

- d) 15 Ave. improvement project.
- e) A part of intersection improvement project.
- f) Busway (Ciudad Real to Zona 4) development project.
- g) Traffic control system improvement project.
- h) Parking card system development project.
- i) Pedestrian mall development project.

3) Phase III, IV (1996 - 2010, Mid Term and Long Term Projects)

In the phase III and Phase IV stages, following implementation program policies are adopted.

- a) To maintain the future transport demand.
- b) To link the future road network.
- c) To maintain good transport network system.

According above mentioned policies, following projects are selected for Mid Term project.

- a) Eastern part of middle ring road development project.
- b) Intersection improvement project.
- c) Bus way development (Mixco to Centro) project.
- d) Bus center Zona 4 improvement project.
- e) Extra - Urban bus terminal project.
- f) Bus inspection center construction project.
- g) Traffic control system development project.
- h) traffic safety Park development project.

and following projects are selected for Long Term project taking into account the function and characteristics of the projects.

- a) Outer ring road development project.
- b) Northern part of the middle ring road development project.
- c) Inner ring road improvement project
- d) CA-9 (South) improvement project.
- e) CA-1 (East) improvement project.
- f) 13 Ave. 6a Ave. and 35 Ave. improvement project
- g) Boulevard Sur improvement project.
- h) Bus way (Villa Nueva - Centro) development project.
- i) Bus center Zona 1 development project.
- j) Car parking development project.

The above mentioned implementation schedule are summarized in Figure 13.2.1.

Figure 13.2.1 Implementation Schedule

Unit(Q 1000)

Project Name	Project Cost	1990		2000		
		92	95	00	05	10
1 Outer Ring Road(North)	287,525					-----
2 Outer Ring Road(South)	163,339					-----
3 Middle Ring Road	469,999		-----			
4 East-West Corridor	151,399	-----				
5 Periferico Toramo	25,519	-----				
6 Inner Ring Road	81,029					-----
7 CA-9 (South)	61,048					-----
8 CA-1 (East)	84,743					-----
9 Ave.Hincapie	124,670					-----
10 Ave.Petapa	59,361	-----				
11 13 Ave. Zona 7	2,642					-----
12 69 Ave. Zona 2	17,001					-----
13 15 Ave. Zona 6	16,514	-----				
14 35 Ave. Zona 11	35,784			-----		
15 Boulevard Sur	11,729					-----
16 Intersection Improve	105,817	-----				
17 Bus Stop Development	3,306	-----				
18 Bus Lane Development	3,794	-----				
19 Busway Development	493,950	-----	-----			
20 Bus Center Zona 1	9,620			-----		
21 Bus center Zona 4	12,000		-----			
22 Extraurban Bus Term.	42,842		-----			
23 Bus Inspection Center	21,700		-----			
24 Effective Lane Usage	4,841	-----				
25 Traffic Control System	11,301	-----				
26 Traffic Safety Park	5,940		-----			
27 Pavement Marking	1,548	-----				
28 Parking Card System	500	-----				
29 Pedestrian Mall	2,843		-----			
30 Car Parking	72,200			-----		
31 Sidewalk Development	2,673			-----		
<b>Total</b>	<b>2,387,177</b>	<b>394,990</b>	<b>508,560</b>	<b>1,483,627</b>		

----- Short Term Projects  
 ----- Middle Term Projects  
 ----- Long Term Projects



(3) Traffic Conditions by Phasing

The traffic conditions such as average congestion rate and average travel speed on the future transport network in Study Area is examined for verification of implementation schedule by phasing. The average congestion rate and travel speed are calculated by each 5 years interval. The result of the traffic condition analysis are summarized in Table 13.2.1.

Table 13.2.1 Average Congestion and Travel Speed by Phasing

Phasing			Short Term	Mid Term	Long Term	
Calculation Items			1995	2000	2005	2010
Average Congestion rate (Volume/Capacity)	Without Projects	Public Transport	1.20	1.33	1.46	1.59
		Passenger Car	0.81	0.93	1.13	1.48
		Total	0.89	1.02	1.19	1.50
	With Projects	Public Transport	1.32	1.26	1.09	1.20
		Passenger Car	0.69	0.78	0.89	0.92
		Total	0.85	0.89	0.93	0.98
Average Congestion rate (km/h)	Without Projects	Public Transport	9.6	9.2	8.7	8.2
		Passenger Car	29.5	26.1	21.9	18.7
		Total	25.1	22.6	19.4	16.8
	With Projects	Public Transport	12.1	12.8	13.6	13.4
		Passenger Car	32.7	31.2	30.0	27.8
		Total	27.4	26.7	26.2	24.8

From Table 13.2.1, following traffic conditions are pointed out for traffic condition by phasing.

- a) The average traffic congestion rate of phasing are indicated to be less than 1.0.
- b) The average travel speed of phasing are improved to compare with the without projects.
- c) Judging from above two reasons, the recommended implementation schedule is maintained the future traffic demands increased based on the future traffic conditions.

#### (4) Economic Indicators by Phasing

The detailed economic analysis by phasing is described in Chapter 13.3 in this report. The result of economic indicators by phasing is presented in Table 13.2.2. From this Table, IRR of phasing are indicated to be over 45% and B/C ratio also indicated to be 3.4 to 5.0, respectively.

Judging from these economic indicators, the implementation schedule recommended is verified as good program.

Table 13.2.2 Economic Indicators by Phasing

Phasing	Year	Irr	B/C	NPV
Short Term	1992-1993	59.7	5.081	1,015
Mid Term	1992-1995	46.3	3.499	10,781
Long Term	1992-2005	45.9	3.855	2,767
	1992-2010	45.5	3.400	2,771

#### 13.2.2 Investment Schedule

Based on the sector plans of each fields, the project costs was calculated in previous section. The investment schedule by year are calculated according to the implementation schedule recommended. The results of investment schedule by year is presented in Figure 13.2.1.

### 13.3 Financial Consideration

#### 13.3.1 Organization for Road Improvement Works

The Republic of Guatemala is composed of 22 departments. Each department includes many municipalities called as Municipio, (which covers towns and villages). However, the autonomous administrative organizations to undertake major public works are the Central Government as a national level and the Municipality of Guatemala as a local level. There is no administrative organization in department, town and village. (Each department has only its own nominal governor, but they do not have any substantial power.) Therefore, the major road improvement works have been undertaken by the Central Government or the Municipality of Guatemala, too.

The national roads (including the Central American highways) are planned, constructed and maintained by the Ministry of Communication, Transport & Public Works of the central government except the road sections within the Guatemala city.

On the other hand, every road improvement work (planning, construction and maintenance) within the Guatemala city is undertaken by the Guatemala Municipality even for the American highways or the national roads passing through the Guatemala Municipality. Main units of the Guatemala Municipality in charge of road works are the Works Implementation Direction and the Planning Control Coordination Unit. The duties of the former direction are road construction and maintenance, while the latter is in charge of the road planning:

Roads passing within each municipality (except the national roads and the Central American highway) are responsible for its own municipality. The executing unit of each municipality for road works is almost like the system of the Guatemala Municipality.

#### 13.3.2 Fund Source for Road Improvement Works

The fund for road improvement works of the central government comes from the general revenue of the central government. It is true that the central government levies taxes on gasoline/diesel, car import, car purchase, car ownership, etc., however, revenues from these taxes go to the general revenue of the government, not to the source specified to the use only for road improvement works. In past seven years the total revenue of the central government has been always lower than its total expenditure as shown Table 13.3.1. The ratio of road expenditure to the total expenditure has been decreasing with fluctuation, from the maximum rate of 10.8% to the minimum rate of 6.3%. Judging from the size of the project cost proposed in the Study (the total cost of the proposed alternative E is Q2,503 millions), it seems very difficult to cover the project cost only from the existing level of the government road budget. Therefore, the potential fund source should be sought for the proposed project. It is recommended that some portion of the project cost (for example, the foreign portion of the project cost) be borrowed from international lending agencies.

Table 13.3.1 Revenue and Expenditure of the Central Government and the Expenditure of Road

(Unit: Million Q)

Year	Total Revenue		Expenditure		
	Amount	G.R.(%)	Total	Road Share(%)	
1983	704.0		1,034.0	95.8	9.3
1984	690.2	(-2.0)	1,041.6	112.8	10.8
1985	866.6	(25.6)	1,068.6	72.9	6.8
1986	1,466.8	(69.3)	1,704.9	121.0	7.1
1987	1,857.8	(26.7)	2,093.6	131.7	6.3
1988	2,299.0	(23.7)	2,669.9	195.3	7.6
1989	2,433.7	( 5.9)	3,130.6	254.1	8.1

Looking at the road investment of CAMINOS of the Ministry of Communications, Transport and Public Works in Table 13.3.2, the road investment shows the same tendency as the central government, that is, the amount of the road investment has been decreased with fluctuation in the past years. The share of the actual road expenditure to the total expenditure has been around 60%. In 1989 the amount of investment drastically decreased to only 13 million Quetzales from 70 million Quetzales in the previous year. However, judging from the past trend, the investment amount is considered to maintain about 40 million Quetzales per year at the existing level.

Table 13.3.2 Revenue and Expenditure of CAMINOS  
(Unit: Million Q)

Year	Budget			Executed		
	Total	Road	%	Total	Road	%
1983	59.5	45.4	76.3	38.6	25.3	65.6
1984	82.4	67.7	82.2	60.1	46.2	76.9
1985	44.0	31.2	70.9	38.7	26.5	68.6
1986	88.8	71.4	80.4	52.6	35.6	67.7
1987	91.0	64.8	71.2	56.5	32.9	58.3
1988	97.4	71.0	72.9	96.5	70.3	72.8
1989	281.2	248.2	90.8	21.2	13.2	62.3
1990	273.5	241.7	88.4	N.A.	N.A.	N.A.
1991	539.6	458.2	84.9	-	-	-

N.A. Not available

On the other hand, as shown in Table 13.3.3, the expenditure for road improvement works in Guatemala Municipality drastically fluctuated in past years. However, the budget is too small for cover the project cost.

Table 13.3.3 Revenue and Expenditure in Guatemala Municipality  
(Unit: Q1,000)

Year	Total Revenue	Expenditure		
		Total	Road	%
1983	34,438	30,978	N.A.	-
1984	30,679	28,598	1,166	4.1
1985	24,236	23,244	N.A.	-
1986	38,882	31,604	3,933	12.4
1987	59,815	44,965	10,145	22.6
1988	72,120	50,742	11,506	22.7
1989	78,117	61,660	2,089	3.4
1990	161,732	146,683	4,864	3.3

N.A. Not available

### 13.3.3 Fund Procurement

According to the cost estimation of the Study Team, the proposed plans necessitate 1,696 million Quetzales under Plan A (the least cost case) to 4,918.7 million Quetzales under Plan C (the largest cost case) by the year of 2010. If these costs will be disbursed over 20 years, the Municipality should procure 94.2 million Quetzales for Plan A to 273.3 million Quetzales for Plan C for each year. It is significantly difficult for the Municipality to assign the budget to these plans. Therefore, the another financial source should be examined.

Based on the tax theory of economics, the fund to improve the living environment is desired to be procured through tax on beneficiaries and should not rely on the general revenue of the government as much as possible. The followings are potential sources for the proposed projects from the viewpoint of this concept:

#### A. Potential Source - 1 Increase of Road Budget

The proposed projects are expected to be undertaken mainly by the Guatemala Municipality with the help of CAMINOS, however, judging from their existing financial assignment for the road improvement projects as shown in Table 13.3.2 and Table 13.3.3, the amount of these financial assignments are not sufficient at all at the moment. In addition, the project cost is requested not to be covered by the general revenue under the above fund procurement concept. However, judging from the financial assignment in 1987 and 1988 - Municipality spent about Q10 millions each year -, Municipality will be able to assign less than Q5 millions for the proposed project. On the other hand, considering the existing CAMINOS's help to the Municipality's road improvement works, CAMINOS will also be expected to burden less than Q5 millions each year. Therefore, at least Q5 million per year will be probably assigned to the proposed



project by the Guatemala Municipality and CAMINOS. Furthermore, these Q5 millions is expected to increase at the rate of 5% through raising the revenue in Guatemala under the following factors:

- Projected economic growth of 4.5% in Guatemala
- Increase of tax revenue from gasoline/diesel and car ownership tax, because of 5.4 % and 4.9% growth rates of vehicle and the number of car ownership, respectively
- Increase of the coverage ratio of the property tax (only 60% coverage until now)
- Reassessment of the property tax (There has been no reassessment in past 10 years)
- Appropriation of the abolished bus subsidy to the recommended projects (See D. Potential Source - 4)

As a result, from 1992 to 2010, 152.7 millions Quetzales will be financed by the general budget of Municipality and CAMINOS.

B. Potential Source - 2 City Planning Tax

The proposed project undoubtedly improves the daily living conditions in the project area. There is no doubt that it is desirable to charge beneficiaries to the degree of their benefit from the viewpoint of resource allocation efficiency and equity. Therefore, beneficiaries have their obligation to burden the expense for their improved living conditions. The introduction of the city planning tax is strongly recommended by these reasons.

The Congress of the Republic issued the Decree Number 25-70, which prescribes the Municipal Code be modified in order to create the Municipal development conditions due to the current needs. Under this Decree the Municipal Code was modified in 1970 with the purpose of fixing a maximum percentage to the neighbor contributions for the urbanization works that improve the area where they live.

According to this Municipal Code, three road sections have already been improved until now, that is, a section on Periferico in 1973, a section on Petapa in 1980, and a section on calle 18 in 1988. In case of Calle 18, the Municipality collected 0.5 - 1.6 Quetzales per one m<sup>2</sup> as a contribution for the road improvement.

As shown in Table 2.2.4, the existing urban habitable area is 25 thousand ha. 50% of this habitable area is occupied by roads, parks, public buildings, etc. Therefore, 12.5 thousand ha is taxable area. According to the information from the Municipality, this taxable area can be broadly categorized from the property assessment by the government as follows:

Property assessment (Q/m <sup>2</sup> )	area
0 - 50	25% (3.125 ha)
50 - 250	25% (3.125 ha)
250 -	50% (6.25 ha)

If the Municipality collects 1% of the property assessment per one  $m^2$ , the average tax per one  $m^2$  is estimated to be Q2 per  $m^2$  ( $0.25*50*0.01 + 0.25*150*0.01 + 0.5*300*0.01$ ). As a result, the Municipality could collect Q250 millions per year. As the beneficiary is requested to pay the contribution within 60 months by the above Municipal Code, if this tax collects every five year, the Municipality could collect 50 million Quetzales each year.

C. Potential Source - 3 Development Tax

The developers can obtain some profit by developing the land within the Study area. Therefore, they are requested to pay some contribution to the Municipality as a fund for building and/or preserving a good living environment.

As shown in Table 2.2.4 of the this Report, the existing habitable area is 25 thousand ha and until 2010, 8 thousands ha is projected to be developed as the urban area. If the Municipality collects 10 Quetzales per one  $m^2$ , considering the recent price hike of the property, the Municipality could collect 80 million Quetzales until 2010 ( $8,000 \text{ ha} \times 10,000 \times 10 = 800,000,000$ ).

D. Potential Source - 4 Appropriation of Bus Subsidy

At the moment about Q72 millions is given to private bus companies as a subsidy every year by the Municipality through the Ministry of Finance.

Through the public transport study, it could be issued that the subsidy to the urban bus operators would be cut in the future and its fund should be remained as a fund for the urban transport infrastructure development.

If one half of the annual subsidy for the bus operators is remained, Q36 millions annually and total amount of Q648 millions can be used as urban transport development projects such as busway construction.

E. Potential Source - 5 Automobile Fuel Surcharge Tax

It is sure that the car owners have already pay some amount of tax to the government for gasoline and diesel consumption (9% to the central government and 2% to the Municipality) to use their private cars. However, judging from the amount of benefit obtained from the road improvement, the burden of the car users seems not to be sufficiently enough (for example, about 45% of gasoline price is occupied by tax in Japan). In Guatemala, the total tax rate of gasoline or diesel (including the import tax) is 20%, therefore, more two percents of for the gasoline or diesel price should be accepted by the car users as the surcharge tax for the road improvement. Based on Table 13.3.4 tax revenue for the gasoline and diesel was calculated to be 22.0 million Quetzales in 1992 and 50.4 million Quetzales in 2010. The total surcharge tax revenue from 1992 to 2010 will be calculated to be 584.7 million Quetzales.

Table 13.3.4 Base Data for Automobile Fuel Surcharge Tax

Items	Gasoline	Diesel
A Consumption in whole country (1990) in 1990	2,676.82 (1000 barrel)	3,985.48
B Consumption in Study area in 1990	1,833.62 (1000 barrel)	2,024.62
C price (Q/Liter)	2.36	1.57
D 1% surcharge tax (Q/liter)	0.024	0.016
E Vehicle Travel Distance (1990)	4,135.4 (1000 Veh.*h/day)	663.2
F Vehicle Travel Distance (2010)	12,072.3 (1000 Veh.*h/day)	1,775.7
G Growth Rate (F/E)	2.919	2.677
H Consumption in Study area (2010)	5,352.34 (1000 barrel)	5,419.91
I Revenue from Surcharge tax in 1992	5.8 (Million Quetzales)	4.3
J Revenue from Surcharge Tax in 2010	15.3 (Million Quetzales)	10.3

F. Potential Source - 5 Automobile Tonnage Tax

The damage of road surface depends on the automobile tonnage. Therefore, there is the insistence from the viewpoint of highway engineering and economics that the repair and maintenance cost of road surface should be covered in accordance with the automobile tonnage. As the financial source is not enough in Guatemala, the introduction of the automobile tonnage tax is strongly recommended. In Guatemala, the ad valorem motor vehicle tax on private cars and specific motor vehicle tax are already introduced. However, the revenue from these taxes is not enough to repair and maintain for the roads within the Study area. Considering the above tax burden on the car owners, on an average, the tax rates of 20 Quetzales for passenger car and 10 Quetzales for bus and truck is recommended on the basis of the Japanese automobile tonnage tax rate. Judging from the adverse affect for the business activities and/or tax transfer to the consumer, the automobile tonnage tax rate for bus and truck is decreased to half, compared with the passenger car. As a result, the revenue from the above taxes is calculated to be 3.7 million Quetzales in 1990 and 8.0 million Quetzales in 2010 based on Table 13.3.5.

Table 13.3.5 Base Data for Automobile Tonnage Tax

Items	1990	2010
No. of Passenger Car (Vehicle)	144,690	376,300
No. of Bus and Truck (Vehicle)	19,677	51,172
Tax Revenue from Passenger Car	1,446,900	3,763,000
		(Quetzales)
Tax Revenue from Bus and Truck	98,385	255,860
		(Quetzales)
Total Revenue	1,545,285	4,018,860
		(Quetzales)

G. Potential Source - 7 Revenue from Toll Busway

The busway is planned for only bus operation. Therefore, this busway is desired to be operated as toll way. According to the analysis of busway of the Study, if bus passenger pays one Quetzal as a toll rate, the Municipality is estimated to collect Q170 millions until 2010.

H. Potential Source - 8 Foreign Loan

Foreign loan is the effective financial source for the foreign portion of the project cost, especially to the projects such as East-West Corridor, Av. Patapa, Busway, and rail transit, because of its huge amount of construction cost.

Together with the above-mentioned revenues, the total revenue is expected

to 2,738.9 million Quetzales except the foreign loan and the revenue from toll busway. This amount is considered to be enough to finance Plan-A, Plan-B, Plan-D and Plan-E, while, it is unable to finance Plan-c and Plan-F, that is, railway transit system introduction plan (these plans require more than 4,000 million Quetzales). However, since these two plans includes the railway construction cost, all cost is not necessarily covered by the Guatemalan government agencies. If the railway system can run under the self-supporting system, the executing agency could borrow the fund from an international lending institute or bilateral loan and pay back it from the fare revenue. In this case it must keep it mind that the project be feasible from the financial viewpoint. The feasibility of the railway system introduction project is examined in Section 11.8. It is not needless to say that if the above revenue exceeds the project cost, the contribution rate based on the Municipal Code should decrease lower than the average Q2 per one m<sup>2</sup>.

The financial source is summarized in Table 13.3.6.

Table 13.3.6 Financial sources for Alternative Plans  
(unit: Millions Q)

Source	Plan A	Plan B	Plan C	Plan D	Plan E	Plan F
Construction Cost	1,696	2,186	4,919	2,316	2,503	4,803
1. General Revenue of Municipality	153	153	153	153	153	153
2. City Planning Tax	1,119	1,119	1,119	1,119	1,119	1,119
3. Development Tax	758	758	758	758	758	758
4. Subsidy Cut for Bus Company	37	37	37	37	37	37
5. Automobile Fuel Surcharge Tax	585	585	585	585	585	585
6. Automobile Tonnage Tax	96	96	96	96	96	96
7. Revenue from Toll busway		(170)			(170)	
8. Foreign Loan			(2,171)		(258)	(2,055)
Balance	1,052	582 (732)	-2,171 ( 0)	432	245 (415)	-2,055 ( 0)

Note: ( ) includes the revenue from the toll busway and the foreign loan.

## 14. EVALUATION OF MASTER PLAN

### 14.1 Economic Analysis

In Section 9.5 six alternative plans were tentatively evaluated through the comparison of their costs and benefits. The internal rate of return (IRR), benefit and cost ratio (B/C) and net present value (NPV) were adopted as the economic indicators of economic evaluation. As a result, Alternative was selected as the most feasible plan. As the evaluation in Section 9.5 is provisional, the shadow price was not applied, since even if the shadow price were applied, the order of project priority would not be affected because of the small change of their cost by the shadow price. In this section much more detailed evaluation is performed under the application of the shadow price.

#### (1) Estimation of Shadow Price

The financial cost estimated in the previous sections should be converted into the economic cost from the viewpoint of the national economy. The UNIDO method is applied for this purpose. Therefore, the shadow exchange rate and the shadow wage rate for unskilled laborers are estimated as follows:

#### Shadow Exchange Rate

The foreign portion of the project cost is converted into the domestic price with the shadow exchange rate. The shadow exchange rate was estimated by the following equation using the data listed in Table 14.1.1.

$$SER = OER \times (M+X+T-S)/(M+X)$$

Where, SER : Shadow Exchange Rate  
OER : Official Exchange Rate  
M : Import  
X : Export  
T : Tax for Import  
S : Tax for Export

Table 14.1.1 Import and Export Data  
(Unit: Million Q)

Year	Export	Import	Export Tax	Import Tax
1985	1020.6	1748.1	9.9	80.5
1986	424.7	383.8	213.1	138.6
1987	394.9	578.9	150.7	278.0
1988	390.0	594.3	102.8	393.2
1989	407.3	608.0	54.3	412.3
1990	205.5	267.1	4.2	385.0

Using the above equation, the shadow exchange rate was estimated from 1985 to 1990 as shown in Table 14.1.2. The average value of 1.250 was adopted as the shadow exchange rate.

Table 14.1.2 Shadow Exchange Rate by Year

Year	Exchange Rate
1985	1.006
1986	0.908
1987	1.131
1988	1.295
1989	1.353
1990	1.806
Ave.	1.250

### Shadow Wage Rate

The opportunity cost of the unskilled labors was estimated based on the data obtained in the field survey. Table 14.1.3 shows this data. From this survey the opportunity cost of the unskilled laborers was estimated Q335.38 per month. Since the average monthly wage of the unskilled laborers is Q450 per month, the shadow wage rate can be calculated to be 0.745.

Table 14.1.3 Wage Survey of the Unskilled Laborer

No.	Age	Sex	Job	Wage	Holiday	Partiday	Holiday	Wage	Salary*
1	31	M	Const. Worker	455.75	2/Week				516.52
2	37	M	Const. Worker	425.75	2/Week	Part Timer	1/Week	30.00	482.52
3	21	M	Const. Worker	219.00	2/15 days				248.20
4	27	M	Const. Worker	440.00	2/15 days	Laborer	1/Week	50.00	498.67
5	23	M	Const. Worker	240.00	2/15 days				272.00
6	55	M	Const. Worker	468.68	4/Month				468.68
7	48	M	Const. Worker	425.52	2/15 days				482.26
8	51	M	Const. Worker	434.00	2/15 days				491.87
9	41	M	Const. Worker	230.00	4/Month	Part Timer	1/Week	30.00	350.00
10	53	M	Const. Worker	235.00	2/15 days				266.33
11	25	M	Surveyor	495.00	1/Week				495.00
12	42	M	Surveyor	460.00	1/Week				460.00
13	38	M	Surveyor	495.00	1/Week				495.00
14	33	M	Const. Worker	300.00	2/15 days				340.00
15	21	M	Const. Worker	300.00	2/Month				340.00
16	18	M	Const. Worker	380.00	1.5/Week				405.33
17	14	M	Const. Worker	330.00	1.5/Week				352.00
18	16	M	Vendor	404.00	2/Month				377.07
19	52	F	Vendor	450.00	0				390.00
20	19	M	Gab. Collector	200.00	4/Month				228.67
21	38	M	Shoe Polisher	80.00	2/Month				74.67
22	17	M	Vendor	350.00	1/Week				350.00
23	33	M	Gab. Collector	300.00	1/week				300.00
24	29	M	Vendor	250.00	1/Week				250.00
25	17	M				Shoe Polisher	10/Month	54.00	54.00
26	21	M	Vendor	286.00	1/Month				247.87
27	65	F	Vendor	500.00	1/Week				500.00
28	18	M	Vendor	130.00	1/Week				130.00
29	35	M	Car Washer	390.00	1/Week				390.00
30	29	M	Gar. Collector	268.00	1/Week				268.00
31	39	M	Car Washer	350.00	1/Week				350.00
32	25	F	Vendor	280.00	1/Week				260.00
33	42	M	Vendor	360.00	1/Week				408.00
34	21	M	Laborer	341.80	2/Week				387.37
35	32	M	Vender	100.00	1/Week				100.00
36	23	M				Vender	8/Month	160.00	160.00
37	21	M	Vendor	300.00	1.5/Week				320.00
38	50	M	Vendor	312.00	1/Week				312.00
39	56	M	Vendor	300.00	0				260.00

Note: Salary is adjusted for one holiday per month.



(2) Economic Cost

The financial project cost was converted into the economic cost with the above shadow exchange rate and shadow wage rate, after the tax was subtracted from the financial cost. Table 14.1.4 shows the financial cost and economic cost of the recommended project.

Table 14.1.4 Financial and Economic Project Cost  
(Unit: Million Q)

Year	Financial Cost	Economic Cost	Foreign Portion	Unskilled Labor Cost	Domestic
1992	42.2	43.2	21.1	1.0	21.1
1993	98.8	100.0	45.2	2.5	52.3
1994	113.9	114.3	46.4	2.6	65.3
1995	140.1	138.8	51.9	5.4	81.5
1996	127.7	126.7	48.6	5.2	72.9
1997	127.0	124.6	40.7	4.7	79.2
1998	127.0	124.6	40.7	4.7	79.2
1999	127.0	124.6	40.7	4.7	79.2
2000	120.9	117.9	35.2	4.5	78.2
2001	120.9	117.9	35.2	4.5	78.2
2002	136.0	133.3	42.5	4.9	85.9
2003	136.0	133.3	42.5	4.9	85.9
2004	136.0	133.3	42.5	4.9	85.9
2005	158.7	161.5	76.0	3.8	81.8
2006	164.6	167.3	77.9	3.9	85.6
2007	164.6	167.3	77.9	3.9	85.6
2008	172.9	173.9	71.9	3.6	98.5
2009	172.9	173.9	71.9	3.6	98.5

(3) Economic Benefit

Benefit from the project was calculated for the vehicle operation cost saving and the time saving by the same procedure explained in Section 9. The estimated benefit is shown in Table 14.1.5.

Table 14.1.5 Project Benefit  
(Unit: Million Q)

Year	VOC Saving Benefit	Time Saving Benefit
1995	178.4	276.9
2000	293.1	433.6
2005	534.1	809.6
2010	537.9	1128.8

(4) Results of Economic Analysis

Using the above economic cost and benefit, three economic indicators were calculated in four project terms, which is shown in Table 14.1.6. According to

this Table, the recommended Alternative E shows the high IRR of 45.5% compared with not only 12% of interest rate of the international lending agencies but also 27% of the prime rate in Guatemala. Furthermore, Table 14.1.6 suggests the project package is selected under the concept that the project indicated higher economic viability should be constructed earlier as much as possible.

Table 14.1.6 Economic Indicators by Project Term

Project Term	IRR (%)	B/C	NPV (Million Q)
1992-1995	59.7	5.081	1051
1992-2000	46.3	3.499	1781
1992-2005	45.9	3.855	2767
1992-2010	45.5	3.400	2791

Also the sensitivity analysis was performed in order to take the uncertain change of project environment into consideration for the whole project package (1992-2010). The result of the sensitivity analysis is shown in Table 14.1.7. Judging from the economic analysis, the recommended project package is identified to be significantly feasible.

Table 14.1.7 Result of Sensitivity Analysis  
(Unit: IRR %, NPV Million Q)

		0% :	+5% :	+10% :	+15% :	+20%
0%	IRR	45.5 :	43.7 :	40.5 :	36.3 :	31.8
	B/C	3.400 :	3.238 :	2.957 :	2.616 :	2.267
	NPV	2791 :	2733 :	2616 :	2442 :	2209
-5%	IRR	43.6 :	41.9 :	38.7 :	34.7 :	30.3
	B/C	3.230 :	3.076 :	2.809 :	2.485 :	2.153
	NPV	2593 :	2535 :	2419 :	2244 :	2012
-10%	IRR	41.7 :	40.0 :	36.9 :	33.0 :	28.7
	B/C	3.060 :	2.914 :	2.661 :	2.354 :	2.040
	NPV	2395 :	2337 :	2221 :	2047 :	1814
-15%	IRR	39.7 :	38.0 :	35.0 :	31.2 :	27.1
	B/C	2.890 :	2.753 :	2.513 :	2.223 :	1.927
	NPV	2198 :	2140 :	2023 :	1849 :	1616
-20%	IRR	37.6 :	36.0 :	33.1 :	29.4 :	25.4
	B/C	2.720 :	2.591 :	2.365 :	2.092 :	1.813
	NPV	2000 :	1942 :	1826 :	1651 :	1419

IRR by major projects is shown in Table 14.1.8.

Table 14.1.8 IRR by Project

No.	Project	IRR (%)
1	Outer Ring Road (North)	20.8
2	Outer Ring Road (South)	33.4
3	Middle Ring Road	11.9
4	East-West Corridor	16.9
9	Ave. Hincapie	40.7
10	Ave. Petapa	47.6
17	Busway Development	22.4

## 14.2 Financial Evaluation

Based on the engineering and economic analysis, Alternative E was recommended as the most desirable plan among six alternatives. As explained in Section 13, the project cost of Alternative E can be covered by the several financial sources. Table 14.2.1 shows one of the example of the disbursement of the project cost and yearly fund assignment.

Table 14.2.1 Fund Allocation by Year

(Unit: Million)

Year	Cost	General Revenue	Planning Tax	Development Tax	Cut off Subsidy	Fuel Surcharge	Automobile Tonnage	Toll Revenue	Foreign Loan	Fund Total (1)*	Total (2)**
1992	42.0	5.0	0.0	0.0	37.0	0.0	0.0		0.0	42.0	42.0
1993	98.8	5.3	50.0	42.1	0.0	0.0	0.0		43.7	97.4	141.1
1994	113.9	5.5	50.0	42.1	0.0	22.0	3.7		43.7	123.4	163.2
1995	140.1	5.8	50.0	42.1	0.0	23.2	3.9		39.8	125.0	137.8
1996	127.7	6.1	50.0	42.1	0.0	24.4	4.1		12.8	126.7	139.5
1997	127.0	6.4	50.0	42.1	0.0	25.7	4.3		12.8	128.5	141.3
1998	127.0	6.7	54.2	42.1	0.0	27.1	4.5		12.8	134.6	147.4
1999	127.0	7.0	56.3	42.1	0.0	28.5	4.8		12.8	138.7	151.5
2000	120.9	7.4	58.4	42.1	0.0	30.0	5.0	10	12.8	142.9	165.7
2001	120.9	7.8	60.5	42.1	0.0	31.6	5.2	10	12.8	147.2	170.0
2002	136.0	8.1	62.6	42.1	0.0	33.3	5.5	10	12.8	151.6	174.4
2003	136.0	8.6	64.7	42.1	0.0	35.1	5.8	10	12.8	156.2	179.0
2004	136.0	9.0	66.8	42.1	0.0	36.9	6.0	10	12.8	160.9	183.7
2005	158.7	9.4	68.9	42.1	0.0	38.9	6.3	20		165.7	198.5
2006	164.6	9.9	71.0	42.1	0.0	41.0	6.6	20		170.6	190.6
2007	164.6	10.4	73.1	42.1	0.0	43.2	7.0	20		175.7	195.7
2008	172.9	10.9	75.2	42.1	0.0	45.5	7.3	20		181.0	201.0
2009	172.9	11.5	77.3	42.1	0.0	47.9	7.7	20		186.4	206.4
2010	0.0	12.0	79.4	42.1	0.0	50.4	8.0	20		192.0	212.0
TOT	2387.2	152.7	1118.8	757.9	37.0	584.7	95.8	170.0	255.2	2738.9	3140.8

Note: \* Excluding toll revenue and foreign loan

\*\* Including toll revenue and foreign loan

Judging from the above Table, the project cost can not be covered by the yearly revenue in 1993, 1995 and 1996. However, as the fund shortage in these years is not so large at all, the Municipality is requested for asking the central government to appropriate the abolished bus subsidy to the projects or to issue the short-term bonds. If some of the projects will be financed by the foreign loan, there will be no fund shortage until 2010.

Keep it in mind that Table 14.2.1 is only the example for financing the project cost. In most cases, the immediate introduction of any kind of tax is not easy task, therefore, the Municipality is recommended to find way out to finance the project cost during the early year of the plan by making efforts to introduce the necessary taxation as much as possible.

### 14.3 Social Impact

In addition to the above-mentioned benefits, the proposed plans bring about many other tangible and intangible benefits. These benefits are summarized as follows:

a) In the process of planning and design

- Economic and educational effect

The various surveys conducted for the proposed plan serve as an incentive to private development and private investment. In addition, the advanced technology and experience contributed by foreign consultants in the process of the study can be transferred to local staff.

b) During construction

- Demand effect for employment

Many skilled and unskilled laborers will be hired during construction, which will alleviate the problems of unemployment and underemployment.

- Increment of GDP

During the construction period of the project proposed by the recommended plan, construction works will necessitate some construction materials. This demand will produce subsequent demand for other consumer's goods. As a result, GDP will increase depending the size of road improvement investment.

- Technology transfer

Technology related to the construction work is transferred to the local staff.

c) After completion of the project

- User's benefit

The completion of the plan will improve both driver and passenger comfort and will ensure punctuality at both the origin and the destination, especially in the case of public transport.

- Energy saving

Decrease in gasoline consumption by eliminating severe traffic congestion will contribute to saving of energy worldwide.

Among the above tangible and intangible benefits, the effects of increasing employment, GDP and saving of energy are quantified as explained in Section 9.5. Table 14.3.1 summarized these benefit.

Table 14.3.1 Other Quantified Benefit

Items	Benefit
Employment demand effect	23,100 unskilled workers
GDP increase	6.9 Million quetzales
Saving of energy	
Gasoline	856.5 thousand liter
Diesel	855.3 thousand liter

#### 14.4 Environment Impact

The recommended projects give different environment impact not only to the natural conditions but also to the daily living conditions of citizen. Since it is difficult to quantified the environment impact correctly in this Master Plan stage, the quality evaluation was studied for the following two environment aspect, that is, Impact to the natural conditions and Impact to the daily living conditions.

##### (1) Impact to the natural conditions

Environment impact to the natural conditions should be carefully paid attention to in case of introducing new road and rail transit because some areas are enforced to be cut and filled or cut down trees for the purpose of constructing roads and railways. This construction work might easily bring about debris flow, change of underground water, unfavorable ecological impact, etc. Therefore, it is needless to say that during the construction stage it is necessary for the careful device to keep these negative impact minimum as much as possible.

In addition, new constructions might deteriorate the visual aspect in the city. In some cases the construction of big infrastructure such as elevated railway or elevated expressway does not often harmonize with the existing city's visual environment. Therefore, whenever introducing the big infrastructure, it must be carefully designed from the aesthetic aspect.

##### (2) Impact to the living conditions

The environment impact caused by the traffic considerably depends on the volume of traffic. The following three impacts are regarded as a negative impact;

###### 1) Air pollution

Air pollution depends on the congestion level in the study area. Therefore, the higher congestion level is, the worse the air pollution becomes.

###### 2) Noise

Noise level is much influenced by the traffic volume, that is, vehicle travel distance shown in Table 9.4.5.

###### 3) Safety

Traffic safety has also close relationship with the traffic volume, that is, vehicle travel distance. Therefore, generally the impact would be the same as that in the above "2) Noise". However, traffic safety can secure under the installation of good traffic facilities and introduction of efficient traffic management.

The above environment impact is summarized in the following Table 14.4.1.

Table 14.4.1 Comparison of Environment Impact

Factor	Level
Natural Conditions	Average
Aesthetic Aspect	Fair
Pollution	Excellent
Noise	Good
Safety	Fair
Overall Evaluation	Good





## 15. CONCLUSION AND RECOMMENDATION

### (1) Necessity for Realization of the Master Plan

The total number of generated trips in the Study Area will increase by 1.8 times the 1990's scale by 2010. To meet the future transportation demand, the transportation network should be expanded according to the schedule recommendations.

All projects in the Master Plan are economically and technically feasible. Therefore, the only one thing to be done is to seek the measure to realize the Master Plan.

### (2) Financial Resources

Public facilities and infrastructure projects provide specific benefits to certain beneficiaries. Therefore, it is strongly recommended that the necessary funds be collected according to the amount and direction of the benefits as much as possible. The financial program is planned on the basis of this principle, that is, beneficiary charge.

The financial sources are as follows;

- City Planning Tax, Development Tax
- Conversion from Bus Subsidy Fund
- Automobile Fuel Surcharge Tax, Automobile Tonnage Tax
- Revenue from Toll Busway
- Increase of Road Budget
- Foreign Loan

### (3) Institutional Reforms

To secure the financial resources of the Master Plan, it is necessary to create a separate revenue collecting system exclusively for urban transport infrastructure development.

Since Guatemala lack an organization to coordinate between the various official agencies related to urban transportation in GMA, it is also necessary to create a organization, such as Guatemala Metropolitan Transport Commission, representing local governments, the central government and the private sector.

### (4) Further Studies

For the Master Plan advance, further studies are required as the next stage.

- a) Feasibility study on large scale short and mid term projects such as development of roads and public transport axis in the direction of East/West and North/South.
- b) Feasibility study or detailed study on small scale projects such as interchange improvement or traffic control.
- c) Bus operating rationalization study on bus rerouting, bus mainte-

nance and bus management database etc..

Furthermore, an integrated urban development study is essential to harmonize with urban transportation development and land use or other sectors.

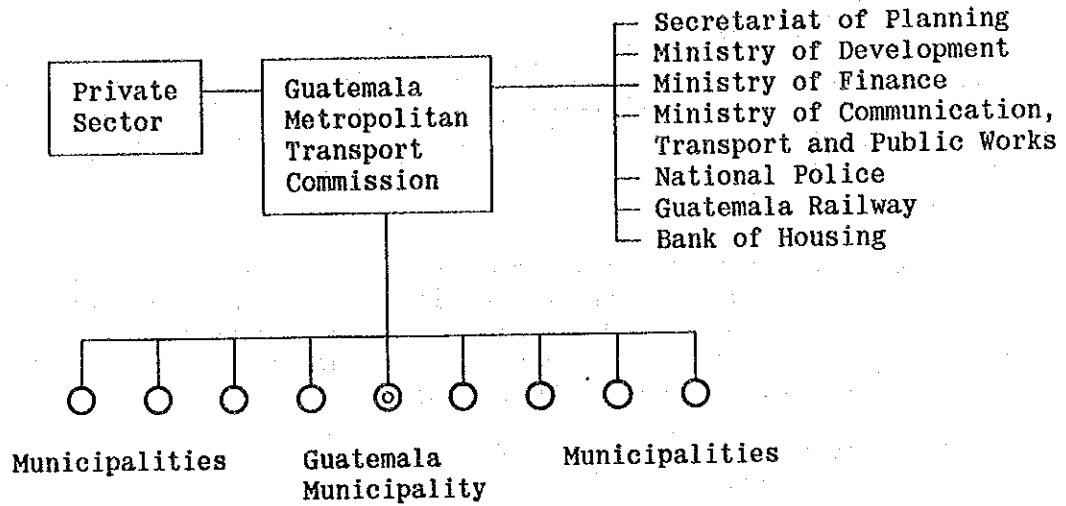


Figure 15.1 Organization Chart of Metropolitan Transport Commission

## **ANNEX**

*A. List of Tables*

*B. List of Figures*

*C. Abbreviations*

*D. OD Tables*



## ANNEX A. List of Tables

Table 2.1.1	Population Change in Study Area
Table 2.1.2	Economic Activities in the Study Area
Table 2.1.3	Employment by Sector
Table 2.2.1	Land Use in the Study Area
Table 2.2.2	Urban Land Use Composition
Table 3.1.1	Person Trip Survey Items
Table 3.4.1	Trip Generation and Attraction by Traffic Zone
Table 3.5.1	Present OD Table of All Purpose and All Mode by Postal Zone
Table 4.1.1	Road Space Ratio
Table 4.2.1	Number of Registered Vehicle in 1990
Table 4.2.2	Past Trend of Vehicle Registration in Guatemala
Table 4.2.3	Results of Traffic Volume Counting Survey at Road Sections for 24 Hours
Table 4.2.4	Results of Traffic Volume Counting Survey at Road Sections for 12 Hours
Table 4.2.5	Results of Signalized Intersection Analysis
Table 4.2.6	Results of Unsignalized Intersection Analysis
Table 4.3.1	Summary of Road Facilities Problems
Table 5.1.1	Operating Buses and Microbuses by Company and Size
Table 5.1.2	Urban Bus Routes and Operation
Table 5.1.3	Microbus Routes and Operation
Table 5.1.4	Summary of Passengers Counting Survey Results
Table 5.1.5	Estimation of Bus and Microbus Costs
Table 5.2.1	Number of Routes and Vehicles
Table 5.2.2	Extra-urban Buses Connecting Guatemala City and Municipality Centers
Table 5.2.3	Extra-urban Buses Connecting Guatemala City and Small Towns/Villages in Municipalities
Table 5.2.4	Extra-urban Buses Connecting Centers of Municipalities and Neighboring Places
Table 6.1.1	Number of Traffic Signal
Table 6.1.2	Number of Traffic Accidents and Casualties in Guatemala Department in 1989
Table 6.1.3	Past Trend of Traffic Accident
Table 6.1.4	Type of Victims by Traffic Accidents
Table 6.1.5	Comparison of Traffic Accident Indicators (Nation Level)
Table 6.1.6	Comparison of Traffic Accident Indicators (City Level)
Table 6.1.7	Capacity of Parking
Table 6.1.8	Number of Parking Lots
Table 6.1.9	Regulation of Obligatory Parking for New Building
Table 6.2.1	Summary of Traffic Management Problems
Table 7.1.1	Economic Development Estimation for the Study Area
Table 7.1.2	Future Population in the Study Area
Table 7.1.3	Future Employment by Sector
Table 7.2.1	Habitable Lands and Present Uses
Table 7.2.2	Future Distribution of Population and Employment in Polycentric Pattern
Table 7.2.3	Future Distribution of Population and Employment in Corridor

	Pattern
Table 7.2.4	Comparison of Urban Development Patterns
Table 7.3.1	Location of New Residential Area
Table 7.3.2	Location of New Industrial Area
Table 7.3.3	Location of New Commercial/Institutional Core
Table 7.3.4	Summary of Land Use Plan
Table 7.4.1	Planned Population and Average Population Density
Table 7.4.2	Change in Population Distribution, 1990-2010
Table 7.4.3	Planned Number of Employed Persons by Sector on Work Place Basis
Table 7.4.4	Change in Employment Distribution, 1990-2010
Table 8.2.1	Model for Car Ownership
Table 8.2.2	Trip Production Rate
Table 8.2.3	Comparison of Car Ownership
Table 8.2.4	Trip Production in 2010
Table 8.3.1	Generation and Attraction Model
Table 8.3.2	Comparison of Generation and Attraction by Postal Zone and Municipality
Table 8.4.1	Intra-zonal Distribution Model
Table 8.5.1	Modal Split Model for Walking Trips
Table 8.5.2	Modal Split Model for Private Car and Public Transport
Table 8.5.3	Modal Share of "Do-nothing" Case
Table 8.6.1	Passenger Car Unit Conversion (PCU)
Table 9.3.1	Outline of Alternative Plans
Table 9.3.2	Projected Cost of Each Alternative
Table 9.4.1	Road Project Components by Alternative
Table 9.4.2	Public Transport Project Components by Alternative
Table 9.4.3	Modal Share by Master Plan Alternative
Table 9.4.4	Traffic Volume Assigned on Principal Road
Table 9.4.5	Comparison of Alternatives
Table 9.5.1	Vehicle Operating Cost (VOC)
Table 9.5.2	Fuel Consumption by Vehicle Running Speed
Table 9.5.3	VOC Depending on Vehicle Running Speed
Table 9.5.4	Vehicle Operating Cost for Traffic Assignment
Table 9.5.5	Household and Car ownership by Income Class
Table 9.5.6	Summary of Estimated Benefit
Table 9.5.7	Cost Estimation
Table 9.5.8	Value of Economic Indicators by Alternative
Table 9.5.9	Benefit and Cost Stream by Alternative
Table 9.5.10	Results of Sensitivity Analysis
Table 9.5.11	Expected Unskilled Workers
Table 9.5.12	Expected GDP Increment through the Proposed Projects
Table 9.5.13	Gasoline and Diesel Consumption
Table 9.5.14	Energy Consumption Corresponding to the Average Travel Speed
Table 9.5.15	Saving of Energy Consumption in Alternative Plans
Table 9.5.16	Comparison of Environment Impact
Table 9.5.17	Comparison of Alternative Plans
Table 10.1.1	Planned Roads and Number of Lanes
Table 10.1.2	Required Collector and Local Road Length
Table 10.1.3	List of Construction Material Market Price
Table 10.1.4	List of Main Construction Work Unit Cost
Table 10.1.5	List of Project Costs

Table 10.2.1	Improvement Plan of Intersections (1)
Table 10.2.1	Improvement Plan of Intersections (2)
Table 10.2.1	Improvement Plan of Intersections (3)
Table 10.2.1	Improvement Plan of Intersections (4)
Table 10.2.1	Improvement Plan of Intersections (5)
Table 10.2.2	Rough Intersection Improvement Costs (1)
Table 10.2.2	Rough Intersection Improvement Costs (2)
Table 11.1.1	Major OD Pairs of Public Transport Person Trip Zones in 2010
Table 11.2.1	Comparison of Key Route Network Patterns in CBD
Table 11.2.2	Bus Routes in 2010
Table 11.2.3	Urban Bus Route Characteristics in 2010
Table 11.3.1	Demand for Non-Commuter Extra-urban Bus Terminals
Table 11.3.2	Characteristics of Extra-urban Bus Terminals
Table 11.5.1	Estimated Financial Performance of Urban Buses in 2010
Table 11.5.2	Basic Idea of Additional Fares for Inter-Zonal Trips
Table 11.5.3	Financial Performance of Key Route Buses and Feeder Buses
Table 11.6.1	Major Plans and Projects of Public Transport
Table 11.8.1	Recommended Financial Statement
Table 12.1.1	Concepts of Traffic Management Schemes
Table 12.1.2	Examination of Applicability of Traffic Management Schemes for the Study
Table 12.1.3	Applicable Area of Traffic Management Schemes
Table 12.2.1	Improvement Cost of 6a and 7a Ave.
Table 12.2.2	Improvement Cost of Traffic Control System
Table 12.2.3	Outline of Traffic Safety Park
Table 12.2.4	Improvement Cost of Pavement Marking Installation
Table 12.3.1	Future Parking Demand
Table 12.3.2	Assumed Parking Capacity
Table 12.3.3	Projection of Improvement of Roads in Centro Area
Table 12.3.4	Effects of Improvement of Sidewalks in the Centro Area
Table 13.1.1	Outline of Projects on Transport Master Plan
Table 13.2.1	Average Congestion and Travel Speed by Phasing
Table 13.2.2	Economic Indicators by Phasing
Table 13.3.1	Revenue and Expenditure of the Central Government and the Expenditure of Road
Table 13.3.2	Revenue and Expenditure of CAMINOS
Table 13.3.3	Revenue and Expenditure in Guatemala Municipality
Table 13.3.4	Base Data for Automobile Fuel Surcharge Tax
Table 13.3.5	Base Data for Automobile Tonnage Tax
Table 13.3.6	Financial sources for Alternative Plans
Table 14.1.1	Import and Export Data
Table 14.1.2	Shadow Exchange Rate by Year
Table 14.1.3	Wage Survey of the Unskilled Laborer
Table 14.1.4	Financial and Economic Project Cost
Table 14.1.5	Project Benefit
Table 14.1.6	Economic Indicators by Project Term
Table 14.1.7	Result of Sensitivity Analysis
Table 14.1.8	IRR by Project
Table 14.2.1	Fund Allocation by Year
Table 14.3.1	Other Quantified Benefit
Table 14.4.1	Comparison of Environment Impact



## ANNEX B. List of Figures

Figure 1.1	Study Area
Figure 1.2	Study Organization
Figure 1.3	Study Organization Members
Figure 2.2.1	Present Land Use (Scale: 1/50,000)
Figure 2.2.2	Present Land Use of the Central Area
Figure 3.1.1	Cordon Line and Screen Line Survey Location
Figure 3.1.2	Data Processing for PT Data
Figure 3.2.1	Outline of Person Trips
Figure 3.2.2	Composition of Trip Purpose
Figure 3.2.3	Trip Composition by Mode
Figure 3.3.1	Trip Production by Sex and Age Group
Figure 3.3.2	Trip Production by Work Status
Figure 3.3.3	Trip Production by Industry
Figure 3.3.4	Trip Production by Income Level
Figure 3.3.5	Trip Production Rate by Car Owning
Figure 3.4.1	Trip Generation and Attraction by Trip Purpose
Figure 3.4.2	Trip Generation by Mode
Figure 3.4.3	Number of Trips by Departure or Arrival Time
Figure 3.5.1	Desired Line of All Purposes
Figure 3.5.2	Desired Line of "to work" Purpose Trip
Figure 3.5.3	Desired Line of "to school" Purpose Trip
Figure 3.5.4	Desired Line of Other Purposes' Trip
Figure 3.5.5	Desired Line of "to home" Purpose Trip
Figure 3.6.1	Modal Split by Purpose
Figure 3.6.2	Desired Line of Trips by Passenger Car
Figure 3.6.3	Desired Line of Trips by Bus
Figure 3.6.4	Modal Split by Travel Time
Figure 3.6.5	Modal Split by Travel Distance
Figure 3.6.6	Modal Split by Car Owning
Figure 4.1.1	Existing Road Network
Figure 4.1.2	Typical Cross-Section (1)
Figure 4.1.3	Typical Cross-Section (2)
Figure 4.1.4	Planned Project Location Map
Figure 4.2.1	Daily Traffic Volume on Major Roads
Figure 4.2.2	Congestion Degree of Major Roads
Figure 4.3.1	Location Map of Traffic Problems
Figure 5.1.1	Registered Buses by Production Year
Figure 5.1.2	Registered Microbuses by Production Year
Figure 5.1.3	Urban Bus and Microbus Network
Figure 5.1.4	12 Hour Traffic Volume of Buses and Microbuses
Figure 5.1.5	Low Speed Sections of Surveyed Urban Buses and Microbuses
Figure 5.1.6	Location of Facilities at Bus and Microbus Stops
Figure 5.1.7	Heavily Congested Section of Surveyed Route
Figure 5.2.1	Estimated Flow of Extra-urban Buses
Figure 5.2.2	Heavily Congested Sections of Surveyed Extra-urban Buses
Figure 5.2.3	Low Speed Sections of Surveyed Extra-urban Buses
Figure 5.3.1	Production Years of Samples of Taxis
Figure 5.4.1	Cargo and Passenger Volume of FEGUA in Recent Years
Figure 5.4.2	FEGUA Route

Figure 6.1.1	Signalized Intersections in Guatemala City
Figure 6.1.2	Traffic Accidents in Guatemala City (1989)
Figure 6.1.3	Parking Demand by Type of Parking by Time
Figure 6.1.4	Parking Demand by Purpose by Time
Figure 6.1.5	Parking Demand by Purpose by Zone
Figure 6.1.6	One-way Traffic System in Guatemala
Figure 7.2.1	Urban Development Pattern (Corridor Pattern)
Figure 7.2.2	Urban Development Pattern (Polycentric Pattern)
Figure 7.3.1	Future Land Use in 2010
Figure 8.1.1	Model Development Process
Figure 8.1.2	Traffic Demand Forecast Procedure
Figure 8.2.1	Model for Car Ownership
Figure 8.2.2	Comparison of Person Trips by car Ownership
Figure 8.3.1	Growth of Generation by Postal Zone
Figure 8.4.1	Principal Person Trip Flow
Figure 8.4.2	Desire Line of "to work" Trip in 2010
Figure 8.4.3	Desire Line of "to school" Trip in 2010
Figure 8.4.4	Desire Line of Other Purposes' Trip in 2010
Figure 8.4.5	Desire Line of "to home" Trip in 2010
Figure 8.5.1	Reference of Modes
Figure 8.5.2	Binary Choice Structure
Figure 8.5.3	Present Modal Share of Walking Trips
Figure 8.5.4	Modal Split Curve for Walking Trips
Figure 8.5.5	Modal Split Curve for Private Car and Public Transport
Figure 8.5.6	Comparison of Modal Share
Figure 8.5.7	Modal Share by Direction
Figure 8.6.1	Traffic Assignment Procedure
Figure 8.6.2	Basic Idea of QV Curve
Figure 8.6.3	Traffic Assignment on Spider Network
Figure 8.6.4	Traffic Assignment of "Do-Nothing" Case
Figure 9.1.1	Congestion Degree on the Road Network
Figure 9.3.1	Formation of Alternative Plan
Figure 9.3.2	Combination of Six Alternative Plans
Figure 9.3.3	Alternative Plan A
Figure 9.3.4	Alternative Plan B
Figure 9.3.5	Alternative Plan C
Figure 9.3.6	Alternative Plan D
Figure 9.3.7	Alternative Plan E
Figure 9.3.8	Alternative Plan F
Figure 9.4.1	Road Network for Traffic Assignment
Figure 9.4.2	Road Section of Project
Figure 9.4.3	Project Section of Public Transport
Figure 9.4.4	Road Section for Traffic Volume Analysis
Figure 9.4.5	Traffic Flow (Traffic Assignment Result) (1)
Figure 9.4.6	Traffic Flow (Traffic Assignment Result) (2)
Figure 9.4.7	Traffic Flow (Traffic Assignment Result) (3)
Figure 9.5.1	Sketch of Comparison of Alternative Plans
Figure 10.1.1	Relationship between Problems and Solution
Figure 10.1.2	Function and Characteristics of Road
Figure 10.1.3	Relation of Road Function to Characteristics of Road Traffic

Figure 10.1.4	Road Network System Configuration
Figure 10.1.5	Criteria of Road Function
Figure 10.1.6	Cross-Section of Urban Expressway
Figure 10.1.7	Cross-Section of Principal Arterial Road
Figure 10.1.8	Cross-Section of Minor Arterial Road
Figure 10.1.9	Future Road Network Configuration (2010)
Figure 10.1.10	Future Traffic Volume on Major Road (2010)
Figure 10.1.11	Location of Planned Roads
Figure 10.1.12	Outer Ring Road Development Project
Figure 10.1.13	Outer Ring Road Development Project
Figure 10.1.14	Middle Ring Road Development Project
Figure 10.1.15	East-West Corridor Development Project
Figure 10.1.16	Periferico Tramo Development Project
Figure 10.1.17	Inner Ring Road Development Project
Figure 10.1.18	General Plan of Inner Ring Road
Figure 10.1.19	General View of Inner Ring Road
Figure 10.1.20	CA-9 (South) Widening Project
Figure 10.1.21	CA-1 (East) Widening Project
Figure 10.1.22	Avenida Hincapie Widening Project
Figure 10.1.23	Avenida Petapa Widening Project
Figure 10.1.24	13 AV. Widening Project
Figure 10.1.25	6 Av. Widening Project
Figure 10.1.26	15 Avenida Widening Project
Figure 10.1.27	13 Avenida Widening Project
Figure 10.1.28	Boulevard Sur Widening Project
Figure 10.1.29	Concept Plan of Collector and Local Road Network
Figure 10.2.1	Location of Intersection Improvement Sites
Figure 10.2.2	Perspective View of Continuous Underpass at Obelisco and Blvd. Liberación
Figure 10.2.3	Conceptual Plan of Continuous Underpass at Obelisco and Blvd. Liberación
Figure 11.1.1	Integrated Zones of Public Transport Person Trips
Figure 11.2.1	Alternative Location Patterns of Extra-urban Bus Terminals
Figure 11.2.2	Alternative Patterns of Key Route Bus Network in CBD
Figure 11.2.3	Ordinary Bus Network Pattern at CBD
Figure 11.2.4	Busway and Bus Lane Network
Figure 11.2.5	Examples of Busways
Figure 11.2.6	Examples of Bus Lanes
Figure 11.2.7	Bus Routes in 2010
Figure 11.3.1	Example of Bus Stop
Figure 11.3.2	Conceptual Plan of Zona 1 Bus Center
Figure 11.3.3	Conceptual Plan of Zona 4 Bus Center
Figure 11.3.4	Conceptual Plan of Extra-urban Bus Terminal
Figure 11.3.5	Conceptual Plan of Bus Inspection Center and Maintenance
Figure 11.5.1	Example of Fare Zones
Figure 11.6.1	Implementation Schedule of Public Transport Projects
Figure 11.7.1	Short Term Plan of Key Route Buses
Figure 11.7.2	Short Term Plan of Ordinary Buses
Figure 11.7.3	Short Term Plan of Bus Lanes
Figure 11.8.1	Conceptual Plan of Urban Railway Routes and Stations
Figure 12.2.1	Proposed Typical Cross Section of 6a and 7a Ave.
Figure 12.2.2	Improvement Plan of 6a and 7a Ave.
Figure 12.2.3	Perspective View of 6a and 7a Ave. Improvement

Figure 12.2.4	Traffic Control System Improvement in the "Centro" Area
Figure 12.2.5	Traffic Control System Improvement Location
Figure 12.2.6	Traffic Control System Improvement on Major Radial Roads
Figure 12.2.7	Conceptual Plan of Traffic Safety Park
Figure 12.3.1	Flow of Parking Demand Forecast
Figure 12.3.2	Market of Off-street Parking and Parking Control
Figure 12.3.3	Parking Control Plan
Figure 12.3.4	Depiction of Streets in Centro Area
Figure 12.3.5	Perspective of 6a Avenida (Bus Priority Street)
Figure 12.3.6	Perspective the Mall on 12 Calle
Figure 12.3.7	Perspective the Mall on 6"A" Avenida
Figure 12.3.8	Traffic Management Plan in the Centro Area
Figure 12.3.9	Location of Projects
Figure 12.3.10	Location of Public Parking to be Constructed
Figure 13.1.1	Location Map of Projects
Figure 13.2.1	Implementation Schedule
Figure 15.1	Organization Chart of Metropolitan Transport Commission

## ANNEX C. Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
Av.	(Avenida) Avenue
BANVI	(Banco de Vivienda) Housing Bank
B/C	Cost Benefit Ratio
CAMINOS	General Bureau of Highway
CBD	Central Business District
CENMA	"Central de Mayoreo" Project
Cile	(Calle) Street
DR	Department Road
D/D	Detail Design
EIRR	Economic Internal Rate of Return
ESTUAM	(Estudio Transporte Urbano de Area Metropolitana) Transport Study of Metropolitan Area
E/S	Engineering and Supervision
FEGUA	(Ferrocarriles de Guatemala) Guatemala Railway
FIRR	Financial Internal Rate of Return
F/S	Feasibility Study
GDP	Gross Domestic Product
GMA	Guatemala Metropolitan Area
GRP	Gross Regional Product
HCM	Highway Capacity Manual
HDQ	Headquarter
hr	hour
JICA	Japan International Cooperation Agency
MOC	Ministry of Construction
NPTD	Traffic Department of National Police
NPV	Net Present Value
NR	National Road
OD	Origin and Destination
PCU	Passenger Car Unit
PT	Person Trip
Q	(Quetzal) Monetary Unit in Guatemala
SER	Shadow Exchange Rate
UNIDO	United Nations Industrial Development Organization
USAC	University of San Carlos
veh	vehicle
VOC	Vehicle Operating Cost
VTR	Video Tape Recorder

**ANNEX D. OD Tables**

**D.0. Zoning System**

- D.0.1 Zone Reference Table
- D.0.2 Traffic Zone Map

**D.1. Present OD Tables in 1990  
(Results of Person Trip Survey)**

- D.1.1 All Mode Trips with All Purposes
- D.1.2 Walk & Motorcycle Trips with All Purposes
- D.1.3 Passenger Car Trips with All Purposes
- D.1.4 Public Transport Trips with All Purposes
- D.1.5 All Mode Trips with "to Work" Purpose
- D.1.6 All Mode Trips with "to School" Purpose
- D.1.7 All Mode Trips with "to Home" Purpose
- D.1.8 All Mode Trips with Other Purposes

**D.2. Future OD Tables in 2010  
(OD Tables Estimated by JICA Team)**

- D.2.1 All Mode Trips with All Purposes
- D.2.2 Walk & Motorcycle Trips with All Purposes
- D.2.3 Passenger Car Trips with All Purposes
- D.2.4 Public Transport Trips with All Purposes

Table D.0.1 Zone Reference Table

Zone Type		
Traffic Zone for Demand Forecast	Postal Zone (Zona/ Municipality)	Integrated Zone for Land Use
1	1	1
2		1
3		1
4		1
5	2	1
6	3	1
7		1
8	4	1
9	5	1
10		1
11	6	1
12		1
13		1
14	7	1
15		1
16		1
17	8	1
18	9	1
19		1
20	10	1
21		1
22	11	1
23		1
24	12	1
25		1
26	13	1
27	14	1
28	15	1
29		1
30	16	2
31	17	2
32	18	2
33		2
34	19	3
35	21	1
36	24	2
37	25	2
38	Mixco	3
39		3
40		3
41		3
42		3
43		3
44	V.Nueva	4
45		4
46		4
47		4
48		4
49	Petapa	5
50	Amatitlan	4
51		4
52	V.Canales	5
53		5
54	Sta.C.Pinula	6
55		6
56	San Jose Pinula	6
57	Fraijanes	6
58	Chinautla	1

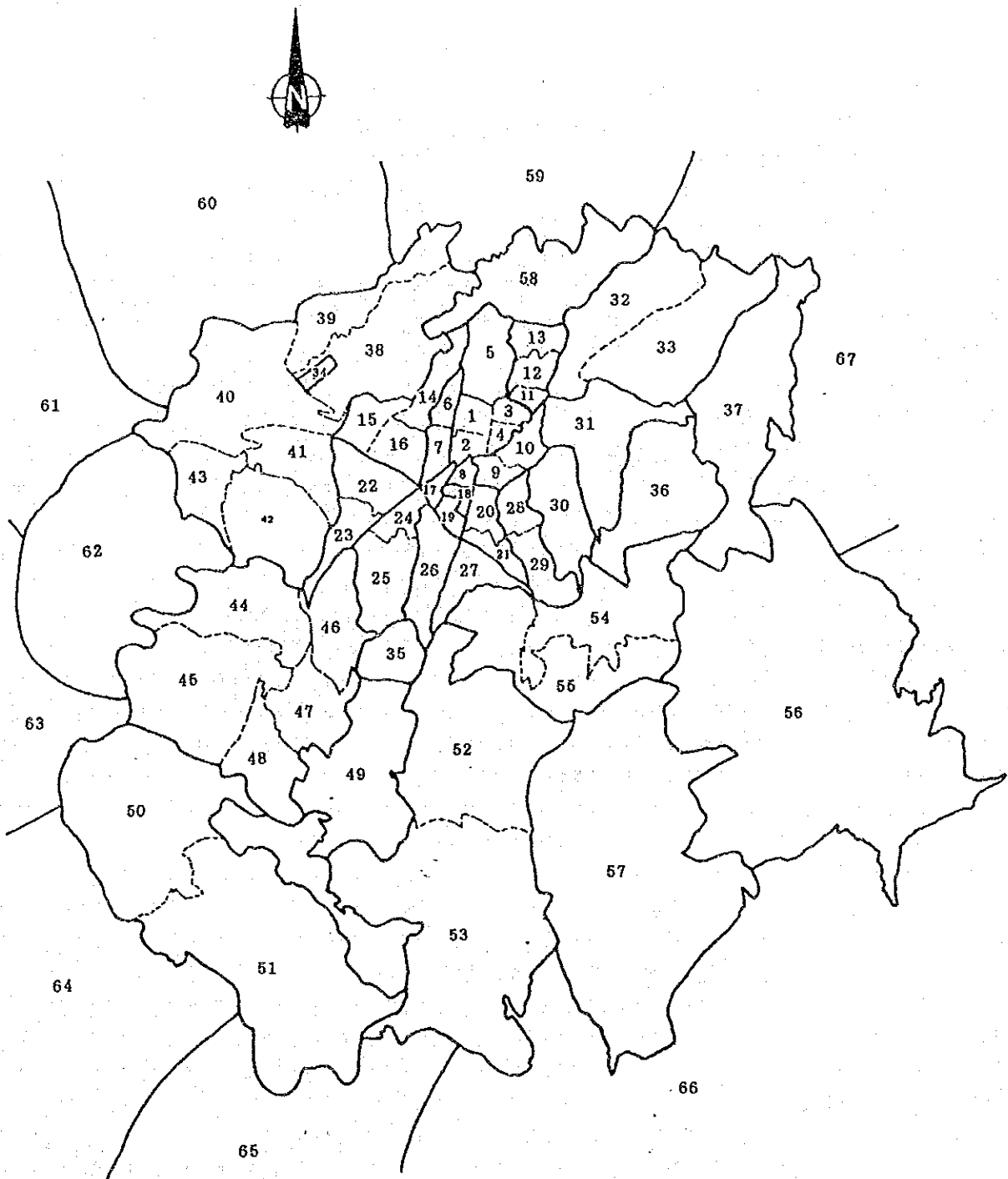


Figure D.0.2 Traffic Zone Map















Figure D.1.4 Public Transport Trips with All Purposes

(Unit: Person Trips/Day)

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37					
1	6057	4060	1318	1865	6617	1308	5553	1262	2574	10753	4265	6944	3841	7369	1331	6255	2710	772	696	700	421	4274	657	4446	4730	1847	261	57	338	419	2524	3414	19804	4031	7614	1263	376					
2	4682	4417	2044	1351	3021	1106	2790	921	1714	3313	1337	3912	317	7647	1038	4099	963	335	736	782	236	2015	521	4511	5953	1079	487	211	80	403	1241	1658	11007	1079	9871	163	0					
3	1271	1877	450	343	630	176	206	369	419	208	350	964	170	885	132	445	217	129	125	146	30	160	61	329	180	253	1902	330	40	34	0	253	331	1572	289	289	104	541				
4	2042	1484	369	298	574	92	270	340	433	978	807	1469	465	344	214	598	271	180	518	177	192	180	230	30	40	175	398	1137	359	60	71	0	113	132	1154	2938	447	558	96	31		
5	7655	3517	599	608	3003	180	558	596	822	1162	580	2209	1240	734	479	510	543	330	549	1163	38	444	175	398	1137	359	60	71	0	78	81	147	450	1376	210	0	159	183	0			
6	1138	1394	147	152	131	319	186	313	138	290	102	98	43	60	91	208	107	268	302	207	0	230	132	227	227	573	256	167	166	122	293	89	132	563	289	479	0	0	0			
7	5630	2676	235	270	283	175	2185	494	164	413	202	308	46	851	276	800	347	334	654	280	42	1712	154	1145	3270	601	184	166	122	293	89	132	563	289	479	0	0	0	0			
8	1388	700	399	229	340	294	402	129	517	4329	543	2330	726	5399	432	2137	429	938	110	0	445	371	96	1038	1720	914	384	39	79	152	1533	300	2038	1086	1546	212	288	0				
9	2783	1832	221	253	906	138	252	500	1073	1649	78	152	81	250	304	599	124	538	641	1038	224	527	94	769	877	429	1814	384	39	79	152	1533	300	2038	1086	1546	212	288	0			
10	18255	3463	200	1010	1140	321	564	4724	2099	10303	457	919	116	625	199	488	88	1134	633	1063	1023	197	380	1934	1675	84	54	135	374	683	283	597	282	359	0	25	0	0	0			
11	4431	1301	470	867	1513	102	242	519	118	390	1951	798	102	315	170	181	200	350	238	0	207	0	0	1127	370	31	40	40	147	351	1152	4500	182	524	2314	1197	0	0	0			
12	6750	3653	1002	1161	2269	98	270	2121	152	750	937	4966	158	526	271	62	338	279	152	152	163	487	352	260	1308	610	62	0	78	81	147	450	1376	210	0	159	183	0	0			
13	3431	317	170	607	1187	88	46	936	160	116	123	963	1365	0	221	86	43	274	507	547	85	43	227	135	811	457	0	46	92	0	135	210	35	0	67	106	0	0	0			
14	7989	7462	905	472	968	137	842	4726	250	347	385	158	0	15365	851	2897	1378	903	1968	479	445	3403	504	360	3449	682	78	0	252	116	129	167	118	734	236	0	0	0	0			
15	3314	922	132	214	322	127	322	453	150	225	268	372	178	1055	1312	822	433	265	440	253	64	1090	86	373	1145	304	186	144	147	72	0	235	492	359	567	0	0	0	0			
16	4436	4356	445	714	474	206	930	2065	467	414	128	250	88	2978	894	9443	1285	922	952	518	33	2192	388	704	5253	1532	170	125	170	176	172	96	442	1250	864	0	0	0	0			
17	2903	1034	261	251	590	153	428	513	102	296	209	225	43	1288	421	1479	390	41	165	33	164	277	563	1393	527	230	0	62	38	0	141	607	282	1365	43	0	0	0	0			
18	680	377	129	170	296	238	438	74	307	1008	253	114	274	860	279	906	20	1040	136	0	31	162	115	812	427	246	273	0	80	66	116	725	455	1247	0	67	0	0	0			
19	613	670	125	510	591	302	654	137	347	670	404	429	554	1806	467	1038	264	158	388	87	130	1188	0	1363	864	374	391	39	204	34	0	94	919	308	1175	49	152	0	0			
20	637	880	194	158	648	207	282	0	814	1445	200	1943	288	610	457	817	264	1382	328	248	360	588	229	903	386	1179	1358	4032	428	165	40	92	61	100	738	348	1385	0	67	0		
21	438	437	0	30	287	90	164	243	221	84	31	31	31	39	108	168	155	243	370	427	370	427	370	427	370	427	370	427	370	427	370	427	370	427	370	427	370	427	370	427	370	427
22	3000	2348	130	192	478	309	1670	979	616	748	159	525	43	2920	909	2711	804	244	1092	563	301	6704	343	1082	3384	597	230	0	0	215	51	145	1025	1256	2035	0	0	0	0	0		
23	708	485	61	217	322	132	194	142	64	139	0	358	227	465	130	490	264	116	0	58	0	336	1266	286	301	531	180	104	40	0	155	85	596	214	871	0	76	0	0	0		
24	3763	3556	287	253	256	154	1475	959	171	411	0	242	135	471	415	658	605	815	992	465	403	3578	2193	5709	1077	261	165	181	77	188	211	407	147	2036	0	0	0	0	0	0		
25	2149	3160	1028	1209	1019	629	3431	453	1448	2956	1346	592	420	937	800	534	397	149	40	253	3569	401	6984	3688	958	122	0	252	160	127	910	448	1242	17320	0	62	0	0	0			
26	1788	840	35	537	349	238	532	782	276	1443	288	610	457	817	264	1382	328	248	360	588	229	903	386	1179	1358	4032	428	165	40	92	61	100	738	348	1385	0	67	0	0	0		
27	438	437	0	30	287	90	164	243	221	84	31	31	31	39	108	168	155	243	370	427	370	427	370	427	370	427	370	427	370	427	370	427	370	427	370	427	370	427	370	427		
28	97	128	39	40	191	71	166	188	39	81	40	40	46	0	144	169	20	40	80	192	0	104	165	0	104	165	0	104	165	0	104	165	0	104	165	0	104	165	0	104	165	
29	338	80	0	34	401	0	113	0	124	227	36	303	40	38	0	72	176	16	80	0	66	65	61	132	61	108	280	251	169	62	202	66	0	7875	279	528	61	0	49	0		
30	250	224	46	0	113	0	124	227	36	303	40	38	0	72	176	16	80	0	66	65	61	132	61	108	280	251	169	62	202	66	0	43	55	65	45	308	23	67	0	0	0	0
31	1939	1635	188	177	351	0	90	1594	530	503	3639	147	135	129	0	172	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
32	1269	1479	442	471	983	136	107	362	255	214	1088	409	228	207	251	99	110	105	86	89	37	276	47	163	558	81	37	35	45	12	279	973	688	63	101	57	140	0	0			
33	16300	10361	1410	1855	3461	375	534	1936	342	1086	4365	1474	34	238	583	517	620	932	1050	1390	132	1089	636	504	3511	853	74	34	248	154	488	726	19007	267	143	18	86	0	0	0		
34	3725	1122	177	278	447	223	262	1258	196	215	192	260	0	553	985	1800	262	473	305	243	63	1123	214	266	1061	310	84	23	36	124	48	208	2486	601	0	0	0	0	0	0		
35	7469	10045	634	368	634	134	546	2117	304	233	411	0	67	190	701	800	1365	1422	1386	701	304	2188	905	2094	13793	1725	134	232	67	128	0	101	63	694	7412	0	0	0	0	0	0	
36	1105	212	256	159	96	0	0	259	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	
37	319	0	116	388	103	67	0	361	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	
38	12313	5588	262	438	860	741	999	3523	527	52	81																															







Figure D.1.5 All Mode Trips with "to Work" Purpose  
(Unit: Person Trips/Day)

ZONE	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	TOTAL															
1	44	0	0	30	15	0	10	15	0	153	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	30	0	0	0	10546															
2	33	47	101	28	142	0	0	0	0	164	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	63	17	0	17	65	11256															
3	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	82	0	0	0	0	0	5751															
4	0	0	0	0	34	0	0	0	0	0	0	0	34	0	0	0	0	0	0	0	0	0	0	0	39	39	5579	0	0	0	16206															
5	28	0	0	50	100	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0	138	0	162	50	300	0	44	0	16206															
6	0	0	0	67	62	0	0	0	0	42	0	0	65	0	133	0	0	0	0	0	0	0	0	40	42	134	0	0	0	0	0	17059														
7	40	0	0	42	47	0	0	0	0	29	0	0	0	0	0	0	0	0	0	0	230	0	0	0	0	0	0	0	0	0	0	0	17059													
8	0	0	88	219	0	0	0	0	0	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10317												
9	176	0	0	0	0	0	0	0	0	0	0	0	29	0	0	0	0	83	44	0	0	0	0	0	27	32	0	0	0	0	0	0	10317													
10	182	0	0	54	231	0	0	0	0	57	0	0	27	32	91	0	0	123	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23730												
11	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23730												
12	38	0	0	38	0	0	0	0	0	70	0	0	44	0	38	0	0	38	38	0	0	0	0	0	0	38	0	0	0	0	0	0	0	0	6850											
13	0	0	0	43	0	0	0	0	0	0	0	0	0	0	0	0	0	142	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14551											
14	773	0	0	315	36	0	124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	0	0	0	0	0	0	0	11081												
15	240	0	150	36	36	0	78	0	0	126	0	0	42	0	0	0	35	0	0	0	36	0	0	0	0	0	0	0	0	0	0	0	0	0	27907											
16	743	42	468	143	95	0	44	62	29	92	0	0	44	62	92	0	0	0	0	0	0	0	0	0	0	42	51	364	0	0	0	0	0	10359												
17	21	21	65	21	23	0	0	0	0	65	0	0	0	0	133	0	20	0	0	0	0	0	0	0	42	48	141	0	0	0	0	0	0	35284												
18	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	6942												
19	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	986											
20	26	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	1221											
21	0	38	0	69	0	0	72	0	0	0	0	0	0	0	0	24	26	0	0	0	0	0	0	0	0	25	52	0	0	0	0	0	0	26	5236											
22	43	0	205	141	504	0	0	87	0	0	0	0	54	0	30	168	0	0	0	0	0	0	0	0	0	276	0	0	0	0	0	0	0	0	335	10033										
23	0	0	0	0	30	0	30	0	18	0	0	0	60	30	0	0	60	0	0	0	0	0	0	0	0	47	209	0	0	0	0	0	0	0	76	2723										
24	225	0	91	0	0	0	42	123	0	77	0	48	43	0	0	48	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	6027									
25	0	0	75	69	0	0	96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72	0	0	0	0	0	0	0	0	29882										
26	40	0	36	0	47	0	47	0	47	41	0	0	217	0	651	47	0	0	0	0	0	0	0	0	0	0	343	745	0	47	87	22561	0	0	7727											
27	0	0	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	70	0	0	0	0	0	0	0	420	6876									
28	0	0	0	0	0	0	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	0	0	0	0	0	0	0	420	6876									
29	0	0	0	0	0	0	0	0	0	245	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	47	5275								
30	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	1084								
31	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	9395								
32	31	0	0	0	0	0	0	0	0	14	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	77	0	9395							
33	170	0	263	94	18	0	0	0	0	38	38	0	36	36	0	0	0	0	0	0	0	114	38	18	38	0	0	45	0	0	0	0	0	0	0	0	0	56	112	41642						
34	942	67	395	67	23	0	23	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	123	10213						
35	170	0	237	0	0	0	0	0	0	47	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	36	182	33995					
36	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	2357						
37	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	1682						
38	2975	87	532	0	88	0	102	0	0	123	0	0	190	0	0	0	176	0	0	0	0	0	0	0	0	88	190	0	0	0	0	0	0	0	0	0	0	0	0	87	204	45143				
39	1478	4624	1338	29	0	0	124	0	0	0	0	0	278	0	102	88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88	0	67836				
40	294	211	4025	504	52	100	50	0	18	80	0	0	129	26	25	25	29	0	0	0	0	0	0	0	0	0	0	105	274	55	0	0	0	0	0	0	0	0	25	79	28417					
41	151	0	450	1465	78	0	0	0	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	182	0	39	0	0	0	0	0	0	0	0	0	0	0	0	14789				
42	23	23	379	46	38	0	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	123	105	283	0	0	0	0	0	0	0	0	0	0	0	0	155	8330			
43	49	0	0	0	0	129	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	1669				
44	0	0	208	0	125	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	210	0	1669		
45	0	0	0	0	0	250	1527	0	0	0	0	0	0	0	0	0	0	0	0	0	125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	113	0	8225		
46	0	0	102	124	82	0	0	0	0	3455	0	48	24	284	0	15	0	0	0	0	0	0	0	0	0	31	54	287	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	112	7186	
47	0	0	82	0	0	0	222	41	7254	45	1227	204	0	0	41	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	31932
48	0	0	0	0	35	73	0	210	0	36	58	674	180	22	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	2985
49	0	0	0	0	0	0	0	0	0	152	0	1732	94	105	0	0	0	0	0																											









Figure D.1.8 All Mode Trips with Other Purposes

(Unit: Person Trips/Day)

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37		
1)	6504	2178	38	357	562	383	441	1683	165	714	114	493	51	361	424	311	362	384	748	841	312	797	533	0	660	301	87	41	72	0	202	114	456	382	43	0	0	0	
2)	2373	4018	206	62	733	87	784	910	84	244	272	801	0	169	407	274	251	324	351	253	576	379	135	233	360	535	0	0	31	15	230	220	641	280	0	0	0	0	
3)	1021	1020	500	143	360	259	0	165	261	152	122	443	64	0	0	35	59	166	136	54	0	30	0	72	60	76	0	0	47	0	51	18	103	0	0	0	0		
4)	1863	1123	224	1082	39	11	61	107	180	196	34	222	0	0	39	34	107	44	253	0	194	78	0	194	78	0	0	39	0	747	187	0	0	0	0	0	0		
5)	4119	1803	393	227	1659	44	85	207	168	50	92	1307	0	38	81	166	169	94	158	577	44	43	0	0	165	96	36	38	81	0	209	119	103	476	0	0	0	0	
6)	1828	987	29	64	230	1219	24	166	45	63	36	29	0	0	54	124	247	495	185	60	0	83	0	90	268	55	42	0	0	42	0	0	0	18	345	0	0	0	
7)	1972	1196	42	40	141	234	1455	198	250	124	127	47	0	0	40	47	167	142	206	224	0	546	0	90	268	55	42	0	0	42	0	0	0	18	345	0	0	0	
8)	1170	273	47	0	0	42	41	1208	234	255	31	174	0	0	0	76	498	128	185	131	31	478	23	43	275	68	36	90	36	0	0	54	174	36	92	0	0	0	
9)	1554	1102	82	161	127	14	0	633	2422	315	88	45	38	0	165	133	44	192	256	193	1	180	0	0	0	0	0	44	127	44	221	64	50	115	0	0	0	0	
10)	6217	1543	27	246	321	59	126	3096	1175	6309	162	298	0	182	235	145	32	499	198	484	64	984	82	324	177	298	0	32	0	0	31	200	32	113	0	0	0	0	
11)	1773	685	211	440	87	0	101	313	0	221	1390	188	0	0	76	945	0	108	440	2377	213	0	127	0	0	0	0	32	0	0	81	126	383	18	120	0	0	0	67
12)	2586	1461	190	274	278	0	0	76	945	0	108	440	2377	213	0	76	945	0	108	440	2377	213	0	127	0	0	0	32	0	0	81	126	383	18	120	0	0	0	67
13)	1336	50	0	92	52	0	46	244	0	46	0	281	213	0	0	0	43	51	53	39	0	43	0	0	89	53	0	0	0	0	0	32	32	32	88	0	0	0	0
14)	3762	3831	340	129	40	77	40	2494	39	0	0	80	0	2588	120	494	395	79	329	160	0	1801	40	127	58	120	0	0	0	0	0	0	35	0	0	0	0	0	0
15)	1563	109	0	64	42	90	31	611	0	126	36	72	42	0	207	108	9935	607	632	417	663	51	2229	51	146	556	522	0	48	51	0	99	15	0	701	55	0	0	0
16)	3596	2438	83	281	551	92	302	1558	241	92	44	44	0	0	108	9935	607	632	417	663	51	2229	51	146	556	522	0	48	51	0	99	15	0	701	55	0	0	0	
17)	1742	886	44	54	212	45	124	1002	88	114	68	14	0	0	21	216	1027	99	683	180	23	221	290	75	122	162	90	0	0	0	0	24	38	20	0	0	0	0	
18)	993	298	0	34	10	4	0	299	0	116	44	0	0	0	47	29	81	149	52	220	589	150	106	647	79	45	118	169	105	0	0	18	0	0	35	0	0	0	
19)	1093	456	0	110	0	0	64	226	0	26	0	0	0	0	68	96	0	231	868	1584	104	100	56	0	127	193	105	26	196	0	0	14	0	47	0	31	0	0	
20)	1096	72	38	88	418	0	593	112	68	168	0	0	0	0	71	268	377	605	1901	92	26	129	150	198	186	102	232	0	0	0	0	15	134	209	0	0	0	0	
21)	2011	2221	0	54	79	124	201	975	368	152	29	140	0	50	310	1183	621	158	1278	840	748	6999	430	29	569	393	54	252	0	36	54	16	15	0	0	0	0	0	
22)	623	249	0	130	65	0	0	95	100	123	0	35	168	35	264	96	135	65	110	123	62	0	1075	0	0	0	0	0	0	0	0	0	35	0	42	0	0	0	0
23)	1517	1042	0	0	0	75	213	547	86	31	0	173	0	0	172	144	140	42	322	180	48	478	152	536	792	244	50	0	0	0	0	179	0	42	0	0	0	0	
24)	1208	805	0	267	0	40	72	182	44	0	48	0	0	0	185	117	29	300	175	95	321	432	51	1392	149	0	0	0	24	0	0	60	44	47	0	44	0	0	0
25)	1549	1921	0	273	140	46	72	153	0	196	0	185	0	0	474	235	89	309	692	545	341	1290	119	275	409	2634	89	47	0	0	0	47	0	44	0	0	0	0	
26)	459	269	0	70	0	0	70	397	192	106	0	0	0	0	35	74	0	100	244	1467	470	555	133	0	35	0	458	1166	70	72	0	24	24	0	51	0	0	0	
27)	459	269	0	70	0	0	70	397	192	106	0	0	0	0	35	74	0	100	244	1467	470	555	133	0	35	0	458	1166	70	72	0	24	24	0	51	0	0	0	
28)	120	264	0	85	0	0	47	92	94	47	0	0	0	0	112	0	51	0	174	186	233	0	0	0	0	0	94	0	597	188	0	0	0	0	0	0	0	0	
29)	680	90	0	282	137	47	42	216	126	186	47	0	0	0	149	39	69	188	227	182	40	47	0	0	0	0	311	0	45	1661	47	0	47	39	47	0	0	0	0
30)	180	34	0	0	32	0	47	227	44	37	0	0	0	0	0	0	0	0	48	0	0	0	0	0	0	0	0	89	255	0	0	0	0	0	36	0	0	0	
31)	1011	532	45	0	290	54	0	550	56	363	3038	143	0	0	0	0	0	0	77	0	0	0	0	0	0	0	71	0	0	0	699	25	60	61	0	0	0	0	
32)	1208	961	54	68	301	14	0	105	70	45	781	110	0	0	372	51	30	44	110	0	111	0	0	0	62	141	0	35	0	0	1142	39	0	0	0	0	0	0	
33)	5357	3937	376	60	545	137	212	823	128	303	2469	648	0	18	153	174	75	155	149	18	39	190	38	18	414	113	38	0	77	0	97	384	8183	296	0	0	259		
34)	2046	307	68	21	65	63	56	660	0	116	21	67	0	68	152	347	109	128	134	147	21	371	738	0	42	86	94	0	23	0	0	0	0	0	0	0	0	0	
35)	2382	3626	98	67	36	0	67	391	0	108	0	0	0	0	103	108	67	206	103	0	67	0	412	104	412	970	158	67	0	0	0	0	0	0	0	0	0	0	
36)	106	212	0	0	0	0	0	269	0	0	2155	0	0	0	38	0	0	0	106	0	0	0	0	0	0	0	0	0	0	0	49	0	0	0	0	0	0	371	0
37)	98	0	0	116	189	103	67	174	0	0	849	67	0	0	88	437	895	655	68	275	0	105	889	0	87	88	491	0	0	0	0	0	0	0	0	0	0	195	
38)	4651	1891	175	88	296	375	669	999	87	481	0	0	0	0	292	0	292	68	468	0	0	176	0	0	658	88	0	102	0	0	0	0	0	0	0	0	0	87	
39)	2584	1018	0	86	565	102	556	176	0	0	0	292	0	26	410	464	229	229	101	288	26	897	56	103	571	963	26	109	26	0	0	0	0	0	0	0	0	0	
40)	2183	1045	109	79	58	55	81	1432	106	143	0	23	0	26	410	464	229	229	101	288	26	897	56	103	571	963	26	109	26	0	0	0	0	0	0	0	0	0	
41)	799	78	0	0	0	0	231	181	153	0	44	0	0	88	106	183	112	73	88	82	44	530	0	39	44	38	0	83	0	0	0	0	0	0	0	0	0	0	26
42)	188	223	0	77	174	0	0	231	224	23	0	125	0	0	88	106	183	112	73	88	82	44	530	0	39	44	38	0	83	0	0	0	0	0	0	0	0	0	0
43)	84	0	0	0	0</																																		

Figure D.1.8 All Mode Trips with Other Purposes

(Unit: Person Trips/Day)

Table with 67 columns (labeled 38 to TOTAL) and 67 rows (labeled 1 to 67). Each cell contains a numerical value representing person trips per day for a specific zone and purpose.



Figure D.2.1 All Mode Trips with All Purposes

(Unit: Person Trips/Day)

1	15378	5401	2985	3543	13791	5224	5535	2850	3444	11711	3223	6586	3210	8463	4442	16174	2077	817	914	3238	2030	7441	2613	4250	3043	2395	1717	1000	1214	2275	7037	4367	17618	3093	4462	2316	412	36	37							
2	4257	9390	1931	2360	4939	1793	5119	1861	3398	7653	1499	8048	1427	746	523	8482	1674	752	438	4229	1227	1480	4829	4239	1237	1083	1977	4036	2562	9231	938	1176	715	227	10	27	15	27	27							
3	3698	1650	2366	502	1467	326	419	345	991	1195	1340	243	469	241	181	717	233	361	716	159	239	325	234	296	388	296	388	414	1033	467	1968	298	469	475	285	51	27	27	27							
4	3271	2401	822	2823	1184	252	450	818	500	1235	1070	1239	520	383	390	590	282	202	368	428	485	802	845	456	1548	1084	233	296	388	414	1033	467	1968	298	469	475	285	51	27	27						
5	13688	4981	1519	1198	26912	176	1351	1919	1464	1036	1855	4114	1296	1761	510	1692	372	1057	1184	822	2055	861	782	358	1143	1022	1823	6404	3812	1108	2472	1062	294	108	2472	1062	294	108	2472	1062	294					
6	4374	2217	349	247	931	3042	453	779	238	402	230	1207	456	907	913	978	278	510	163	324	356	397	794	122	73	82	180	357	218	658	285	200	200	16	16	16	16	16	16	16						
7	5356	4253	220	367	1322	476	6643	1599	486	639	250	37	132	972	655	2027	120	721	911	605	933	624	532	1794	2895	701	331	187	1037	558	305	972	831	449	464	21	21	21	21	21	21					
8	2001	2660	566	589	2024	636	1079	2493	2463	4955	1173	1909	689	5865	1522	5535	1426	574	383	814	1783	628	503	1739	542	575	300	206	2739	942	1035	322	381	385	74	74	74	74	74	74						
9	3530	2333	247	620	1061	157	429	2025	4793	2930	482	400	151	367	790	897	444	754	834	1783	628	503	1739	542	575	300	206	2739	942	1035	322	381	385	74	74	74	74	74	74							
10	12749	6763	987	1503	1864	381	671	3802	3045	20643	1895	1264	310	654	495	1289	4391	1914	557	703	460	1125	248	587	802	406	651	276	1331	1294	1748	851	746	582	1788	4396	894	2141	915	938						
11	4652	1971	815	723	2172	200	254	644	495	1289	4391	1914	557	703	460	1125	248	587	802	406	651	276	1331	1294	1748	851	746	582	1788	4396	894	2141	915	938	1446	47	47	47	47	47	47					
12	6333	3010	959	755	3577	242	323	1536	486	1157	1913	6578	1412	362	591	832	359	467	532	915	586	914	1081	398	1445	1329	313	368	284	599	2891	1882	2682	417	442	763	45	45	45	45	45	45				
13	3466	1204	208	462	1285	84	112	728	174	256	397	1316	3640	75	439	239	164	250	339	490	204	280	376	194	2895	701	331	187	1037	558	305	972	831	449	464	21	21	21	21	21	21					
14	9472	6579	483	510	2837	119	1136	3948	372	600	592	345	61	28704	2129	4059	695	715	1194	698	1035	1244	803	3627	523	296	179	404	1333	512	955	1076	801	679	12	12	12	12	12	12						
15	3711	2330	398	1081	2028	711	2177	4214	777	1215	651	780	280	5656	5699	33920	2035	1726	2107	2326	1072	9539	2912	1652	1571	1554	444	344	484	2701	1356	1906	1124	453	57	57	57	57	57	57						
16	2479	1604	130	358	711	688	1158	1867	718	555	376	354	172	610	510	1574	869	1043	406	558	577	825	627	1860	707	700	969	530	373	496	773	338	1715	356	939	306	47	47	47	47	47	47				
17	1627	635	224	371	4263	571	513	909	1618	2195	577	640	964	837	1244	2298	796	587	1728	5770	2513	2168	1096	1743	1867	1747	1900	1383	1223	1487	1375	806	1838	507	815	442	64	64	64	64	64	64				
18	2105	3113	618	831	1174	504	1978	2610	1003	1398	626	775	397	2857	4404	9664	1753	1173	2560	2321	327	30204	3461	3794	1505	631	826	1780	2845	688	2613	1905	2722	789	75	75	75	75	75	75	75	75	75			
19	3644	2496	227	347	760	275	1547	2179	430	700	278	395	151	566	1202	2052	1264	193	2080	1514	1342	352	3345	10581	6069	1777	2242	382	383	676	1762	633	927	588	2004	521	35	35	35	35	35	35				
20	1438	1080	297	318	1389	152	427	1072	729	1107	614	528	234	882	840	1884	428	634	1895	1637	5055	1635	980	1211	1345	1528	3142	1509	1383	1223	1487	1375	806	1838	507	815	442	64	64	64	64	64	64			
21	2105	3113	618	831	1174	504	1978	2610	1003	1398	626	775	397	2857	4404	9664	1753	1173	2560	2321	327	30204	3461	3794	1505	631	826	1780	2845	688	2613	1905	2722	789	75	75	75	75	75	75	75	75	75			
22	3644	2496	227	347	760	275	1547	2179	430	700	278	395	151	566	1202	2052	1264	193	2080	1514	1342	352	3345	10581	6069	1777	2242	382	383	676	1762	633	927	588	2004	521	35	35	35	35	35	35	35	35		
23	2105	3113	618	831	1174	504	1978	2610	1003	1398	626	775	397	2857	4404	9664	1753	1173	2560	2321	327	30204	3461	3794	1505	631	826	1780	2845	688	2613	1905	2722	789	75	75	75	75	75	75	75	75	75			
24	3644	2496	227	347	760	275	1547	2179	430	700	278	395	151	566	1202	2052	1264	193	2080	1514	1342	352	3345	10581	6069	1777	2242	382	383	676	1762	633	927	588	2004	521	35	35	35	35	35	35	35	35		
25	2901	2177	1509	3491	692	3424	1398	2179	3212	1271	1768	660	3888	2336	9456	176	423	911	1433	1795	7861	8285	6141	22710	3129	1129	574	1093	1185	2952	968	5523	1532	14567	974	165	165	165	165	165	165	165	165	165		
26	2413	2934	173	888	826	232	814	2525	513	1685	711	1137	331	490	1699	2556	787	531	1343	1679	1866	3701	2061	2108	4828	1692	2927	587	744	736	901	766	1615	545	2564	453	50	50	50	50	50	50	50	50		
27	1438	1080	297	318	1389	152	427	1072	729	1107	614	528	234	882	840	1884	428	634	1895	1637	5055	1635	980	1211	1345	1528	3142	1509	1383	1223	1487	1375	806	1838	507	815	442	64	64	64	64	64	64	64	64	
28	2105	3113	618	831	1174	504	1978	2610	1003	1398	626	775	397	2857	4404	9664	1753	1173	2560	2321	327	30204	3461	3794	1505	631	826	1780	2845	688	2613	1905	2722	789	75	75	75	75	75	75	75	75	75	75		
29	3644	2496	227	347	760	275	1547	2179	430	700	278	395	151	566	1202	2052	1264	193	2080	1514	1342	352	3345	10581	6069	1777	2242	382	383	676	1762	633	927	588	2004	521	35	35	35	35	35	35	35	35	35	
30	2105	3113	618	831	1174	504	1978	2610	1003	1398	626	775	397	2857	4404	9664	1753	1173	2560	2321	327	30204	3461	3794	1505	631	826	1780	2845	688	2613	1905	2722	789	75	75	75	75	75	75	75	75	75	75		
31	3644	2496	227	347	760	275	1547	2179	430	700	278	395	151	566	1202	2052	1264	193	2080	1514	1342	352	3345	10581	6069	1777	2242	382	383	676	1762	633	927	588	2004	521	35	35	35	35	35	35	35	35	35	
32	2105	3113	618	831	1174	504	1978	2610	1003	1398	626	775	397	2857	4404	9664	1753	1173	2560	2321	327	30204	3461	3794	1505	631	826	1780	2845	688	2613	1905	2722	789	75	75	75	75	75	75	75	75	75	75		
33	3644	2496	227	347	760	275	1547	2179	430	700	278	395	151	566	1202	2052	1264	193	2080	1514	1342	352	3345	10581	6069	1777	2242	382	383	676	1762	633	927	588	2004	521	35	35	35	35	35	35	35	35	35	35
34	2105	3113	618	831	1174	504	1978	2610	1003	1398	626	775	397	2857	4404	9664	1753	1173	2560	2321	327	30204	3461	3794	1505	631	826	1780																		

Figure D.2.1 All Mode Trips with All Purposes

(Unit: Person Trips/Day)

ZONE	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	TOTAL	
1)	16191	21561	7238	4775	11082	989	1032	2205	3367	3678	563	4031	3329	265	2333	1080	3273	1180	630	516	5685	50	51	17	60	258	420	32	71	304	288766	
2)	7921	10453	3912	1902	6160	554	2223	597	5052	1507	423	1783	909	126	263	1765	1867	1782	1156	3392	31	49	0	4	0	35	145	242	20	5	25	29759
3)	564	700	391	274	484	51	198	268	413	307	64	247	158	16	263	378	355	177	159	49	1237	4	6	0	4	23	31	2	5	25	29759	
4)	651	2329	519	406	959	86	345	609	299	263	112	987	728	78	401	310	613	301	169	84	636	7	10	2	7	28	51	3	7	35	41711	
5)	2301	2183	1813	1537	4577	245	953	1851	522	741	359	1039	706	62	1298	557	3018	620	785	161	1833	19	30	7	20	97	153	12	31	127	122229	
6)	998	2659	382	515	325	44	530	409	886	153	81	213	177	17	271	288	376	117	715	151	251	4	7	0	5	21	31	4	7	23	32933	
7)	1269	2233	714	1504	4784	425	3319	874	3616	2057	298	1628	904	31	8090	1003	5183	1365	419	778	3359	19	33	8	25	103	175	15	28	103	122974	
8)	1029	1022	548	411	1856	86	1893	602	273	276	128	481	261	32	1213	376	1039	790	274	243	3	8	1	7	33	51	6	9	39	51674		
9)	1650	2154	935	2017	1183	127	459	1638	436	620	351	978	714	77	2658	1363	2544	1461	965	215	922	13	18	4	16	73	104	12	21	87	112489	
10)	1095	1341	572	384	571	74	249	523	206	251	160	403	300	32	513	440	1039	293	311	103	2008	9	11	3	8	35	34	5	10	50	59077	
11)	1308	1554	631	559	735	95	498	1024	379	386	201	563	445	52	767	732	1419	1082	511	121	1148	14	17	4	11	50	80	7	16	79	64466	
12)	315	171	208	212	112	26	66	675	51	144	109	255	236	23	409	532	675	120	330	143	458	8	9	1	6	21	36	4	8	33	27522	
13)	2930	537	948	990	379	59	919	1898	103	474	347	668	746	61	986	1433	1157	336	681	169	208	14	25	5	19	68	77	10	18	50	90077	
14)	8375	6088	2662	3528	4083	423	1197	2021	321	1243	297	1088	1057	79	1035	886	1080	524	669	153	945	11	36	6	30	106	154	11	20	84	96891	
15)	6639	2889	2662	3528	4083	364	1069	3023	2542	1858	774	2327	1162	119	1875	1708	2553	1434	868	269	582	13	34	3	34	131	186	14	29	104	167507	
16)	1998	1362	1002	1144	5848	154	888	333	635	407	193	671	243	35	1527	437	701	372	196	104	464	5	10	2	10	38	62	5	8	34	47464	
17)	1300	1911	1334	1042	1248	118	1907	526	452	464	227	705	294	35	1527	437	701	372	196	104	464	5	10	2	10	38	62	5	8	34	47464	
18)	2648	1967	1705	1188	3680	282	1146	631	1035	693	195	1280	418	67	875	433	1458	1119	149	159	869	7	16	4	16	68	118	9	17	70	71934	
19)	2167	1446	1643	1884	3682	284	1279	836	1246	797	178	1440	550	79	1074	578	1841	2019	258	157	615	5	15	4	16	78	133	10	21	87	78848	
20)	1257	1875	1949	1969	2046	194	860	1026	885	893	1307	813	5879	1525	429	178	1213	1525	284	1051	15	48	11	54	205	287	20	35	138	182426		
21)	4443	4004	4864	6400	10021	740	2188	6033	2058	1861	639	2417	1424	166	2354	1577	2488	2483	955	284	1051	15	48	11	54	205	287	20	35	138	182426	
22)	2130	841	2649	2928	8441	2051	2802	2871	3453	1384	400	1883	1483	100	1557	954	958	777	439	173	438	8	16	4	20	65	114	10	22	75	98496	
23)	1590	969	969	1277	7524	1039	5393	2897	10356	2570	793	5814	1350	258	3564	1599	2433	2684	540	475	1874	23	51	15	67	262	442	34	58	177	197258	
24)	4855	7448	5334	4032	1624	1039	5393	2897	10356	2570	793	5814	1350	258	3564	1599	2433	2684	540	475	1874	23	51	15	67	262	442	34	58	177	197258	
25)	1370	1232	1228	1186	5753	251	1884	2597	1558	1185	318	1809	1471	108	6026	1596	2648	1128	723	240	595	8	20	5	28	97	186	12	27	82	105039	
26)	913	1461	731	958	1894	143	665	1039	708	589	163	1073	372	59	1283	651	3089	1065	397	120	276	3	9	1	11	53	53	6	15	55	62281	
27)	499	367	239	197	1831	44	163	558	133	154	44	290	150	17	464	240	629	203	243	30	138	1	3	0	4	19	38	4	7	26	27450	
28)	863	856	570	3121	1123	104	453	830	386	1166	82	847	288	284	1102	479	2327	1332	491	352	239	3	6	2	8	42	83	7	16	73	43325	
29)	643	875	458	695	302	70	279	781	288	287	91	321	344	31	814	576	728	361	578	128	462	5	9	2	10	49	77	5	16	73	43325	
30)	1596	1918	1084	933	1364	154	637	2502	710	752	244	4853	977	102	1662	2405	2304	869	1705	225	1034	23	28	7	19	81	125	17	47	182	153077	
31)	1062	888	902	542	738	112	290	2228	218	395	284	537	602	142	702	3170	1793	458	1173	175	1221	28	27	7	19	81	125	17	47	182	153077	
32)	3162	2683	2106	1686	742	189	711	5927	557	1557	1443	2575	2854	252	4598	5032	8639	1784	4667	1145	3875	15	27	9	19	57	207	356	56	112	591	222284
33)	8147	5834	5581	2380	2185	370	742	1580	488	568	269	695	695	63	710	854	665	303	421	133	1350	16	49	8	31	93	128	9	15	60	87152	
34)	2864	967	1335	1425	2564	232	1644	8190	7498	4309	1814	6951	2615	260	7652	5351	3471	1584	1452	510	250	14	23	10	44	165	286	35	51	85	152808	
35)	278	121	172	269	129	21	78	1425	98	331	79	353	581	49	645	1469	3002	204	1584	119	62	7	12	3	12	42	86	6	24	111	36458	
36)	90	44	53	49	48	5	21	311	22	71	36	79	107	10	141	269	200	61	291	28	36	2	1	0	1	7	13	1	5	25	7279	
37)	92162	4630	6133	3098	1059	280	1615	5543	460	1079	699	1724	2682	146	2555	2846	1832	597	1708	357	695	39	80	20	58	195	265	29	50	150	227645	
38)	9750	23454	5239	2715	1206	427	1462	7793	447	1185	645	2103	2401	197	2886	4100	3293	478	1982	255	1024	52	191	35	107	309	313	33	46	123	180841	
39)	5697	4596	63178	7801	3834	2333	1241	7606	645	1492	1255	2225	2538	209	2880	3032	3131	378	343	253	175	129	7	16	6	39	126	254	18	32	73	112710
40)	2424	2925	7111	29341	8238	796	1623	3731	883	919	511	1369	1097	90	1448	1230	1484	496	518	161	521	10	32	9	15	129	246	45	30	55	147	155441
41)	918	669	6948	6434	6643	1842	5836	15284	538	2054	1416	2874	2571	272	4141	2393	4680	513	1776	252	166	8	53	15	129	246	45	30	55	147	155441	
42)	139	301	1582	468	239	1843	315	1472	58	204	124	276	378	21	334	441	144	54	156	42	21	1	5	2	24	47	50	4	4	16	16433	
43)	968	1282	1495	1348	12170	440	30190	6533	1598	1905	1750	5801	1148	155	1743	1586	2253	395	660	237	210	8	20	9	71	223	149	17	62	120	211079	
44)	3181	5100	4375	2231	5408	946	10112	69419	7917	16753	3560	5374	11452	414	4114	4890	1529	786	652	589	1681	35	67	27	212	527	722	57	62	120	211079	
45)	512	390	818	1125	1018	213	1245	11719	26803	2974	832	2761	2763	151	3095	2491	1634	323	992	175	129	7	16	6	39	126	254	18	32	73	112710	
46)	1151	1483	1390	1161	2160	295	2432	18371	1834	38475	13738	22651	5588	302	5228	6425	1458	808	1071	381	657	13	26	8	57	151	445					

Figure D.2.2 Walk & Motorcycle Trips with All Purposes

(Unit: Person Trips/Day)

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37			
1)	5912	618	342	495	782	651	382	141	175	822	328	268	89	674	51	425	88	29	19	44	10	74	7	60	10	9	6	18	2	13	123	16	0	22	34	35	36	37		
2)	493	3877	155	315	144	159	517	164	303	642	84	95	21	328	68	361	104	51	22	3	41	67	6	96	30	22	9	27	0	20	74	0	0	6	0	0	0	0		
3)	343	123	1479	66	85	23	8	20	21	92	166	90	10	23	1	9	4	6	3	3	2	4	2	0	0	0	1	2	0	2	26	3	7	0	0	0	0	0		
4)	366	317	86	2500	44	15	23	69	96	185	102	65	17	13	4	22	14	12	15	16	8	6	2	6	9	4	2	7	1	7	35	2	0	0	0	0	0	0		
5)	798	145	94	41	1035	42	27	27	19	49	110	372	81	115	10	31	13	6	15	0	7	0	10	3	2	0	0	2	2	20	29	0	7	0	0	0	0	0		
6)	544	195	18	18	21	38	4528	151	21	22	5	5	1	50	27	193	126	41	18	4	95	5	80	25	7	2	3	0	0	3	0	0	0	0	0	0	0	0	0	
7)	377	411	8	18	21	38	4528	151	21	22	5	5	1	50	27	193	126	41	18	4	95	5	80	25	7	2	3	0	0	3	0	0	0	0	0	0	0	0	0	
8)	120	252	28	45	25	48	96	1643	221	309	34	29	9	224	6	16	26	61	37	132	22	7	4	11	11	6	6	40	6	20	93	0	0	0	0	0	0	0	0	
9)	888	594	107	210	49	15	23	251	326	10459	155	51	7	18	7	16	26	61	37	132	22	7	4	11	11	6	6	40	6	20	93	0	0	0	0	0	0	0	0	
10)	314	86	112	70	107	8	5	17	15	91	1500	217	43	12	2	5	3	4	5	8	3	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11)	258	82	66	40	258	7	4	26	8	47	219	3191	173	6	2	5	3	4	5	8	3	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12)	100	19	10	16	84	2	1	8	2	9	29	164	1618	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
13)	865	364	25	22	255	170	69	136	9	16	23	16	1	1332	78	189	25	17	16	7	7	60	5	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14)	50	47	4	9	14	29	18	8	4	2	2	0	0	69	5241	240	0	0	0	0	0	158	12	28	15	4	1	3	0	0	0	0	0	0	0	0	0	0	0	
15)	365	274	6	21	25	42	197	186	14	16	6	5	1	244	423	17827	139	63	64	31	9	625	46	88	65	21	6	3	0	0	0	0	0	0	0	0	0	0	0	0
16)	120	127	4	15	10	23	122	221	29	17	5	3	1	25	0	144	3170	85	85	48	9	71	9	121	28	17	7	5	1	3	5	0	0	0	0	0	0	0	0	
17)	33	56	4	14	6	23	52	124	72	57	5	4	1	17	0	58	104	45	45	58	19	20	8	73	10	15	20	27	4	7	9	0	0	0	0	0	0	0	0	
18)	27	29	6	15	6	5	45	46	40	38	4	4	0	14	10	80	78	42	343	112	53	65	10	153	34	55	57	22	6	9	8	0	0	0	0	0	0	0	0	
19)	47	43	3	13	17	7	19	67	112	82	6	5	3	9	4	33	45	60	135	167	154	20	4	44	22	37	72	160	24	34	15	0	0	0	0	0	0	0	0	
20)	67	64	3	6	4	9	83	52	10	8	2	0	0	61	220	671	72	23	60	22	10	13392	198	339	144	47	8	3	0	0	0	0	0	0	0	0	0	0	0	0
21)	54	70	2	1	0	3	6	9	4	0	0	0	0	5	10	50	11	4	11	5	2	382	2506	167	235	44	8	3	0	0	0	0	0	0	0	0	0	0	0	
22)	7	19	0	9	0	2	29	14	12	0	0	0	0	9	25	111	105	51	131	40	23	310	170	6894	268	75	44	4	2	2	0	0	0	0	0	0	0	0	0	
23)	9	10	3	0	1	7	30	7	13	0	0	0	0	14	103	79	6	22	15	19	151	284	267	4304	239	29	3	4	3	0	0	0	0	0	0	0	0	0	0	0
24)	8	8	0	2	0	1	5	20	20	22	3	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		
25)	19	32	2	7	3	0	0	5	82	33	30	2	2	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	
26)	3	4	0	1	0	0	0	4	6	6	1	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	
27)	21	21	3	8	1	1	10	14	17	53	6	4	1	4	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	
28)	6	8	0	2	0	1	7	30	7	13	0	0	0	14	103	79	6	22	15	19	151	284	267	4304	239	29	3	4	3	0	0	0	0	0	0	0	0	0	0	0
29)	19	8	0	2	0	1	5	20	20	22	3	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	
30)	3	4	0	1	0	0	0	4	6	6	1	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	
31)	66	76	22	35	22	2	4	73	51	147	347	49	8	7	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	
32)	17	0	0	2	4	31	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	
33)	19	8	0	5	0	0	0	4	25	25	43	0	4	7	8	11	1	76	273	93	12	10	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
34)	19	8	0	5	0	0	0	4	25	25	43	0	4	7	8	11	1	76	273	93	12	10	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
35)	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	
36)	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	
37)	6	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	
38)	342	112	8	5	75	37	25	43	4	7	8	11	1	76	273	93	12	10	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
39)	97	34	3	25	25	6	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	
40)	0	0	0	0	0</																																			



Figure D.2.3 Passenger Car Trips with All Purposes

(Unit: Person Trips/Day)

1	3664	1702	500	1082	3919	1683	2227	816	1472	3735	1956	2597	1063	3291	2096	4793	331	779	327	398	1874	1178	3508	1298	1742	1724	1148	1036	26	27	28	29	30	31	32	33	34	35	36	37					
2	1318	1837	746	611	2051	564	1953	881	1343	2255	367	1187	436	1201	2966	303	573	314	202	436	484	2081	253	1287	1458	2220	1776	176	619	570	1185	1202	920	1974	268	1849	91	37	6	74					
3	983	581	406	165	605	133	87	133	128	429	302	558	81	121	113	216	81	55	70	120	205	317	70	87	191	78	172	76	172	63	59	64	121	188	161	262	51	69	50	6					
4	984	614	173	0	474	74	169	238	373	284	308	117	150	156	339	83	84	91	185	153	357	474	158	310	565	327	194	668	561	684	2130	1007	357	576	117	47	24	19	3	3					
5	5633	2022	561	503	5828	283	593	640	687	731	730	1775	494	573	653	1059	834	614	944	1877	327	970	654	824	327	732	272	156	668	561	684	2130	1007	357	576	117	47	24	19	3	3				
6	1380	740	147	80	332	119	163	289	112	132	79	96	31	473	408	341	503	502	304	85	273	114	94	359	87	64	40	115	541	103	147	135	195	308	123	64	3	3	3	3	3	3			
7	121	1725	79	152	682	181	318	672	231	241	104	142	49	207	405	751	412	353	405	159	939	266	941	1218	318	318	654	576	415	743	607	518	301	284	563	62	116	116	116	116	116	116			
8	1446	752	102	347	472	61	202	539	153	898	225	219	65	126	312	439	183	344	419	635	503	475	218	625	616	1422	654	576	415	743	607	518	301	284	563	62	116	116	116	116	116	116			
9	3733	1731	339	430	1033	62	94	226	225	569	851	735	161	226	429	224	410	419	635	503	475	218	625	616	1422	654	576	415	743	607	518	301	284	563	62	116	116	116	116	116	116	116	116		
10	2385	1024	416	226	1443	62	135	494	246	491	792	1189	491	155	302	403	112	161	208	439	193	214	124	124	99	536	237	114	183	125	395	2276	83	876	82	88	258	45	10	10	10	10			
11	1737	707	179	179	1033	62	94	226	225	569	851	735	161	226	429	224	410	419	635	503	475	218	625	616	1422	654	576	415	743	607	518	301	284	563	62	116	116	116	116	116	116	116	116		
12	1090	358	70	102	460	21	37	204	52	117	128	443	554	33	132	98	43	82	103	333	170	64	144	102	42	255	163	409	37	58	176	174	225	130	41	28	48	2	2	2	2				
13	2546	2100	98	145	815	236	343	1131	126	223	141	164	35	804	753	1461	147	183	333	170	64	144	102	42	255	163	409	37	58	176	174	225	130	41	28	48	2	2	2	2	2	2			
14	4364	2146	151	465	1000	263	844	1610	311	301	282	381	133	1776	240	5754	1331	637	12547	1586	1308	3088	2109	892	388	443	1198	1402	491	757	703	866	154	16	16	16	16	16	16	16	16	16			
15	281	582	281	52	68	327	244	341	365	380	417	134	185	84	177	234	467	579	327	368	361	376	740	311	219	196	368	99	273	36	9	9	9	9	9	9	9	9	9	9	9				
16	1009	464	107	156	2345	331	232	448	843	1070	292	467	190	295	798	1307	384	275	965	2948	1363	1265	680	1022	977	1024	1091	178	762	594	598	459	475	216	345	51	17	17	17	17	17	17			
17	2851	1585	310	391	523	204	743	1210	497	591	271	414	155	620	2080	4173	759	580	1246	1331	637	12547	1586	1308	3088	2109	892	388	443	1198	1402	491	757	703	866	154	16	16	16	16	16	16	16		
18	1618	948	66	121	311	71	632	858	185	235	99	143	47	127	516	747	448	512	1012	863	703	1242	1424	421	2493	808	1332	146	227	418	285	173	214	610	348	120	517	4472	137	31	31	31	31		
19	1195	1710	71	424	392	73	418	1323	233	602	309	476	160	402	1024	1392	298	254	610	950	861	1636	984	919	2012	2447	1576	286	476	489	216	348	120	517	4472	137	31	31	31	31	31	31			
20	82	577	59	228	1055	41	125	442	187	353	306	182	61	92	560	169	194	321	422	982	726	271	250	250	352	298	271	597	243	468	258	102	140	43	88	57	9	9	9	9	9	9			
21	1731	813	84	760	250	41	190	577	233	453	218	187	42	107	308	308	146	298	434	885	795	548	187	135	339	285	398	179	355	711	565	216	300	77	151	223	12	12	12	12	12	12			
22	2083	1635	230	319	735	103	199	909	402	1892	2253	890	167	203	373	1209	185	303	452	595	2648	116	261	933	339	379	311	386	847	4088	793	1193	190	235	505	28	28	28	28	28	28				
23	4086	2982	200	562	982	85	144	817	220	714	738	912	133	442	464	453	269	371	525	765	468	711	416	197	1530	363	323	173	326	841	1319	2882	2269	475	180	736	193	193	193	193	193	193			
24	796	289	38	54	320	58	54	320	58	439	198	83	267	89	243	77	342	582	179	261	485	593	440	1131	661	114	59	82	140	153	179	391	459	287	43	6	6	6	6	6	6	6	6		
25	162	917	55	88	342	15	34	322	59	121	151	80	18	14	99	104	177	132	180	237	184	20	110	59	312	118	92	51	101	254	439	157	95	54	47	2585	16	16	16	16	16	16	16		
26	5218	2199	228	162	1391	228	418	1279	390	691	305	415	72	446	2387	2568	460	598	1853	825	484	1964	606	378	247	900	1034	681	2423	391	233	69	212	456	140	86	143	143	143	143	143	143			
27	5358	2121	257	367	1142	577	645	1203	596	647	298	437	98	598	2705	958	268	238	2724	305	439	596	578	2012	2012	548	409	132	436	279	503	739	380	1714	224	238	8	8	8	8	8	8	8		
28	2688	1164	120	187	758	98	386	1044	596	454	180	252	67	175	1409	1119	353	531	689	719	2044	1646	387	2856	645	447	144	384	630	425	401	384	1682	356	175	7	7	7	7	7	7	7	7		
29	2477	707	85	116	671	97	219	577	148	334	224	312	62	185	2114	1399	571	2590	1590	2851	863	551	7018	932	5486	2760	924	1276	575	1301	668	368	287	716	853	226	7	7	7	7	7	7	7	7	
30	4407	2821	193	352	2230	119	325	1967	828	434	224	312	62	185	2114	1399	571	2590	1590	2851	863	551	7018	932	5486	2760	924	1276	575	1301	668	368	287	716	853	226	7	7	7	7	7	7	7	7	
31	380	186	15	28	64	10	24	149	24	35	25	30	3	146	584	406	267	109	193	378	247	900	1034	681	2423	391	233	69	212	456	140	86	143	143	143	143	143	143	143	143	143	143			
32	1201	317	26	33	219	50	341	1432	377	149	49	97	19	184	602	571	117	94	189	214	258	2318	614	749	1315	429	244	99	198	321	241	237	525	272	622	92	15	15	15	15	15	15	15	15	
33	805	316	39	60	277	54	128	235	121	218	98	153	71	94	305	1227	194	447	424	681	407	1109	1424	1591	3794	872	434	277	215	331	215	108	112	159	1038	93	3	3	3	3	3	3	3	3	3
34	1315	1938	178	121	242	489	241	1377	114	339	76	286	17	52	305	1227	194	447	424	681	407	1109	1424	1591	3794	872	434	277	215	331	215	108	112	159	1038	93	3	3	3	3	3	3	3	3	3
35	986	257	34	90	166	30	77	563	74	115	61	81	28	92	551	291	101	138	437	297	232	575	553	163	1368	365	222	63	498	217	151	110	176	135	521	59	6	6	6	6	6	6	6	6	6
36	151	65	4	9	22	4	11	43	15	23	10	16	1	9	33	63	24	24	41	54	56	106	62	16	135	54	32	8	23	15	20	27	18	24	66										

Figure D.2.3 Passenger Car Trips with All Purposes

(Unit: Person Trips/Day)

ZONE	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	TOTAL	
1)	6228	7278	3154	2471	5761	553	421	851	1226	1571	114	1446	1672	65	905	423	2162	633	289	115	1111	8	22	8	29	147	164	21	46	154	16510	
2)	2514	2514	1776	1031	3917	292	964	430	2136	458	77	851	286	4	91	35	197	101	54	8	428	0	1	0	1	11	12	1	24	57	63121	
3)	249	164	150	113	311	29	85	91	176	48	9	90	44	4	51	27	100	101	54	8	428	0	1	0	1	11	12	1	24	57	10143	
4)	159	430	221	160	592	44	144	109	115	75	16	407	56	8	126	76	337	190	56	14	174	2	1	0	1	13	19	2	4	13	12650	
5)	908	897	894	647	3070	153	357	746	105	202	74	414	234	22	515	247	1917	324	391	34	318	4	8	3	11	54	57	6	20	54	50143	
6)	280	898	136	136	210	23	79	138	380	42	17	76	47	4	91	76	214	63	69	11	53	0	1	0	2	9	11	1	2	9	10728	
7)	405	877	276	297	548	56	358	377	104	100	34	181	105	5	232	268	434	131	148	16	85	0	2	1	3	20	22	2	4	15	20726	
8)	1571	1703	1064	764	3040	214	1654	237	1756	851	47	667	455	35	3301	215	3958	231	63	1283	3	5	3	11	55	73	10	17	45	46008		
9)	503	363	252	207	1349	53	1131	250	126	100	31	222	94	13	658	125	546	429	146	18	115	0	1	4	6	20	26	4	6	17	20717	
10)	3885	2038	1565	1550	2724	231	588	1038	147	621	86	434	551	32	463	314	673	315	265	362	2	3	1	6	32	35	6	10	33	33515		
11)	358	408	276	181	364	43	95	155	66	64	28	129	73	7	162	91	628	136	120	18	906	2	3	1	3	16	17	3	6	18	18770	
12)	521	690	341	256	523	67	159	381	180	105	47	214	125	13	308	157	916	729	225	26	329	2	4	2	5	25	31	4	10	28	23455	
13)	88	85	81	78	74	19	24	218	12	30	22	67	48	4	138	60	404	122	11	174	2	2	0	2	5	22	29	4	6	18	19181	
14)	654	242	231	296	213	38	115	415	42	80	46	134	127	11	212	155	440	172	165	15	47	1	5	1	4	22	20	3	5	15	19857	
15)	3885	2038	1565	1550	2724	231	588	1038	147	621	86	434	551	32	463	314	673	315	265	362	2	3	1	6	32	35	6	10	33	33515		
16)	3823	1210	1319	1136	2957	213	528	1140	1225	340	150	1028	363	36	704	420	1451	382	404	50	225	2	9	3	15	72	67	9	17	48	61040	
17)	426	233	538	304	796	62	1068	178	175	124	32	210	83	10	764	134	362	182	75	17	101	0	2	1	4	19	22	3	4	13	16923	
18)	524	284	406	625	3909	84	372	128	266	147	25	306	92	15	214	108	452	371	42	22	179	1	2	2	5	22	29	4	6	18	19181	
19)	1057	4339	797	608	2363	185	622	248	553	290	42	648	154	31	419	184	779	692	72	37	279	2	4	2	9	43	61	7	11	33	32876	
20)	1078	400	864	709	2557	188	706	440	618	361	55	832	219	42	650	320	1163	1971	159	44	342	1	6	2	10	53	61	8	16	45	42047	
21)	3459	1934	2472	3270	6319	445	703	4699	945	640	170	1075	570	54	1033	540	1422	1598	463	58	320	3	15	6	30	126	122	14	23	64	79455	
22)	867	372	1216	1510	5300	1389	1309	1578	1201	670	111	1020	487	45	731	409	583	461	273	36	174	2	6	3	21	65	92	9	15	22	47655	
23)	445	384	324	586	1197	1521	2607	1932	1614	235	97	423	208	24	538	282	905	793	27	87	2	4	2	8	34	160	198	22	38	83	85307	
24)	2071	2678	2586	2162	4738	673	3047	1587	5940	854	191	3938	100	103	1564	522	1579	1804	283	111	528	4	14	8	17	60	106	9	19	43	45469	
25)	403	456	411	375	1333	96	357	579	761	354	55	704	188	37	822	404	2155	242	242	37	122	1	3	1	7	36	166	5	12	30	32387	
26)	332	417	317	2213	812	74	273	523	227	627	33	568	163	200	799	337	1612	832	346	47	124	1	2	2	6	31	50	5	9	33	27189	
27)	188	159	154	419	232	35	108	429	71	107	20	231	154	23	28	70	14	44	2	7	0	0	0	0	0	0	0	0	0	0	0	1208
28)	612	753	480	377	850	98	278	704	220	193	41	2256	228	25	617	418	1249	477	546	49	294	3	8	3	9	49	61	10	24	56	40112	
29)	465	390	457	252	459	78	140	875	85	131	88	212	200	49	328	620	1269	496	58	472	4	5	3	10	28	112	112	19	31	69	46777	
30)	1115	2536	5263	2346	2530	1503	642	3228	254	454	298	759	787	61	1691	984	1674	267	646	48	118	4	22	11	40	155	126	17	25	55	52544	
31)	919	1180	2465	6678	4943	441	853	1800	419	398	171	688	443	46	698	309	955	276	300	31	185	3	9	4	16	76	88	10	15	33	49222	
32)	589	428	2001	3836	2073	1167	4405	9908	317	1197	802	1685	1680	152	2358	1293	3028	368	1329	118	106	4	25	10	86	231	204	26	45	87	95649	
33)	51	183	925	220	133	1317	106	795	22	86	27	128	167	9	158	175	64	18	109	9	5	0	1	1	12	33	30	2	3	9	9043	
34)	363	182	563	517	7937	246	97	1209	592	485	508	1618	664	45	579	294	1303	145	255	26	23	0	4	3	26	126	39	4	10	16	32044	
35)	644	780	1121	711	2957	358	2426	2244	1350	2731	959	1560	2151	132	930	1422	922	922	287	74	181	3	11	4	30	231	229	11	20	38	59052	
36)	182	96	362	524	554	129	669	4155	3785	984	295	1304	713	55	1564	849	932	151	510	38	20	1	4	2	15	73	110	10	19	26	40127	
37)	239	245	402	394	1086	131	672	4620	614	4815	3802	5841	1826	102	1577	1763	656	285	367	57	60	1	5	1	12	93	159	12	16	25	40031	
38)	167	632	930	625	3111	236	2205	4437	1522	6384	504	4125	1212	236	5787	3335	982	1148	399	189	187	3	7	0	0	3	29	28	2	3	6	4145
39)	548	787	882	533	2380	265	1191	3566	627	3780	362	1378	8935	376	628	835	634	467	239	62	150	2	7	4	19	257	530	20	26	39	36515	
40)	127	179	187	134	588	61	232	470	160	267	86	676	827	1855	318	565	266	213	104	35	36	0	1	0	3	46	144	21	13	11	10881	
41)	702	1069	959	785	2895	245	1101	2509	1998	1665	314	4923	643	169	247	1434	2920	3126	3117	275	344	3	8	2	11	100	262	28	54	78	62792	
42)	158	138	174	131	197	45	180	658	227	928	228	1213	297	413	3903	942	584	122	328	155	102	2	0	0	3	45	123	20	27	13	16076	
43)	119	56	154	195	117	43	93	1146	46	174	49	536	268	37	1996	1015	584	375	1192	52	24	1	3	1	6	37	39	8	21	31	26819	
44)	332	274	306	231	216	71	210	1064	108	246	127	737	310	82	1458	338	110	1925	536	1941	1639	142	8	4	10	86	190	18	62	109	32683	
45)	927	1517	949	500	2406	201	915	391	592	517	82	1458	338	110	1925	536	1941	1639	142	141	377	2	8	4	10	86	190	18	62	109	32683	
46)	17	8	17	14	20	4	13	67	8	22	7	66	29	8	122	459	85	20	79	5	3	0	0	0	1	5	14	1	2	2	16895	
47)	317	245	183	194	146	35	65	464	36	85	25	150	134	10	263	247	320	73	255	25	370	6	6	2	7	26	34	6	11	28	14917	
48)	5	8	4	4	4	1	1	7	1	1	0	2	2	0	0	2	1	2	1	3	0	0	0	0	0	0	0	0	0	0	0	126
49)	14	34	20	10	19	3	7	22	3	5	1	6	7	0	6	6	9	4	8	2	4	0	0	0	0</							

Figure D.2.4 Public Transport Trips with All Purposes

(Unit: Person Trips/Day)

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37			
1	5860	3081	1733	2075	7090	2890	1303	1797	7154	2937	3723	2866	4769	1895	6656	1206	461	557	1320	642	9639	1308	2448	2109	1238	759	550	452	873	5109	2564	19334	2150	3308	2124	338				
2	2446	3676	1050	1664	2741	1070	2649	786	1752	4766	1046	1919	3277	3740	1745	4696	740	381	299	410	110	154	395	88	206	466	105	117	48	42	79	515	223	535	141	311	550	45		
3	1772	946	501	371	177	235	131	286	195	460	637	562	157	684	778	366	220	178	684	778	366	220	178	684	778	366	220	178	684	778	366	220	178	684	778	366	220	178	684	778
4	1921	1470	357	523	666	162	238	522	475	777	684	778	366	220	178	684	778	366	220	178	684	778	366	220	178	684	778	366	220	178	684	778	366	220	178	684	778	366	220	178
5	7457	2794	864	654	10779	461	731	1052	776	1051	1015	2067	721	993	647	578	560	384	812	1845	610	485	1030	540	485	1030	540	485	1030	540	485	1030	540	485	1030	540	485	1030	540	485
6	2460	1862	184	152	543	476	235	448	118	754	142	171	70	75	252	422	1043	582	327	465	201	180	1200	261	793	1651	149	76	32	67	264	134	533	209	151	180	15	59		
7	1105	1095	366	346	1066	50	493	533	1075	2041	728	1140	600	4416	803	3336	700	255	183	346	645	1954	874	1487	1004	1561	149	76	32	67	264	134	533	209	151	180	15	59		
8	1904	1349	132	368	572	90	420	886	924	1721	243	194	84	249	471	442	235	349	878	318	384	416	408	288	870	280	183	225	166	286	2223	456	745	233	318	318	36			
9	7728	4038	541	893	1089	252	398	2416	1739	8257	1990	729	178	443	671	715	516	738	819	117	115	1560	489	1648	1169	382	346	328	742	2439	455	1605	602	621	1228	178	36			
10	3712	1178	425	474	1072	130	155	401	235	620	942	332	629	902	4198	749	199	168	424	244	242	341	377	354	468	577	246	791	135	96	249	5011	1254	3670	217	300	3902	457		
11	2901	1178	425	474	1072	130	155	401	235	620	942	332	629	902	4198	749	199	168	424	244	242	341	377	354	468	577	246	791	135	96	249	5011	1254	3670	217	300	3902	457		
12	3712	1178	425	474	1072	130	155	401	235	620	942	332	629	902	4198	749	199	168	424	244	242	341	377	354	468	577	246	791	135	96	249	5011	1254	3670	217	300	3902	457		
13	2345	827	129	344	741	61	74	516	120	230	240	709	1668	42	307	146	120	167	235	318	140	246	214	308	516	258	179	134	49	109	440	1003	2061	293	277	663	35			
14	6081	4215	369	344	1066	50	493	533	1075	2041	728	1140	600	4416	803	3336	700	255	183	346	645	1954	874	1487	1004	1561	149	76	32	67	264	134	533	209	151	180	15	59		
15	6180	3510	239	385	1011	406	1148	2418	392	688	363	394	146	3036	2158	10239	1175	1077	1164	1643	680	3430	1556	965	1200	409	194	215	423	2268	477	1551	1584	1784	903	34	31			
16	1575	891	88	210	447	369	565	915	257	915	174	711	194	259	158	522	216	444	450	327	188	227	234	457	370	319	208	227	129	178	545	162	1319	257	661	270	38			
17	502	407	92	143	381	423	460	448	414	711	194	259	158	522	216	444	450	327	188	227	234	457	370	319	208	227	129	178	545	162	1319	257	661	270	38					
18	896	377	178	288	824	153	513	288	397	821	242	338	702	686	521	1422	431	172	614	517	528	1245	406	1117	722	583	554	231	203	324	743	841	1709	969	1262	382	55			
19	1313	492	114	189	1901	243	262	394	663	1043	279	368	371	598	452	988	357	232	628	1155	957	863	412	677	968	576	737	647	439	802	367	1423	281	467	358	47				
20	737	408	131	231	573	84	206	414	307	607	271	253	142	702	323	638	212	240	419	649	1470	929	381	588	558	1316	535	519	338	1684	256	617	228	999	373	45				
21	3869	2065	305	424	647	291	1552	1348	466	799	353	362	242	2176	2204	4760	522	570	1254	968	160	1365	1677	2147	3235	1617	604	240	383	582	1443	407	2156	1174	1841	635	59			
22	1042	1478	157	221	445	197	756	1231	238	456	718	222	401	670	623	1194	710	620	537	611	616	1970	1751	3476	3788	894	896	132	154	545	206	1563	860	161	353	46				
23	2171	1478	157	221	445	197	756	1231	238	456	718	222	401	670	623	1194	710	620	537	611	616	1970	1751	3476	3788	894	896	132	154	545	206	1563	860	161	353	46				
24	1289	1567	102	441	434	158	389	1172	279	1070	402	661	711	515	1125	467	264	672	653	947	1066	1031	1096	2417	6589	1185	290	272	343	307	143	559	134	711	169	16				
25	576	423	112	83	536	46	221	400	247	318	89	130	246	155	255	372	304	235	742	979	1035	515	1048	931	654	955	2616	140	272	343	307	143	559	134	711	169	16			
26	576	423	112	83	536	46	221	400	247	318	89	130	246	155	255	372	304	235	742	979	1035	515	1048	931	654	955	2616	140	272	343	307	143	559	134	711	169	16			
27	576	423	112	83	536	46	221	400	247	318	89	130	246	155	255	372	304	235	742	979	1035	515	1048	931	654	955	2616	140	272	343	307	143	559	134	711	169	16			
28	576	423	112	83	536	46	221	400	247	318	89	130	246	155	255	372	304	235	742	979	1035	515	1048	931	654	955	2616	140	272	343	307	143	559	134	711	169	16			
29	548	367	4	136	964	29	123	587	188	272	73	132	33	85	329	177	146	223	274	482	423	263	150	214	328	223	946	158	224	748	63	329	69	158	102	10				
30	1273	791	94	168	248	88	498	421	218	728	218	264	126	256	561	353	387	128	218	305	241	201	133	451	87	341	182	13	30	159	1296	201	1665	100	654	671	59			
31	3945	3254	450	703	1277	144	155	715	413	539	992	692	730	629	469	613	290	286	346	369	369	164	104	136	338	1678	8625	7268	308	303	861	41	207	2350	107					
32	2523	5827	737	1150	3155	405	547	1673	610	5307	2251	2180	683	4758	1244	3559	384	999	1473	1268	1665	1647	1057	983	3499	993	511	338	142	7963	6426	13929	1399	1555	10203	786				
33	1825	942	107	228	526	174	365	570	328	512	204	193	190	749	977	2101	235	187	284	244	277	1317	1096	757	263	127	63	74	127	512	326	628	1795	705	374	40				
34	3078	1928	110	427	259	62	87	789	112	241	1691	439	143	53	183	207	263	227	418	295	327	114	295	327	114	295	327	114	295	327	114	295	327	114	295	327	114	295	327	
35	3078	1928	110	427	259	62	87	789	112	241	1691	439	143	53	183	207	263	227	418	295	327	114	295	327	114	295	327	114	295	327	114	295	327	114	295	327	114	295	327	
36	3078	1928	110	427	259	62	87	789	112	241	1691	439	143	53	183	207	263	227	418	295	327	114	295	327	114	295	327	114	295	327	114	295	327	114	295	327	114	295	327	
37	3078	1928	110	427	259	62	87	789	112	241	1691	439	143	53	183	207	263	227	418	295	327	114	295	327	114	295	327	114	295	327	114	295	327	114	295	327	114	295	327	
38	3078	1928	110	427	259	62	87	789	112	241	1691	439	143	53	183	207	263	227	418	295	327	114	295	327	114															





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