	-17.	0.	1.	1.	0
14	-3.	4.	2.	-4.	-3.	0.	-3.	-2.	14.	3.	0.	1.	-2.	0.	0.	-14
15	-13.	0.	-2.	-2.	-2.	-1.	0.	0.	-9.	4.	0.	-2.	-1.	1.	0.	-6
16	1.	-3.	3.	6.	-5.	0.	-5.	-10.	-3.	-12.	0.	12.	-13.	-2.	0.	0
17	-1.	-2.	0.	3.	1.	0.	-2.	0.	1.	1.	0.	1.	1.	0.	3.	5
18	27.	5.	-15.	-15.	-2.	4.	-15.	-13.	-16.	7.	0.	34.	11.	6.	-2.	27
19	16.	-1.	-4.	8	0.	0	-2.	11.	49.	-1.	0.	3.	2.	4.	0.	-3
20	0.	1.	1.	-1.	0.	0.	-1.	0.	1.	0.	0.	-4.	0.	0.	0.	2
21	4.	-1.	2.	0.	0.	0.	0.	0.	3.	3.	0.	-1.	-8.	0.	0.	-2
22	-6.	1.	1.	-2.	-4.	0.	-2.	0.	-1.	-1.	0.	3.	0.	2.	0.	1
23	87.	6.	-9.	1.	-9.	-6.	9.	10.	-24.	-1.	0.	142.	15.	-4.	2.	-8
TOTAL	-245.	-7.	29.	-61.	-87.	-16.	-90.	60.	-102.	-2.	-75.	181.	-3.	17.	-42.	-16

SUM SQS. = 102789. MEAN DIF. = -1. VARIANCE = 194.04 STD. DEV. = 13.93

10f

OR 1979 AND 1980

10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
NUMBER OF TRIPS														
-1.	0.	-23.	11.	-4.	-16.	-1.	1.	1.	-29.	10.	0.	1.	21.	-152.
-7.	0.	5.	0.	-4.	0.	1.	-1.	16.	-4.	0.	-1.	0.	5.	9.
3.	0.	-21.	-11.	11.	-2.	5.	0.	10.	-11.	-1.	-2.	-2.	9.	-33.
-7.	0.	-8.	-6.	-5.	-4.	-10.	2.	0.	-3.	0.	1.	0.	-15.	-78.
16.	0.	0.	-5.	0.	0.	-7.	1.	-14.	1.	0.	0.	0.	15.	-110.
3.	-15.	-5.	1.	-1.	0.	-1.	1.	1.	1.	0.	0.	0.	-6.	-27.
10.	-22.	4.	-5.	1.	1.	-3.	0.	6.	-1.	0.	0.	0.	3.	-30.
6.	-17.	4.	6.	4.	-2.	2.	-1.	-5.	-1.	0.	1.	1.	6.	-13.
5.	-21.	33.	7.	-10.	-8.	-14.	4.	-9.	19.	-2.	0.	-2.	-2.	-92.
0.	0.	19.	-12.	14.	-3.	17.	-2.	2.	-2.	0.	-3.	-1.	-11.	2.
0.	0.	1.	0.	0.	0.	-22.	0.	0.	0.	0.	0.	0.	2.	-96.
3.	0.	0.	6.	3.	-12.	15.	1.	3.	4.	-3.	-6.	1.	-21.	-70.
6.	0.	-17.	0.	1.	1.	0.	11.	-4.	-2.	0.	0.	0.	-1.	-43.
3.	0.	1.	-2.	0.	0.	-14.	0.	-8.	9.	-1.	0.	1.	1.	-5.
4.	0.	-2.	-1.	1.	0.	-6.	-1.	-8.	-1.	0.	-1.	-1.	-2.	-47.
12.	0.	12.	-13.	-2.	0.	0.	7.	86.	9.	0.	2.	0.	1.	74.
1.	0.	1.	1.	0.	3.	5.	0.	11.	-1.	-2.	0.	1.	1.	21.
7.	0.	34.	11.	6.	-2.	27.	3.	0.	0.	2.	21.	-1.	-7.	61.
1.	0.	3.	2.	4.	0.	-3.	5.	29.	0.	1.	2.	5.	3.	127.
0.	0.	-4.	0.	0.	0.	2.	-2.	15.	7.	0.	1.	-1.	-7.	12.
3.	0.	-1.	-8.	0.	0.	-2.	0.	-19.	-3.	-5.	0.	-1.	4.	-24.
1.	0.	3.	0.	2.	0.	1.	0.	3.	-6.	0.	-1.	0.	-8.	-18.
1.	0.	142.	15.	-4.	2.	-8.	-2.	8.	12.	-0.	9.	19.	0.	257.
2.	-75.	181.	-3.	17.	-42.	-16.	27.	124.	-2.	-1.	-25.	20.	-9.	-275.

194.04 STD. DEV. = 13.93 M.S.E. = 212.37 ROOT M.S.E. = 14.57

2 of 2

250

TABLE D-30 TRIPS BY DISTANCE CLASSES AND RELATED CHI-SQUARES (OBSERVED 1979 A

DISTANCE CLASS (KM)	NUMBER OF TRIPS YR: 1979	1980	CHI-SQ.	DISTANCE CLASS (KM)	NU YR: 197
0 - 19	13.				
20 - 39	361.	315.	6.72	540 - 559	212.
40 - 59	473.	362.	34.04	560 - 579	13.
60 - 79	197.	185.	0.78	580 - 599	74.
80 - 99	591.	626.	1.96	600 - 619	179.
100 - 119	362.	394.	2.60	620 - 639	228.
120 - 139	167.	134.	8.13	640 - 659	163.
140 - 159	542.	625.	11.02	660 - 679	49.
160 - 179	459.	462.	0.02		
180 - 199	671.	829.	30.11	700 - 719	64.
200 - 219	1000.	972.	0.81	720 - 739	201.
220 - 239	80.	83.	0.11	740 - 759	39.
240 - 259	594.	583.	0.21		
260 - 279	539.	586.	3.77	780 - 799	23.
280 - 299	365.	363.	0.01	800 - 819	
300 - 319	294.	297.	0.03	820 - 839	1.
320 - 339	604.	776.	38.12	840 - 859	15.
340 - 359	386.	456.	10.75	860 - 879	23.
360 - 379	408.	450.	3.92	880 - 899	0.
380 - 399	141.	147.	0.24	900 - 919	447.
400 - 419	140.	83.	39.14	920 - 939	0.
420 - 439	920.	991.	5.09	940 - 959	0.
440 - 459	101.	95.	0.38	960 - 979	0.
460 - 479	306.	182.	84.48	980 - 999	0.
480 - 499	27.	34.	1.44		
500 - 519	32.	28.	0.57		

H -SQUARE VALUE

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TED CHI-SQUARES (OBSERVED 1979 AND 1980)

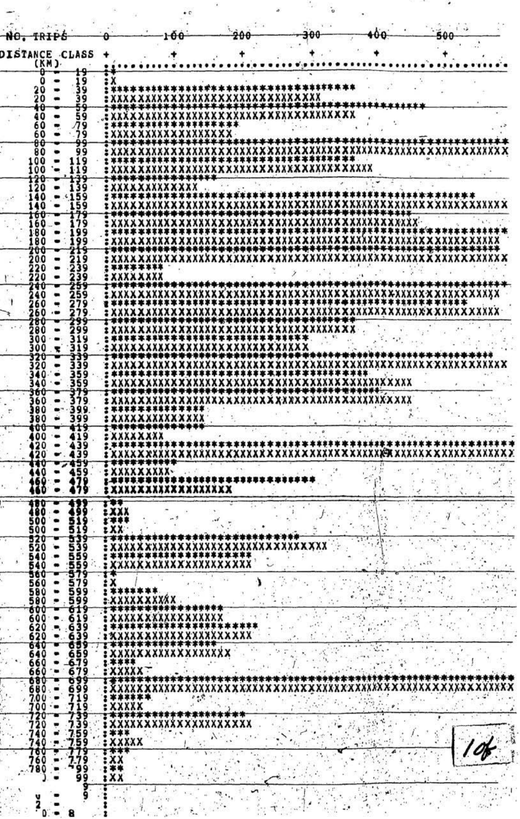
DISTANCE CLASS (KM)	NUMBER OF TRIPS YR: 1979	1980	CHI-SQ.
520 - 539	286.	322.	4.02
540 - 559	212.	210.	0.02
560 - 579	13.	12.	0.08
580 - 599	74.	102.	7.69
600 - 619	179.	175.	0.09
620 - 639	228.	216.	0.67
640 - 659	163.	182.	1.98
660 - 679	49.	53.	0.30
680 - 699	681.	670.	0.18
700 - 719	64.	59.	0.42
720 - 739	201.	214.	0.79
740 - 759	39.	55.	4.65
760 - 779	31.	21.	4.76
780 - 799	23.	20.	0.45
800 - 819	0.	0.	0.0
820 - 839	1.	0.	0.0
840 - 859	15.	4.	30.25
860 - 879	23.	28.	0.89
880 - 899	0.	0.	0.0
900 - 919	447.	339.	34.41
920 - 939	0.	0.	0.0
940 - 959	0.	0.	0.0
960 - 979	0.	0.	0.0
980 - 999	0.	0.	0.0
1000 -1019	0.	0.	0.0
CHI-SQUARE VALUE			376.11

2 of 2

FIGURE D-8 TRIP LENGTH FREQUENCY DISTRIBUTION OF OD DATA FOR 1979 AND 1980

YR 1979: * (10 PASSENGERS)

YR 1980: X (10 PASSENGERS)



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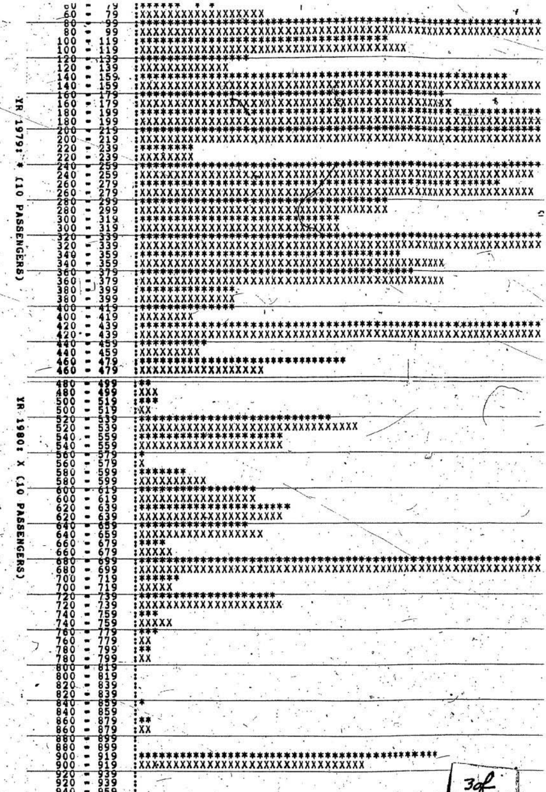
-8

TRIP LENGTH FREQUENCY DISTRIBUTION OF OD DATA FOR 1979 AND 1980



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252

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