## 6-2 MAINTENANCE COST

### 6-2-1 Preconditions for Maintenance Cost Estimation

Maintenance work is classified into routine maintenance work and periodic maintenance work. Routine maintenance work is required irrespective of traffic volume or road surface condition and includes such works as grass cutting and the cleaning of road side ditches and culverts. Periodic maintenance work is required depending on traffic volume and road surface condition and includes such works as road overlay, patching, sealing, and other road surface repair, as well as the repair of bridge slabs.

For the present estimation, the following are not included in the road maintenance cost:

a. Road patrol and inspection personnel wages and overhead. These costs shall be included in current expenses of the agencies responsible. Therefore, the maintenance cost shall be expressed in direct cost.

b. Minor existing road improvement such as the addition of shoulders and side ditches, which are usually included in road maintenance cost in Panama, but shall be treated as a part of the initial cost in the Study.

c. Electric power charge for road lighting which shall be paid by the municipal government or by IRHE. Therefore the maintenance cost does not include the electric power consumption cost.

### 6-2-2 Present Road Maintenance

The road maintenance is executed by the Road Maintenance Division of MOP for all roads in Panama. In the Panama Metropolitan Area, four local departments of the division perform the road maintenance, such as Panama Oeste, Panama Este, San Miguelito and Panama Metro. The budget for those departments was 4.1 million balboas per year for road maintenance of 1800 km, including small scale improvements. Other maintenance works, such as traffic management facilities, are dependent on Transit Police, the same as road surface cleaning works depend on Direccion Metropolitana de Aseo (DIMA), illumination on IRHE, and grass cutting on medians on the Municipality of Panama.(See TABLE V-6-10).

TABLE V-6-10 ANNUAL ROAD MAINTENANCE COSTS IN PANAMA METROPOLITAN AREA IN YEAR 1987

| Metropolitan Area | Road Length (km) | Estimation Cost (millon Balboas) | Executed Cost (millon Balboas) |
|---|---|---|---|
| Metrovia and San Miguelito | 803 | 2.24 | 1.40 |
| Panama Oeste | 714 | 1.38 | 0.80 |
| Panama Este | 276 | 0.51 | 0.50 |
| TOTAL | 1793 | 4.13 | 2.70 |

Source: ESTAMPA

### 6-2-3 Maintenance Cost Estimation

The project subject to the Study will, when implemented and completed, affect the amount of government funds required for road maintanance from year to year.

The maintenance cost of the subject projects is estimated excluding the cost of minor improvement work, although this work is presently executed by the government. A higher maintenance level has been assumed, such as more frequent renewal of road markings than now actually executed.

As defined in the above, the cost is estimated in terms of the direct construction cost for each work item; the routine maintenance cost, which is not affected by road standards and traffic volume, is given as grass cutting, cleaning and repairment of ditches, drainage, culverts, bridges, illumination and signs. Markings and periodic maintenance, which inherently varies depending on traffic volume and lane width, are proportional to the width of the road surface. Work items, frequency and estimated cost are given in TABLE V-6-11.

**TABLE V-6-11 ESTIMATION OF MAINTENANCE COSTS**

( Unit: Balboas )

| Maintenance | Unit | Foreign | Local | Remarks |
|---|---|---|---|---|
| Routine Maintenance | | | | |
| Grass Cutting | Ha | 18.7 | 355.3 | 2 times/year |
| Ditch, Drainage, Culvert and Bridge Maintenance | Km | -- | 680.0 | 2 times/year |
| Lamp Change | Place | 67.5 | 45.0 | 1 times/2 year |
| Repair Signs and Markings | Place | 3.5 | 3.5 | 2 times/2year |
| Periodic Maintenance | | | | |
| Sealing of Asphalt | m2 | 4.0 | 4.0 | 1 time/10 year |
| Replenishing of Sidewalks | m2 | 1.5 | 1.5 | 1 time/10 year |
| Line Painting | Km | 30.0 | 20.0 | 1 time/5 year |
| Sealing of Cement Concrete Joint | m2 | 0.35 | 0.35 | 1 time/3 year |

Source: ESTAMPA

# 7. IMPLEMENTATION SCHEDULE

## 7-1 PLANNING CONDITIONS

The projects of Corredor Sur, the Main Access Roads, and Corredor Sur Extension are planned to be opened to service by the year 2000. The total construction period of this project is twelve years, but the net period of ten years is programmed excluding the term of the detail designing and other preparatory works.

The total project cost was estimated at 258 million balboas, and the required investment can be estimated at 20 to 35 million balboas in each year. Introduction of some foreign funds will be inevitable due to the magnitude of the project.

Between the completion of the feasibility study and commencement of construction, almost two years of preparatory period should be scheduled, as mentioned above, for the purpose of executing the following matters:

a. Budgeting the local currency portion of the construction cost

b. Refund scheduling for the foreign financing and its interest

c. Initiation of land acquisition from private owners

d. Specification writing for detail design and construction works

e. Bid for design and construction

f. Detail design work

## 7-2 IMPLEMENTATION SCHEDULE

Road projects can be divided into four parts as shown below:

a. Corredor Sur I : Widening the existing roads and new construction in the built-up area

b. Corredor Sur II: New construction in the suburban area

c. Main Access Roads : Mixture of widening the existing roads and new road construction

d. Corredor Sur Extension : Road widening and partial new construction at the densely inhabited and commercialized area

The construction works will be commenced in order, starting with the highest priority work section. Consequently, the earliest completion of the construction for certain partial sections will be the middle of the year 1992.

1) Work Volume

The main work volume is shown in TABLE V-7-1. Concerning Corredor Sur I (Work Sections 1 to 5), it itemizes the miscellaneous works, such as demolition, over-lay of pavement and placement of curb stones, for widening the existing roads, and it also itemizes land fill work and bank revetment for the expansion to the seashore.

**TABLE V-7-1 WORK VOLUME FOR ROAD CONSTRUCTION FOR EACH SECTION**

| Item | Unit | Corredor Sur I (Built-up) | | | | | Corredor Sur (Suburban) | | | Main Access Roads | | | | | | Ext. | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Section -1 | Section -2 | Section -3 | Section -4 | Section -5 | Section -6 | Section -7 | Section -8 | Section -9 | Section -10 | Section -11 | Section -12 | Section -13 | Section -14 | Section -15 | |
| Road | | | | | | | | | | | | | | | | | |
| Cutting | CUM | -- | -- | -- | -- | 65,761 | 3,812 | -- | 64,680 | 1,843 | 3,622 | 3,719 | 2,200 | 23,796 | -- | 5,449 | 174,064 |
| Embankment | CUM | 281,778 | 2,964 | 3,963 | 249,856 | 23,961 | 344,153 | 679,584 | 357,015 | 97,516 | 153,542 | 109,819 | 159,348 | 70,474 | 12,181 | 55,360 | 2,571,514 |
| Concrete Pavement (20 cm) | SQM | -- | -- | -- | -- | -- | -- | -- | -- | 15,770 | 12,450 | 20,375 | 6,845 | -- | -- | -- | 55,240 |
| Concrete Pavement (25 cm) | SQM | -- | -- | -- | 51,289 | 41,929 | -- | -- | 131,221 | -- | -- | -- | -- | 32,375 | -- | 31,200 | 287,814 |
| Asphalt Pavement A-1 | SQM | -- | -- | -- | -- | -- | 59,369 | 103,955 | -- | 4,553 | 15,900 | 5,303 | 28,870 | -- | -- | -- | 217,950 |
| Asphalt Pavement A-2 | SQM | 30,790 | 22,809 | 34,890 | -- | -- | -- | -- | -- | 3,916 | -- | -- | -- | -- | 13,049 | 1,923 | 107,377 |
| Sidewalk Pavement | SQM | 149,350 | 13,470 | 14,660 | 28,248 | 23,786 | 22,499 | 57,920 | 56,670 | 23,250 | 16,900 | 10,848 | 22,970 | 23,220 | 16,209 | -- | 480,012 |
| Retaining Wall | LM | -- | -- | -- | 160 | 320 | 160 | -- | -- | -- | -- | -- | -- | -- | 460 | -- | 1,100 |
| Box Culvert | LM | -- | -- | -- | 96 | -- | 67 | 136 | 423 | -- | 30 | -- | -- | -- | -- | -- | 752 |
| Pipe Culvert | LM | 7,471 | 2,963 | 3,325 | 4,888 | 4,118 | 5,685 | 8,940 | 12,729 | 5,321 | 117 | 5,155 | 5,181 | 5,159 | 3,640 | 4,950 | 79,842 |
| Bridge | | | | | | | | | | | | | | | | | |
| Structural Concrete | CUM | 1,784 | 783 | -- | 4,229 | 2,979 | 990 | 2,571 | 890 | 2,290 | 773 | 1,419 | 2,327 | 1,036 | 2,861 | -- | 24,772 |
| Prestressed Concrete | CUM | -- | 287 | -- | 1,368 | 1,669 | 482 | 1,098 | 372 | 649 | 191 | 320 | 570 | 263 | 682 | -- | 7,751 |
| Forming | SQM | 1,554 | 3,537 | -- | 16,876 | 16,225 | 4,934 | 10,722 | 2,808 | 8,188 | 2,798 | 4,744 | 8,212 | 3,577 | 9,112 | -- | 92,587 |
| Reinforcing Bar | TON | 102 | 95 | -- | 529 | 412 | 136 | 338 | 96 | 265 | 89 | 159 | 266 | 119 | 328 | -- | 2,934 |
| Prestressing Steel | TON | -- | 17 | -- | 87 | 110 | 33 | 66 | 10 | 44 | 11 | 19 | 36 | 16 | 42 | -- | 489 |
| Excavation | CUM | 1,363 | 612 | -- | 7,749 | 2,075 | 1,572 | 6,150 | 2,313 | 2,877 | 1,125 | 2,618 | 3,586 | 1,390 | 6,369 | -- | 39,790 |
| Pile | LM | -- | 204 | -- | -- | 1,360 | 336 | -- | -- | 794 | 290 | 290 | 304 | 304 | -- | -- | 3,822 |

Source: ESTAPPA

In Corredor Sur II (Work Sections 6 to 8), which passes through the low-lying marsh land, two to three meter thickness of soil was planned as embankment over the existing land surface, considering the water drainage. A huge volume of embankment, therefore, will be required for this section.

Five Main Access Roads, except Via E.T. Lefevre, have the work items of both widening and new construction. Therefore, their required earth volume is comparatively larger than that of Via E.T. Lefevre, which contains only widening work for existing road.

The expansion to the seashore by widening the existing road for the section of Corredor Sur Extension results in a certain amount of land-fill work.

2) Work Program and Work Section

The Work Program shoud be determined depending on the work volume of each section. Considering that the mass curve is of little use because there is practically no earth cutting work in the whole section of Corredor Sur, borrow material and embankment work are necessary.

In Panama, the dry season usually occurs from January to April, and the rainy season is from May to December. In view of the climate conditions, earth work and construction work for bridge foundations should be implemented during the dry season.

Finally, the work periods by section were determined based on the necessary term for land acquisition, removal of houses and transmission lines, etc.

3) Work Sequence

This project does not entail large scale work which takes several years to complete. As no technical difficulties are expected for the entire construction work, the work sequence was, therefore, examined in consideration of the future traffic demand of the work section. As a result, the construction at the section between ATLAPA and Ciudad Radial should be commenced with higher priority, and its completion is expected in the year 1993. Coping with the total construction cost and the balance of work quantities, the other work sections were scheduled in an order based on the higher traffic demand.(TABLE V-7-2, FIGURE V-7-1, V-7-2)

**TABLE V-7-2 INVESTMENT PLAN FOR ROAD PROJECTS (FINANCIAL COST IN 1987 PRICES)**

Unit:1,000 Balboas

| SECTION/YEAR | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | TOTAL | FOREIGN | LOCAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CORREDOR SUR I | | | | | | | | | | | | | | | | |
| SECTION- 1 | 372 | 372 | 0 | 0 | 0 | 0 | 0 | 2,559 | 7,620 | 7,620 | 0 | 0 | 0 | 18,544 | 9,298 | 9,246 |
| SECTION- 2 | 99 | 99 | 0 | 0 | 0 | 3,032 | 3,032 | 2,035 | 2,035 | 0 | 0 | 0 | 0 | 10,333 | 2,534 | 7,799 |
| SECTION- 3 | 107 | 107 | 0 | 0 | 1,679 | 3,357 | 3,145 | 2,933 | 0 | 0 | 0 | 0 | 0 | 11,328 | 2,800 | 8,528 |
| SECTION- 4 | 416 | 416 | 854 | 4,260 | 6,814 | 6,814 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19,574 | 10,549 | 9,025 |
| SECTION- 5 | 259 | 3,720 | 6,922 | 6,116 | 5,310 | 2,655 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24,983 | 6,666 | 18,297 |
| SUB-TOTAL | 1,255 | 4,716 | 7,776 | 10,377 | 13,803 | 15,358 | 6,177 | 7,527 | 9,655 | 7,620 | 0 | 0 | 0 | 84,763 | 31,868 | 52,895 |
| CORREDOR SUR II | | | | | | | | | | | | | | | | |
| SECTION- 6 | 377 | 2,080 | 5,515 | 7,725 | 3,852 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19,509 | 10,564 | 8,945 |
| SECTION- 7 | 679 | 679 | 0 | 0 | 1,973 | 13,888 | 13,888 | 0 | 0 | 0 | 0 | 0 | 0 | 31,107 | 19,127 | 11,980 |
| SECTION- 8 | 680 | 680 | 0 | 0 | 0 | 0 | 0 | 0 | 5,590 | 13,924 | 13,924 | 0 | 0 | 34,799 | 18,423 | 16,376 |
| SUB-TOTAL | 1,736 | 3,389 | 5,515 | 7,725 | 5,835 | 13,888 | 13,888 | 0 | 5,590 | 13,924 | 13,924 | 0 | 0 | 85,415 | 48,113 | 37,302 |
| TOTAL | 2,991 | 8,105 | 13,291 | 18,101 | 19,638 | 29,246 | 20,065 | 7,527 | 15,245 | 21,544 | 13,924 | 0 | 0 | 170,178 | 79,981 | 90,196 |
| MAIN ACCESS ROADS | | | | | | | | | | | | | | | | |
| SECTION- 9 | 177 | 177 | 0 | 2,039 | 3,615 | 3,615 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9,622 | 4,656 | 4,966 |
| SECTION- 10 | 153 | 153 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,755 | 3,643 | 4,186 | 0 | 13,095 | 4,262 | 5,834 |
| SECTION- 11 | 142 | 142 | 0 | 0 | 0 | 0 | 1,132 | 3,072 | 3,681 | 0 | 0 | 0 | 0 | 8,368 | 3,839 | 4,529 |
| SECTION- 12 | 193 | 193 | 0 | 0 | 995 | 3,623 | 5,257 | 0 | 0 | 0 | 0 | 0 | 0 | 10,260 | 5,211 | 5,049 |
| SECTION- 13 | 144 | 144 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,317 | 5,919 | 0 | 0 | 7,516 | 3,862 | 3,654 |
| SECTION- 14 | 157 | 157 | 0 | 3,194 | 3,194 | 3,210 | 3,210 | 0 | 0 | 0 | 0 | 0 | 0 | 13,121 | 3,932 | 9,189 |
| SUB-TOTAL | 966 | 966 | 0 | 5,233 | 7,803 | 10,448 | 9,599 | 3,072 | 3,681 | 3,072 | 9,758 | 4,186 | 0 | 53,934 | 25,763 | 33,221 |
| C.S. EXT. SECTION- 15 | 124 | 124 | 0 | 0 | 0 | 0 | 0 | 7,824 | 7,824 | 7,824 | 2,533 | 2,533 | 0 | 28,934 | 3,203 | 25,731 |
| GRAND TOTAL | 4,081 | 9,195 | 13,290 | 23,334 | 27,441 | 40,195 | 29,664 | 18,423 | 26,999 | 32,490 | 26,215 | 6,719 | 0 | 253,045 | 108,948 | 144,097 |
| PRICE CONTINGENCY | 82 | 371 | 315 | 1,923 | 2,856 | 5,071 | 4,411 | 5,171 | 5,267 | 7,115 | 6,326 | 1,802 | 0 | 39,254 | | |

4) Implementation Agency

In Panama, the construction of new roads and the improvement of existing roads are accomplished under the authority of the Ministry of Public Works (MOP). In the past, MOP established ad hoc project organizations for the planning and implementation of such large scale projects as the Autopista Project and the Pan American Highway Project. In order to coordinate with other projects which are under planning close to Corredor Sur, such ad hoc project organization should be formed for the implementation of the subject project also, which is believed to be too large to be handled by any of the existing ordinary routine MOP work sections.

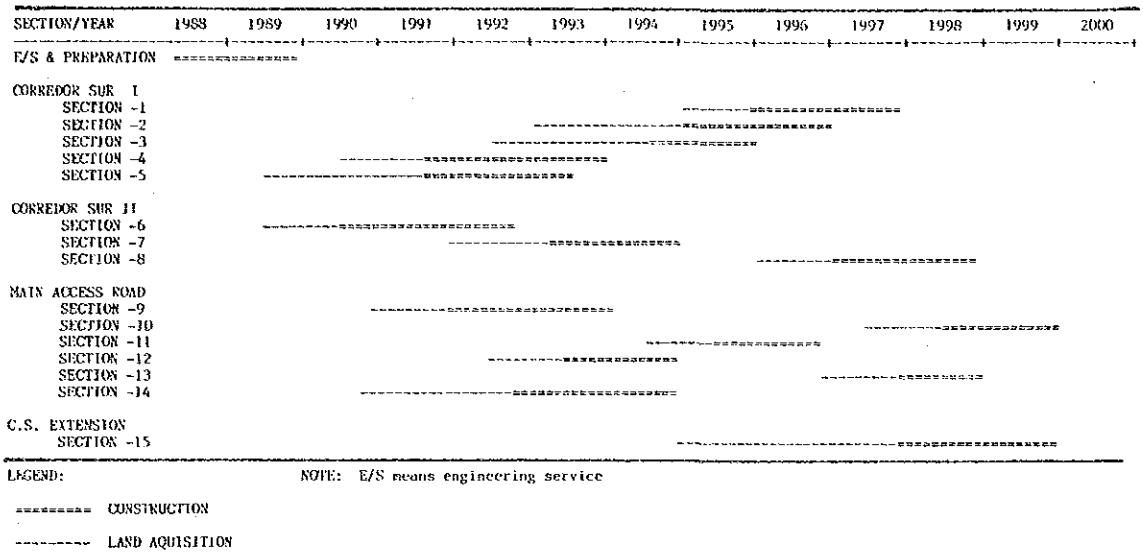



FIGURE V-7-1 PROJECT IMPLEMENTATION SCHEDULE

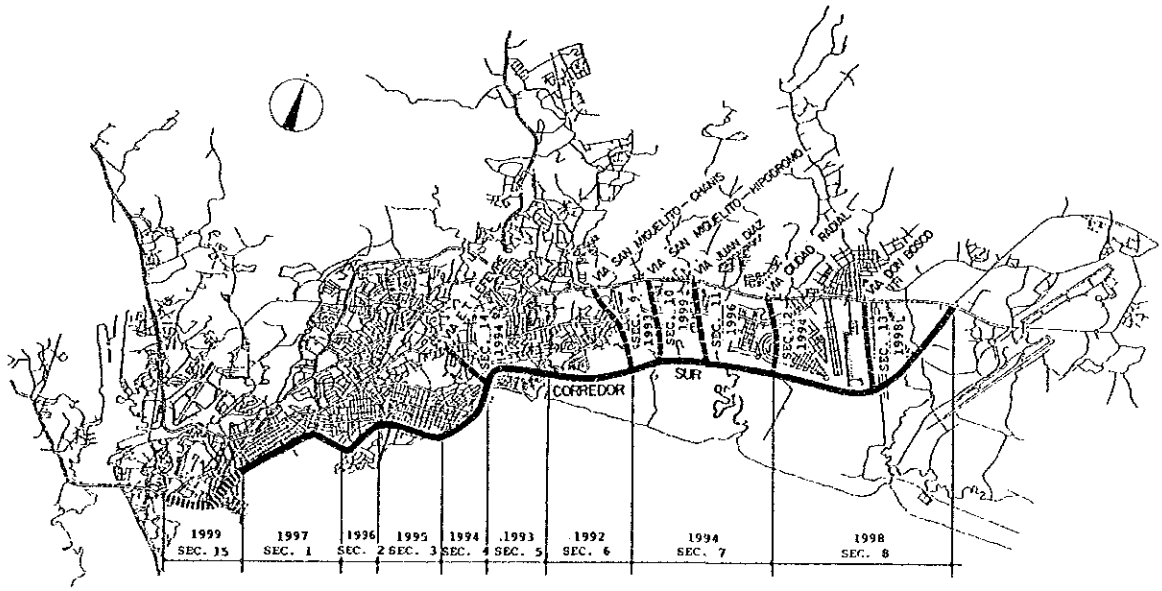



FIGURE V-7-2 CONSTRUCTION COMPLETION SCHEDULE FOR EACH SECTION

# VI. PROJECT EVALUATION

1. METHOD OF EVALUATION
2. EVALUATION RESULTS
3. OTHER SOCIAL AND ECONOMIC BENEFITS
4. FINANCIAL CONSIDERATION OF PROJECT
5. OVERALL EVALUATION AND RECOMMENDATIONS

# VI PROJECT EVALUATION

## 1. METHOD OF EVALUATION

### 1-1 ECONOMIC BENEFITS OF PROJECT

The project discussed in the previous chapter is subject to cost/benefit analysis from the economic viewpoint. In the economic analysis, the costs and benefits are calculated within the Panamanian economy.

The economic benefits of the project can broadly be divided into two: direct benefits and indirect benefits.

Through the improvement of the road network, the project will bring about direct benefits for numerous road users, such as vehicle operating cost savings, passenger time savings, reduction of traffic accidents, as well as an increase of driver's comfort, safety and punctuality, etc.

Indirect benefits will also be expected in various parts of the community through the expansion of the direct benefits, such as an acceleration of the regional development, particularly at roadside areas, energy savings, and so on.

Aside from those benefits as stated above, the creation of employment opportunities will eventuate in the course of the construction.

## 1-2 DIRECT BENEFITS OF PROJECT

The indirect benefits were not quantified in this evaluation, but a qualitative consideration was made instead. Among various direct benefits, it was considered that it would be very difficult to quantify such benefits as driver's comfort, safety and punctuality. Ultimately, the following two quantifiable direct benefits have been measured;

a. Vehicle Operating Cost Savings; and
b. Passenger Time Savings.

Vehicle Operating Cost Savings were determined by comparing "with-project case" to "without-project case" concerning the total vehicle operating costs for five types of vehicles traveling on the road network.

Passenger Time Savings derived from reductions in travel time were computed by comparison of the total vehicle operating hours of "with-project case" and those of "without-project case".

## 1-3 COST BENEFIT ANALYSIS

### (1) General

The evaluation was based upon the benefit/cost analysis wherein the costs and benefits are assessed in economic terms.

The basic condition of the evaluation was formulated as follows;

a. WITHOUT PROJECT CASE:

The case where the existing road network is left as it is until the year 2000, except for the construction of the Autopista and Corredor Norte to be completed by the year 2000.

b. WITH PROJECT CASE:

The case where the project subjected to the Study is implemented on the Without Project Case Network by the year 2000.

In addition, cost/benefit analyses were conducted, after having examined the relative importance of each section, for the following cases; where either the sections for new road construction or the sections for improvement works would be dropped from the implementation schedule; and where either the sections in the suburban area or the sections in the built-up area would not be constructed. In addition, an analysis was attempted if Corredor Sur should be implemented without the Corredor Sur Extension, and the reverse case as well.

### (2) Base Year of Cost Estimate and Project Life

The base year of the cost estimates is the year 1987. The cost/benefit flow was prepared up to the year 2010. However, since the planning year of the project is the year 2000, the benefits after the year 2010, are deemed constant.

### (3) Evaluation Indexes

The evaluation index is the Economic Internal Rate of Return (hereinafter called EIRR). Net Present Value (NPV) and Benefit Cost Ratio (BCR) are also examined for additional consideration.

### (4) Representing Vehicle Models for Evaluation and Basic Vehicle Data

Vehicles for this evaluation were clasified under the following five vehicle categories in accordance with the ESTAMPA Masterplan; passenger cars,trucks, taxis, public buses and private buses.

A representing vehicle was selected in each vehicle category. The choice of the representing vehicle models was made with consideration given to the number of vehicle models within the category and the results of the interviews with car dealers in Panama City. Although there is a minimum of differences amongst vehicle models within the same category concerning vehicle price or diesel and gasoline consumption rate etc, such differences were assumed to have only a minor effect on the results of the evaluation.

Within the category of passenger cars, there are gasoline-driven vehicles and diesel-driven vehicles (e.g. jeeps and light trucks) with different vehicle characteristics. Therefore, once each cost was estimated separately, they have been unified considering the current numbers of passenger cars and light trucks.

Representing vehicles and their basic data are summarized in TABLE VI-1-1. The economic vehicle costs were estimated by excluding one set of new tire costs, the import tax and ITBM from their financial costs. ITBM is fixed at 5% for any type of vehicle but the import taxes differ with vehicle type. Public buses and taxis are exempted from all tax imposition.

**TABLE VI-1-1 REPRESENTATIVE VEHICLES AND BASIC VEHICLE DATA**

| | Car | L.Truck | Truck | Taxi | Pub.Bus | Priv.Bus |
|---|---|---|---|---|---|---|
| Model | Toyota *Corolla* | Toyota *Dyna 3.5t* | Isuzu *FSR 8t* | Toyota *Corolla* | Ford *B700* | Toyota *Lite Ace* |
| Cylinder(CC) | 1600 | 4000 | 6500 | 1600 | - | - |
| Fuel Type | Gasoline | Diesel | Diesel | Gasoline | Diesel | Diesel |
| Annual Operating Distance (1000km) | 15 | 30 | 30 | 35 | 35 | 15 |
| Vehicle Life Time (year) | 10 | 12 | 12 | 10 | 20 | 12 |
| Financial Cost (B/.) | 9,375.0 | 16,430.0 | 30,807.0 | 7,500.0 | 52,000.0 | 13,400.0 |
| Tires (B/.) | 153.6 | 349.2 | 1,091.4 | 153.6 | 1,127.4 | 349.2 |
| Financial Cost (B/.)* | 9,221.4 | 16,080.8 | 29,715.6 | 7,346.4 | 50,872.6 | 13,050.8 |
| ITBM (5%) | 439.1 | 765.8 | 1,415.0 | - | - | 621.5 |
| Import Tax (B/.) | 1,290.7 | 2,004.5 | 2,519.0 | - | - | 1,657.4 |
| Economic Vehicle Cost (B./) | 7,491.6 | 13,310.5 | 25,781.5 | 7,346.4 | 50,872.6 | 10,771.9 |

* Tire cost excluded
Source: ESTAMPA

## 1-4 UNIT VEHICLE OPERATING COSTS

### (1) General

The unit vehicle operaing costs for this analysis were assumed to be comprised of fuel cost, lubricating oil cost, tire wear cost, vehicle maintenance cost, depreciation expense and occupant's time cost, which could be fairly quantified.

The unit vehicle operating costs were prepared with assumed level of travel speed, taking into consideration that vehicle travel speed will have an effect on consumption of fuel and lubricating oil, as well as tire wear. The normal or average speed in the study area was assumed at 30 to 40km per hour.

### (2) Fuel and Lubiricating Oil Costs

Fuel and lubricating oil costs in Panama City are set out in TABLE VI-1-2.

**TABLE VI-1-2 FUEL AND LUBRICATING OIL COSTS**

| | Gasoline | Diesel | Lubricant |
|---|---|---|---|
| Financical Cost (B/./gal) | 1.98 | 1.19 | 10.75 |
| (B/./lit)* | 0.52 | 0.31 | 2.84 |
| Tax (B/./lit) | 0.11 | 0.02 | 0.87 |
| Economic Cost(B/./lit) | 0.42 | 0.29 | 1.97 |

*1 gallon = 3.7854 liters
Source: ESTAMPA

Economic costs were estimated by eliminating the taxes from the financial costs. The assumed tax rates were referenced to the tax rates for imported crude oil. The basic unit fuel and lubricating oil costs are set out in TABLE VI-1-3.

**TABLE VI-1-3 BASIC CONSUMPTION RATE AND COSTS OF FUEL AND LUBRICATING OIL**

| | Car | L.Truck | Truck | Taxi | Pub.Bus | Priv.Bus |
|---|---|---|---|---|---|---|
| Basic Consumption Rate | | | | | | |
| Gasoline (km/lit)* | 8.00 | - | - | 8.00 | - | - |
| Diesel (km/lit) | - | 7.50 | 3.50 | - | 3.00 | 7.50 |
| Lubricant (lit/1000km) | 0.60 | 1.10 | 5.00 | 0.60 | 6.70 | 1.10 |
| Fuel & Lubricant Costs (Cents/Km) | | | | | | |
| Fuel | 5.20 | 3.89 | 8.33 | 5.20 | 9.72 | 3.89 |
| Lubricant | 0.12 | 0.22 | 0.99 | 0.12 | 1.32 | 0.22 |

* 1 gallon = 3.7854 liters
Source: ESTAMPA

### (3) Tire Wear Cost

The tire wear costs were calculated as the number of tires times the unit cost, and by dividing a set of tire costs per vehicle by tire life. The basic tire wear costs are set out in TABLE VI-1-4. In calculations of the economic costs, the import tax (20%) and ITBM (5%) were eliminated from financial tire costs.

TABLE VI-1-4 BASIC TIRE WEAR COSTS

| | Car | L.Truck | Truck | Taxi | Pub.Bus | Priv.Bus |
|---|---|---|---|---|---|---|
| Number of Tire | 4 | 6 | 6 | 4 | 6 | 6 |
| Financial Cost (B/.) | 38.4 | 58.2 | 181.9 | 38.4 | 187.9 | 58.2 |
| ITBM (5%) | 1.8 | 2.8 | 8.7 | 1.8 | 8.9 | 2.8 |
| Import Tax (20%) | 6.1 | 9.2 | 28.9 | 6.1 | 29.8 | 9.2 |
| Economic Cost (B/.) | 30.5 | 46.2 | 144.4 | 30.5 | 149.1 | 46.2 |
| Tire Life (1000 km) | 36.0 | 50.0 | 50.0 | 35.0 | 16.0 | 22.0 |
| Tire Wear Cost (B/./1000 km. veh) | 3.39 | 5.54 | 17.32 | 3.48 | 55.92 | 12.60 |

Source: ESTAMPA

## (4) Vehicle Maintenance Costs

The maintenance costs were assumed to consist of maintenance spare parts and maintenance labor costs. The cost of maintenance spare parts was calculated by multiplying certain rates by the economic vehicle costs. The rates used in this calculation were the same ones as obtained in the ESTAMPA II Study. The economic labor costs were estimated taking into consideration that vehicle maintenance works are carried out partially by unskilled labor. The vehicle maintenance costs are set out in TABLE VI-1-5.

TABLE VI-1-5 MAINTENANCE OF PARTS AND LABOR COSTS

| | Car | L.Truck | Truck | Taxi | Pub.Bus | Priv.Bus |
|---|---|---|---|---|---|---|
| Maintenance Spare Parts Costs | | | | | | |
| Spare Parts Required (% of vehicle cost/1000km) | 0.091 | 0.088 | 0.122 | 0.318 | 0.318 | 0.318 |
| Economic Vehicle Cost (.B/.) | 7,491.6 | 13,310.5 | 25,781.5 | 7,346.4 | 50,872.6 | 10,771.9 |
| Parts Cost (.B/./1000km) | 6.82 | 11.71 | 31.45 | 23.36 | 161.77 | 34.25 |
| Maintenance Labor Costs | | | | | | |
| Annual Hours of Labor | 24 | 50 | 250 | 320 | 320 | 250 |
| Unit Labor Cost(B/./hr) | 3.16 | 3.16 | 3.16 | 3.16 | 3.16 | 3.16 |
| Labor Cost (B/./year) | 75.92 | 158.18 | 790.88 | 1,012.32 | 1,012.32 | 790.88 |
| Operating Dist. (1000km/year) | 15 | 30 | 30 | 35 | 35 | 15 |
| Economic Labor Cost (B/./1000km) | 5.06 | 5.27 | 26.36 | 28.92 | 28.92 | 52.73 |

Source: ESTAMPA

## (5) Depreciation Expenses

Depreciation expenses were calculated by dividing the depreciable value of the vehicle cost (economic vehicle costs excluded the residual value) by life operating distance. The results of calculations are presented in TABLE VI-1-6.

TABLE VI-1-6 DEPRECIATION EXPENSE OF VEHICLES

| | Car | L.Truck | Truck | Taxi | Pub.Bus | Priv.Bus |
|---|---|---|---|---|---|---|
| Economic Vehicle Cost (B/.) | 7,491.6 | 13,310.5 | 25,781.5 | 7,346.4 | 50,872.6 | 10,771.9 |
| Residual Value (%) | 5 | 5 | 10 | 10 | 10 | 10 |
| Total Depreciation Cost (B/.) | 7,117.0 | 12,645.0 | 23,203.4 | 6,611.8 | 45,785.3 | 9,694.7 |
| Operating Distance (1000km) | 150 | 360 | 360 | 350 | 700 | 180 |
| Depreciation Expense (B/./1000km) | 47.45 | 35.13 | 64.45 | 18.89 | 65.41 | 53.86 |

Source: ESTAMPA

## (6) Occupant's Time Cost

The time value of occupants (drivers of taxi, bus and truck and

truck helpers) was included in the vehicle operating cost components. Buses in Panama City have no helper. So helper wages weren't considered. Hourly wage of occupants and their working hours were obtained through the interview survey at MOP.

A shadow wage rate was applied in the calculations of unit labor cost of truck helpers because some of them are deemed unskilled labor. The occupant's time costs of taxi, truck and buses are set out in TABLE VI-1-7.

**TABLE VI-1-7 CREW HOURS AND COSTS**

| | | Car | L.Truck | Truck | Taxi | Pub.Bus | Priv.Bus |
|---|---|---|---|---|---|---|---|
| No. of Crew Member | Driver | - | - | 1 | 1 | 1 | 1 |
| | Helper | - | - | 1 | - | - | - |
| Annual Working Hours (hr) | | - | - | 1500 | 2400 | 2400 | 1800 |
| Annual Operating Dist. (1000km) | | - | - | 30 | 35 | 35 | 15 |
| Working Hours (hr/1000km) | | - | - | 100.0 | 68.6 | 68.6 | 120.0 |
| Unit Crew Cost (B/./hr) | | - | - | 1.80 | 2.50 | 3.13 | 2.90 |
| Crew Cost (B/./1000km) | | - | - | 180.00 | 171.43 | 214.63 | 348.00 |

Source: ESTAMPA

### (7) Unit Cost by Travel Speed

In theory, it is considered that vehicle operating costs will vary with road gradient, road alignment, road surface condition and traffic congestion etc. In this analysis, however, all physical conditions such as road surface condition etc. have been omitted. Because, in the case of intra-urban roads, which are nearly all paved and whose road surface conditions are generally comparable, vehicle operating costs are affected more importantly by such factors as traffic volume, intersection density and traffic controls rather than by the physical conditions of the road. Therefore, only the effect of travel speed on the vehicle operating cost was taken into account.

Vehicle operating costs by travel speed were estimated by the use of modifying factors described in the World Bank Report.* It was assumed in this computation that the travel speed will have an effect on consumption of fuel, lubricating oil and tire wear. Such particular modifying factors as utilized in the said report were thereby applied. The results of the unit vehicle operating cost estimates with different levels of travel speed are set out in TABLE VI-1-8.

* Highway Transport Planning Project, A Simplified Vehicle Operating Cost Model for Use in Screening Analysis, IBRD, 1986

**TABLE VI-1-8 UNIT VEHICLE OPERATING COSTS BY TRAVEL SPEED**

(Unit: Cents/veh.km)

| Class (km/hr) | Car | Truck | Taxi | Pub.Bus | Priv.Bus |
|---|---|---|---|---|---|
| -10 | 16.20 | 49.73 | 35.25 | 73.42 | 57.96 |
| 10-20 | 15.45 | 48.22 | 34.48 | 70.28 | 57.28 |
| 20-30 | 12.26 | 42.89 | 31.08 | 64.81 | 54.89 |
| 30-40 | 11.19 | 41.28 | 29.93 | 63.70 | 54.25 |
| 40-50 | 10.79 | 40.92 | 29.48 | 64.44 | 54.23 |
| 50-60 | 10.87 | 41.52 | 29.54 | 66.63 | 54.71 |
| 60-70 | 11.21 | 42.56 | 29.88 | 69.41 | 55.38 |
| 70-80 | 11.93 | 44.34 | 30.62 | 73.27 | 56.43 |
| 80- | 13.04 | 46.82 | 31.76 | 78.00 | 57.81 |

Source: ESTAMPA

## 1-5 UNIT TIME VALUE

### (1) General

The time savings enjoyed by users of commercial vehicles have already been accounted for in the calculations of vehicle operating cost savings. Here, the time savings derived from reductions in travel time benefiting passengers of commercial vehicles and non-commercial vehicles were computed.

Unit time value was estimated by each vehicle type; taxi, public bus, private bus, and passenger car. Average number of passengers per vehicle and future trip purpose composition by mode have already been formulated in the ESTAMPA Masterplan.

### (2) Time Value

Passenger time savings were measured on the basis of the average labor wage. According to figures released by the Government, the average labor wage in 1983, was 424 balboas per month (in 1983, current prices)(See TABLE VI-1-9).

TABLE VI-1-9 AVERAGE LABOR WAGE

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|
| Average Wage (B././Month) | 312.19 | 331.82 | 369.02 | 384.64 | 408.40 | 423.96 |
| Growth Rate (%) | - | 6.3 | 11.2 | 4.2 | 6.2 | 3.8 |

Source: Estadisticas del Trabajo: Ano 1984

The growth rate of average labor wage was estimated at about 6% per year at an average for the period from 1978, to 1983. However, the recent economic indicators have shown signs of moderate economic growth. For instance, the growth rate of the average monthly income in the public sector has declined from some 8% per year in average from 1978, to 1983, to about 4.3% from 1983, to 1985.

Taking into consideration such economic conditions in Panama in the very recent years, the labor wage in 1987, was estimated at an average 496 balboas per month, assuming the increase rate of the average wage at 4% per annum. from 1984, to 1987.

As the average number of working hours was assumed at 160 hours per month (8 hours/day x 20 days/month), the average hourly labor wage was estimated at 3.10 balboas.

A finding in the ESTAMPA Masterplan indicated that there was a substantial difference in income between car-owning households and non-car-owning ones.

The said study pointed out the relation between particular transport means and level of income. Public transport means, particularly buses, are the basic movers for people ranked at a lower level of income (average or below the average) and non-car owning families. The study also revealed

that a majority of those ranked above the average income is likely to utilize its own passenger cars. This is the reason why a certain fixed unit value for time savings shall not be applied uniformly to all modes of transportation.

Therefore, different time values were considered for car-trip and bus-trip separately. Each value was determined on the basis of each gap in the average labor wage in accordance with the ESTAMPA Masterplan. The adoption of these figures could be sustained in view of the relationship between the increases of average income and automobile prices in Panama City over a number of years. In other words, the price of a passenger car has risen at an equal or greater pace as the increase in income in the 1980's. It will cost about 1.5 times the average annual income to purchase it today, which is just about the same as at the time when the ESTAMAP Masterplan was drafted.

In conclusion, the time value to be applied for bus passengers was estimated at 2.17 balboas per hour, down 30% from the average income and for drivers of passenger cars at 5.58 balboas, 80% higher than the average income. The average hourly income value was applied for co-riders of passenger cars and for passengers of taxi cabs.

### (3) Composition of Future Trip Purposes

Compositions of future trip purposes by traffic mode for the years of 1990, and 2000, have been established in the ESTAMPA Masterplan. For this evaluation, the one for the year 2000, as shown in TABLE VI-1-10, was used in light of the planning year of the project and the pattern of the benefit generation.

TABLE VI-1-10 FUTURE TRIP COMPOSITION BY TRAFFIC MODE IN YEAR 2000

(Unit: Percent)

| Traffic Mode | Work | School | Home | Business | Shopping | Private | Total |
|---|---|---|---|---|---|---|---|
| 1. Walk, Two Wheelers | 8.07 | 27.48 | 48.86 | 0.76 | 5.71 | 9.12 | 100.00 |
| 2. Private Car | 22.35 | 6.84 | 36.86 | 4.68 | 5.82 | 23.44 | 100.00 |
| 3. Truck | 20.32 | 0.03 | 33.17 | 39.90 | 2.13 | 4.45 | 100.00 |
| 4. Taxi | 13.53 | 6.76 | 45.56 | 2.98 | 3.82 | 27.35 | 100.00 |
| 5. Route Bus | 21.28 | 13.58 | 45.44 | 1.34 | 4.06 | 14.31 | 100.00 |
| 6. Private Bus | 8.03 | 39.51 | 47.75 | 2.21 | 0.74 | 1.76 | 100.00 |
| Total | 18.07 | 14.40 | 42.94 | 4.76 | 4.63 | 15.20 | 100.00 |

Source: ESTAMPA

Of the various trip purposes as stated above, the time benefits were considered when traveling only for business-category trips consisting of trips of "work" and "business". Other trip purposes such as home, school, shopping and private were not considered, because it is difficult to consider that travel time savings resulting from such trips are used for some additional productive activities.

It shall be noted that even though the trip purpose "home" is considered to include some "work", it was not accounted for in time benefit calculations owing to the uncertain classification of such trips.

Therefore, as for the case of the taxi as an example, about 16.5% of the total trips was considered for time benefits, consisting of 13.53% for work trips and 2.98% for business trips. The remaining trips were not considered because of the reason mentioned above.

The composition ratios of the business-category trip purposes to be accounted for in the time saving benefits of the project were likewise calculated for each type of vehicle respectively.

### (4) Time Value Per Vehicle

Computation of travel time value per vehicle was made on the basis of the time value per passenger, the composition ratio of the business-category trip and the average number of passengers per vehicle.

The average number of passengers established in the ESTAMPA Masterplan is presented in TABLE VI-1-11.

TABLE VI-1-11 AVERAGE NUMBER OF PASSENGERS FOR EACH VEHICLE TYPE

| Vehicle Types | Composition of Passengers |
|---|---|
| Passenger Car | Driver 1* + Passenger 0.5 |
| Taxi | (Driver 1)* + Passenger 0.8 |
| Public Bus | (Driver 1)* + Passenger 27 |
| Private Bus | (Driver 1)* + Passenger 16 |

*Time cost included in occupant's costs
Source: ESTAMPA

Again taking a taxi as an example, the time value per one taxi is calculated at 0.41 balboas per vehicle per hour by multiplying the average labor wage of 3.1 balboas per hour by said average number of passengers of 0.8 and considering the trip purpose composition of 16.5%.

The unit time values for other vehicles were likewise calculated and are presented in TABLE VI-1-12.

TABLE VI-1-12 UNIT TRAVEL TIME VALUE FOR EACH VEHICLE TYPE
(Unit:.B/Vehicle.Hour)

| Vehicle Type | Time Value |
|---|---|
| Passenger Car | 1.93 |
| Taxi | 0.41 |
| Public Bus | 13.25 |
| Private Bus | 3.56 |

Source: ESTAMPA

## 1-6 ECONOMIC COSTS OF PROJECT

### (1) General

The total financial construction cost of the project is estimated at 175 million balboas in 1987, prices, of which the foreign currency portion accounts for about 62%.

The project cost including the compensation cost and the land acquisition cost of 83 million balboas totals 258 millions balboas.

Here, the financial costs were converted to the economic costs by means of elimination of transfer payments and the application of a shadow wage rate.

### (2) Taxes

With regard to the foreign currency portion of the direct material costs, the import duties and ITBM (a fixed 5% for all commodities) were eliminated from the financial costs. Though the rates of the import duties depend upon the goods and materials to be imported under this project, an average of 25 % of the import duties was removed in this calculation. While concerning the local currency portion, the 5% of ITBM levied on the financial costs was excluded. Finally, the taxes imposed on petroleum fuels were excluded from the equipment rental rates and running costs.

### (3) Labor

The implementation of the project requires a large amount of labor. The estimated labor costs are approx. 30 million balboas, which is about 17% of the total construction cost. And the cost for unskilled labor accounts for about 40% of the total labor cost.

The shadow wage rate was applied for measurement of the opportunity costs of unskilled labors, taking into consideration the present labor situation in Panama.

The unemployment rate was estimated at 11.8% for the whole nation and 15% for the Metropolitan Areas (Panama and Colon Provinces) which was about 27% higher than the former, both in 1985. Based on the unemployment rate as mentioned above and by use of the Haveman formula*, the shadow wage rate is assumed to range from 0.7 to 0.5.

Taking into consideration the very recent economy in Panama which achieved a significant mark down in the rate of unemployment from said 11.8% in 1985, to 10.2% in 1986, 0.7 of the shadow wage rate was used for this evaluation.

*So = Sn (1.25-D/0.2)
where So: Shadow Wage
Sn: Nominal Wage
D: Unemployment Rate

### (4) Others

Since the project assets will actually continue to exist beyond the year 2010, the portion which was not depreciated until the year 2010, shall

be defined as a residual value, and accounted for as a negative cost in the year 2010.

The residual value was computed by dividing the depreciable costs (total investment amount minus land acquistion costs) by period of depreciation. Although the depreciation period depends on the project assets, the residual value for the project was calculated using the depreciation period of 25 years for all the project assets.

The results of the economic cost calculation together with the annual economic costs are set out in TABLE VI-1-13 and TABLE VI-1-14. The total economic costs of the project including the compensation cost and the land acquisition cost were estimated at 246 million balboas compared to the financial project costs of 258 million balboas.

TABLE VI-1-13 ECONOMIC COST OF PROJECT FOR EACH ROAD SECTION

(Unit:1000 Balboas in 1987 Prices)

| | Financial Costs | | | Economic Cost | | |
|---|---|---|---|---|---|---|
| | Foreign | Local | Total | Foreign | Local | Total |
| Corredor Sur I | | | | | | |
| Section 1 | 9,298 | 9,246 | 18,544 | 9,053 | 8,222 | 17,275 |
| Section 2 | 2,534 | 7,799 | 10,333 | 2,468 | 7,527 | 9,996 |
| Section 3 | 2,800 | 8,528 | 11,328 | 2,733 | 8,244 | 10,977 |
| Section 4 | 10,549 | 9,025 | 19,574 | 10,287 | 7,929 | 18,216 |
| Section 5 | 6,686 | 18,297 | 24,983 | 6,526 | 17,627 | 24,153 |
| Subtotal | 31,868 | 52,895 | 84,763 | 31,067 | 49,549 | 80,617 |
| Corredor Sur II | | | | | | |
| Section 6 | 10,564 | 8,945 | 19,509 | 10,382 | 8,186 | 18,567 |
| Section 7 | 19,127 | 11,980 | 31,107 | 18,812 | 10,670 | 29,482 |
| Section 8 | 18,423 | 16,376 | 34,799 | 18,036 | 14,764 | 32,799 |
| Subtotal | 48,113 | 37,302 | 85,415 | 47,230 | 33,619 | 80,849 |
| Total | 79,981 | 90,196 | 170,178 | 78,297 | 83,169 | 161,466 |
| Main Access Roads | | | | | | |
| Section 9 | 4,656 | 4,966 | 9,622 | 4,553 | 4,536 | 9,088 |
| Section 10 | 4,262 | 5,834 | 10,096 | 4,190 | 5,532 | 9,722 |
| Section 11 | 3,839 | 4,529 | 8,368 | 3,763 | 4,208 | 7,972 |
| Section 12 | 5,211 | 5,049 | 10,260 | 5,109 | 4,618 | 9,727 |
| Section 13 | 3,862 | 3,654 | 7,516 | 3,781 | 3,314 | 7,094 |
| Section 14 | 3,932 | 9,189 | 13,121 | 3,822 | 8,729 | 12,551 |
| Subtotal | 25,763 | 33,221 | 58,984 | 25,217 | 30,937 | 56,153 |
| Corredor Sur Ext. | | | | | | |
| Section 15 | 3,203 | 25,731 | 28,934 | 3,126 | 25,411 | 28,537 |
| Grand Total | 108,948 | 149,148 | 258,095 | 106,640 | 139,516 | 246,156 |

Source: ESTAMPA

## TABLE VI-1-14 ANNUAL ECONOMIC COST OF PROJECT FOR EACH ROAD SECTION

(Unit: 1000 Balboas in 1987 Prices)

| | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Construction Cost | | | | | | | | | | | | | |
| Corredor Sur I | | | | | | | | | | | | | |
| S 1 | 343 | 343 | 0 | 0 | 0 | 0 | 0 | 2,559 | 7,015 | 7,015 | 0 | 0 | 0 |
| S 2 | 92 | 92 | 0 | 0 | 0 | 3,032 | 3,032 | 1,874 | 1,874 | 0 | 0 | 0 | 0 |
| S 3 | 99 | 99 | 0 | 0 | 1,679 | 3,357 | 3,033 | 2,710 | 0 | 0 | 0 | 0 | 0 |
| S 4 | 385 | 385 | 854 | 4,002 | 6,296 | 6,296 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S 5 | 240 | 3,701 | 6,922 | 5,918 | 4,914 | 2,457 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subtotal | 1,158 | 4,619 | 7,776 | 9,920 | 12,889 | 15,142 | 6,065 | 7,143 | 8,889 | 7,015 | 0 | 0 | 0 |
| Corredor Sur II | | | | | | | | | | | | | |
| S 6 | 355 | 2,008 | 5,290 | 7,276 | 3,638 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S 7 | 641 | 641 | 0 | 0 | 1,973 | 13,114 | 13,114 | 0 | 0 | 0 | 0 | 0 | 0 |
| S 8 | 634 | 634 | 0 | 0 | 0 | 0 | 0 | 0 | 5,590 | 12,971 | 12,971 | 0 | 0 |
| Subtotal | 1,630 | 3,238 | 5,290 | 7,276 | 5,611 | 13,114 | 13,114 | 0 | 5,590 | 12,971 | 12,971 | 0 | 0 |
| Total | 2,788 | 7,902 | 13,066 | 17,195 | 18,500 | 28,256 | 19,179 | 7,143 | 14,479 | 19,986 | 12,971 | 0 | 0 |
| Main Access Roads | | | | | | | | | | | | | |
| S 9 | 164 | 164 | 2,039 | 3,361 | 3,361 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S 10 | 145 | 145 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,755 | 3,729 | 3,948 | 0 |
| S 11 | 133 | 133 | 0 | 0 | 0 | 0 | 1,132 | 2,946 | 3,628 | 0 | 0 | 0 | 0 |
| S 12 | 180 | 180 | 0 | 0 | 995 | 3,454 | 4,918 | 0 | 0 | 0 | 0 | 0 | 0 |
| S 13 | 135 | 135 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,317 | 5,508 | 0 | 0 |
| S 14 | 144 | 144 | 0 | 3,194 | 3,194 | 2,938 | 2,938 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subtotal | 900 | 900 | 2,039 | 6,554 | 7,549 | 6,392 | 8,988 | 2,946 | 3,628 | 3,072 | 9,237 | 3,948 | 0 |
| C/S Ext(S 15)15 | 115 | 0 | 0 | 0 | 0 | 0 | 7,874 | 7,874 | 7,874 | 2,343 | 2,343 | 0 | |
| G.Total | 3,803 | 8,916 | 15,105 | 23,749 | 26,048 | 34,648 | 28,167 | 17,962 | 25,981 | 30,932 | 24,552 | 6,292 | 0 |
| (2) Maintenance Costs | 0 | 0 | 0 | 0 | 33 | 112 | 182 | 368 | 394 | 452 | 516 | 726 | 801 |

Source: ESTAMPA

## 2. EVALUATION RESULTS

### 2-1 EVALUATION RESULTS OF PROJECT

#### (1) Evaluation Results for Whole Project

The benefit/cost flow of the project is presented in TABLE VI-2-1 where the costs and benefits are in 1987, prices suitably modified to reflect economic costs.

TABLE VI-2-1 ANNUAL BENEFIT AND COST FLOW
(Unit:1000 Balboas in 1987 Prices)

| Year | Costs | Benefits | (VOCS)* | (PTS)** | Net Benefits |
|---|---|---|---|---|---|
| 1988 | 3,803 | 0 | 0 | 0 | -3,803 |
| 1989 | 8,916 | 0 | 0 | 0 | -8,916 |
| 1990 | 15,105 | 0 | 0 | 0 | -15,105 |
| 1991 | 23,749 | 0 | 0 | 0 | -23,749 |
| 1992 | 26,081 | 324 | -257 | 580 | -25,757 |
| 1993 | 34,760 | 9,341 | 860 | 8,454 | -25,446 |
| 1994 | 28,349 | 34,483 | 5,296 | 29,188 | 6,134 |
| 1995 | 18,330 | 64,899 | 9,849 | 55,049 | 46,569 |
| 1996 | 26,375 | 68,115 | 11,310 | 56,805 | 41,740 |
| 1997 | 31,384 | 76,963 | 11,573 | 65,390 | 45,579 |
| 1998 | 25,067 | 88,413 | 12,734 | 75,678 | 63,346 |
| 1999 | 7,017 | 106,060 | 15,785 | 90,276 | 99,043 |
| 2000 | 801 | 108,668 | 16,050 | 92,618 | 107,867 |
| 2001 | 801 | 108,668 | 16,050 | 92,618 | 107,867 |
| 2002 | 801 | 108,668 | 16,050 | 92,618 | 107,867 |
| 2003 | 801 | 108,668 | 16,050 | 92,618 | 107,867 |
| 2004 | 801 | 108,668 | 16,050 | 92,618 | 107,867 |
| 2005 | 801 | 108,668 | 16,050 | 92,618 | 107,867 |
| 2006 | 801 | 108,668 | 16,050 | 92,618 | 107,867 |
| 2007 | 801 | 108,668 | 16,050 | 92,618 | 107,867 |
| 2008 | 801 | 108,668 | 16,050 | 92,618 | 107,867 |
| 2009 | 801 | 108,668 | 16,050 | 92,618 | 107,867 |
| 2010 | -58,590*** | 108,668 | 16,050 | 92,618 | 167,258 |
| Total | 198,356 | 1,643,919 | 243,700 | 1,400,218 | 1,445,563 |

* Vehicle Operating Costs Savings
** Passenger Time Savings
*** Residual as of the year 2010 included
Source: ESTAMPA

The cumulative benefits for the period from 1988, to 2010, were estimated at 1,644 million balboas, while, the cumulative costs for this same period were 198 million balboas. It shall be noted that the benefits for the period from the year 2000, to 2010, are considered constant as initially explained, and that the residual value of the project as of the year 2010, is accounted for in the cost stream at the year 2010.

As the results of cost/benefit analysis, EIRR for the project was estimated at 30.4% considering vehicle operating cost savings and passenger time savings. From an economic standpoint, the implementation of the project as a whole is well justified with a high EIRR as indicated above.

A Benefit/Cost Ratio (BCR) was estimated at 2.7 if 12% of the discount rate which is used for most development projects in Panama is applied. And a Net Present Value (NPV) under the same discount rate is estimated at about 200 million balboas.

The high EIRR is brought about by a large amount of economic benefits derived from passenger time savings. The time benefits in the year 2000, are approximately 93 million balboas, equivalent to about 85% of the total benefits of that year. As for the accumulative benefits up to the year 2010, some 85% of the total economic benefits are attributable to passenger time savings and the rest to vehicle operating cost savings.

These results imply that the project will fulfill its purpose as an additional urban arterial road to increase smooth traffic flow in the east-west direction of the Metropolitan Area and to assist in mitigating the traffic congestion in that area.

### (2) Evaluation Results by Network Conditions

To furnish a general understanding of the relative importance of each road section, whose alternative routes are few, an analysis was conducted for each section on the basis of the traffic volume expected after completion thereof and the investment efficiency, both at the year 2000.

The traffic volume of each section was based on the results for traffic assignment, while the investment efficiency was calculated by dividing the said traffic volume by the construction cost of each section.

As a result, concerning Corredor Sur, a relatively high value is placed on sections 5, 6 and 7, the locations all of which are in the suburban area, thus indicating preferable investment efficiency and a higher degree of road utility over the other sections. With regard to the Main Access Roads, at sections 9, 12 and 14, a higher traffic volume and investment efficiency were obtained, as compared to the other sections (See FIGURE VI-2-1).

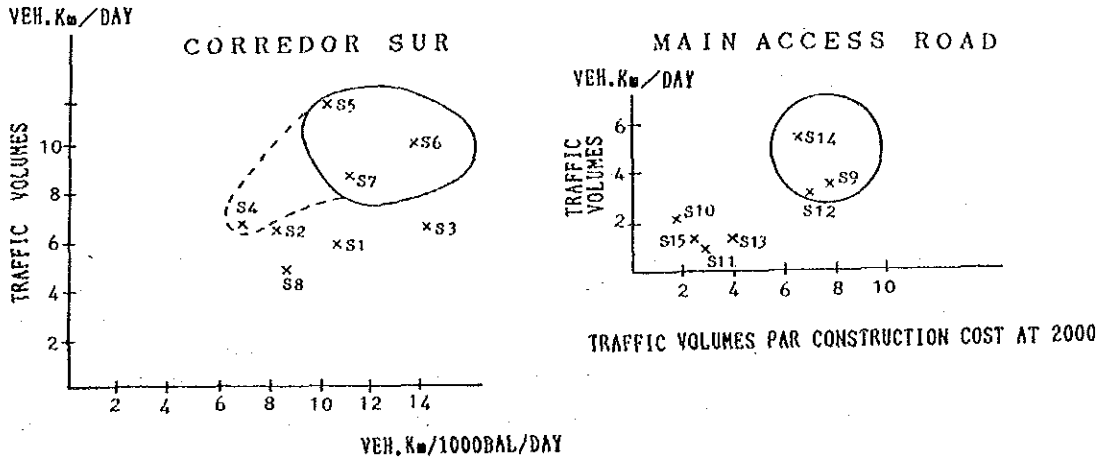



FIGURE VI-2-1 ROAD UTILITY AND INVESTMENT EFFICIENCY OF EACH SECTION

The project is subdivided into the following two parts by the nature of the work:

a. Improvement Section
b. New Road Section

Simultaneously, it is subdivided into another two parts by project location:

a. Sections in Built-up Area
b. Sections in Suburban Area

The Corredor Sur Extension is categorized independently from the above sections.

For additional considerations, economic justification was attempted to assess the feasibility for such cases where a particular section would be dropped from the implementation schedule as shown in TABLE VI-2-2.

**TABLE VI-2-2 PROJECT COMPONENTS FOR EVALUATION**

| | Case A | | Case B | | Case C | |
|---|---|---|---|---|---|---|
| | A-1 | A-2 | B-1 | B-2 | C-1 | C-2 |
| Section 1* | O | X | X | O | O | X |
| Section 2* | O | X | X | O | O | X |
| Section 3* | O | X | X | O | O | X |
| Section 4** | X | O | X | O | O | X |
| Section 5** | X | O | X | O | O | X |
| Section 6 | X | O | O | X | O | X |
| Section 7 | X | O | O | X | O | X |
| Section 8 | X | O | O | X | O | X |
| Section 9 | X | O | O | X | O | X |
| Section 10 | X | O | O | X | O | X |
| Section 11 | X | O | O | X | O | X |
| Section 12 | X | O | O | X | O | X |
| Section 13 | X | O | O | X | O | X |
| Section 14** | X | O | X | O | O | X |
| Section 15 | X | X | X | X | X | O |

O: WITH PROJECT
X: WITHOUT PROJECT

Notes:
* Improvement Section in Built-up Area Section
** New Road Section in Built-up Area

Section 1-8 Corredor Sur
Section 9-14 Main Access Roads
Section 15 Corredor Sur Extension

In any case of the said analyses, both the time benefits and the vehicle operating benefits were determined by means of with/without comparison as done in the previous analysis; the case where such a particular section would be undertaken (with-section case) and the case where none of the sections would be implemented (without-project case).

The construction of the improvement sections (sections 1, 2 and 3) will have an EIRR of 16.1%. It is relatively low compared to other cases, but is still considered feasible, as long as an EIRR of 12% is assumed standard. It was estimated that the new road sections (sections from 4 to 14) will enjoy a higher EIRR of 32.0%.

The reason for the high EIRR for the new road sections is because it is considered that sections 4, 5, 6 and 7, where the higher traffic demand would be expected in the future, are comprised in these sections, and that the highest priority of construction is thereby placed on these sections.

On the contrary, a relatively low EIRR in the improvement sections is caused by relatively high construction costs, as well as the land acquisition cost in relation to the increase of the road capacity by widening the existing roads.

In such a case where the improvement sections would be implemented prior to the new road sections, EIRR as a whole would decrease from 30.4% to 24%, a downturn of about 21% in the economic rate of return.

Therefore, it can be said that it would be worthwhile to implement the improvement sections alone, but if it were done following the construction of the new road sections, this would bring about very substantial benefits.

Concerning the sections in the built-up area (sections 1 to 5 and 14) and in the suburban area (sections 6 to 13), they are likely to enjoy a comparatively high EIRR of 21.4% and 27.8% respectively. A difference in EIRR between the above two cases is substantiated with the same reasons as those analyzed in the previous case.

Concerning the Corredor Sur Extension (section 15), it is conceived from the viewpoint of economic analysis which deals the road user savings that the construction of this section will not be feasible unless other proposed sections are constructed. However, it will play an important role not only for facilitating the better functioning of Corredor Sur but for improving a better land use and living environment, as well as accelerating the existing urban renewal projects in the area.

On the contrary, the implementation of all sections but the Corredor Sur Extension (sections 1 to 14) will have a high EIRR of 31.4%, thus confirming the appropriateness of its implementation, even without the Corredor Sur Extension.

The results of the economic evaluation are set out in TABLE VI-2-3. FIGURE VI-2-2 illustrates the variations of Present Net Value under various discount rates and EIRR for the aforesaid cases.

**TABLE VI-2-3 EVALUATION RESULTS OF PROJECT COMPONENTS**

| Case | Length (Km) | Cost* (1000 Balboas) Financial | Economic** | EIRR (%) | Evaluation Indexes NPV(1000 Balboas) (12%) | (8%) | BCR (12%) | (8%) |
|---|---|---|---|---|---|---|---|---|
| Whole Project | 36.931 | 258,094 | 198,356 | 30.4 | 199,866 | 378,969 | 2.7 | 3.7 |
| Case A-1 : Improvement Section | 5.800 | 40,205 | 30,306 | 16.1 | 5,147 | 16,201 | 1.3 | 1.8 |
| Case A-2 : New Road Section | 28.921 | 188,955 | 141,613 | 32.0 | 184,061 | 339,955 | 3.1 | 4.2 |
| Case B-1 : Suburban Section | 23.359 | 131,277 | 94,106 | 27.8 | 93,810 | 185,946 | 2.7 | 3.7 |
| Case B-2 : Built-up Area Section | 11.362 | 97,883 | 77,813 | 21.4 | 40,305 | 88,408 | 1.8 | 2.5 |
| Case C-1 : Corredor Sur Main | 34.721 | 229,160 | 171,918 | 31.4 | 207,297 | 388,044 | 3.0 | 4.1 |
| Case C-2 : Corredor Sur Extension | 2.210 | 28,934 | 26,210 | - | -6,322 | -7,168 | 0.3 | 0.5 |

* Costs of main access roads in the subject area included
** Residual value included
Source: ESTAMPA

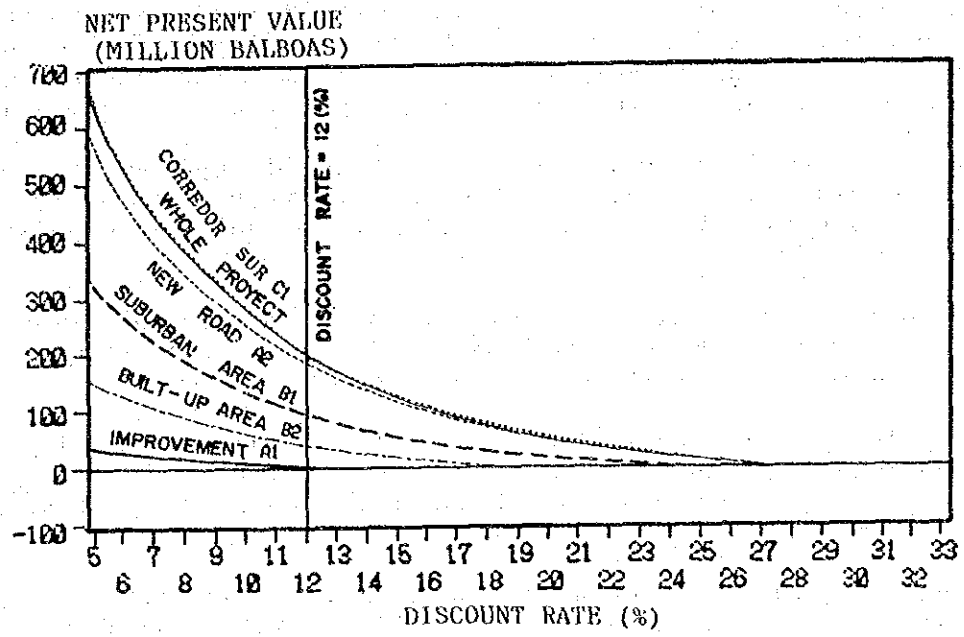



FIGURE VI-2-2 RELATION BETWEEN ECONOMIC INTERNAL RATE OF RETURN (EIRR) AND NET PRESENT VALUE

## 2-2 SENSITIVITY ANALYSIS

A sensitivity analysis was carried out in order to assess a magnitude to be brought by changes in the future traffic demand and the project costs.

In cases where the future traffic demand would decrease 10% and 20%, EIRR will decrease to 28.1% and 25.6% respectively. While, if the construction costs would be up 10% and 20%, EIRR will decline to 28.3% and 26.5% respectively.

And the project will remain feasible (and EIRR will remain over 12%), as long as the traffic demand does not fall 63% or more from the forecast, or the project costs would increase to 2.7 times or more over the estimates.

It can be concluded from the above that the project's feasibility will not be threatened by reasons of traffic demand or project costs unless such a drastic change, unrealistically, would take place.

The previous analyses were conducted providing both the projects of the Autopista and Corredor Norte would be completed by the year 2000. An analysis was carried out for the following two cases; in case the Autopista project would not be completed within the evaluation period and; where neither the Autopista nor the Corredor Norte would be completed.

In conclusion, the former will increase EIRR by 12% (EIRR is 34.0%) and the latter also increases it by 41% (EIRR is 42.8 %). But this result does not deny the implementation of both projects. In other words, the project will play a greater role if the Autopista and the Corredor Norte are not constructed.

The results of the sensitivity analyses are summarized in TABLE VI-2-4.

TABLE VI-2-4 EVALUATION RESULTS OF SENSITIVITY ANALYSIS

| Conditions | IRR (%) | NPV* (1000 Balboas) | BCR* |
|---|---|---|---|
| 1. Traffic Demand down 10% | 28.1 | 168,435 | 2.5 |
| 2. Traffic Demand down 20% | 25.6 | 137,004 | 2.2 |
| 3. Construction Costs up 10% | 28.3 | 188,421 | 2.5 |
| 4. Construction Costs up 20% | 26.5 | 176,977 | 2.3 |
| 5. Without Autopista | 34.0 | 276,350 | 3.4 |
| 6. Without Both Autopista & Corredor Norte | 42.8 | 416,879 | 4.6 |

* Figures under the discount rate of 12%
Source: ESTAMPA

## 3. OTHER SOCIAL AND ECONOMIC BENEFITS

### 3-1 MITIGATION OF TRAFFIC CONGESTION

The value of major traffic indices as a result of traffic assignment is set out in TABLE VI-3-1.

TABLE VI-3-1 TRAFFIC INDICATORS BY NETWORK CONDITIONS

| Indicators | Without Project | With Project |
|---|---|---|
| 1.Total Length of Network (Km) | 272.0 | 285.9 |
| 2.Traffic Load (1000 veh.km) | 7,720.8 | 7,646.9 |
| 3.Total Travel Time (1000 veh.hr) | 765.1 | 541.9 |
| 4.Average Congestion Rate | 1.425 | 1.088 |
| 5.Average Travel Speed (km/hr) | 27.2 | 31.2 |
| 6.Length of Congestion Section (Km) | | |
| - 1.0 | 125.1 | 167.1 |
| 1.0 - 1.5 | 69.9 | 75.7 |
| 1.5- | 77.1 | 43.2 |
| 7.Traffic Load by Congestion (1000 veh.km) | | |
| - 1.0 | 2,413.4 | 3,525.5 |
| 1.0 - 1.5 | 2,540.5 | 3,073.4 |
| 1.5 - | 2,766.9 | 1,048.0 |

Source: ESTAMPA

With-project case decreases the total travel time by some 30%, and the average congestion rate by some 25% against without-project case. These analytical figures reveal a significant effect of the project on the mitigation of traffic congestion.

## 3-2 IMPACT ON URBAN AND ROADSIDE DEVELOPMENT

### (1) Impacts for Regional Development

1) Transfiguration of Axial Type Urban Development into Areawide Type

The tendency of urban development in the eastern part of Panama City shows the axial expansion for the east-west direction. Both the roads Via Domingo Diaz and J. A. Arango play the roles of spines for the above axial urban expansion. Corredor Sur will be an additional axis which brings about the huge urban development at the southern part of Juan Diaz and Pedregal areas. Consequently, the Corredor Sur project will have the effect of inducement for the decrease of rapid urban sprawl to the east.

According to a rough calculation of travel time from the central business district (CBD) to the east for the case of "with Corredor Sur" and "without it" in the year 2000, the travel time of the former is figured at almost one half to one third of that of the latter. It reveals an improvement in the distance and time from one's residence to one's place of work. (See FIGURE VI-3-1)

2) Land Acquisition for Future Urban Expansion

Today's urban development sprawls to an area which offers difficulties in land preparation in order to acquire a certain amount of developable area for housing sites. Under the above conditions, lack of appropriate area for housing development will increase in the near future, Corredor Sur, however, will give rise to the commencement of huge land preparation for housing. It is expected, that almost 1300 hectares of residential area will be provided until the year 2000, based on the construction of Corredor Sur and the Main Access Roads. (See FIGURE VI-3-1)

3) Improvement of Effectiveness for Public Investment

Acquisition of an aggregate large amount of land facilities and its preparation in accordance with a plan for the infrastructure, such as the water supply and sewer system, electricity, telephone and so on. In addition, there is a decrease in the investment cost for the above facilities.

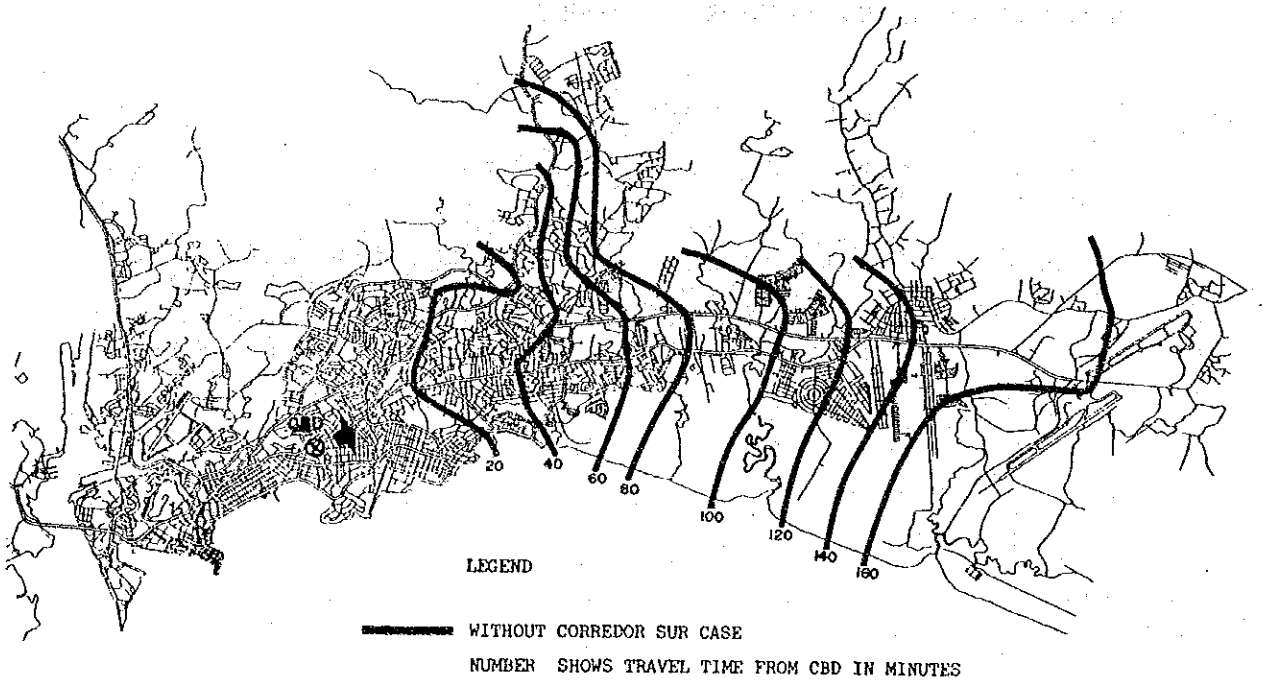
### (2) Impact for Roadside Development

1) Built-up Area

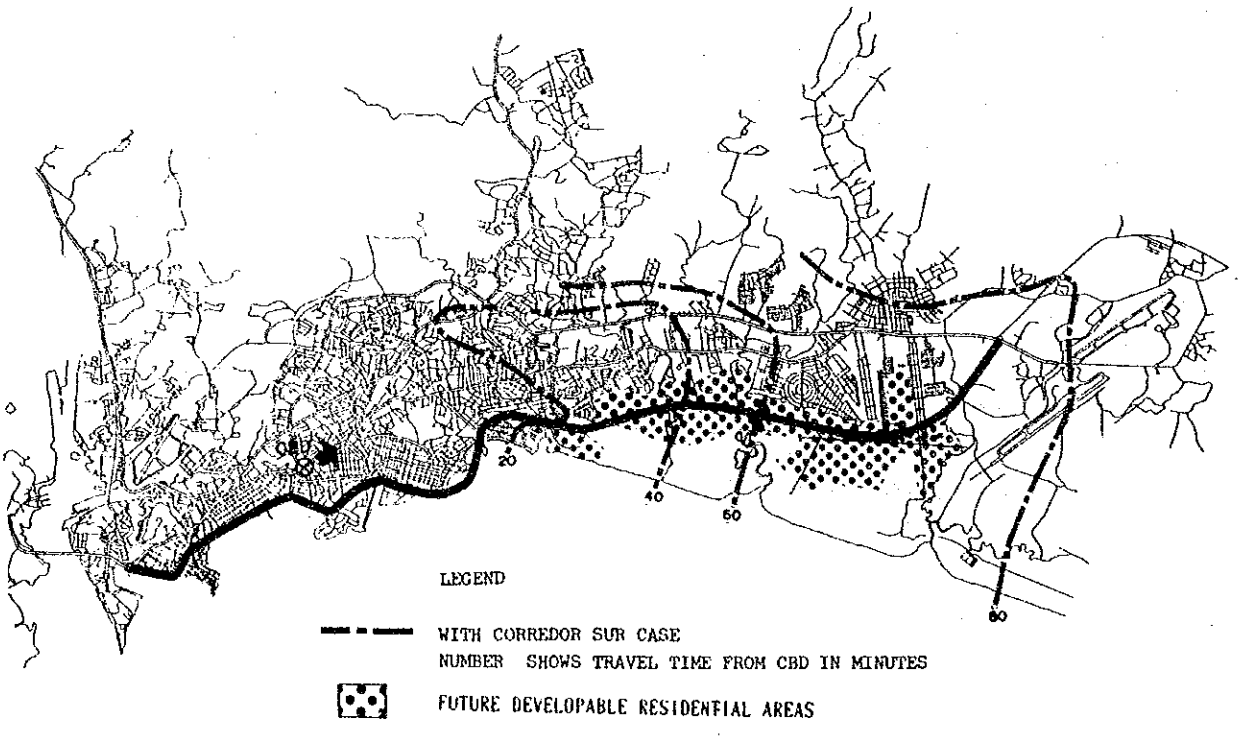
For the area of the section along the Ave. Balboa, the widening toward the seashore implies the inducement of recreational development along the Panama Bay area and an increase in the value of the cityscape.

2) Suburban area

Synthetic development planning which concerns the social public facilities including local roads, water, electricity, sewerage network, etc., can be executed dealing with Corredor Sur in a large amount of vacant land. The land price along the project will be inclined owing to an improved accesibility and an improved environment. If the land price




(1) PRESENT TRAVEL TIME FROM CBD




(2) ESTIMATED TRAVEL TIME FROM CBD AFTER CONSTRUCTION OF CORREDOR SUR

FIGURE VI-3-1 COMPARISON OF TRAVEL TIME WITH/WITHOUT CORREDOR SUR

reflects the travel time to the central business district, the price will be increassing, after the completion of the project, from 5 to 10 times its present value.

3) Corredor Sur Extension

a. Due to the increased land value along the road, intensive land use and effective private investment will be motivated. These phenomena accelerate the existing urban renewal project in the Santa Ana and Chorrillo areas.

b. The road plays the role of prevention of an urban disaster, that is to say, the spread of fire can be blocked by the road in areas where a lot of conflagrations have taken place in the past.

c. Decrease of the traffic passing through the local streets brings about safety and calmness for dwellers and pedestrians in this area. Consequently, the value of the living environment will be raised and the area, with it's history, can become a cultural asset.

## 3-3 TRANSPORT ENERGY SAVINGS

In 1986, the energy consumption in the nation was estimated to total 12,961 theracalories of which about 47% accounted for petroleum-based energy in the form of gasoline, kerosene, diesel oil and fuel oil. And of the petroleum-based energy consumption, the share of the transport sector accounted for about 60%. Namely, about 28% of the total energy was consumed by the transport sector.

Among the transport sector, air travel, coastal shipping and railways are the only and scant means of transportation, while highway and land transportation are the nation's basic movers of domestic passengers. In addition, the number of automobiles is remarkably concentrated on the Metropolitan Area (some 60% of the total automobiles is registered in the Metropolitan Area, based on the figures in 1984).

As examined in the previous section, the project is expected to bring about vehicle operating cost savings. In other words, such effect, derived from vehicle operating benefits, will also be significant from the viewpoint of the national energy situation as stated above.

Transport energy savings were computed by employing the identical method as calculations of vehicle operating cost savings. The unit cost for this analysis was, however, defined as the costs of fuel and lubricating oil.

In conclusion, energy savings were estimated at about 0.2 million liters per day at the year 2000, or 44 million liters per year (one year being equivalent to 220 days in this calculation). In monetary terms (economic cost base), the project will have 0.072 million balboas per day or 16 million balboas per year of petroleum energy savings at the year 2000. And the aggregate savings for the period from the year 2000, to 2010, will reach 175 million balboas which correspond to about 72% of the total economic costs of the project or 1.6 times the foreign currency portion thereof, indicating that the foreign currency portion to be invested under the project will be recovered by said energy savings.

## 3-4 CREATION OF EMPLOYMENT OPPORTUNITY

Because of the labor situation that the nation is suffering as stated before, the impact of the project upon the creation of employment opportunities was contemplated.

Of the estimated total cost of the project, some 30 million balboas are allocated for labor costs. And the labor requirements are estimated at a total of 756,000 man-days including 382,000 man-days for unskilled labor and 374,000 man-days for skilled labor. Therefore, it is expected that 300 to 400 laborers will be employed per day through the construction of the project over ten years.

Regarding the industries related to the project, it is considered that an extremely large number of additional employment opportunities will be indirectly created as a result of the project.

## 4. FINANCIAL CONSIDERATION OF PROJECT

Past investments in the road sector are presented in TABLE VI-4-1 in comparison with those of other sectors such as railways, ports and airports.

TABLE VI-4-1 TRANSPORT INVESTMENTS, 1975-1986

(Unit: Million Balboas in Current Prices)

| Sector/Year | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Roads | 31.60 | 36.70 | 26.00 | 28.50 | 53.70 | 44.55 | 50.40 | 41.35 | 40.54 | 69.19 | 44.30 | 22.90 |
| Railways | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.35 | 0.00 | 0.53 | 2.00 | 0.02 | 0.75 | 1.00 |
| Airports | 17.50 | 25.00 | 15.60 | 6.50 | 4.20 | 0.91 | 0.00 | 0.06 | 0.00 | 3.80 | 3.96 | 2.51 |
| Ports | 2.30 | 3.40 | 12.10 | 18.70 | 9.40 | 7.80 | 19.30 | 0.09 | 0.22 | 1.32 | 15.75 | 7.45 |
| Subtotal of Transp. Sec. | 51.40 | 65.10 | 53.70 | 53.70 | 67.30 | 53.61 | 69.70 | 42.03 | 42.76 | 74.27 | 64.76 | 33.86 |

Source: Ministry of Public Works

For the period from 1975, to 1986, the government invest-ment in the road sector totaled approx. 490 million balboas, with an average 40 million balboas per year. With regard to the regional allocation in the last five years since 1982, some 8 to 11 million balboas have been allocated for the Metropolitan Area, which represented about 16% to 36% of the total road investment.

The past achievement in subject sector, however, has not brought about significant changes, as shown in the said table. Moreover, in 1986, only 22.9 million balboas were invested, an amount some 50% lower than that of the previous year. Despite this, about 8.3 million balboas were allocated to the Metropo-litan Area, indicating a 7% decline from the previous year.

The construction of the project road will require about 175 million balboas in total over 12 years, from 1988, to 1999. The annual fund demand will range from a low of 2 million balboas in 1990, to a high of 33 million balboas in 1993, averaging about 15 million balboas throughout the construction period.

This means that the construction of the project, in 1993, when the maximum funding is needed in the course of the construction period, will increase the annual road investment by about three times the current road investment in the Metropolitan Area. Even at an average, it will swell to approx. one and a half times the current record.

In view of the need of the investment for the project, it will be recommendable to have a possible external fund source for at least the foreign currency portion, which is estmated at 62% of the total construction costs. As for road construction financing of MOP, about 50% has been financed by external sources, and the rest by Government funds.

Estimated contributions from road user charges are shown in TABLE VI-4-2. Road user revenues for the period from 1982, to 1986, have covered about 48% to 61% of the road investment. Including the road user charge as mentioned above, the consideration concerning various measures and their possibilities for the local fund shall be undertaken as soon as possible.

TABLE VI-4-2 GOVERNMENT REVENUE FROM MOTOR VEHICLE USERS

(Unit: Million of Current Balboas)

| | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|
| Motor Fuel Tax | 6.23 | 6.30 | 6.43 | 6.11 |
| Valorization | 0.10 | 0.73 | 0.65 | 0.50 |
| Vehicle Registration | 12.69 | 14.91 | 16.80 | 19.63 |
| Autopista Charges | 0.29 | 0.92 | 1.02 | 0.99 |
| Total | 19.81 | 22.86 | 24.90 | 27.23 |
| Road Investments | 41.35 | 40.54 | 69.19 | 44.30 |
| As % of Road Investment | 48% | 56% | 44% | 61% |

Source: Cotraloria General de la Republica

In addition, in light of the huge amount of the land acquisition costs particularly in the built-up area, it is recommended to consider the institutional development such as "Valorization System", cooperating with the progress of surrounding urban development.

## 5. OVERALL EVALUATION AND RECOMMENDATIONS

A comprehensive evaluation of the project can be summarized as follows;

After detailed studies concerning technical issues, among several alternatives, an optimum investment plan has been chosen chiefly in view of the necessity of coping with increasing traffic demand and the comparatively easy land acquisition and compensation for the demolition works.

The economic justification was conducted based on the quantification of direct benefits; vehicle operating cost savings and passenger time savings, and resulted in that the said plan has a high economic rate of return of 30.4% as a whole.

Of the total benefits up to the year 2010, some 85% are generated from passenger time savings derived from reductions in travel time. This means that the project, which accommodates a heavy traffic of 40,000 to 80,000 vehicles or more a day (pcu) at main sections of the proposed road, will simultaneously have a significant impact on the mitigation of the traffic load in the Metropolitan Area, particularly in the east-west direction, now suffering from heavily congested roads.

It is considered that such effects will enhance the role of Panama City as an international center of trade and trasit, which contribute to economic production. Furthermore, vehicle operating cost savings, resulting mostly from energy savings, are considered highly significant in view of the national energy situation.

Further benefits, such as increased comfort and safety to road users and creation of employment opportunities during the construction period, etc., will be expected, although they have not been quantified. Particularly, it shall be emphasized that with the completion of the project, a huge urban development at the southern part of Juan Diaz and Pedregal areas will be accelerated by this important urban principal axial road.

One of the primary issues, which is considered as an undesirable impact, is the traffic noise problem. Details regarding the traffic noise survey and its results are described in the previous chapter. The results indicate that the forecasted noise level exceeds the reference value (upper limits of ISO's standard) by more than 5 dB at certain points of the proposed road. It will therefore be recommendable to have possible countermeasures in the future, such as construction of walls and buffer zones, etc., along the project road.

It shall be pointed out from the financial view point that the magnitude of the budgetary requirement for the project will be inordinetely huge compared to the past road investment in the Metropolitan Area. The project, throughout its construction, will increase the yearly road investment in that area by almost one and a half times the current investment.

Based on the aforesaid results, the following recommendations are hereby made;

The construction of the project as a whole is feasible not only from the technical aspects but from the view point of the national economy. Therefore it can be recommended that the project be implemented.

The recommendation is to complete the whole project in accordance with the implementation schedule. Should any part of the proposed road be dropped from the schedule due to financial reasons or whatever, the highest priority shall be given to the construction of the new road sections (sections 4 to 14). The total investment needed for the new road construction is estimated at 145 million balboas (or 189 million balboas including the costs for compensation and land acquisition), of which 91 million balboas are the foreign currency portion. A high EIRR of 32% is expected for those new road sections.(See TABLE VI-5-1)

TABLE VI-5-1 PROJECT COST

| | Length (km) | Construction Cost (Million B/.) | Comp.& Land Acq. Cost (Million B/.) | Project Cost (Million B/.) |
|---|---|---|---|---|
| Corredor Sur | 10.0 | 74.4 | 20.8 | 95.2 |
| Main Access Road | 6.4 | 22.6 | 10.4 | 33.0 |
| Total | 16.4 | 97.0 | 31.2 | 128.2 |

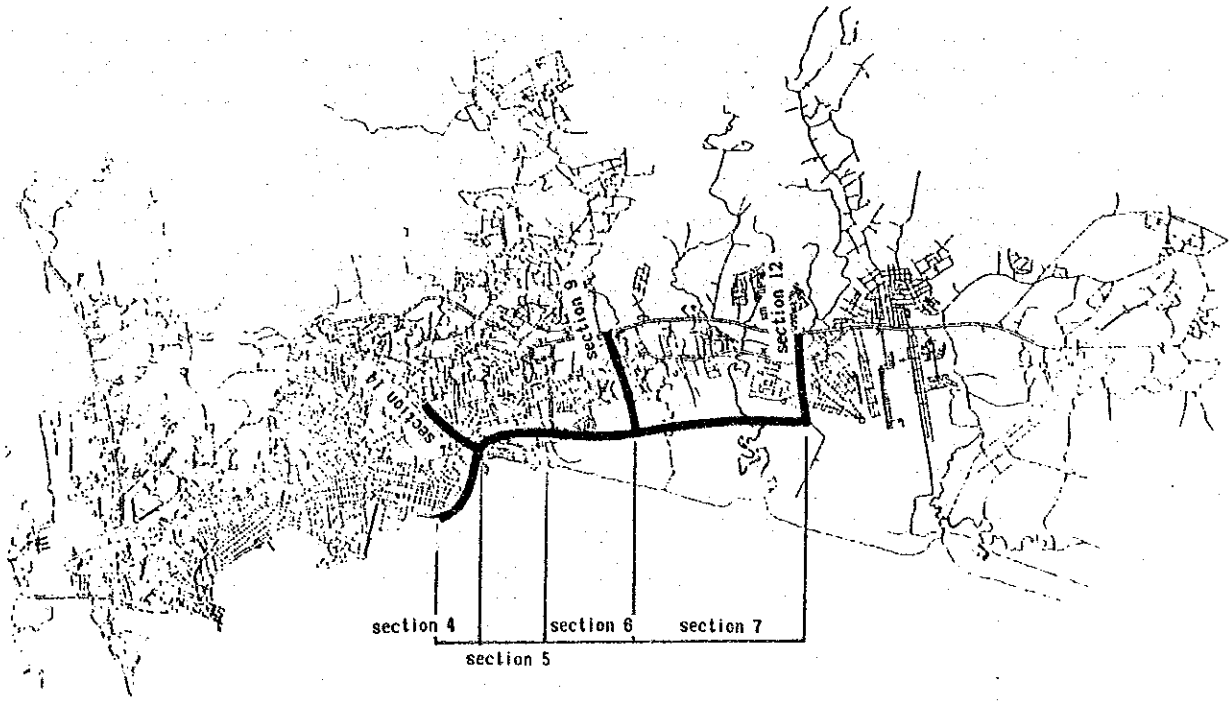
In view of medium-term planning up to the year 1994, a recommendation is the completion of the new road construction section between ATLAPA and Via Ciudad Radial and such main access roads as Via San Miguelito-Chanis, Via Ciudad Radial and Via E. T. Lefevre. The total investment needed for these sections of 16 km is about 97 million balboas of which details are presented below. The foreign currency portion thereof accounts for about 63%. A high EIRR of about 32.5% is expected. Under the discount rate of 12%, 3.0 of Benefit Cost Ratio and about 138 million balboas of Net Present Value are obtained. ( See FIGURE VI-5-1 )

Other sections such as the improvement section, the sections in the suburban area and the sections in the built-up area will be feasible, even if each of them were to be implemented independently.

On the road user saving aspect, the independent implementation of the Corredor Sur Extension is, however, not worthwhile because of its low EIRR, but will be recommendable providing all other sections would be realized. Because it will facilitate the better functioning of Corredor Sur, and at the same time accelerate the existing urban renewal projects in the area. Namely, it is recommended that this section be implemented taking into consideration the progress of urban renewal projects in the area.

Availability of the necessary funds for the project is one of the primary issues. In light of the Panama's recent economic circumstances, it is recommended the foreign currency portion be obtained from external sources with preferable conditions.

It is also necessary, concerning the local funds, to devise various domestic measures such as institutional development, etc, in order to meet the requirements for the fund demand and to reduce the financial burden on it derived from the project.




(Annual Financial Construction Cost*)

| Section/Year | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | Total | Foreign | Local |
|---|---|---|---|---|---|---|---|---|---|---|
| Section 4 | 416 | 416 | 0 | 3,407 | 6,814 | 6,814 | 0 | 17,867 | 10,549 | 7,318 |
| Section 5 | 259 | 259 | 0 | 2,655 | 5,310 | 2,655 | 0 | 11,139 | 6,686 | 4,453 |
| Section 6 | 377 | 377 | 3,862 | 7,725 | 3,862 | 0 | 0 | 16,204 | 10,564 | 5,640 |
| Section 7 | 679 | 679 | 0 | 0 | 0 | 13,888 | 13,888 | 29,134 | 19,127 | 10,007 |
| Section 9 | 177 | 177 | 0 | 0 | 3,615 | 3,615 | 0 | 7,583 | 4,656 | 2,927 |
| Section 12 | 193 | 193 | 0 | 0 | 0 | 2,629 | 5,257 | 8,271 | 5,211 | 3,060 |
| Section 14 | 157 | 157 | 0 | 0 | 0 | 3,210 | 3,210 | 6,734 | 3,932 | 2,802 |
| Total | 2,258 | 2,258 | 3,862 | 13,787 | 19,601 | 32,811 | 22,356 | 96,933 | 60,726 | 36,207 |

* Cost for compensation and land acquisition excluded

(Annual Financial Project Cost*)

| Section/Year | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | Total | Foreign | Local |
|---|---|---|---|---|---|---|---|---|---|---|
| Section 4 | 416 | 416 | 854 | 4,260 | 6,814 | 6,814 | 0 | 19,574 | 10,549 | 9,025 |
| Section 5 | 259 | 3,720 | 6,922 | 6,116 | 5,310 | 2,655 | 0 | 24,983 | 6,686 | 18,297 |
| Section 6 | 377 | 2,030 | 5,515 | 7,725 | 3,862 | 0 | 0 | 19,509 | 10,564 | 8,945 |
| Section 7 | 679 | 679 | 0 | 0 | 1,973 | 13,888 | 13,888 | 31,107 | 19,127 | 11,980 |
| Section 9 | 177 | 177 | 0 | 2,039 | 3,615 | 3,615 | 0 | 9,622 | 4,656 | 4,966 |
| Section 12 | 193 | 193 | 0 | 0 | 995 | 3,623 | 5,257 | 10,206 | 5,211 | 5,049 |
| Section 14 | 157 | 157 | 0 | 3,194 | 3,194 | 3,210 | 3,210 | 13,121 | 3,932 | 9,189 |
| Total | 2,258 | 7,371 | 13,290 | 23,334 | 25,762 | 33,806 | 22,356 | 128,177 | 60,726 | 67,451 |

* Cost for compensation and land acquisition included

(Implementation Schedule)

| Section/Year | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
|---|---|---|---|---|---|---|---|
| E/S | ==========* | | | | | | |
| Section 4 | | | ----------========== | | | | |
| Section 5 | | ---------- | ========== | | | | |
| Section 6 | | ---------- | ========== | | | | |
| Section 7 | | | | | ---------- | ========== | |
| Section 9 | | | | ---------- | ========== | | |
| Section 12 | | | | | | ---------- | ========== |
| Section 14 | | | | ---------- | ========== | | |

------ Land acquision
====== Construction
* Engineering Services and preparation

FIGURE VI-5-1 PROJECT SCHEDULE FOR MEDIUM-TERM PLANNING

# APPENDIX

# APPENDIX 1 OD TABLE - ALL MODE, ALL PURPOSE

## (1) O-D TABLE - ALL MODE, ALL PURPOSE YEAR 2000(a)

| ZONA | 1) | 2) | 3) | 4) | 5) | 6) | 7) | 8) | 9) | 10) | 11) | 12) | 13) | 14) | 15) | 16) | 17) | 18) | 19) | 20) | 21) | 22) | 231) | 232) | 233) | 234) | 235) | 236) | 237) | 241) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1) | 5659 | 1648 | 2499 | 852 | 993 | 1210 | 648 | 892 | 626 | 550 | 1025 | 224 | 366 | 265 | 239 | 242 | 412 | 565 | 670 | 219 | 170 | 232 | 66 | 134 | 54 | 72 | 70 | 77 | 19 | 271 |
| 2) | 1605 | 11385 | 4758 | 1716 | 1528 | 532 | 1465 | 964 | 478 | 752 | 1606 | 251 | 508 | 396 | 428 | 771 | 1560 | 584 | 485 | 1503 | 561 | 497 | 93 | 169 | 79 | 109 | 102 | 107 | 32 | 325 |
| 3) | 2862 | 5138 | 34185 | 3081 | 3249 | 1144 | 3388 | 2712 | 1309 | 1413 | 2745 | 988 | 1379 | 1039 | 1205 | 761 | 1566 | 2249 | 1883 | 859 | 1079 | 1307 | 317 | 577 | 274 | 391 | 371 | 386 | 109 | 1212 |
| 4) | 832 | 1892 | 3115 | 9277 | 4522 | 2409 | 1880 | 3321 | 1571 | 1988 | 1993 | 1356 | 1328 | 779 | 1103 | 699 | 1961 | 2913 | 1048 | 894 | 2277 | 984 | 220 | 410 | 191 | 277 | 262 | 273 | 75 | 739 |
| 5) | 937 | 1632 | 3360 | 4166 | 20801 | 1421 | 1611 | 2892 | 1912 | 2565 | 2672 | 967 | 1724 | 1011 | 1123 | 1081 | 1861 | 1762 | 1534 | 654 | 531 | 788 | 318 | 540 | 283 | 407 | 382 | 389 | 120 | 827 |
| 6) | 623 | 517 | 645 | 1802 | 1311 | 2540 | 628 | 527 | 218 | 355 | 888 | 188 | 266 | 185 | 375 | 210 | 253 | 158 | 177 | 60 | 308 | 133 | 32 | 68 | 25 | 27 | 28 | 33 | 7 | 106 |
| 7) | 648 | 1101 | 2460 | 775 | 1399 | 363 | 2948 | 2030 | 1396 | 1546 | 1406 | 877 | 1040 | 794 | 510 | 702 | 1926 | 2729 | 1131 | 645 | 674 | 709 | 246 | 401 | 219 | 318 | 298 | 390 | 96 | 779 |
| 8) | 877 | 1105 | 2761 | 4169 | 3106 | 751 | 2512 | 17307 | 5309 | 5762 | 5006 | 4511 | 3283 | 1788 | 2750 | 1247 | 4996 | 4315 | 1656 | 1414 | 1273 | 1507 | 269 | 478 | 237 | 322 | 307 | 319 | 115 | 1515 |
| 9) | 470 | 628 | 978 | 1825 | 1594 | 217 | 1769 | 4634 | 7583 | 3698 | 3089 | 2820 | 3021 | 1769 | 939 | 768 | 1666 | 863 | 1448 | 617 | 766 | 880 | 204 | 320 | 185 | 272 | 253 | 250 | 81 | 221 |
| 10) | 460 | 772 | 1431 | 2203 | 2703 | 465 | 2344 | 6323 | 3564 | 17512 | 4279 | 1799 | 2485 | 1616 | 1285 | 1042 | 3976 | 2000 | 2156 | 645 | 421 | 813 | 296 | 521 | 256 | 354 | 338 | 352 | 106 | 826 |
| 11) | 654 | 1502 | 2394 | 1579 | 2490 | 798 | 1689 | 5458 | 2710 | 2982 | 10250 | 2571 | 2540 | 1173 | 1000 | 693 | 2659 | 2177 | 3378 | 1304 | 1029 | 1118 | 336 | 499 | 313 | 450 | 415 | 411 | 147 | 1644 |
| 12) | 203 | 197 | 790 | 1096 | 1021 | 150 | 1305 | 3400 | 2123 | 1678 | 3819 | 5579 | 1211 | 704 | 254 | 229 | 1378 | 746 | 774 | 265 | 147 | 75 | 70 | 144 | 57 | 78 | 73 | 79 | 20 | 231 |
| 13) | 309 | 617 | 1342 | 1236 | 1497 | 216 | 1709 | 2721 | 2847 | 2013 | 4002 | 1266 | 9212 | 1237 | 815 | 1154 | 1314 | 781 | 1182 | 257 | 675 | 483 | 157 | 323 | 129 | 162 | 160 | 177 | 44 | 336 |
| 14) | 78 | 303 | 977 | 631 | 1025 | 158 | 1010 | 1732 | 1169 | 1619 | 1426 | 793 | 1330 | 5059 | 2638 | 644 | 1886 | 2078 | 743 | 760 | 936 | 493 | 124 | 215 | 110 | 146 | 140 | 143 | 48 | 266 |
| 15) | 207 | 524 | 1518 | 845 | 1203 | 287 | 1026 | 2360 | 468 | 1110 | 1180 | 318 | 1047 | 1803 | 7354 | 587 | 1411 | 1433 | 1781 | 225 | 1207 | 523 | 163 | 329 | 136 | 162 | 164 | 180 | 63 | 291 |
| 16) | 289 | 837 | 634 | 483 | 953 | 106 | 1089 | 1210 | 563 | 1299 | 852 | 186 | 228 | 888 | 472 | 2499 | 1161 | 1117 | 552 | 176 | 261 | 202 | 50 | 118 | 47 | 57 | 56 | 62 | 14 | 265 |
| 17) | 408 | 887 | 1848 | 1694 | 1896 | 201 | 2489 | 5314 | 1155 | 3928 | 3035 | 1009 | 1495 | 1844 | 1277 | 1181 | 24321 | 4359 | 1572 | 151 | 420 | 498 | 202 | 437 | 164 | 236 | 226 | 247 | 56 | 730 |
| 18) | 588 | 399 | 2049 | 2238 | 1613 | 222 | 3352 | 3589 | 765 | 1898 | 2546 | 643 | 738 | 1779 | 1479 | 1472 | 3366 | 18509 | 668 | 350 | 642 | 272 | 86 | 184 | 73 | 84 | 87 | 96 | 27 | 193 |
| 19) | 447 | 456 | 1418 | 749 | 1302 | 212 | 1385 | 1507 | 1061 | 2588 | 3378 | 633 | 1013 | 657 | 1985 | 282 | 1237 | 1125 | 15548 | 1161 | 2196 | 1380 | 230 | 598 | 171 | 213 | 225 | 271 | 43 | 429 |
| 20) | 248 | 410 | 880 | 775 | 663 | 79 | 980 | 1019 | 808 | 755 | 1599 | 282 | 365 | 758 | 297 | 161 | 107 | 369 | 1393 | 3545 | 2179 | 1153 | 199 | 310 | 178 | 232 | 220 | 225 | 93 | 128 |
| 21) | 218 | 701 | 749 | 2695 | 436 | 268 | 952 | 1003 | 518 | 479 | 939 | 215 | 686 | 833 | 896 | 182 | 408 | 612 | 2587 | 2606 | 6801 | 1571 | 174 | 359 | 143 | 199 | 196 | 210 | 55 | 584 |
| 22) | 186 | 436 | 1330 | 951 | 884 | 147 | 1013 | 795 | 652 | 717 | 1186 | 165 | 484 | 509 | 510 | 242 | 345 | 287 | 2092 | 975 | 1497 | 4267 | 104 | 205 | 87 | 110 | 108 | 119 | 37 | 228 |
| 231) | 30 | 110 | 271 | 116 | 238 | 36 | 272 | 258 | 66 | 256 | 363 | 65 | 164 | 141 | 154 | 86 | 192 | 91 | 267 | 310 | 137 | 98 | 483 | 991 | 422 | 569 | 548 | 572 | 202 | 362 |
| 232) | 58 | 203 | 500 | 199 | 435 | 64 | 401 | 399 | 108 | 430 | 565 | 133 | 295 | 217 | 381 | 153 | 345 | 165 | 505 | 638 | 275 | 194 | 891 | 2199 | 778 | 1082 | 1031 | 1078 | 357 | 757 |
| 233) | 27 | 88 | 227 | 102 | 200 | 28 | 247 | 234 | 59 | 224 | 327 | 51 | 134 | 127 | 123 | 72 | 158 | 77 | 212 | 235 | 110 | 74 | 392 | 766 | 342 | 450 | 436 | 457 | 167 | 267 |
| 234) | 34 | 109 | 296 | 133 | 267 | 36 | 349 | 322 | 79 | 287 | 451 | 67 | 161 | 163 | 145 | 87 | 186 | 84 | 216 | 255 | 131 | 78 | 445 | 935 | 383 | 490 | 478 | 508 | 193 | 246 |
| 235) | 31 | 108 | 287 | 130 | 255 | 32 | 323 | 301 | 74 | 274 | 422 | 65 | 156 | 154 | 146 | 86 | 181 | 84 | 221 | 257 | 127 | 81 | 439 | 935 | 377 | 489 | 476 | 501 | 189 | 259 |
| 236) | 32 | 115 | 301 | 132 | 272 | 36 | 320 | 304 | 76 | 282 | 426 | 70 | 169 | 157 | 158 | 91 | 194 | 90 | 246 | 293 | 140 | 90 | 475 | 1067 | 411 | 538 | 522 | 551 | 199 | 305 |
| 237) | 11 | 28 | 79 | 46 | 78 | 12 | 118 | 109 | 26 | 92 | 151 | 15 | 43 | 56 | 37 | 25 | 54 | 35 | 68 | 57 | 29 | 16 | 129 | 210 | 117 | 140 | 135 | 143 | 65 | 57 |
| 241) | 153 | 284 | 1140 | 574 | 684 | 101 | 868 | 926 | 237 | 682 | 1169 | 327 | 261 | 272 | 183 | 252 | 607 | 242 | 576 | 165 | 608 | 211 | 264 | 657 | 217 | 258 | 261 | 290 | 105 | 3697 |
| 242) | 162 | 295 | 1133 | 565 | 682 | 109 | 836 | 907 | 228 | 661 | 1132 | 313 | 266 | 264 | 195 | 243 | 612 | 256 | 552 | 165 | 615 | 249 | 268 | 667 | 221 | 270 | 269 | 298 | 104 | 4060 |
| 243) | 74 | 152 | 553 | 281 | 334 | 55 | 429 | 457 | 121 | 338 | 574 | 160 | 134 | 138 | 104 | 126 | 294 | 120 | 283 | 78 | 299 | 108 | 136 | 302 | 112 | 134 | 136 | 149 | 54 | 1908 |
| 244) | 54 | 121 | 450 | 229 | 267 | 41 | 365 | 380 | 103 | 285 | 484 | 137 | 110 | 116 | 78 | 107 | 232 | 99 | 238 | 63 | 235 | 70 | 108 | 226 | 92 | 105 | 106 | 118 | 44 | 1349 |
| 251) | 407 | 1848 | 2455 | 1605 | 1969 | 358 | 3795 | 1865 | 1645 | 3164 | 3511 | 377 | 426 | 957 | 963 | 1085 | 1366 | 833 | 867 | 452 | 1362 | 947 | 482 | 1138 | 364 | 397 | 426 | 510 | 121 | 2996 |
| 261) | 23 | 165 | 159 | 70 | 170 | 25 | 15 | 299 | 126 | 130 | 96 | 113 | 73 | 56 | 69 | 11 | 206 | 69 | 125 | 72 | 90 | 256 | 35 | 93 | 29 | 41 | 41 | 44 | 9 | 228 |
| 271) | 397 | 1192 | 1731 | 683 | 1286 | 289 | 1357 | 1662 | 1734 | 871 | 2746 | 751 | 1045 | 871 | 607 | 346 | 410 | 705 | 1536 | 557 | 1508 | 1528 | 324 | 725 | 253 | 285 | 297 | 347 | 88 | 2291 |
| 281) | 303 | 1085 | 1635 | 1359 | 1697 | 170 | 2023 | 849 | 599 | 502 | 1682 | 417 | 439 | 534 | 1041 | 731 | 1468 | 874 | 877 | 271 | 1229 | 447 | 138 | 265 | 117 | 157 | 152 | 161 | 52 | 450 |
| 291) | 226 | 752 | 950 | 998 | 748 | 65 | 677 | 978 | 415 | 570 | 1629 | 133 | 289 | 461 | 811 | 541 | 783 | 1503 | 1760 | 228 | 335 | 261 | 78 | 192 | 60 | 77 | 79 | 92 | 18 | 204 |
| 301) | 374 | 618 | 1375 | 1215 | 726 | 99 | 1345 | 682 | 1949 | 527 | 1882 | 264 | 386 | 438 | 1068 | 719 | 883 | 373 | 303 | 44 | 396 | 309 | 63 | 137 | 51 | 52 | 56 | 62 | 22 | 137 |
| 311) | 484 | 734 | 1995 | 2085 | 2877 | 360 | 1460 | 2215 | 760 | 1218 | 2789 | 149 | 639 | 736 | 1023 | 668 | 1501 | 195 | 190 | 336 | 811 | 144 | 41 | 207 | 27 | 33 | 39 | 50 | 5 | 361 |
| 321) | 388 | 310 | 1405 | 2069 | 1092 | 121 | 1187 | 1065 | 545 | 1464 | 1924 | 143 | 210 | 269 | 833 | 854 | 944 | 398 | 149 | 79 | 279 | 23 | 35 | 103 | 23 | 20 | 23 | 31 | 5 | 260 |
| 331) | 214 | 377 | 995 | 593 | 609 | 49 | 443 | 800 | 253 | 461 | 1155 | 65 | 97 | 323 | 209 | 368 | 287 | 593 | 402 | 393 | 331 | 881 | 92 | 264 | 72 | 97 | 95 | 109 | 22 | 351 |
| 332) | 190 | 336 | 894 | 529 | 540 | 44 | 394 | 713 | 223 | 410 | 1053 | 53 | 82 | 291 | 186 | 325 | 253 | 525 | 352 | 351 | 296 | 784 | 81 | 233 | 64 | 87 | 87 | 95 | 21 | 314 |
| 333) | 357 | 637 | 1621 | 981 | 1012 | 82 | 730 | 1328 | 425 | 767 | 1791 | 106 | 163 | 536 | 356 | 604 | 485 | 1002 | 674 | 669 | 559 | 1496 | 156 | 451 | 124 | 165 | 164 | 186 | 40 | 590 |
| 341) | 194 | 274 | 630 | 961 | 1044 | 201 | 1122 | 1199 | 786 | 723 | 1478 | 462 | 466 | 608 | 350 | 510 | 681 | 131 | 455 | 79 | 906 | 188 | 115 | 291 | 85 | 95 | 100 | 115 | 27 | 496 |
| 342) | 106 | 177 | 386 | 534 | 655 | 94 | 743 | 666 | 381 | 416 | 926 | 258 | 275 | 361 | 175 | 320 | 348 | 85 | 292 | 43 | 551 | 93 | 53 | 145 | 42 | 44 | 47 | 54 | 12 | 289 |
| 351) | 751 | 878 | 1850 | 1983 | 1672 | 233 | 2318 | 1361 | 1776 | 2454 | 3038 | 271 | 629 | 943 | 2435 | 1174 | 3113 | 963 | 724 | 122 | 632 | 213 | 51 | 127 | 40 | 59 | 59 | 67 | 13 | 398 |
| 361) | 299 | 502 | 1189 | 487 | 4302 | 91 | 652 | 736 | 368 | 1071 | 594 | 244 | 349 | 166 | 359 | 426 | 823 | 551 | 520 | 137 | 385 | 179 | 82 | 152 | 69 | 78 | 79 | 87 | 31 | 206 |
| 371) | 1 | 78 | 51 | 79 | 108 | 25 | 29 | 3 | 1 | 1 | 2 | 1 | 27 | 1 | 19 | 33 | 32 | 87 | 1 | 18 | 49 | 1 | 22 | 32 | 19 | 30 | 27 | 27 | 8 | 43 |
| 381) | 1 | 190 | 93 | 22 | 1 | 1 | 7 | 3 | 2 | 53 | 4 | 21 | 1 | 1 | 2 | 2 | 1 | 31 | 1 | 2 | 1 | 3 | 23 | 32 | 21 | 31 | 28 | 28 | 8 | 96 |
| 391) | 346 | 558 | 994 | 482 | 1091 | 169 | 445 | 928 | 298 | 1253 | 468 | 570 | 389 | 307 | 325 | 105 | 537 | 548 | 472 | 224 | 339 | 279 | 65 | 114 | 60 | 86 | 81 | 79 | 26 | 308 |
| 401) | 712 | 1708 | 2682 | 1186 | 1697 | 673 | 928 | 1330 | 646 | 917 | 906 | 534 | 704 | 526 | 646 | 431 | 1066 | 1003 | 937 | 591 | 556 | 607 | 135 | 259 | 120 | 175 | 164 | 165 | 52 | 506 |
| 411) | 661 | 1333 | 2904 | 2412 | 2283 | 400 | 1984 | 3185 | 1737 | 2253 | 2442 | 617 | 929 | 892 | 737 | 721 | 1359 | 840 | 665 | 600 | 813 | 434 | 136 | 368 | 105 | 119 | 125 | 149 | 33 | 395 |
| 421) | 107 | 260 | 489 | 394 | 910 | 56 | 498 | 774 | 401 | 331 | 700 | 113 | 313 | 155 | 126 | 147 | 466 | 124 | 158 | 54 | 437 | 79 | 30 | 106 | 20 | 22 | 26 | 34 | 5 | 184 |
| 431) | 296 | 421 | 612 | 481 | 1445 | 97 | 520 | 277 | 123 | 214 | 397 | 310 | 226 | 144 | 171 | 109 | 652 | 211 | 257 | 208 | 160 | 339 | 7 | 38 | 4 | 5 | 6 | 7 | 1 | 48 |
| 441) | 2717 | 7710 | 8815 | 4623 | 4009 | 1024 | 7982 | 5267 | 3326 | 3560 | 6292 | 762 | 1830 | 1832 | 1126 | 1208 | 3299 | 1096 | 1008 | 566 | 877 | 879 | 216 | 518 | 170 | 209 | 212 | 238 | 55 | 605 |
| 451) | 968 | 936 | 546 | 137 | 235 | 48 | 118 | 71 | 13 | 114 | 50 | 77 | 130 | 106 | 163 | 79 | 256 | 88 | 141 | 23 | 96 | 94 | 27 | 68 | 21 | 28 | 30 | 33 | 11 | 238 |
| TOTAL) | 29976 | 57779 | 113814 | 73211 | 92079 | 19220 | 72492 | 104505 | 58514 | 84262 | 100540 | 35775 | 47757 | 40201 | 44348 | 29694 | 84044 | 65878 | 60688 | 27898 | 41754 | 31618 | 10473 | 22332 | 8835 | 11581 | 11322 | 12141 | 3771 | 36857 |

## (2) O-D TABLE - ALL MODE, ALL PURPOSE YEAR 2000(b)

| ZONA | 242) | 243) | 244) | 25) | 26) | 27) | 28) | 29) | 30) | 31) | 32) | 331) | 332) | 333) | 341) | 342) | 35) | 36) | 371 | 38) | 39) | 40) | 41) | 42) | 43) | 44) | 45) | TOTAL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1) | 275 | 124 | 97 | 663 | 10 | 564 | 388 | 303 | 587 | 497 | 366 | 186 | 163 | 311 | 113 | 76 | 713 | 298 | 3 | 5 | 322 | 209 | 621 | 168 | 303 | 1914 | 343 | 30587 |
| 2) | 331 | 147 | 111 | 1664 | 172 | 1741 | 745 | 662 | 496 | 866 | 557 | 272 | 241 | 484 | 285 | 141 | 966 | 564 | 52 | 78 | 660 | 730 | 1257 | 338 | 466 | 6099 | 905 | 55077 |
| 3) | 1168 | 573 | 478 | 3194 | 295 | 1992 | 1792 | 867 | 1053 | 2492 | 1692 | 894 | 792 | 1518 | 944 | 667 | 2042 | 1443 | 105 | 51 | 921 | 1214 | 2656 | 661 | 647 | 10042 | 1785 | 121156 |
| 4) | 707 | 350 | 296 | 1697 | 228 | 644 | 1450 | 1134 | 958 | 2374 | 1907 | 556 | 493 | 937 | 1193 | 856 | 2046 | 944 | 12 | 267 | 705 | 597 | 1609 | 438 | 701 | 4748 | 287 | 78703 |
| 5) | 800 | 394 | 326 | 2347 | 252 | 1538 | 1298 | 571 | 792 | 1857 | 1076 | 601 | 535 | 1019 | 898 | 661 | 2285 | 3849 | 138 | 5 | 989 | 1283 | 1786 | 489 | 854 | 4828 | 112 | 91824 |
| 6) | 120 | 54 | 39 | 317 | 37 | 292 | 181 | 74 | 171 | 494 | 145 | 207 | 190 | 318 | 160 | 109 | 322 | 166 | 4 | 17 | 172 | 401 | 459 | 69 | 121 | 697 | 35 | 17982 |
| 7) | 740 | 367 | 312 | 2796 | 96 | 1327 | 1451 | 630 | 716 | 1158 | 984 | 390 | 347 | 658 | 890 | 642 | 2218 | 709 | 7 | 17 | 329 | 272 | 1038 | 320 | 313 | 5238 | 59 | 54540 |
| 8) | 1445 | 718 | 608 | 3158 | 240 | 1910 | 953 | 1069 | 926 | 2469 | 1296 | 710 | 629 | 1195 | 1536 | 1102 | 5315 | 809 | 39 | 16 | 616 | 700 | 2221 | 613 | 601 | 6086 | 98 | 116023 |
| 9) | 209 | 103 | 87 | 2410 | 124 | 1131 | 763 | 597 | 1783 | 731 | 512 | 340 | 307 | 568 | 580 | 415 | 2711 | 437 | 5 | 11 | 375 | 230 | 1494 | 338 | 135 | 4178 | 65 | 64467 |
| 10) | 775 | 394 | 343 | 4526 | 188 | 864 | 752 | 852 | 570 | 1220 | 1709 | 489 | 432 | 829 | 728 | 518 | 3559 | 1095 | 4 | 30 | 490 | 636 | 1809 | 377 | 423 | 4114 | 71 | 90942 |
| 11) | 1008 | 490 | 410 | 3081 | 54 | 2012 | 1396 | 1034 | 1853 | 1956 | 1818 | 748 | 663 | 1250 | 1558 | 1120 | 2401 | 934 | 5 | 15 | 458 | 448 | 1995 | 502 | 387 | 5956 | 173 | 89486 |
| 12) | 266 | 134 | 116 | 376 | 122 | 465 | 364 | 79 | 198 | 306 | 151 | 181 | 156 | 310 | 355 | 246 | 247 | 224 | 4 | 5 | 550 | 323 | 611 | 100 | 227 | 877 | 47 | 34978 |
| 13) | 355 | 162 | 117 | 541 | 64 | 852 | 372 | 508 | 367 | 652 | 271 | 194 | 173 | 353 | 648 | 456 | 669 | 566 | 4 | 11 | 356 | 425 | 1008 | 203 | 213 | 1601 | 207 | 49701 |
| 14) | 259 | 121 | 102 | 1420 | 51 | 789 | 605 | 554 | 370 | 697 | 365 | 422 | 374 | 712 | 696 | 552 | 1389 | 120 | 8 | 7 | 217 | 289 | 877 | 179 | 120 | 2015 | 85 | 41675 |
| 15) | 316 | 146 | 109 | 1195 | 136 | 794 | 1804 | 750 | 628 | 1138 | 775 | 271 | 242 | 465 | 368 | 258 | 2428 | 581 | 24 | 39 | 349 | 402 | 725 | 134 | 170 | 1161 | 131 | 44644 |
| 16) | 253 | 127 | 108 | 915 | 22 | 398 | 522 | 369 | 363 | 644 | 730 | 489 | 444 | 766 | 351 | 249 | 977 | 387 | 4 | 9 | 65 | 282 | 642 | 128 | 178 | 1183 | 46 | 27307 |
| 17) | 715 | 347 | 283 | 1676 | 79 | 502 | 1557 | 750 | 739 | 1429 | 969 | 511 | 458 | 840 | 466 | 318 | 2816 | 1073 | 59 | 7 | 728 | 745 | 1390 | 249 | 679 | 3221 | 209 | 86087 |
| 18) | 182 | 90 | 77 | 1002 | 50 | 604 | 786 | 593 | 341 | 492 | 438 | 472 | 418 | 816 | 292 | 205 | 1078 | 555 | 11 | 20 | 557 | 501 | 733 | 138 | 295 | 920 | 84 | 61745 |
| 19) | 418 | 203 | 167 | 1067 | 194 | 850 | 773 | 637 | 676 | 479 | 501 | 413 | 364 | 714 | 364 | 239 | 754 | 554 | 3 | 7 | 572 | 526 | 762 | 133 | 240 | 936 | 148 | 56574 |
| 20) | 129 | 66 | 54 | 868 | 375 | 1184 | 276 | 96 | 299 | 448 | 181 | 460 | 404 | 809 | 240 | 159 | 72 | 146 | 25 | 12 | 368 | 442 | 974 | 81 | 100 | 683 | 34 | 29395 |
| 21) | 575 | 267 | 213 | 1612 | 92 | 1014 | 1166 | 256 | 414 | 871 | 571 | 440 | 388 | 758 | 560 | 395 | 509 | 587 | 49 | 8 | 355 | 278 | 744 | 226 | 78 | 869 | 96 | 43466 |
| 22) | 269 | 114 | 71 | 1096 | 229 | 1280 | 364 | 286 | 294 | 273 | 99 | 588 | 524 | 993 | 508 | 213 | 343 | 279 | 3 | 9 | 277 | 317 | 449 | 69 | 237 | 633 | 95 | 30360 |
| 231) | 369 | 175 | 145 | 615 | 33 | 420 | 222 | 95 | 86 | 102 | 89 | 139 | 124 | 235 | 136 | 95 | 60 | 104 | 9 | 4 | 80 | 84 | 233 | 50 | 8 | 341 | 63 | 11966 |
| 232) | 721 | 359 | 304 | 1261 | 59 | 852 | 448 | 180 | 174 | 208 | 186 | 264 | 235 | 459 | 274 | 194 | 112 | 178 | 11 | 9 | 135 | 145 | 468 | 99 | 18 | 610 | 96 | 22813 |
| 233) | 258 | 128 | 108 | 460 | 29 | 322 | 174 | 77 | 71 | 82 | 67 | 115 | 101 | 192 | 104 | 71 | 47 | 90 | 7 | 3 | 67 | 74 | 180 | 39 | 6 | 272 | 55 | 9612 |
| 234) | 238 | 119 | 99 | 451 | 39 | 323 | 216 | 85 | 75 | 100 | 75 | 138 | 122 | 237 | 109 | 78 | 56 | 105 | 11 | 6 | 87 | 95 | 201 | 40 | 9 | 283 | 66 | 11077 |
| 235) | 252 | 124 | 103 | 464 | 37 | 333 | 211 | 85 | 78 | 97 | 76 | 137 | 122 | 252 | 112 | 77 | 56 | 101 | 10 | 6 | 82 | 90 | 201 | 41 | 8 | 287 | 64 | 10946 |
| 236) | 295 | 146 | 122 | 540 | 40 | 379 | 251 | 91 | 88 | 108 | 86 | 148 | 131 | 253 | 127 | 87 | 61 | 107 | 10 | 6 | 88 | 94 | 225 | 46 | 9 | 314 | 67 | 11961 |
| 237) | 56 | 27 | 24 | 102 | 11 | 75 | 26 | 22 | 17 | 20 | 15 | 43 | 36 | 65 | 26 | 19 | 14 | 35 | 5 | 2 | 27 | 29 | 48 | 9 | 1 | 129 | 31 | 3086 |
| 241) | 3897 | 1727 | 1356 | 2689 | 277 | 3329 | 321 | 181 | 217 | 364 | 222 | 276 | 246 | 478 | 470 | 316 | 393 | 353 | 37 | 32 | 284 | 300 | 599 | 88 | 38 | 849 | 551 | 35675 |
| 242) | 4241 | 1914 | 1512 | 3062 | 279 | 3968 | 329 | 189 | 226 | 323 | 233 | 291 | 255 | 497 | 504 | 337 | 436 | 378 | 37 | 32 | 290 | 297 | 671 | 94 | 33 | 925 | 364 | 38286 |
| 243) | 1988 | 931 | 738 | 1448 | 137 | 1872 | 165 | 100 | 110 | 158 | 108 | 143 | 125 | 242 | 229 | 155 | 214 | 221 | 19 | 16 | 141 | 148 | 313 | 47 | 18 | 453 | 239 | 18623 |
| 244) | 1413 | 682 | 537 | 1017 | 111 | 1257 | 132 | 80 | 81 | 119 | 83 | 110 | 100 | 186 | 165 | 114 | 156 | 186 | 15 | 16 | 113 | 120 | 224 | 36 | 15 | 336 | 206 | 14020 |
| 25) | 3221 | 1390 | 1024 | 37914 | 2281 | 8251 | 1899 | 813 | 635 | 1136 | 878 | 1837 | 1643 | 3607 | 3035 | 2170 | 1427 | 1109 | 64 | 32 | 385 | 1113 | 3063 | 294 | 570 | 3022 | 720 | 121624 |
| 26) | 240 | 119 | 98 | 991 | 0 | 2782 | 1014 | 96 | 114 | 176 | 67 | 453 | 415 | 668 | 134 | 85 | 527 | 699 | 7 | 14 | 37 | 128 | 322 | 35 | 42 | 526 | 473 | 13200 |
| 27) | 2587 | 1179 | 943 | 8741 | 2175 | 31308 | 901 | 1072 | 563 | 817 | 2121 | 529 | 467 | 921 | 2424 | 1773 | 1329 | 614 | 13 | 69 | 506 | 984 | 2565 | 242 | 105 | 3105 | 1835 | 97890 |
| 28) | 490 | 216 | 151 | 1987 | 151 | 1102 | 16646 | 3118 | 2342 | 1601 | 996 | 1216 | 1078 | 2068 | 913 | 645 | 2134 | 1223 | 28 | 20 | 303 | 554 | 1161 | 259 | 189 | 1285 | 145 | 63545 |
| 29) | 260 | 111 | 66 | 889 | 82 | 899 | 3617 | 10491 | 1384 | 2297 | 3716 | 581 | 520 | 971 | 276 | 187 | 1646 | 607 | 3 | 17 | 162 | 415 | 834 | 196 | 163 | 1044 | 75 | 47420 |
| 30) | 185 | 79 | 44 | 981 | 53 | 505 | 2686 | 1928 | 14268 | 7131 | 6148 | 660 | 594 | 1075 | 314 | 209 | 535 | 814 | 54 | 14 | 294 | 503 | 783 | 211 | 122 | 995 | 49 | 57789 |
| 31) | 446 | 160 | 92 | 1041 | 267 | 828 | 1548 | 2484 | 5213 | 34132 | 3496 | 479 | 425 | 811 | 305 | 207 | 8144 | 714 | 90 | 30 | 401 | 693 | 1309 | 343 | 148 | 1563 | 7 | 89426 |
| 32) | 326 | 119 | 65 | 722 | 33 | 1475 | 899 | 3294 | 4733 | 6239 | 18513 | 411 | 364 | 708 | 222 | 150 | 2485 | 465 | 51 | 18 | 546 | 514 | 772 | 186 | 173 | 905 | 15 | 60654 |
| 331) | 376 | 171 | 129 | 1823 | 111 | 873 | 943 | 631 | 1352 | 577 | 588 | 4255 | 3798 | 7065 | 532 | 375 | 1559 | 228 | 7 | 15 | 158 | 270 | 527 | 166 | 137 | 897 | 157 | 38720 |
| 332) | 336 | 151 | 116 | 1628 | 97 | 774 | 847 | 557 | 1201 | 512 | 523 | 3779 | 3374 | 6277 | 475 | 335 | 1391 | 204 | 5 | 13 | 138 | 244 | 470 | 147 | 122 | 803 | 138 | 34461 |
| 333) | 631 | 282 | 212 | 3021 | 178 | 1477 | 1562 | 1967 | 2281 | 973 | 978 | 7166 | 6395 | 11928 | 885 | 622 | 2569 | 367 | 9 | 22 | 263 | 429 | 877 | 276 | 228 | 1485 | 263 | 64701 |
| 341) | 624 | 211 | 109 | 2774 | 84 | 1299 | 654 | 391 | 289 | 435 | 277 | 527 | 465 | 875 | 11163 | 8093 | 823 | 550 | 160 | 14 | 536 | 350 | 693 | 137 | 93 | 1007 | 85 | 47490 |
| 342) | 364 | 118 | 56 | 1405 | 44 | 689 | 365 | 230 | 151 | 241 | 147 | 295 | 263 | 497 | 6001 | 4359 | 447 | 302 | 91 | 8 | 280 | 176 | 362 | 73 | 52 | 482 | 48 | 26055 |
| 35) | 483 | 199 | 120 | 1231 | 451 | 1053 | 3323 | 3013 | 927 | 7103 | 3021 | 998 | 882 | 1706 | 1043 | 739 | 36935 | 4207 | 83 | 14 | 696 | 987 | 2734 | 893 | 160 | 2295 | 205 | 105846 |
| 361 | 203 | 106 | 87 | 1227 | 328 | 691 | 751 | 416 | 512 | 933 | 593 | 360 | 322 | 606 | 553 | 394 | 3636 | 15973 | 59 | 41 | 890 | 660 | 21170 | 858 | 163 | 2878 | 222 | 69828 |
| 37) | 40 | 21 | 18 | 55 | 0 | 8 | 55 | 21 | 53 | 37 | 39 | 1 | 1 | 2 | 82 | 59 | 87 | 75 | 405 | 0 | 16 | 7 | 54 | 15 | 3 | 323 | 3 | 2335 |
| 381 | 90 | 46 | 39 | 112 | 0 | 76 | 19 | 22 | 4 | 5 | 4 | 3 | 3 | 4 | 3 | 2 | 6 | 158 | 0 | 971 | 19 | 11 | 81 | 17 | 16 | 154 | 0 | 2575 |
| 39) | 302 | 145 | 122 | 432 | 30 | 477 | 340 | 135 | 165 | 261 | 322 | 125 | 110 | 215 | 533 | 386 | 954 | 2399 | 16 | 12 | 9542 | 285 | 708 | 174 | 216 | 2624 | 11 | 32987 |
| 40) | 493 | 231 | 191 | 1821 | 74 | 1424 | 1025 | 811 | 643 | 1107 | 806 | 345 | 304 | 567 | 467 | 334 | 1721 | 1315 | 14 | 96 | 440 | 4170 | 1243 | 328 | 386 | 3647 | 0 | 46565 |
| 41) | 463 | 185 | 117 | 1730 | 282 | 1641 | 835 | 571 | 437 | 668 | 574 | 374 | 331 | 635 | 466 | 328 | 1814 | 3008 | 73 | 106 | 977 | 1008 | 50072 | 430 | 734 | 4222 | 76 | 103768 |
| 42) | 107 | 49 | 39 | 201 | 37 | 220 | 184 | 168 | 158 | 198 | 425 | 145 | 130 | 246 | 87 | 59 | 803 | 708 | 16 | 22 | 255 | 254 | 664 | 9661 | 211 | 788 | 4 | 23278 |
| 43) | 50 | 19 | 10 | 540 | 29 | 261 | 139 | 188 | 133 | 143 | 77 | 91 | 81 | 157 | 67 | 49 | 122 | 295 | 12 | 22 | 272 | 274 | 798 | 217 | 10120 | 2923 | 27 | 24894 |
| 44) | 886 | 395 | 282 | 3026 | 417 | 2975 | 1143 | 984 | 1162 | 1677 | 1392 | 996 | 884 | 1688 | 916 | 646 | 2299 | 1955 | 183 | 189 | 2376 | 2691 | 7593 | 1807 | 2994 | 332254 | 238 | 446279 |
| 45) | 234 | 132 | 107 | 564 | 193 | 2325 | 179 | 66 | 52 | 57 | 106 | 61 | 55 | 101 | 165 | 108 | 109 | 131 | 0 | 0 | 11 | 0 | 7126 | 0 | 77 | 261 | 0 | 17145 |
| TOTAL) | 38168 | 17657 | 13809 | 124526 | 11539 | 99290 | 63003 | 46423 | 54569 | 93428 | 63738 | 37325 | 33238 | 62655 | 46542 | 33236 | 110967 | 56388 | 2182 | 2539 | 31326 | 29446 | 135034 | 25499 | 24805 | 442275 | 114893 | 142255 |

## (3) O-D TABLE - ALL MODE, ALL PURPOSE YEAR 1990(a)

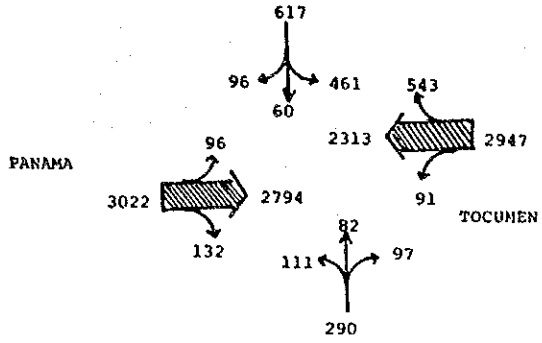
| ZONA | 1) | 2) | 3) | 4) | 5) | 6) | 7) | 8) | 9) | 10) | 11) | 12) | 13) | 14) | 15) | 16) | 17) | 18) | 19) | 20) | 21) | 22) | 231) | 232) | 233) | 234) | 235) | 236) | 237) | 241) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1) | 6303 | 2092 | 3448 | 1007 | 1397 | 1608 | 843 | 871 | 646 | 609 | 1093 | 251 | 419 | 288 | 266 | 296 | 510 | 674 | 765 | 240 | 192 | 278 | 61 | 161 | 59 | 53 | 52 | 0 | 0 | 347 |
| 2) | 1936 | 11781 | 5745 | 1825 | 1682 | 647 | 1417 | 854 | 424 | 716 | 1414 | 276 | 550 | 435 | 427 | 908 | 1747 | 609 | 533 | 1523 | 579 | 522 | 66 | 182 | 64 | 58 | 59 | 0 | 0 | 291 |
| 3) | 4245 | 6368 | 32669 | 3442 | 4321 | 1393 | 3920 | 2646 | 1270 | 1506 | 2714 | 1147 | 1577 | 1241 | 1270 | 863 | 1815 | 2578 | 2151 | 934 | 1187 | 1460 | 275 | 627 | 273 | 263 | 246 | 0 | 0 | 1226 |
| 4) | 1040 | 2072 | 3809 | 6311 | 5705 | 2672 | 1729 | 2937 | 1553 | 2046 | 1799 | 1359 | 1344 | 829 | 1015 | 689 | 1957 | 2868 | 1050 | 836 | 2107 | 934 | 172 | 350 | 171 | 170 | 157 | 0 | 0 | 738 |
| 5) | 1431 | 2076 | 4605 | 4931 | 18783 | 1841 | 2013 | 2982 | 1967 | 3095 | 2856 | 1142 | 2045 | 1231 | 1225 | 1327 | 2207 | 2054 | 1753 | 715 | 624 | 884 | 234 | 479 | 232 | 225 | 209 | 0 | 0 | 989 |
| 6) | 829 | 635 | 885 | 1987 | 1746 | 2767 | 661 | 520 | 228 | 412 | 857 | 145 | 325 | 237 | 424 | 274 | 319 | 199 | 238 | 74 | 393 | 176 | 49 | 110 | 47 | 38 | 41 | 0 | 0 | 114 |
| 7) | 979 | 1350 | 3196 | 861 | 1904 | 468 | 2732 | 2013 | 1504 | 1738 | 1390 | 996 | 1172 | 903 | 515 | 779 | 2156 | 3007 | 1226 | 664 | 685 | 756 | 185 | 336 | 184 | 183 | 169 | 0 | 0 | 802 |
| 8) | 891 | 987 | 2815 | 3594 | 3335 | 669 | 2347 | 11666 | 4193 | 5314 | 2559 | 3559 | 2683 | 1537 | 1931 | 1049 | 4089 | 3405 | 1231 | 1017 | 970 | 1100 | 212 | 401 | 209 | 207 | 191 | 0 | 0 | 869 |
| 9) | 521 | 541 | 923 | 1667 | 1719 | 201 | 1711 | 3837 | 5392 | 3328 | 2497 | 2241 | 2447 | 1543 | 701 | 660 | 1406 | 739 | 1175 | 465 | 570 | 717 | 74 | 132 | 74 | 73 | 69 | 0 | 0 | 314 |
| 10) | 569 | 793 | 1708 | 2257 | 3172 | 537 | 2261 | 5718 | 3190 | 13147 | 3757 | 1676 | 2305 | 1694 | 1061 | 999 | 3737 | 1800 | 1922 | 530 | 406 | 713 | 176 | 370 | 172 | 162 | 154 | 0 | 0 | 719 |
| 11) | 796 | 1527 | 2626 | 1560 | 2861 | 822 | 1425 | 4368 | 2443 | 2835 | 6675 | 2424 | 2373 | 1104 | 835 | 636 | 2527 | 1997 | 3061 | 1121 | 924 | 999 | 230 | 390 | 227 | 229 | 211 | 0 | 0 | 958 |
| 12) | 262 | 242 | 976 | 1195 | 1249 | 216 | 1238 | 3055 | 2000 | 1676 | 3468 | 5091 | 1295 | 772 | 260 | 247 | 1528 | 787 | 869 | 282 | 160 | 80 | 57 | 115 | 58 | 52 | 49 | 0 | 0 | 227 |
| 13) | 374 | 699 | 1613 | 1323 | 1826 | 267 | 1542 | 2436 | 2564 | 1980 | 3630 | 1364 | 7328 | 1330 | 812 | 1181 | 1405 | 850 | 1236 | 280 | 772 | 514 | 96 | 241 | 92 | 76 | 77 | 0 | 0 | 325 |
| 14) | 104 | 359 | 1234 | 661 | 1275 | 202 | 1022 | 1654 | 1124 | 1814 | 1313 | 923 | 1486 | 4400 | 2499 | 696 | 2143 | 2297 | 827 | 802 | 997 | 538 | 94 | 192 | 94 | 88 | 86 | 0 | 0 | 383 |
| 15) | 241 | 533 | 1681 | 825 | 1357 | 315 | 918 | 1869 | 401 | 1018 | 1004 | 305 | 970 | 1780 | 6557 | 573 | 1411 | 1365 | 1719 | 196 | 1122 | 511 | 86 | 205 | 82 | 70 | 73 | 0 | 0 | 262 |
| 16) | 373 | 1052 | 809 | 490 | 1190 | 141 | 1002 | 1067 | 503 | 1232 | 759 | 214 | 267 | 992 | 483 | 2351 | 1332 | 1270 | 681 | 191 | 307 | 229 | 97 | 186 | 94 | 87 | 85 | 0 | 0 | 307 |
| 17) | 575 | 1042 | 2322 | 1899 | 2417 | 264 | 2606 | 4740 | 1100 | 4003 | 2876 | 1718 | 1647 | 2965 | 1266 | 1329 | 16270 | 4647 | 1665 | 154 | 440 | 505 | 145 | 351 | 144 | 135 | 129 | 0 | 0 | 591 |
| 18) | 726 | 636 | 2424 | 2327 | 1895 | 263 | 3305 | 2983 | 700 | 1801 | 2276 | 699 | 766 | 1906 | 1453 | 1624 | 3676 | 14785 | 715 | 352 | 665 | 301 | 66 | 187 | 65 | 55 | 55 | 0 | 0 | 268 |
| 19) | 577 | 542 | 1771 | 806 | 1607 | 275 | 1355 | 1284 | 978 | 2492 | 3053 | 720 | 1128 | 770 | 1957 | 309 | 1588 | 1229 | 12510 | 1356 | 2636 | 1709 | 120 | 386 | 119 | 99 | 102 | 0 | 0 | 512 |
| 20) | 288 | 460 | 1120 | 832 | 813 | 106 | 948 | 908 | 725 | 731 | 1334 | 300 | 393 | 823 | 316 | 178 | 123 | 408 | 1605 | 2992 | 2474 | 1332 | 100 | 195 | 96 | 87 | 84 | 0 | 0 | 294 |
| 21) | 269 | 774 | 954 | 2863 | 526 | 335 | 910 | 865 | 438 | 468 | 806 | 236 | 746 | 896 | 897 | 195 | 462 | 669 | 2855 | 2747 | 5349 | 1781 | 125 | 311 | 127 | 120 | 113 | 0 | 0 | 572 |
| 22) | 230 | 456 | 1486 | 928 | 975 | 165 | 889 | 618 | 534 | 648 | 944 | 164 | 455 | 591 | 470 | 232 | 350 | 286 | 2077 | 931 | 1552 | 2897 | 94 | 258 | 92 | 73 | 77 | 0 | 0 | 294 |
| 231) | 48 | 97 | 327 | 162 | 234 | 39 | 245 | 220 | 68 | 192 | 349 | 70 | 95 | 116 | 77 | 99 | 161 | 88 | 185 | 121 | 159 | 97 | 157 | 313 | 155 | 144 | 136 | 0 | 0 | 561 |
| 232) | 116 | 201 | 727 | 316 | 509 | 81 | 402 | 574 | 120 | 374 | 573 | 137 | 187 | 211 | 167 | 184 | 331 | 180 | 379 | 309 | 346 | 243 | 332 | 794 | 329 | 314 | 301 | 0 | 0 | 1382 |
| 233) | 46 | 93 | 315 | 155 | 227 | 36 | 237 | 212 | 66 | 185 | 341 | 67 | 88 | 114 | 73 | 96 | 157 | 81 | 173 | 110 | 150 | 87 | 141 | 293 | 140 | 131 | 125 | 0 | 0 | 501 |
| 234) | 39 | 73 | 274 | 141 | 206 | 29 | 231 | 202 | 62 | 165 | 325 | 60 | 74 | 105 | 55 | 65 | 134 | 66 | 140 | 72 | 121 | 56 | 103 | 210 | 100 | 89 | 89 | 0 | 0 | 315 |
| 235) | 41 | 74 | 266 | 135 | 196 | 28 | 215 | 191 | 58 | 160 | 310 | 59 | 72 | 102 | 56 | 80 | 131 | 68 | 141 | 77 | 121 | 60 | 106 | 221 | 104 | 93 | 92 | 0 | 0 | 348 |
| 236) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 237) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 241) | 185 | 316 | 1240 | 614 | 939 | 123 | 927 | 796 | 248 | 705 | 1179 | 265 | 303 | 429 | 240 | 361 | 560 | 266 | 572 | 353 | 583 | 260 | 405 | 1021 | 394 | 352 | 351 | 0 | 0 | 1402 |
| 242) | 211 | 361 | 1382 | 669 | 1018 | 142 | 933 | 816 | 260 | 751 | 1207 | 285 | 343 | 447 | 285 | 382 | 620 | 310 | 666 | 464 | 653 | 352 | 506 | 1275 | 498 | 463 | 449 | 0 | 0 | 1957 |
| 243) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 244) | 0 | 0 | 0 | 0 | 0 | 0 | 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) | 366 | 1447 | 2134 | 1220 | 1725 | 282 | 2692 | 1132 | 1043 | 2230 | 2234 | 306 | 309 | 756 | 695 | 861 | 977 | 647 | 691 | 311 | 1083 | 635 | 445 | 1296 | 434 | 356 | 371 | 0 | 0 | 1423 |
| 26) | 31 | 171 | 168 | 79 | 232 | 31 | 21 | 397 | 126 | 141 | 92 | 106 | 70 | 57 | 60 | 14 | 289 | 69 | 114 | 71 | 84 | 229 | 96 | 179 | 93 | 82 | 84 | 0 | 0 | 197 |
| 27) | 345 | 849 | 1522 | 533 | 1089 | 190 | 1008 | 591 | 823 | 569 | 1028 | 515 | 667 | 603 | 343 | 222 | 301 | 434 | 995 | 370 | 1004 | 925 | 360 | 858 | 351 | 287 | 300 | 0 | 0 | 966 |
| 28) | 394 | 1193 | 1990 | 1472 | 2052 | 205 | 1975 | 739 | 524 | 501 | 1510 | 434 | 436 | 586 | 1003 | 782 | 1582 | 907 | 904 | 283 | 1304 | 447 | 149 | 395 | 147 | 126 | 125 | 0 | 0 | 554 |
| 29) | 250 | 694 | 1063 | 998 | 835 | 74 | 607 | 804 | 363 | 530 | 1283 | 124 | 282 | 483 | 712 | 511 | 770 | 1197 | 1536 | 175 | 319 | 206 | 70 | 209 | 67 | 46 | 53 | 0 | 0 | 188 |
| 30) | 402 | 635 | 1466 | 1194 | 783 | 91 | 1272 | 555 | 1545 | 472 | 1613 | 260 | 352 | 434 | 869 | 709 | 833 | 337 | 321 | 45 | 432 | 301 | 114 | 344 | 110 | 78 | 90 | 0 | 0 | 273 |
| 31) | 689 | 614 | 2044 | 1796 | 2608 | 317 | 1256 | 1539 | 565 | 994 | 1321 | 129 | 547 | 735 | 839 | 669 | 1352 | 158 | 159 | 313 | 784 | 91 | 50 | 205 | 47 | 26 | 35 | 0 | 0 | 136 |
| 32) | 376 | 262 | 1222 | 1542 | 969 | 104 | 970 | 659 | 336 | 965 | 1431 | 112 | 158 | 215 | 648 | 773 | 792 | 291 | 133 | 51 | 224 | 18 | 33 | 132 | 29 | 18 | 23 | 0 | 0 | 93 |
| 331) | 89 | 158 | 599 | 296 | 449 | 62 | 450 | 388 | 121 | 340 | 596 | 128 | 154 | 208 | 126 | 175 | 281 | 138 | 297 | 188 | 284 | 139 | 224 | 521 | 219 | 201 | 197 | 0 | 0 | 765 |
| 332) | 75 | 137 | 513 | 257 | 387 | 54 | 399 | 343 | 105 | 296 | 530 | 113 | 132 | 184 | 107 | 156 | 241 | 117 | 255 | 154 | 243 | 114 | 184 | 427 | 183 | 165 | 163 | 0 | 0 | 633 |
| 333) | 149 | 258 | 992 | 484 | 742 | 103 | 727 | 624 | 195 | 557 | 936 | 212 | 245 | 340 | 199 | 285 | 449 | 220 | 471 | 299 | 467 | 218 | 341 | 852 | 335 | 305 | 298 | 0 | 0 | 1225 |
| 341) | 86 | 152 | 589 | 295 | 442 | 61 | 451 | 389 | 120 | 337 | 597 | 129 | 150 | 208 | 121 | 175 | 275 | 134 | 288 | 176 | 279 | 130 | 212 | 496 | 267 | 188 | 186 | 0 | 0 | 731 |
| 342) | 83 | 147 | 549 | 271 | 406 | 59 | 408 | 354 | 110 | 312 | 547 | 117 | 143 | 191 | 116 | 161 | 258 | 130 | 278 | 176 | 259 | 134 | 212 | 486 | 209 | 191 | 187 | 0 | 0 | 750 |
| 35) | 783 | 716 | 1813 | 1811 | 1650 | 235 | 1804 | 1019 | 1339 | 2043 | 2093 | 259 | 513 | 908 | 1974 | 1015 | 2632 | 758 | 603 | 79 | 619 | 142 | 68 | 215 | 67 | 54 | 55 | 0 | 0 | 275 |
| 36) | 310 | 457 | 1159 | 441 | 3852 | 88 | 561 | 615 | 306 | 928 | 477 | 214 | 337 | 149 | 299 | 372 | 789 | 494 | 509 | 118 | 359 | 161 | 64 | 142 | 62 | 55 | 56 | 0 | 0 | 229 |
| 37) | 1 | 79 | 52 | 70 | 132 | 26 | 28 | 3 | 1 | 1 | 2 | 1 | 25 | 2 | 17 | 29 | 30 | 82 | 1 | 15 | 40 | 2 | 10 | 15 | 10 | 10 | 10 | 0 | 0 | 44 |
| 38) | 1 | 166 | 86 | 30 | 1 | 1 | 6 | 3 | 2 | 51 | 3 | 16 | 1 | 1 | 1 | 1 | 1 | 24 | 1 | 2 | 2 | 2 | 11 | 19 | 10 | 11 | 9 | 0 | 0 | 51 |
| 39) | 264 | 308 | 368 | 71 | 908 | 121 | 75 | 209 | 120 | 493 | 81 | 566 | 362 | 151 | 254 | 8 | 448 | 399 | 390 | 197 | 245 | 257 | 59 | 92 | 58 | 60 | 54 | 0 | 0 | 255 |
| 40) | 336 | 783 | 962 | 443 | 888 | 254 | 445 | 826 | 342 | 293 | 539 | 183 | 223 | 178 | 203 | 171 | 621 | 317 | 293 | 180 | 161 | 214 | 35 | 97 | 35 | 34 | 31 | 0 | 0 | 157 |
| 41) | 671 | 1189 | 2521 | 1817 | 2118 | 463 | 1759 | 1882 | 1051 | 1651 | 1753 | 640 | 879 | 789 | 600 | 699 | 1110 | 745 | 671 | 671 | 807 | 456 | 89 | 257 | 85 | 71 | 71 | 0 | 0 | 300 |
| 42) | 44 | 114 | 257 | 163 | 626 | 36 | 245 | 285 | 109 | 135 | 122 | 72 | 198 | 63 | 54 | 151 | 311 | 128 | 93 | 35 | 254 | 59 | 12 | 37 | 11 | 9 | 9 | 0 | 0 | 44 |
| 43) | 266 | 332 | 511 | 362 | 1394 | 86 | 353 | 187 | 78 | 169 | 236 | 233 | 177 | 115 | 127 | 86 | 547 | 167 | 201 | 155 | 118 | 257 | 5 | 33 | 5 | 4 | 4 | 0 | 0 | 26 |
| 44) | 1736 | 5463 | 6654 | 3412 | 2925 | 870 | 5251 | 2889 | 1783 | 2052 | 4109 | 455 | 641 | 1177 | 586 | 673 | 1652 | 557 | 456 | 249 | 569 | 411 | 112 | 363 | 107 | 78 | 86 | 0 | 0 | 341 |
| 45) | 743 | 716 | 469 | 110 | 204 | 40 | 98 | 57 | 11 | 86 | 39 | 69 | 106 | 84 | 137 | 63 | 213 | 74 | 125 | 19 | 82 | 78 | 38 | 78 | 36 | 33 | 32 | 0 | 0 | 104 |
| TOTAL) | 32475 | 55072 | 113051 | 64930 | 92699 | 20503 | 62825 | 79151 | 45877 | 71285 | 76530 | 32677 | 41990 | 37418 | 37683 | 27441 | 71406 | 58086 | 53905 | 24240 | 37266 | 25695 | 7555 | 18029 | 7410 | 6677 | 6560 | 0 | 0 | 27557 |

## (4) O-D TABLE - ALL MODE, ALL PURPOSE YEAR 1990(b)

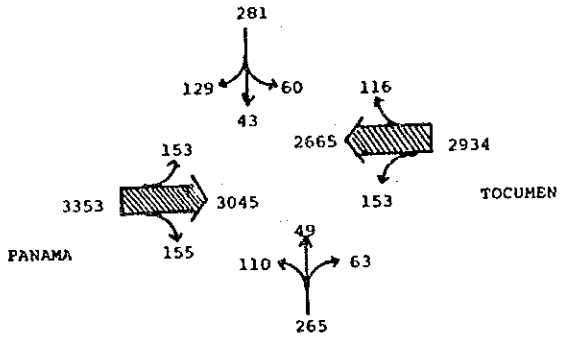
| ZONA | 242) | 243) | 244) | 25) | 26) | 27) | 28) | 29) | 30) | 31) | 32) | 331) | 332) | 333) | 341) | 342) | 35) | 36) | 37) | 38) | 39) | 40) | 41) | 42) | 43) | 44) | 45) | TOTAL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1) | 288 | 0 | 0 | 521 | 9 | 516 | 454 | 331 | 879 | 544 | 342 | 115 | 99 | 197 | 114 | 105 | 729 | 325 | 2 | 6 | 220 | 142 | 674 | 23 | 287 | 1598 | 281 | 33530 |
| 2) | 330 | 0 | 0 | 1280 | 169 | 1119 | 775 | 675 | 554 | 773 | 234 | 132 | 113 | 229 | 131 | 120 | 843 | 682 | 53 | 62 | 319 | 378 | 1093 | 73 | 406 | 5644 | 714 | 54351 |
| 3) | 1311 | 0 | 0 | 2613 | 291 | 1734 | 2007 | 976 | 1259 | 2599 | 1625 | 561 | 486 | 954 | 560 | 505 | 1988 | 1372 | 114 | 36 | 436 | 713 | 2570 | 168 | 577 | 8790 | 1442 | 119314 |
| 4) | 767 | 0 | 0 | 1196 | 200 | 385 | 1613 | 1141 | 1052 | 2122 | 1576 | 342 | 298 | 573 | 341 | 307 | 1794 | 872 | 11 | 307 | 206 | 321 | 1466 | 354 | 557 | 3227 | 221 | 69466 |
| 5) | 1024 | 0 | 0 | 1861 | 229 | 1303 | 1470 | 666 | 894 | 2127 | 1105 | 460 | 404 | 771 | 462 | 416 | 2192 | 3713 | 157 | 7 | 519 | 720 | 1970 | 1169 | 807 | 3853 | 103 | 92546 |
| 6) | 149 | 0 | 0 | 250 | 43 | 197 | 222 | 85 | 105 | 549 | 127 | 67 | 60 | 99 | 65 | 66 | 325 | 157 | 5 | 21 | 148 | 193 | 576 | 25 | 116 | 417 | 31 | 18825 |
| 7) | 882 | 0 | 0 | 2256 | 88 | 1034 | 1586 | 698 | 951 | 1153 | 890 | 369 | 326 | 620 | 374 | 331 | 2157 | 700 | 8 | 16 | 151 | 306 | 1045 | 174 | 279 | 4737 | 50 | 53952 |
| 8) | 891 | 0 | 0 | 1823 | 220 | 1366 | 740 | 832 | 758 | 1740 | 817 | 418 | 360 | 676 | 411 | 368 | 3617 | 652 | 39 | 15 | 223 | 320 | 1466 | 385 | 374 | 3489 | 76 | 85080 |
| 9) | 319 | 0 | 0 | 1278 | 130 | 853 | 600 | 464 | 1710 | 444 | 320 | 145 | 128 | 240 | 146 | 130 | 1851 | 313 | 3 | 10 | 174 | 115 | 1009 | 219 | 88 | 2273 | 46 | 48725 |
| 10) | 756 | 0 | 0 | 2795 | 192 | 578 | 639 | 728 | 547 | 949 | 1217 | 337 | 292 | 558 | 336 | 304 | 2748 | 912 | 6 | 26 | 281 | 354 | 1452 | 277 | 374 | 2498 | 57 | 74907 |
| 11) | 951 | 0 | 0 | 2022 | 47 | 1290 | 1267 | 965 | 2074 | 1644 | 1392 | 446 | 395 | 738 | 452 | 400 | 1881 | 789 | 5 | 13 | 135 | 206 | 1673 | 366 | 288 | 3777 | 136 | 71536 |
| 12) | 243 | 0 | 0 | 296 | 122 | 424 | 364 | 87 | 162 | 152 | 82 | 109 | 92 | 177 | 108 | 98 | 229 | 196 | 3 | 5 | 391 | 115 | 484 | 22 | 203 | 659 | 41 | 32341 |
| 13) | 398 | 0 | 0 | 368 | 63 | 567 | 382 | 512 | 329 | 497 | 179 | 165 | 137 | 267 | 160 | 153 | 512 | 531 | 4 | 13 | 226 | 125 | 994 | 65 | 183 | 659 | 173 | 43807 |
| 14) | 407 | 0 | 0 | 1071 | 48 | 582 | 653 | 608 | 377 | 692 | 315 | 177 | 156 | 296 | 178 | 161 | 1263 | 106 | 8 | 9 | 138 | 91 | 869 | 38 | 104 | 1398 | 75 | 39099 |
| 15) | 317 | 0 | 0 | 663 | 120 | 470 | 957 | 690 | 573 | 943 | 581 | 137 | 116 | 218 | 132 | 129 | 1985 | 511 | 23 | 36 | 229 | 219 | 714 | 25 | 133 | 842 | 108 | 38360 |
| 16) | 338 | 0 | 0 | 684 | 20 | 325 | 566 | 428 | 522 | 661 | 690 | 156 | 138 | 247 | 155 | 145 | 1019 | 406 | 4 | 12 | 20 | 180 | 639 | 98 | 111 | 581 | 38 | 25974 |
| 17) | 665 | 0 | 0 | 1114 | 81 | 237 | 1602 | 769 | 689 | 1533 | 724 | 279 | 239 | 469 | 279 | 252 | 2456 | 1015 | 65 | 9 | 535 | 432 | 1086 | 207 | 642 | 1747 | 170 | 73741 |
| 18) | 309 | 0 | 0 | 611 | 44 | 433 | 806 | 543 | 276 | 152 | 229 | 123 | 106 | 210 | 122 | 114 | 933 | 468 | 12 | 16 | 434 | 184 | 718 | 215 | 239 | 956 | 69 | 55088 |
| 19) | 618 | 0 | 0 | 571 | 195 | 689 | 905 | 795 | 699 | 213 | 313 | 242 | 202 | 419 | 234 | 224 | 673 | 460 | 3 | 8 | 468 | 83 | 772 | 253 | 214 | 544 | 125 | 51692 |
| 20) | 329 | 0 | 0 | 357 | 393 | 924 | 309 | 100 | 46 | 327 | 112 | 155 | 135 | 238 | 150 | 143 | 54 | 129 | 27 | 14 | 340 | 107 | 974 | 34 | 84 | 391 | 27 | 25964 |
| 21) | 617 | 0 | 0 | 1210 | 86 | 798 | 1295 | 267 | 398 | 795 | 324 | 262 | 224 | 447 | 260 | 237 | 509 | 467 | 43 | 9 | 254 | 137 | 912 | 85 | 62 | 613 | 80 | 37800 |
| 22) | 370 | 0 | 0 | 686 | 209 | 968 | 354 | 281 | 319 | 194 | 56 | 153 | 128 | 248 | 148 | 144 | 229 | 201 | 3 | 8 | 256 | 386 | 390 | 26 | 187 | 542 | 78 | 25218 |
| 231) | 603 | 0 | 0 | 551 | 42 | 393 | 190 | 80 | 105 | 67 | 59 | 280 | 246 | 449 | 275 | 258 | 127 | 97 | 13 | 5 | 53 | 32 | 165 | 20 | 14 | 174 | 66 | 9057 |
| 232) | 1567 | 0 | 0 | 1292 | 79 | 950 | 610 | 176 | 275 | 128 | 146 | 629 | 551 | 1076 | 631 | 573 | 265 | 179 | 19 | 11 | 82 | 65 | 398 | 44 | 27 | 363 | 105 | 19960 |
| 233) | 546 | 0 | 0 | 492 | 40 | 347 | 177 | 72 | 91 | 43 | 52 | 251 | 223 | 402 | 248 | 232 | 118 | 93 | 12 | 5 | 52 | 31 | 149 | 18 | 13 | 160 | 63 | 8570 |
| 234) | 356 | 0 | 0 | 322 | 37 | 210 | 140 | 52 | 48 | 25 | 35 | 170 | 149 | 262 | 167 | 159 | 92 | 78 | 11 | 5 | 51 | 26 | 102 | 12 | 10 | 119 | 52 | 6309 |
| 235) | 385 | 0 | 0 | 348 | 36 | 239 | 139 | 53 | 57 | 31 | 36 | 181 | 157 | 285 | 180 | 166 | 93 | 79 | 11 | 5 | 47 | 26 | 109 | 14 | 10 | 124 | 54 | 6478 |
| 236) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 237) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 241) | 1704 | 0 | 0 | 1380 | 158 | 858 | 675 | 208 | 204 | 125 | 163 | 689 | 591 | 1132 | 673 | 637 | 351 | 249 | 35 | 15 | 199 | 99 | 457 | 56 | 29 | 414 | 133 | 26601 |
| 242) | 2283 | 0 | 0 | 1856 | 165 | 1253 | 762 | 288 | 330 | 178 | 214 | 915 | 793 | 1536 | 906 | 839 | 412 | 288 | 36 | 17 | 197 | 111 | 594 | 65 | 39 | 531 | 155 | 32406 |
| 243) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 244) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 251 | 1914 | 0 | 0 | 25771 | 1652 | 3788 | 1402 | 473 | 431 | 463 | 434 | 756 | 632 | 1241 | 725 | 708 | 490 | 591 | 42 | 22 | 104 | 406 | 2032 | 52 | 382 | 839 | 449 | 73980 |
| 26) | 244 | 0 | 0 | 685 | 0 | 1740 | 901 | 101 | 58 | 141 | 48 | 126 | 109 | 174 | 121 | 121 | 418 | 441 | 10 | 27 | 12 | 79 | 240 | 18 | 60 | 272 | 270 | 9799 |
| 27) | 1216 | 0 | 0 | 4358 | 1539 | 19500 | 573 | 435 | 120 | 374 | 860 | 545 | 466 | 834 | 527 | 517 | 441 | 409 | 8 | 47 | 173 | 189 | 1381 | 51 | 70 | 1031 | 1056 | 54766 |
| 28) | 669 | 0 | 0 | 1529 | 152 | 902 | 14842 | 2957 | 2569 | 1000 | 760 | 263 | 226 | 446 | 259 | 242 | 1730 | 1055 | 24 | 19 | 188 | 188 | 903 | 53 | 159 | 722 | 123 | 54497 |
| 29) | 264 | 0 | 0 | 453 | 78 | 505 | 3146 | 10482 | 1258 | 2038 | 2353 | 105 | 85 | 163 | 97 | 99 | 1045 | 378 | 3 | 14 | 72 | 116 | 608 | 25 | 138 | 431 | 54 | 38456 |
| 30) | 410 | 0 | 0 | 334 | 41 | 161 | 2573 | 1373 | 8118 | 4351 | 4177 | 162 | 134 | 250 | 153 | 158 | 318 | 518 | 53 | 14 | 136 | 293 | 538 | 55 | 79 | 645 | 41 | 41015 |
| 31) | 232 | 0 | 0 | 502 | 174 | 402 | 1152 | 1588 | 4200 | 18433 | 2467 | 76 | 58 | 124 | 67 | 73 | 4706 | 432 | 83 | 12 | 266 | 109 | 825 | 39 | 92 | 786 | 5 | 56721 |
| 32) | 157 | 0 | 0 | 395 | 21 | 675 | 612 | 2221 | 4307 | 3958 | 6418 | 49 | 38 | 84 | 43 | 49 | 1454 | 247 | 38 | 15 | 266 | 139 | 483 | 87 | 114 | 382 | 10 | 34841 |
| 331) | 910 | 0 | 0 | 766 | 77 | 511 | 329 | 116 | 127 | 70 | 88 | 385 | 335 | 631 | 379 | 358 | 184 | 140 | 19 | 9 | 96 | 50 | 246 | 29 | 19 | 259 | 85 | 14009 |
| 332) | 736 | 0 | 0 | 627 | 68 | 410 | 281 | 99 | 98 | 54 | 70 | 317 | 273 | 514 | 312 | 290 | 157 | 123 | 18 | 8 | 86 | 43 | 202 | 24 | 15 | 202 | 75 | 11767 |
| 333) | 1459 | 0 | 0 | 1195 | 127 | 769 | 542 | 179 | 192 | 111 | 141 | 595 | 516 | 984 | 585 | 547 | 285 | 210 | 29 | 14 | 153 | 86 | 390 | 46 | 28 | 357 | 115 | 22181 |
| 341) | 856 | 0 | 0 | 717 | 77 | 469 | 322 | 111 | 115 | 66 | 84 | 364 | 316 | 593 | 358 | 337 | 177 | 139 | 18 | 9 | 97 | 49 | 233 | 28 | 18 | 227 | 85 | 13467 |
| 342) | 867 | 0 | 0 | 733 | 70 | 498 | 302 | 110 | 126 | 67 | 83 | 371 | 321 | 606 | 363 | 338 | 176 | 133 | 18 | 8 | 86 | 48 | 236 | 29 | 16 | 227 | 81 | 13157 |
| 351 | 336 | 0 | 0 | 383 | 609 | 285 | 2436 | 2052 | 177 | 4725 | 1721 | 129 | 108 | 223 | 125 | 120 | 28446 | 2653 | 77 | 11 | 471 | 193 | 1800 | 184 | 106 | 877 | 145 | 73643 |
| 36) | 250 | 0 | 0 | 735 | 294 | 463 | 657 | 528 | 420 | 858 | 374 | 109 | 96 | 178 | 107 | 99 | 2437 | 13445 | 47 | 35 | 515 | 341 | 13383 | 193 | 132 | 1321 | 178 | 50569 |
| 371 | 42 | 0 | 0 | 37 | 0 | 5 | 50 | 19 | 62 | 32 | 30 | 20 | 19 | 35 | 20 | 19 | 72 | 54 | 316 | 0 | 0 | 8 | 47 | 6 | 2 | 279 | 2 | 1914 |
| 381 | 48 | 0 | 0 | 64 | 1 | 46 | 15 | 18 | 5 | 5 | 4 | 26 | 21 | 39 | 24 | 21 | 4 | 126 | 0 | 855 | 1 | 9 | 59 | 7 | 12 | 208 | 0 | 2127 |
| 391 | 247 | 0 | 0 | 168 | 2 | 197 | 216 | 88 | 142 | 174 | 219 | 117 | 105 | 195 | 119 | 104 | 566 | 788 | 0 | 1 | 2780 | 87 | 478 | 114 | 88 | 1641 | 8 | 15517 |
| 401 | 184 | 0 | 0 | 517 | 34 | 415 | 445 | 267 | 266 | 357 | 240 | 70 | 61 | 123 | 70 | 65 | 492 | 482 | 10 | 37 | 91 | 1235 | 432 | 101 | 154 | 915 | 0 | 16307 |
| 411 | 386 | 0 | 0 | 1200 | 191 | 901 | 731 | 416 | 339 | 361 | 364 | 151 | 128 | 250 | 146 | 143 | 1502 | 2017 | 52 | 58 | 564 | 342 | 17435 | 236 | 467 | 2266 | 29 | 56490 |
| 42) | 58 | 0 | 0 | 97 | 27 | 121 | 78 | 68 | 71 | 71 | 210 | 20 | 17 | 34 | 19 | 19 | 295 | 295 | 9 | 15 | 112 | 69 | 392 | 3964 | 117 | 278 | 3 | 10115 |
| 431 | 64 | 0 | 0 | 285 | 19 | 146 | 101 | 135 | 69 | 78 | 36 | 12 | 9 | 23 | 10 | 12 | 57 | 167 | 10 | 14 | 108 | 94 | 687 | 47 | 6523 | 1508 | 15 | 16563 |
| 441 | 491 | 0 | 0 | 1173 | 326 | 1071 | 447 | 326 | 627 | 818 | 407 | 178 | 144 | 293 | 166 | 169 | 790 | 1040 | 143 | 147 | 1165 | 957 | 4435 | 416 | 1234 | 193819 | 126 | 256565 |
| 451 | 123 | 0 | 0 | 318 | 121 | 1304 | 148 | 52 | 40 | 42 | 54 | 56 | 49 | 86 | 53 | 52 | 74 | 103 | 0 | 0 | 7 | 0 | 4221 | 0 | 46 | 197 | 0 | 11090 |
| TOTAL) | 31776 | 0 | 0 | 74569 | 9056 | 56326 | 54138 | 37564 | 40218 | 59987 | 35597 | 13457 | 11610 | 22158 | 13246 | 12376 | 77712 | 42006 | 1760 | 2112 | 14313 | 11342 | 77124 | 10326 | 16528 | 260789 | 772222229785 | |

APPENDIX 2 TRAFFIC VOLUME BY DIRECTION AT INTERSECTIONS (2000)

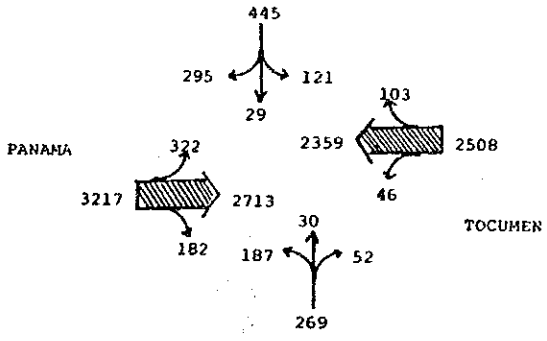
(1) VIA SAN MIGUELITO-CHANIS - CORREDOR SUR INTERSECTION



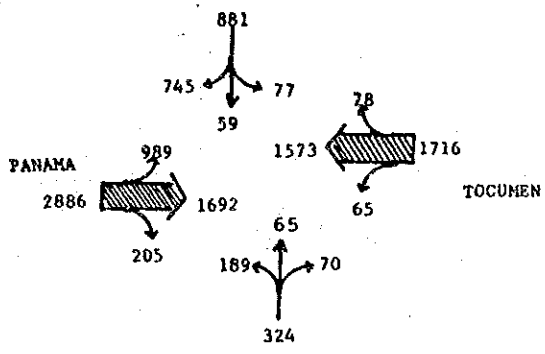

(2) VIA SAN MIGUELITO-HIPODROMO - CORREDOR SUR INTERSECTION



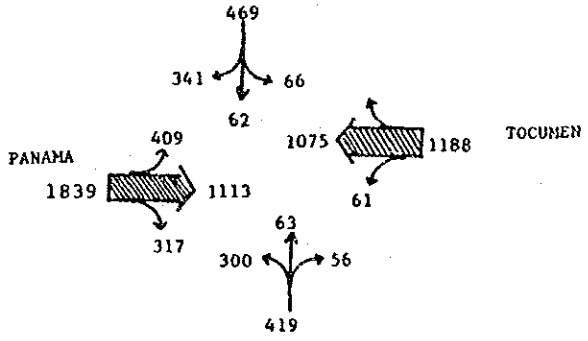

(3) VIA JUAN DIAZ - CORREDOR SUR INTERSECTION



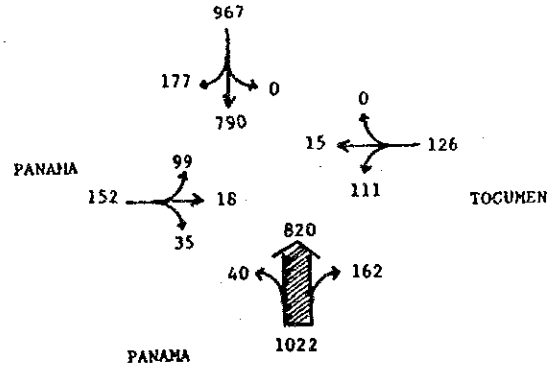
(4) VIA CIUDAD RADIAL - CORREDOR SUR INTERSECTION



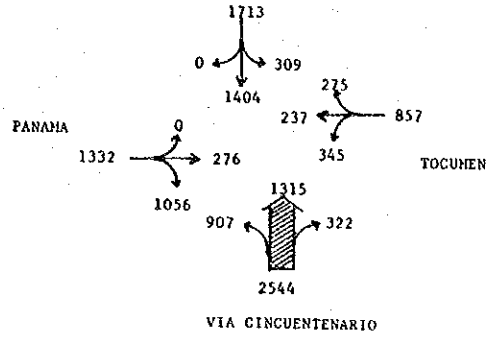

(5) VIA DON BOSCO - CORREDOR SUR INTERSECTION




(6) PAN AMERICAN HIGHWAY - CORREDOR SUR INTERSECTION



(7) VIA ESPAÑA- E. T. LEFEVRE INTERSECTION

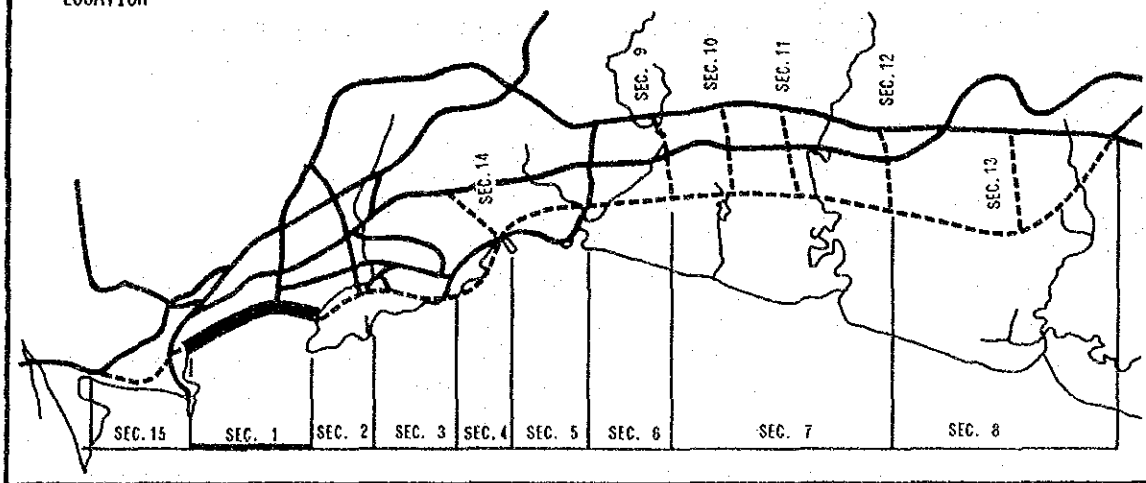


## APPENDIX 3 DESIGN CONTENTS FOR EACH SECTION

### (1) SECTION 1 MARANON - RIO MATAZNILLO

Road Project: Corredor Sur | Section: 1 | Road Length: 2.99km

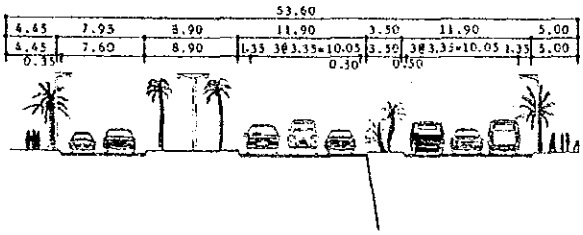
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 58,000 |
| DESIGN SPEED | km/h | 60 |
| NUMBER OF LANE | m | 6 |
| LANE WIDTH | m | 3.35 |
| SHOULDER WIDTH | m | 1.35 |
| MEDIAN | m | 4.5 |
| PEDESTRIAN | m | 5.0 |
| RIGHT OF WAY | m | 53.6 |

TYPICAL CROSS SECTION




MAIN CONSTRUCTION MATERIALS

Embankment 282,000 cum Pavement 31,000 sqm Concrete 1,700 cum
Reinforcement Bar 102 ton

MAIN STRUCTURES (BRIDGES)

Rio Mataznillo Bridge L= 30.0 m W= 20.3 m+14.2m

CONSTRUCTION COST OF BRIDGE 0.8 MILLION BALBOAS

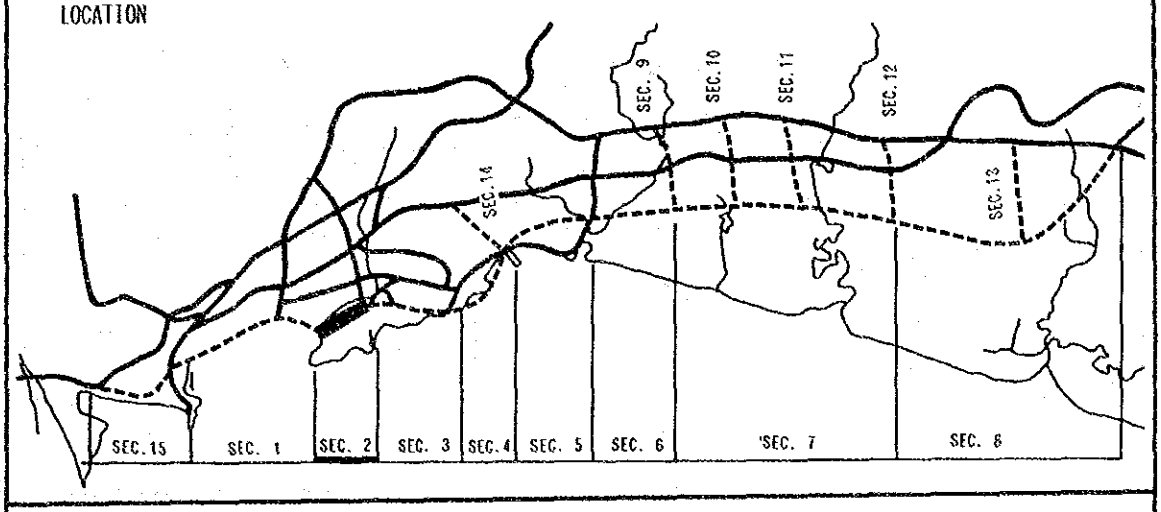
PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 16.0 | Foreign 58% , Local 42% |
| COMPENSATION COST | | |
| LAND ACQUISITION COST | 2.6 | |
| PROJECT COST | 18.5 | Foreign 50% , Local 50% |

## (2) SECTION 2 RIO MATAZNILLO - VIA BRASIL

Road Project: Corredor Sur Section: 2 Road Length: 1.34km

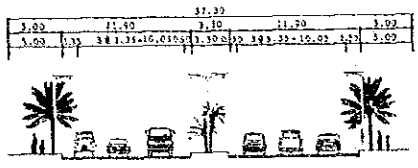
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 55,000 |
| DESIGN SPEED | km/h | 60 |
| NUMBER OF LANE | m | 6 |
| LANE WIDTH | m | 3.35 |
| SHOULDER WIDTH | m | 1.35 |
| MEDIAN | m | 4.5 |
| PEDESTRIAN | m | 5.0 |
| RIGHT OF WAY | m | 37.3 |

TYPICAL CROSS SECTION



MAIN CONSTRUCTION MATERIALS
Embankment 3,000 cum Pavement 23,000 sqm Concrete 1,000 cum
Reinforcement Bar 95 ton

MAIN STRUCTURES (BRIDGES)
Brasil Intersection Bridge L= 150.0m W= 8.5m

CONSTRUCTION COST OF BRIDGE 1.7 MILLION BALBOAS

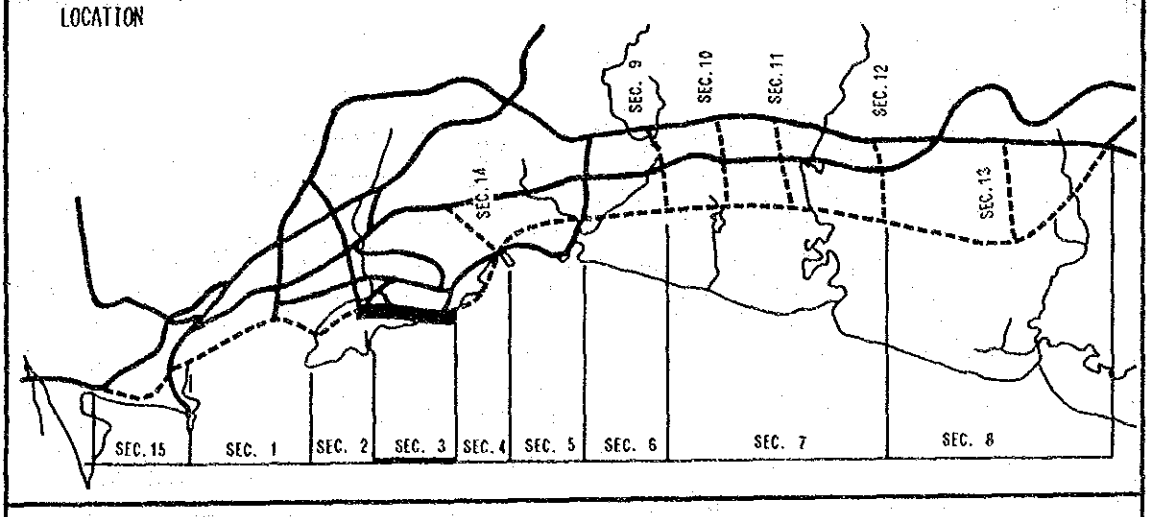
PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 4.3 | Foreign 59% , Local 41% |
| COMPENSATION COST | 1.3 | |
| LAND ACQUISITION COST | 4.7 | |
| PROJECT COST | 10.3 | Foreign 25% , Local 75% |

(3) SECTION 3 VIA BRASIL - ATLAPA

Road Project: Corredor Sur Section: 3 Road Length: 1.47km

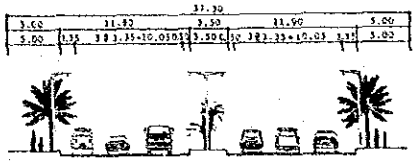
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 59,000 |
| DESIGN SPEED | km/h | 60 |
| NUMBER OF LANE | m | 6 |
| LANE WIDTH | m | 3.35 |
| SHOULDER WIDTH | m | 1.35 |
| MEDIAN | m | 4.5 |
| PEDESTRIAN | m | 5.0 |
| RIGHT OF WAY | m | 37.3 |

TYPICAL CROSS SECTION



MAIN CONSTRUCTION MATERIALS

Embankment 4,000 cum Pavement35,000 sqm

MAIN STRUCTURES (BRIDGES)

CONSTRUCTION COST OF BRIDGE — MILLION BALBOAS

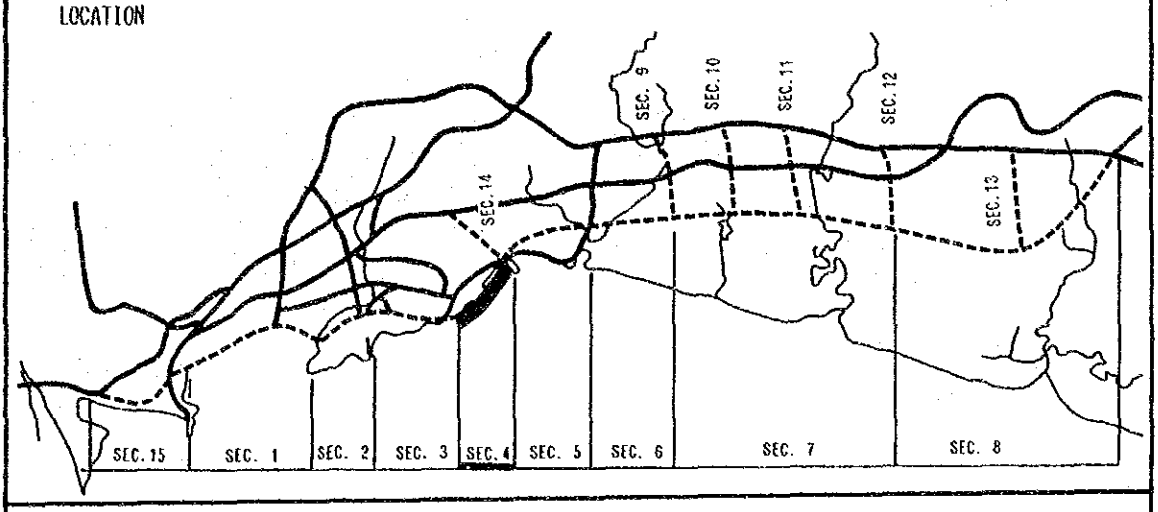
PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 4.6 | Foreign 61% , Local 39% |
| COMPENSATION COST | 1.9 | |
| LAND ACQUISITION COST | 4.8 | |
| PROJECT COST | 11.3 | Foreign 25% , Local 75% |

(4) SECTION 4 ATLAPA - VIA E. T. LEFEVRE

Road Project: Corredor Sur Section: 4 Road Length:2.14km

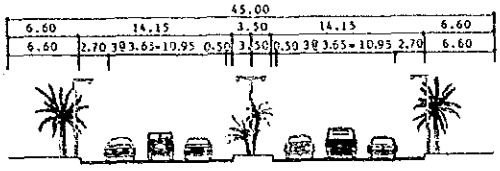
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 64,000 |
| DESIGN SPEED | km/h | 80 |
| NUMBER OF LANE | m | 6 |
| LANE WIDTH | m | 3.65 |
| SHOULDER WIDTH | m | 2.70 |
| MEDIAN | m | 4.5 |
| PEDESTRIAN | m | 6.6 |
| RIHGT OF WAY | m | 45.0 |

TYPICAL CROSS SECTION




MAIN CONSTRUCTION MATERIALS

Embankment 249,000 cum Pavement 51,000 sqm Concrete 5,600 cum
Reinforcement Bar 529 ton

MAIN STRUCTURES (BRIDGES)

E.T. Lefevre Interchange Bridge L=347.0 m W= 2×8.50m

CONSTRUCTION COST OF BRIDGE 6.8 MILLION BALBOAS

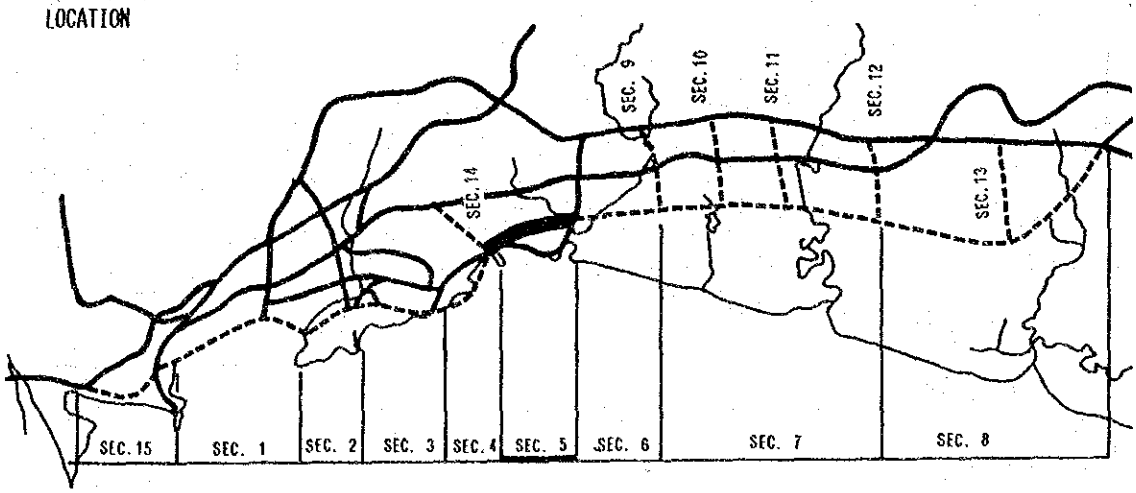
PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 17.9 | foreign 59% , local 41% |
| COMPENSATION COST | 0.1 | |
| LAND ACQUISITION COST | 1.6 | |
| PROJECT COST | 19.6 | Foreign 54% , Local 46% |

(5) SECTION 5 VIA E. T. LEFEVRE - RIO ABAJO

Road Project: Corredor Sur Section: 5 Road Length: 1.80 km

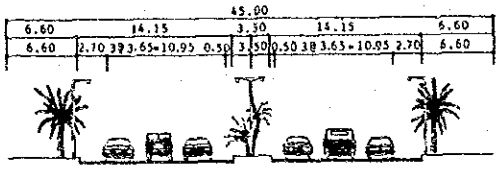
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 86,000 |
| DESIGN SPEED | km/h | 80 |
| NUMBER OF LANE | m | 6 |
| LANE WIDTH | m | 3.65 |
| SHOULDER WIDTH | m | 2.70 |
| MEDIAN | m | 4.5 |
| PEDESTRIAN | m | 6.6 |
| RIGHT OF WAY | m | 45.0 |

TYPICAL CROSS SECTION




MAIN CONSTRUCTION MATERIALS

Embankment 24,000 cum Pavement 42,000 sqm Concrete 4,700 cum
Reinforcement Bar 412 ton

MAIN STRUCTURES (BRIDGES)

Rio Abajo Interchange L=189.0 m W= 2×11.85 m

CONSTRUCTION COST OF BRIDGE 7.3 MILLION BALBOAS

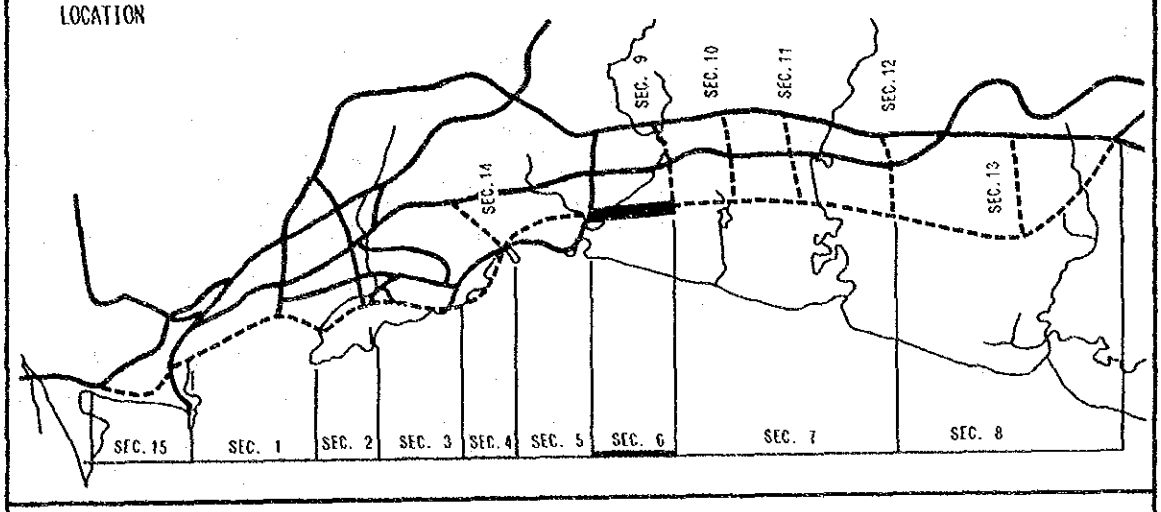
PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 11.1 | Foreign 60% , Local 40% |
| COMPENSATION COST | 9.3 | |
| LAND ACQUISITION COST | 4.6 | |
| PROJECT COST | 25.0 | Foreign 27% , Local 73% |

## (6) SECTION 6 RIO ABAJO - VIA SAN MIGUELITO.CHANIS

Road Project: Corredor Sur Section: 6 Road Length: 2.25 km

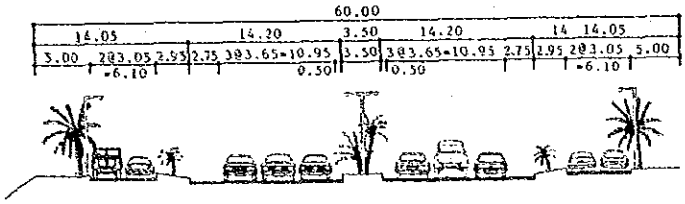
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 69,000 |
| DESIGN SPEED | km/h | 80 |
| NUMBER OF LANE | m | 6 |
| LANE WIDTH | m | 3.65 |
| SHOULDER WIDTH | m | 2.75 |
| MEDIAN | m | 4.5 |
| PEDESTRIAN | m | 5.0 |
| RIGHT OF WAY | m | 60.0 |

TYPICAL CROSS SECTION




MAIN CONSTRUCTION MATERIALS

Embankment 344,000 cum Pavement 59,000 sqm Concrete 1,500 cum
Reinforcement Bar 136 ton

MAIN STRUCTURES (BRIDGES)

Rio Matiaz Hernandez Bridge L= 43.0 m W= 2×16.50 m

CONSTRUCTION COST OF BRIDGE 2.2 MILLION BALBOAS

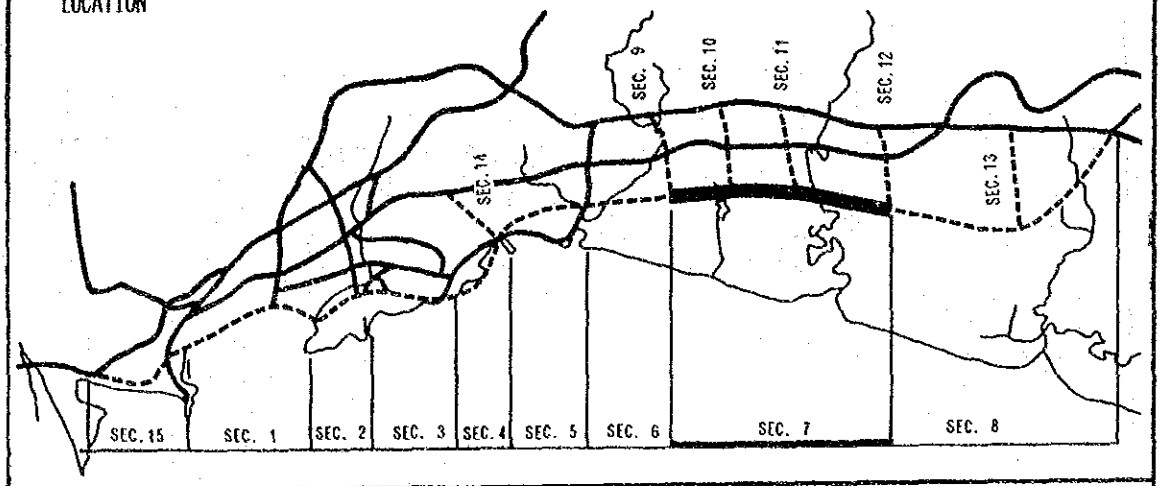
PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 16.2 | Foreign 65% , Local 35% |
| COMPENSATION COST | --- | |
| LAND ACQUISITION COST | 3.3 | |
| PROJECT COST | 19.5 | Foreign 54% , Local 46% |

## (7) SECTION 7 VIA SAN MIGUELITO.CHANIS - VIA CIUDAD RADIAL

Road Project: **Corredor Sur** Section: 7 Road Length: 3.75 km

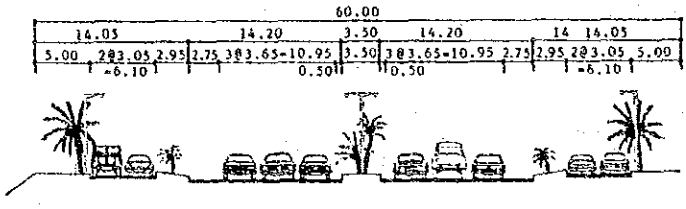
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 79,000 |
| DESIGN SPEED | km/h | 80 |
| NUMBER OF LANE | m | 6 |
| LANE WIDTH | m | 3.65 |
| SHOULDER WIDTH | m | 2.75 |
| MEDIAN | m | 4.5 |
| PEDESTRIAN | m | 5.0 |
| RIGHT OF WAY | m | 60.0 |

TYPICAL CROSS SECTION




MAIN CONSTRUCTION MATERIALS

Embankment 680,000 cum Pavement 104,000 sqm Concrete 3,700 cum
Reinforcement Bar 338 ton

MAIN STRUCTURES (BRIDGES)

Rio Juan Diaz Bridge L=105.0 m W= 2×16.50 m

CONSTRUCTION COST OF BRIDGE 4.4 MILLION BALBOAS

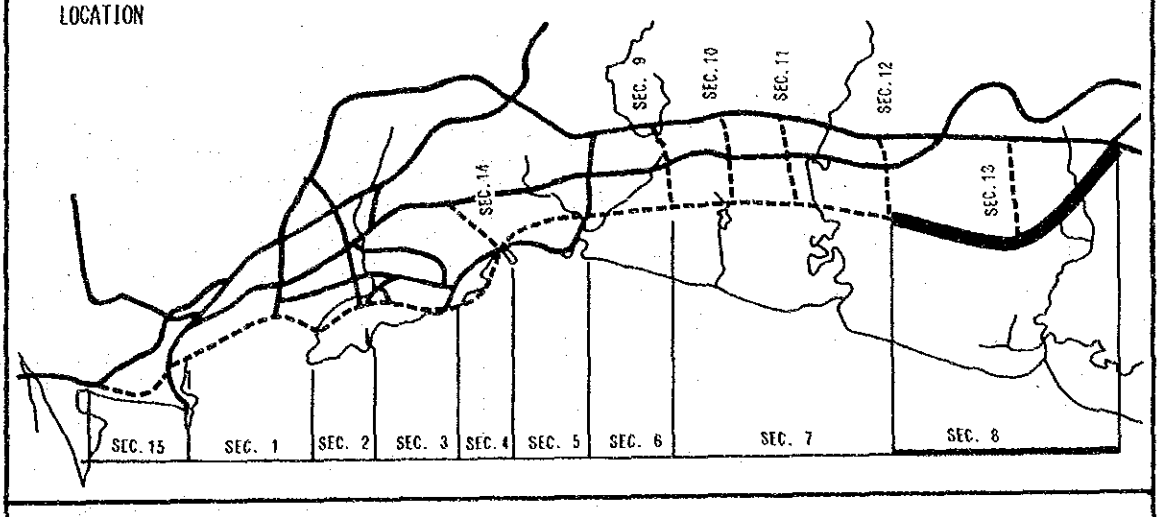
PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 29.1 | Foreign 66% , Local 34% |
| COMPENSATION COST | --- | |
| LAND ACQUISITION COST | 2.0 | |
| PROJECT COST | 31.1 | Foreign 62% , Local 38% |

## (8) SECTION 8 CIUDAD RADIAL - PAN AMERICAN HIGHWAY, TOCUMEN

Road Project: Corredor Sur Section: 8 Road Length: 3.79 km

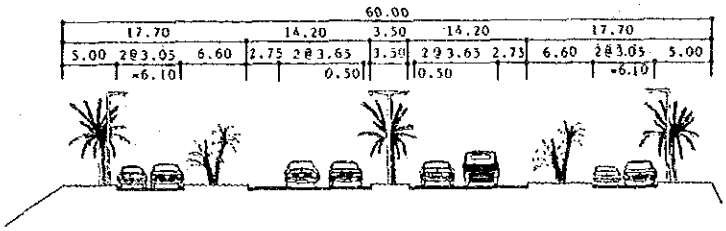
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 44,000 |
| DESIGN SPEED | km/h | 80 |
| NUMBER OF LANE | m | 4 |
| LANE WIDTH | m | 3.65 |
| SHOULDER WIDTH | m | 2.75 |
| MEDIAN | m | 4.5 |
| PEDESTRIAN | m | 5.0 |
| RIGHT OF WAY | m | 60.0 |

TYPICAL CROSS SECTION




MAIN CONSTRUCTION MATERIALS
Embankment 357,000 cum Pavement 131,000 sqm Concrete 1,100 cum
Reinforcement Bar 96 ton

MAIN STRUCTURES (BRIDGES)
Rio Tapia Bridge L= 30.0 m W= 2×12.85 m

CONSTRUCTION COST OF BRIDGE 0.1 MILLION BALBOAS

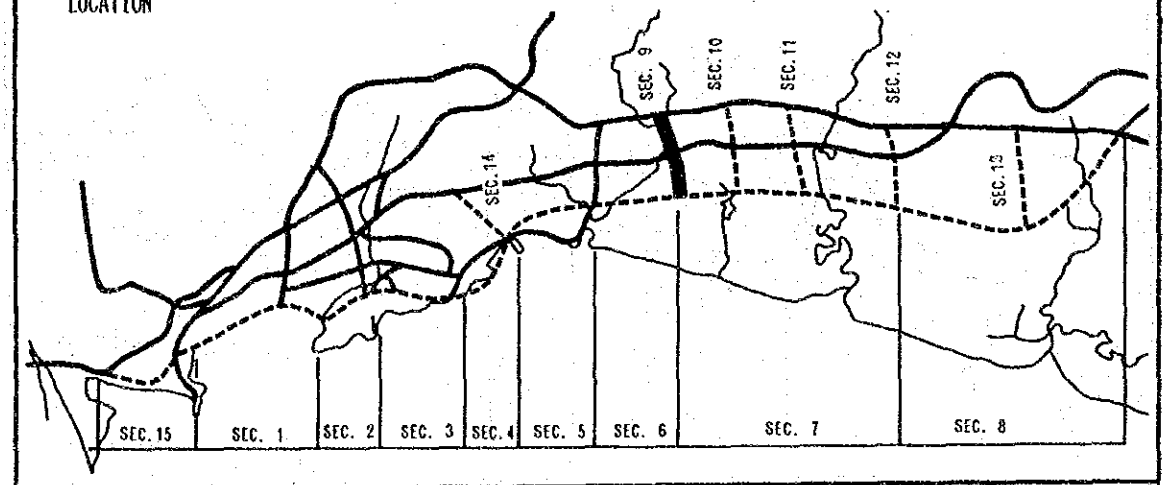
PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 29.2 | Foreign 63% , Local 37% |
| COMPENSATION COST | — | |
| LAND ACQUISITION COST | 5.6 | |
| PROJECT COST | 34.8 | Foreign 53% , Local 47% |

## (9) SECTION 9 ACCESS VIA SAN MIGUELITO.CHANIS

Road Project: (Main Access Road) VIA San Miguelito Chanis  Section:  Road Length: 2.39 km

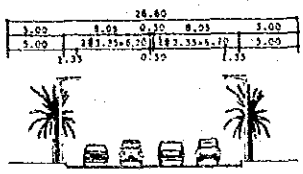
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 18,000 |
| DESIGN SPEED | km/h | 60 |
| NUMBER OF LANE | m | 4 |
| LANE WIDTH | m | 3.35 |
| SHOULDER WIDTH | m | 2.3 |
| MEDIAN | m | 2.0 |
| PEDESTRIAN | m | 5.0 |
| RIGHT OF WAY | m | 30.0 |

TYPICAL CROSS SECTION



MAIN CONSTRUCTION MATERIALS
Embankment 98,000 cum Pavement 24,000 sqm Concrete 3,000 cum
Reinforcement Bar 265 ton

MAIN STRUCTURES (BRIDGES)
Via San Miguelito Chanis Bridge L= 50.0 m W= 23.8 m
Rio Matiaz Hernandez Bridge (1) L= 35.0 m W= 23.8 m
Rio Matiaz Hernandez Bridge (2) L= 35.0 m W= 23.8 m
CONSTRUCTION COST OF BRIDGE 3.8 MILLION BALBOAS

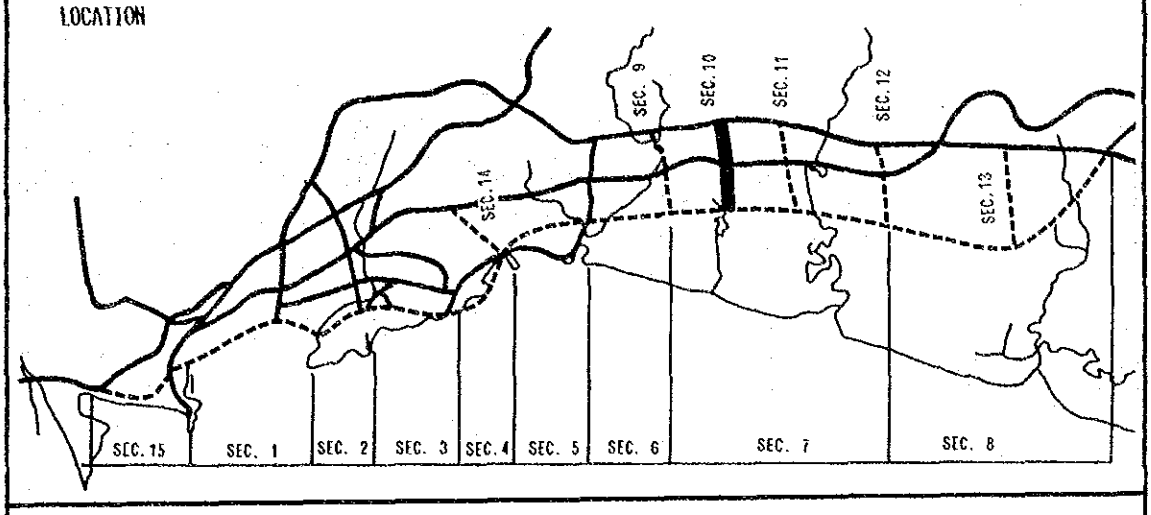
PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 7.7 | Foreign 61% , Local 39% |
| COMPENSATION COST | 0.9 | |
| LAND ACQUISITION COST | 1.2 | |
| PROJECT COST | 9.7 | Foreign 48% , Local 52% |

## (10) SECTION 10 ACCESS VIA SAN MIGUELITO,HIPODROMO

Road Project: (Main Access Road) Via San Miguelito Hipodromo | Section: 10 | Road Length: 2.21 km

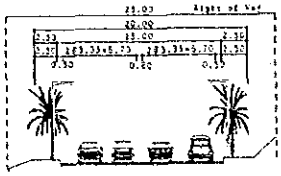
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 8,000 |
| DESIGN SPEED | km/h | 60 |
| NUMBER OF LANE | m | 4 |
| LANE WIDTH | m | 3.35 |
| SHOULDER WIDTH | m | 0.5 |
| MEDIAN | m | 0.6 |
| PEDESTRIAN | m | 2.5 |
| RIGHT OF WAY | m | 25.0 |

TYPICAL CROSS SECTION



MAIN CONSTRUCTION MATERIALS
Embankment 153,000 cum Pavement 28,000 sqm Concrete 1,000 cum
Reinforcement Bar 89 ton

MAIN STRUCTURES (BRIDGES)
Via San Miguelito Hipodromo
Interchange Bridge L= 50.0 m W= 18.8 m

CONSTRUCTION COST OF BRIDGE 1.2 MILLION BALBOAS

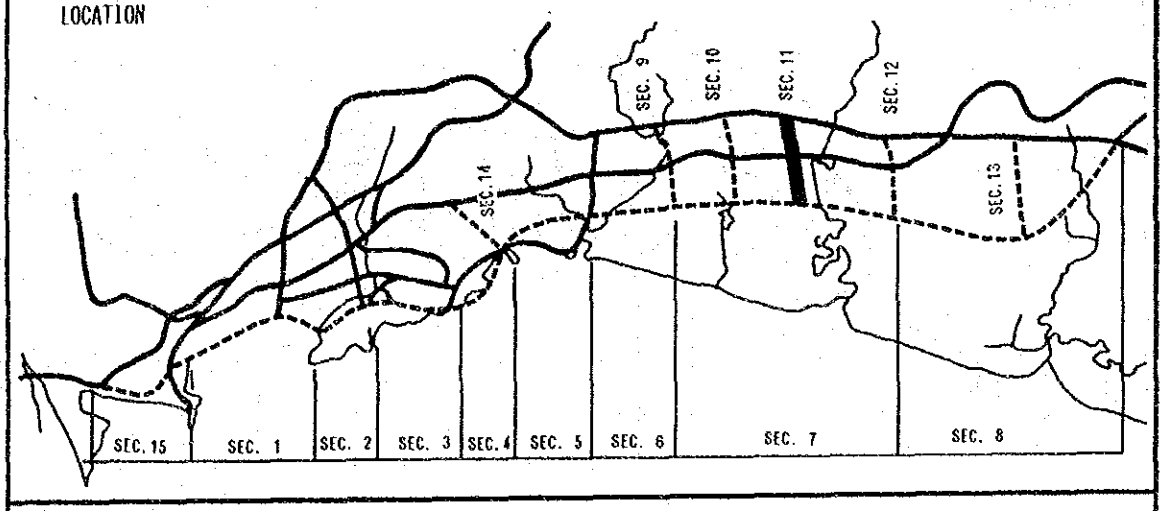
PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 6.6 | Foreign 65% , Local 35% |
| COMPENSATION COST | 0.3 | |
| LAND ACQUISITION COST | 3.2 | |
| PROJECT COST | 10.1 | Foreign 42% , Local 58% |

## (11) SECTION 11 ACCESS VIA JUAN DIAZ

Road Project: (Main Access Road) VIA Juan Diaz | Section: 11 | Road Length: 2.32 km

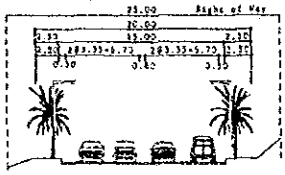
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 11,000 |
| DESIGN SPEED | km/h | 60 |
| NUMBER OF LANE | m | 4 |
| LANE WIDTH | m | 3.35 |
| SHOULDER WIDTH | m | 0.5 |
| MEDIAN | m | 0.6 |
| PEDESTRIAN | m | 2.5 |
| RIGHT OF WAY | m | 25.0 |

TYPICAL CROSS SECTION



MAIN CONSTRUCTION MATERIALS
Embankment 110,000 cum Pavement 26,000 sqm Concrete 1,800 cum
Reinforcement Bar 159 ton

MAIN STRUCTURES (BRIDGES)
Juan Diaz Interchange Bridge L=50.0m W=18.8m
Rio Palomo Bridge L=30.0m W=18.8m

CONSTRUCTION COST OF BRIDGE 2.0 MILLION BALBOAS

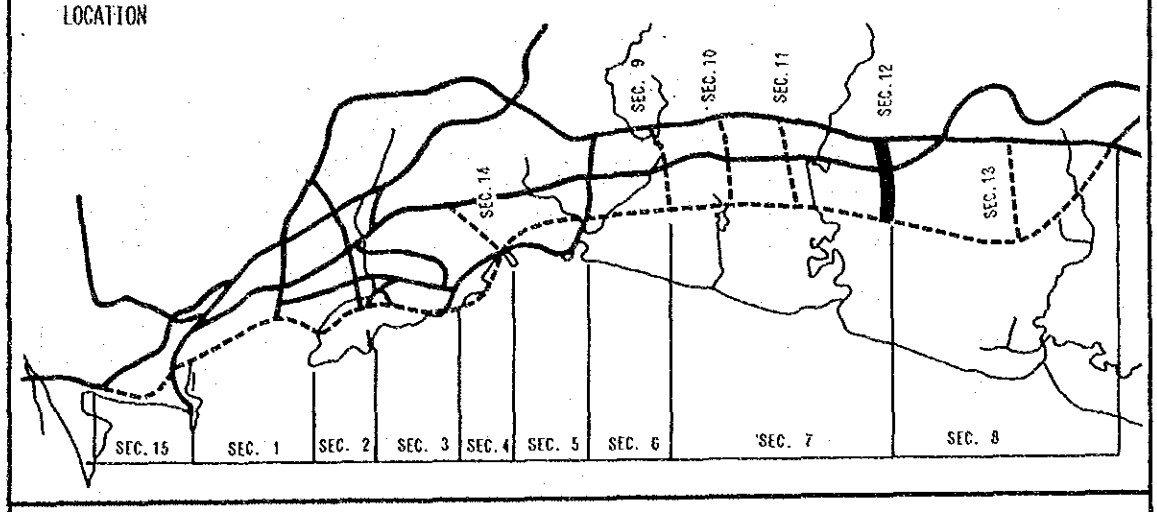
PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 6.1 | Foreign 63% , local 37% |
| COMPENSATION COST | 0.5 | |
| LAND ACQUISITION COST | 1.8 | |
| PROJECT COST | 8.4 | Foreign 46% , Local 54% |

## (12) SECTION 12 ACCESS VIA CIUDAD RADIAL

Road Project: (Main Access Road) VIA Ciudad Radial | Section: 12 | Road Length: 2.36 km

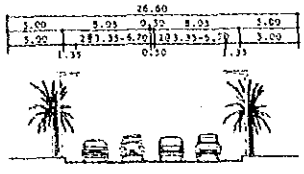
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 25,000 |
| DESIGN SPEED | km/h | 60 |
| NUMBER OF LANE | m | 4 |
| LANE WIDTH | m | 3.35 |
| SHOULDER WIDTH | m | 2.3 |
| MEDIAN | m | 2.0 |
| PEDESTRIAN | m | 5.0 |
| RIGHT OF WAY | m | 30.0 |

TYPICAL CROSS SECTION



MAIN CONSTRUCTION MATERIALS

Embankment 103,000 cum Pavement 34,000 sqm Concrete 2,900 cum
Reinforcement Bar 266 ton

MAIN STRUCTURES (BRIDGES)

Rio Juan Diaz Bridge L=65.0m W=23.8m
Ciudad Radial Bridge L=50.0m W=23.8m

CONSTRUCTION COST OF BRIDGE 3.2 MILLION BALBOAS

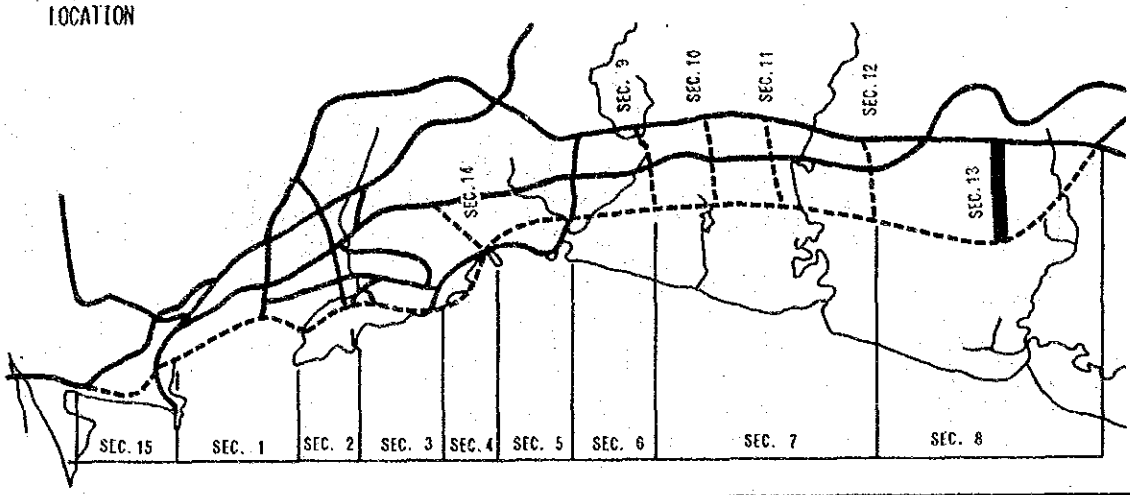
PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 8.3 | Foreign 63% , local 37% |
| COMPENSATION COST | 0.5 | |
| LAND ACQUISITION COST | 1.5 | |
| PROJECT COST | 10.3 | Foreign 51% , local 49% |

## (13) SECTION 13 ACCESS VIA DON BOSCO

Road Project: (Main Access Road) VIA Don Bosco | Section: 13 | Road Length: 2.39 km

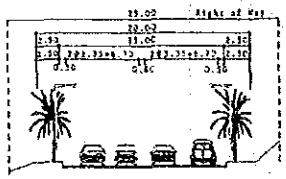
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 13,000 |
| DESIGN SPEED | km/h | 60 |
| NUMBER OF LANE | m | 4 |
| LANE WIDTH | m | 3.35 |
| SHOULDER WIDTH | m | 0.5 |
| MEDIAN | m | 0.6 |
| PEDESTRIAN | m | 2.5 |
| RIGHT OF WAY | m | 25.0 |

TYPICAL CROSS SECTION



MAIN CONSTRUCTION MATERIALS

Embankment 71,000 cum Pavement 32,000 sqm Concrete 1,300 cum
Reinforcement Bar 119 ton

MAIN STRUCTURES (BRIDGES)

Don Bosco Bridge L=50.0m W=18.8m

CONSTRUCTION COST OF BRIDGE 1.5 MILLION BALBOAS

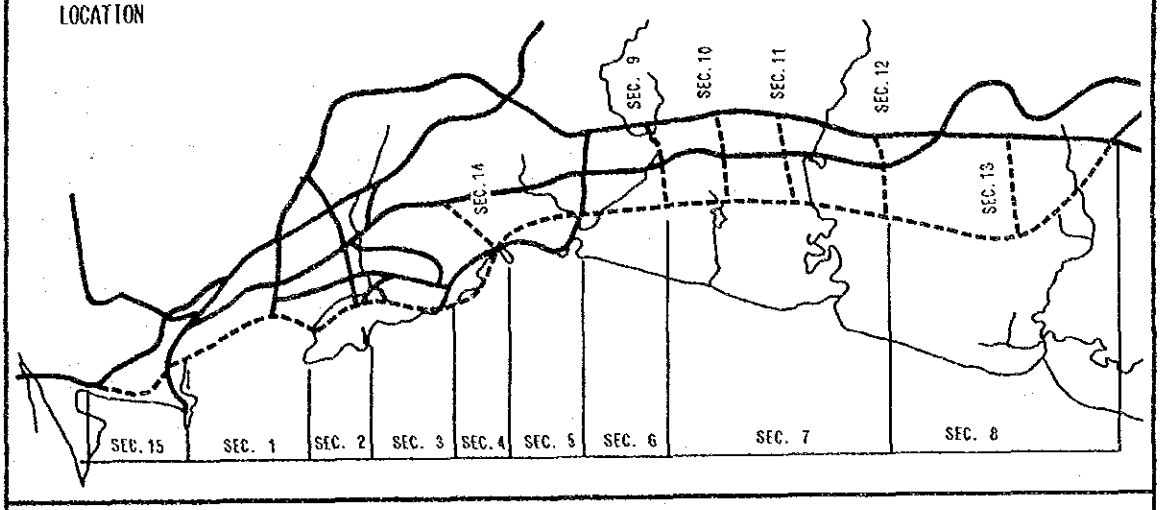
PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 6.2 | Foreign 62% , local 38% |
| COMPENSATION COST | — | |
| LAND ACQUISITION COST | 1.3 | |
| PROJECT COST | 7.5 | Foreign 51% , Local 49% |

## (14) SECTION 14 ACCESS VIA E. T. LEFEVRE

Road Project: (Main Access Road) VIA E.T. Lefevre | Section: 14 | Road Length. 1.62 km

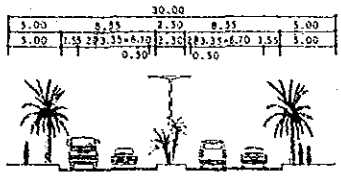
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 59,000 |
| DESIGN SPEED | km/h | 60 |
| NUMBER OF LANE | m | 4 |
| LANE WIDTH | m | 3.35 |
| SHOULDER WIDTH | m | 1.55 |
| MEDIAN | m | 3.5 |
| PEDESTRIAN | m | 5.0 |
| RIGHT OF WAY | m | 30.0 |

TYPICAL CROSS SECTION




MAIN CONSTRUCTION MATERIALS
Embankment 12,000 cum Pavement13,000 sqm Concrete 3,600 cum
Reinforcement Bar 328 ton

MAIN STRUCTURES (BRIDGES)
Espana Intersection Bridge L= 189.0m W= 2×8.5 m

CONSTRUCTION COST OF BRIDGE 4.2 MILLION BALBOAS

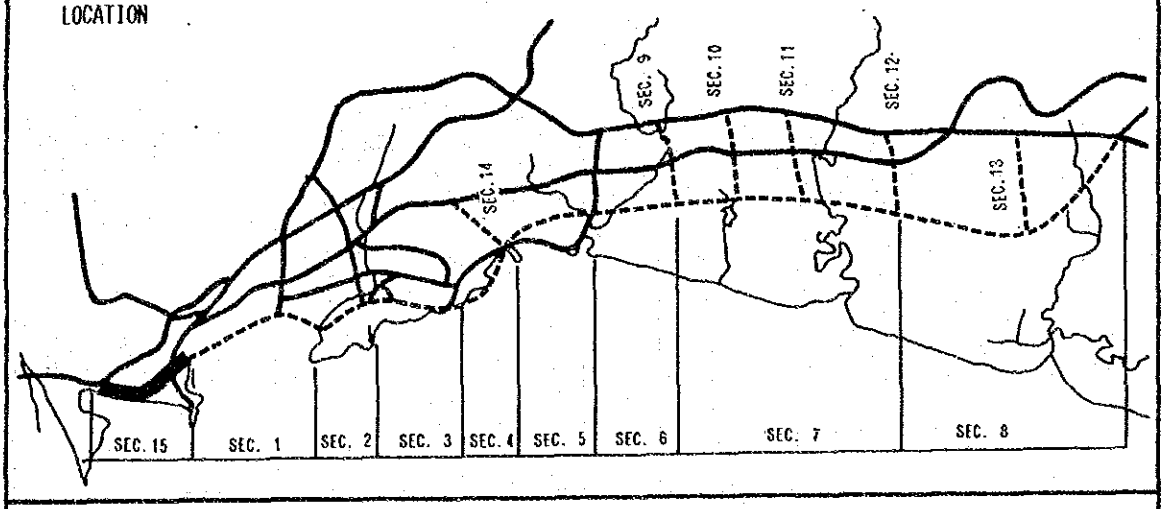
PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 6.7 | Foreign 58% , Local 42% |
| COMPENSATION COST | 2.8 | |
| LAND ACQUISITION COST | 3.9 | |
| PROJECT COST | 13.4 | Foreign 30% , Local 70% |

## (15) SECTION 15 CORREDOR SUR EXTENSION

Road Project: (Main Access Road) Corredor Sur Extension | Section: 15 | Road Length: 2.21 km

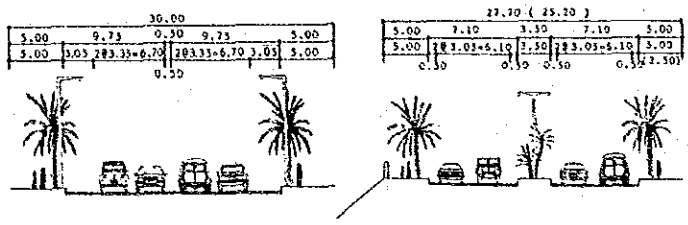
LOCATION




ROAD STRUCTURE

| ITEMS | UNIT | PLANNING VALUES |
|---|---|---|
| TRAFFIC VOLUME | PCU | 20,000 |
| DESIGN SPEED | km/h | 40 |
| NUMBER OF LANE | m | 4 |
| LANE WIDTH | m | 3.35 |
| SHOULDER WIDTH | m | 3.05 |
| MEDIAN | m | 0.50 |
| PEDESTRIAN | m | 5.00 |
| RIGHT OF WAY | m | 30.00 |

TYPICAL CROSS SECTION




MAIN CONSTRUCTION MATERIALS

Embankment 56,600 cum Pavement 33,000 sqm

MAIN STRUCTURES (BRIDGES)

CONSTRUCTION COST OF BRIDGE — MILLION BALBOAS

PROJECT COST (UNIT: MILLION BALBOAS)

| ITEMS | COST | REMARKS |
|---|---|---|
| CONSTRUCTION COST | 5.3 | Foreign 60% , Local 40% |
| COMPENSATION COST | 17.6 | |
| LAND ACQUISITION COST | 6.0 | |
| PROJECT COST | 28.9 | Foreign 11% , Local 89% |