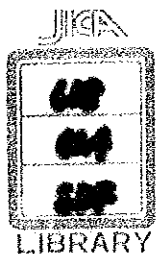
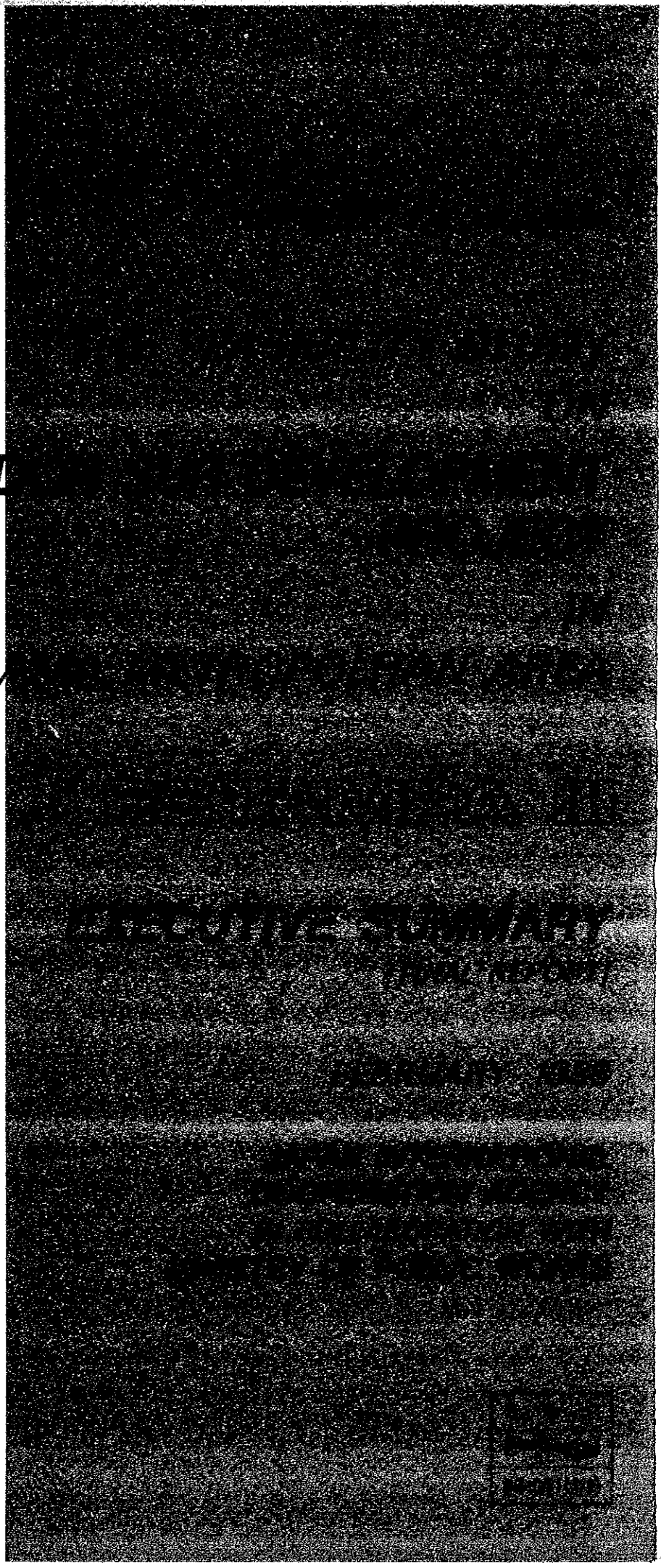


THE CORRELATION

THE PANAMA

EXECUTIVE SUMMARY



THE PRESENTATION OF THE COMPASSION FOR DEVELOPMENT AND PEACE IN THE PANAMA METROPOLITAN AREA EXECUTIVE SUMMARY (FINAL REPORT) FEBRUARY 1988

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REPUBLIC OF PANAMA

*THE FEASIBILITY STUDY
ON
**THE CORREDOR SUR DEVELOPMENT
PROJECT**
IN
THE PANAMA METROPOLITAN AREA*

ESTAMPA III

EXECUTIVE SUMMARY

[FINAL REPORT]

FEBRUARY 1988

**JAPAN INTERNATIONAL
COOPERATION AGENCY
IN COLLABORATION WITH
MINISTRY OF PUBLIC WORKS**

国際協力事業団		
受入 月日	63.4.04	618
登録 No.	17486	61.4 SDF

PREFACE

In response to the request of the Government of the Republic of Panama, the Government of Japan has decided to conduct a feasibility study on the Corredor Sur Development Project in the Panama Metropolitan Area and entrusted the study to the Japan International Cooperation Agency (JICA). The JICA sent to Panama a study team headed by Mr. Takeshi Yoshida of Yachiyo Engineering Co. Ltd., from August of 1986 to November of 1987.

The team exchanged views on the Project with the officials concerned of the Government of Panama and conducted field surveys in the Panama Metropolitan Area.

After the team returned to Japan, further studies were made and the present report has been prepared.

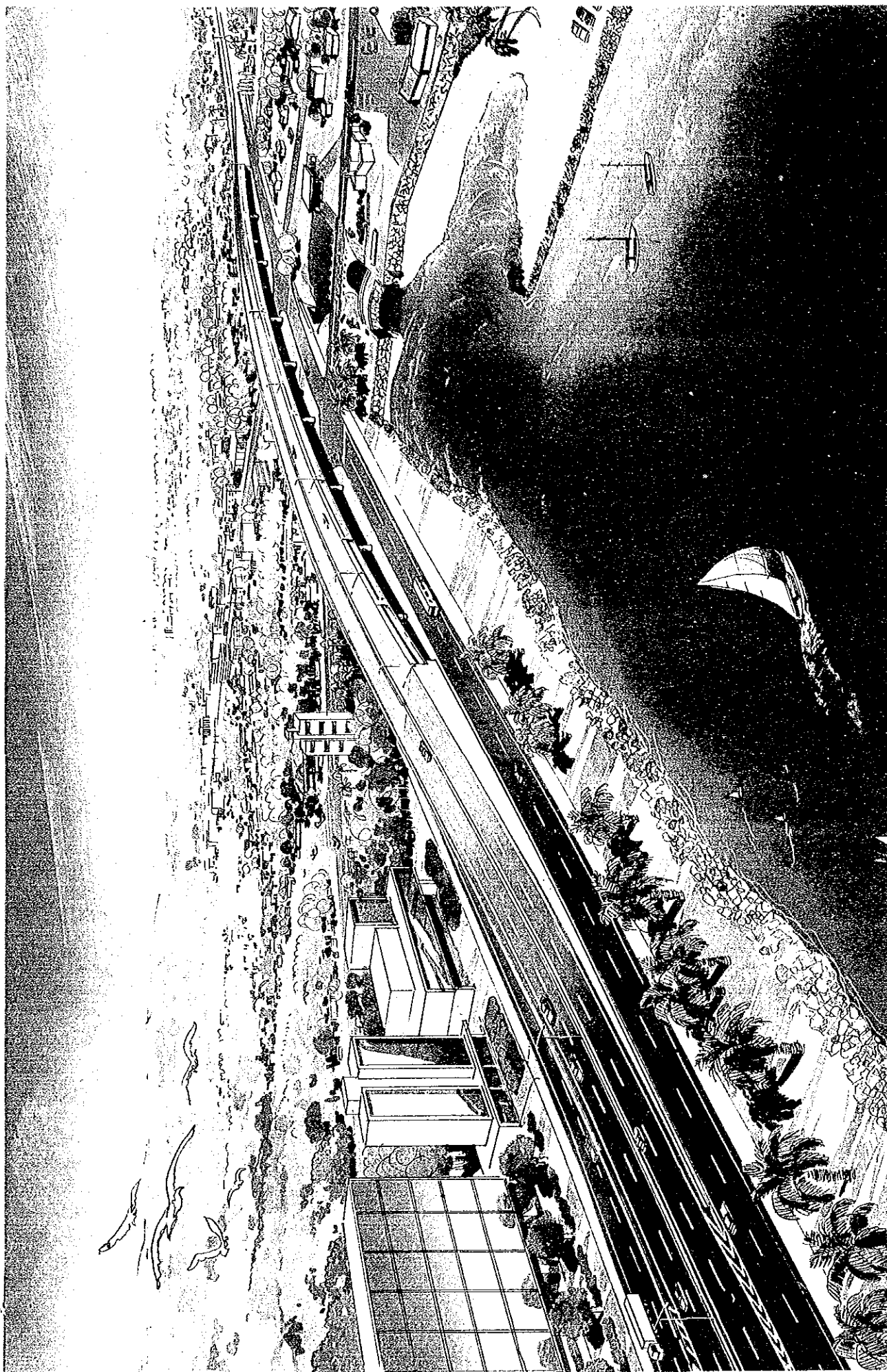
I hope that this report will serve for the development of the Project and contribute to promote friendly relations between our two countries.

I wish to express my deep appreciation to all the officials concerned of the Government of the Republic of Panama for their close cooperation extended to the team.

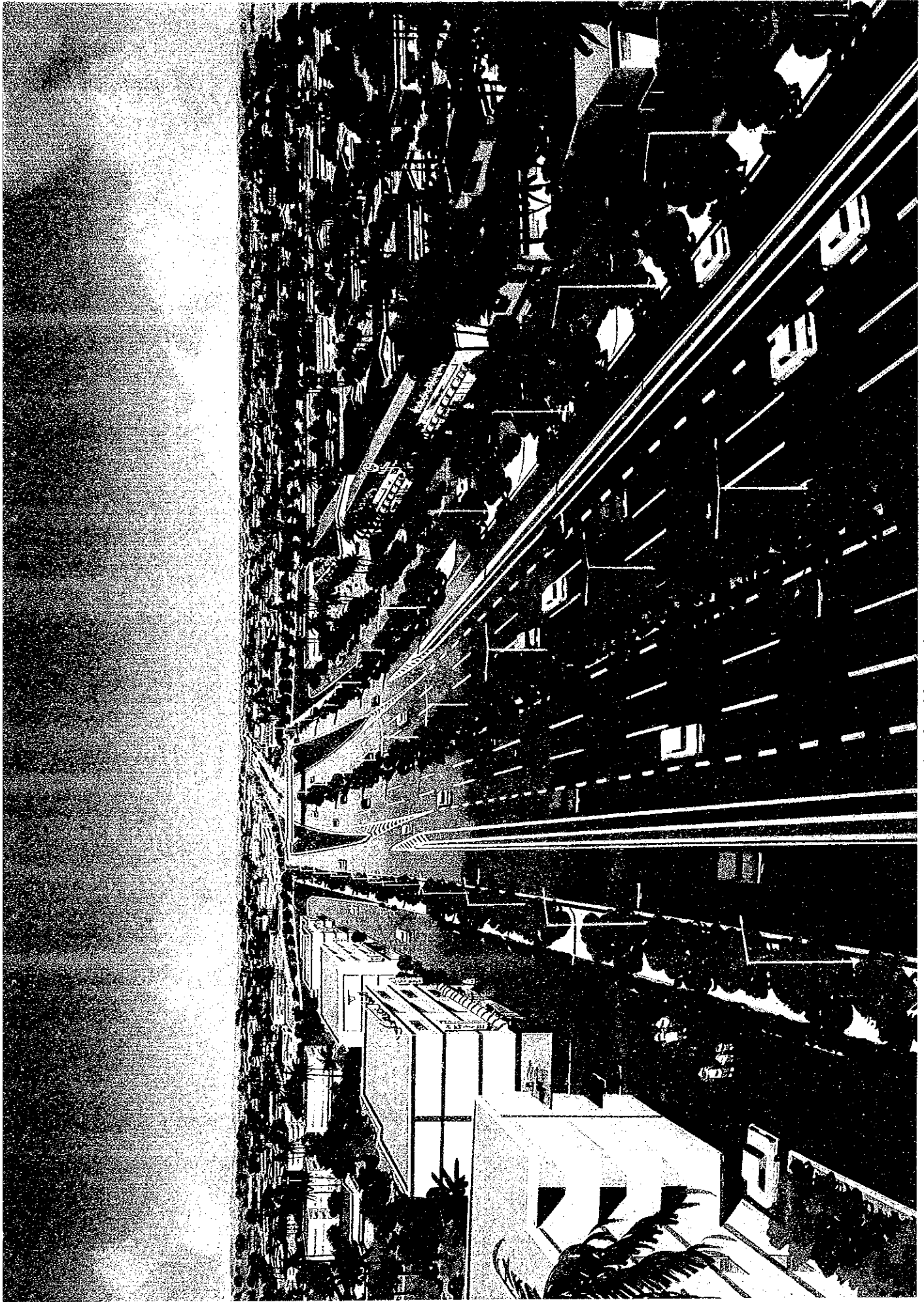
February, 1988



Kensuke Yanagiya
President
Japan International Cooperation Agency



FUTURE IMAGE OF CORREDOR SUR NEAR QUEBRADA SANTA LIBRADA



FUTURE IMAGE OF CORREDOR SUR NEAR JUAN DIAZ

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CONCLUSION AND RECOMMENDATIONS

(1) PROJECT SIZE

The Corredor Sur Development Project (the Project) subject to this feasibility study has an approximate total length of 36km (21 km of Corredor Sur, 13 km of Main Access Roads and 2 km of Corredor Sur Extension). The project includes 9 grade separations.

The total construction cost 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 million balboas.

(2) ECONOMIC AND SOCIAL EFFECTS OF THE PROJECT

Considering only the direct benefits up to the year 2010, the Economic Internal Rate of Return derived from the implementation of the whole project is estimated at about 30%, confirming a high economic return. A Net Present Value under the discount rate of 12% is estimated at about 200 million balboas.

Of the various road sections, the sections subject to new construction will have a higher economic rate of return of 32%, compared to 16% for the sections to be improved. However, from an economic point of view, it is not worthwhile to implement the Corredor Sur Extension independently.

Concerning bus system planning, 11 bus routes related to Corredor Sur were planned in the Study and the introduction of new bus routes is considered to be feasible. The maximum number of future bus passengers on the section of Corredor Sur is estimated at about 50,000 passengers per day in the suburban area and 125,000 passengers per day in the built-up area. These results denote that the project will bring about remarkable benefits, not only for users of private cars but also for a large number of bus passengers.

In addition to the quantifiable benefits, further social impacts will be expected. The proposed road is expected to function as an axis for the future urban development of Panama City, and to induce future urban development in a sound manner. Furthermore, employment opportunities are to be created directly by the implementation of the Project during the construction period, thus contributing to a decrease in the number of unemployed workers.

(3) NECESSITY OF PROJECT REALIZATION

The Corredor Sur is expected to meet the largest amount of traffic volume (maximum 86,000 pcu) in the future transportation network in the Metropolitan Area. In addition, it is expected to function as an imperative road and, hence, to serve as an axis for urban development, particularly to the east.

The results of the economic evaluation imply that the Project, through vehicle operating costs savings resulting mostly from the reduced fuel and oil consumption, will contribute to the conservation of energy, which is an important national resource. The Project will also bring about a large amount of time savings for road users travelling on the improved road network, and will mitigate traffic congestion. This implies that the road development, which can accommodate smooth traffic flow, is considered as an indispensable infrastructure for the future development of the Panama Metropolitan Area, which serves as an international financial and commercial center of Central and South America.

Therefore, in all aspects of the nation's economy and the people's life, it is recommendable to implement the Project as early as possible.

(4) RECOMMENDATIONS FOR PROJECT IMPLEMENTATION

Regarding the implementation of the Project, the following recommendations are hereby made:

1) Financing of Necessary Funds

The implementation of the whole project will necessitate a very large monetary requirement. It is therefore imperative to moderate the financial load throughout the construction. Concerning the foreign currency portion of the Project, it is recommendable to obtain external funds with favorable conditions, considering the present difficult economic

situation of Panama. With regard to the local currency portion, efforts shall be undertaken to make the local funds available. Consideration should be given to obtaining local funds, in accordance with the "beneficiary's pay principle", by means of an objective tax for road investment, which would be collected from road users in the form of a vehicle registration fee or a motor fuel tax.

Because of the enormous cost of land acquisition for the Project in the built-up area, it is necessary for both the public and the private sector to consider such institutional measures as "valorization" and other appropriate methods for enhanced efficiency.

2) Implementation Schedule

The highest priority shall be placed on the construction of the sections where relatively higher traffic demand would be anticipated, and on the new road construction sections. From the view of medium-term planning, it is recommended to complete the new road construction section between ATLAPA and Via. Ciudad Radial and its main access roads by the year 1994.

Following the section as recommended above, the remaining sections shall be gradually implemented taking into consideration the progress made in the acquisition of land, as well as the demolition of works subject to compensation. Particularly, the implementation of the Corredor Sur Extension shall be carried out in line with the progress of urban renewal projects in the area concerned.

3) Operation and Organization of the Project

Prior to the construction works, preparatory works, such as detailed engineering design, preparation of bid documents, land acquisition, etc., are necessary. In addition, the magnitude of the budgetary requirement of the project will be inordinately large compared to the current road investment. Therefore, it is necessary for MOP to establish a new organization for the operation and administration of the Project.

Furthermore, it is desirable that the Team engaged in the Study (the ESTAMPA Team of MOP) will continue further studies in order to solve such transportation problems in the Panama Metropolitan Area as arterial street improvement projects, the extension of Corredor Norte, the introduction of a rail transit system, etc.

1. INTRODUCTION

(1) Study Development

In response to the request of the Government of the Republic of Panama, the Japanese Government, through the Japan International Cooperation Agency (JICA), initiated the Urban Transport Study in the Panama Metropolitan Area (called ESTAMPA).

As the first of a series of ESTAMPA, the ESTAMPA Masterplan was formulated for the metropolitan urban transportation. The work conducted between January 1981 and December 1982 is referred to as ESTAMPA I.

ESTAMPA II, which was conducted from May 1983 to January 1985, was the feasibility study on the road construction project of Corredor Norte and its access roads, road improvement projects on Via Espana and other main roads, and in addition, public transport facilities projects.

The feasibility study on the Corredor Sur Development Project in the Panama Metropolitan Area (hereinafter referred to as the Study), proposed in the ESTAMPA Masterplan, is known as ESTAMPA III.

For the study preparation the Japanese preliminary survey team headed by Dr. Kiyoshi Sato, visited Panama in February 1986 and prepared the scope of work for the Study, jointly with the Panamanian authorities concerned.

The JICA full-scale study team stayed in the Republic of Panama to conduct the Study from August 1986 through November 1987.

(2) Scope of Study

The feasibility of the following projects has been studied:

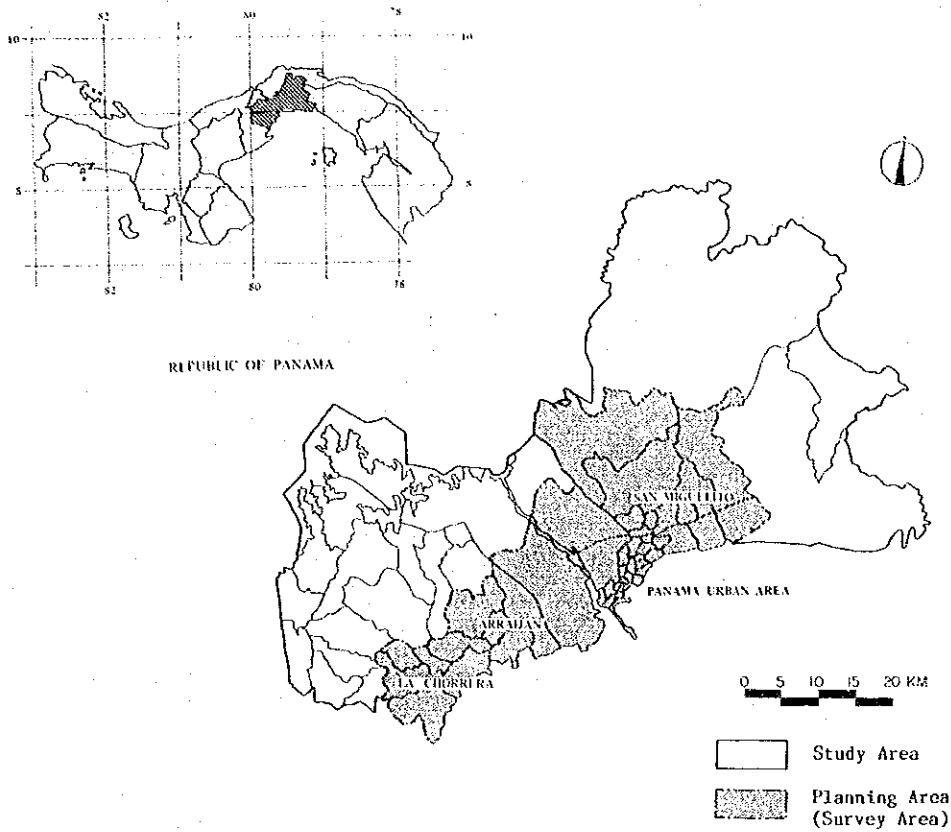
- Corredor Sur: Maranon - Pan American Highway (Tocumen)
- Main Access Roads:
 - Via Ernesto T. Lefevre
 - Via San Miguelito-Chanis
 - Via San Miguelito-Hipodromo
 - Via Juan Diaz Sur
 - Via Ciudad Radial
 - Via Don Bosco
- Corredor Sur Extension: Maranon - American Bridge

In addition, the improvement plan for the bus yards and bus stops, in relation to Corredor Sur, was also examined.

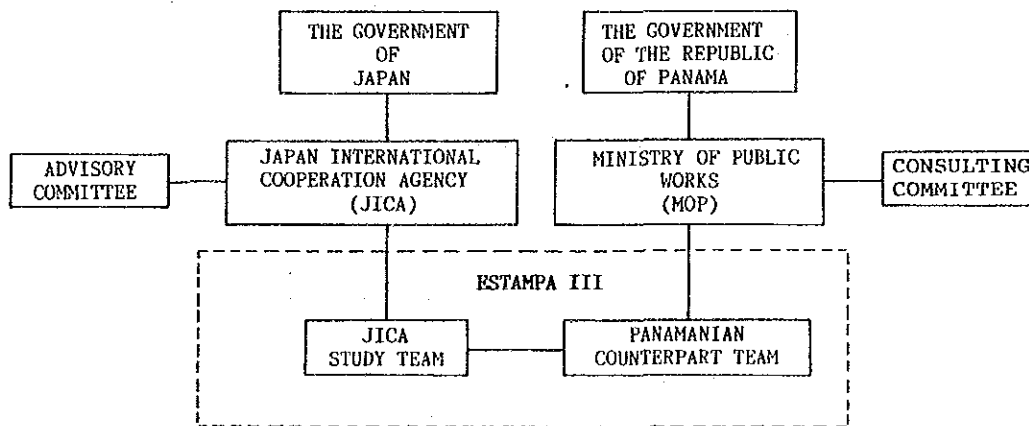
The planning area for the Study is the same as the study area for the ESTAMPA Masterplan. The planning year is the year 2000, which is also the same as for the ESTAMPA Masterplan.

(3) Study Organization

To conduct the Study, JICA has organized both the Study Team, headed by Mr. Takeshi Yoshida and the Advisory Committee, chaired by Mr. Hiroaki Ogawa, to receive the advice for the Study. The government of the Republic of Panama has formed the Counterpart Team, headed by Mr. Marcos Matos under the Ministry of Public Works (MOP). MOP has organized the Consulting Committee, coordinated by Mr. Roberto King, to facilitate the progress of the Study.



PANAMA METROPOLITAN AREA



ORGANIZATION OF THE STUDY

2. SOCIOECONOMIC CONDITION

(1) A Profile

The Republic of Panama is an isthmian nation extending east-west between Colombia and Costa Rica, having a national territory of 77,082 square kilometers and a population of 2,180,500 (estimated in 1985). It has a marine tropical climate with a dry season (January to April) and a rainy season (May to December), when most of the annual precipitation of about 2,000 millimeters takes place.

Located in the middle of the nation and facing the Pacific, the Panama Metropolitan Area around Panama City is an area with 3,580 square kilometers, extending about 80 kilometers east-west and about 50 kilometers north-south, and a population of 730,000 (1980). Projects subject to this Feasibility Study are to be implemented in the Panama Urban Area .

The Panama Metropolitan Area borders on the Gulf of Panama to the south and hilly terrain to the north and is divided in the center by the Panama Canal running north and south. The region where the projects will be implemented is the flat land comprising Panama City.

(2) Economic Framework

Panama City is the political, economic, and cultural center of the nation and, due to its geographical position as the meeting point of the North and South American Continents has long been a nodal point of international transport. It is at the Pacific entrance to the Panama Canal. In recent years, it has developed as an international finance center.

The population of the Metropolitan Area has increased rapidly from 350,000 to 730,000 during the past two decades and is predicted to increase to 1,010,000 by 1990 and further to 1,330,000 or 1.8 times the present, by the year 2000.

The Metropolitan Area's industrial structure consists of heavy or tertiary industries, which employ 160,000 persons or 74% of the total working population of 220,000. Employment is expected to increase to 340,000 by 1990 and to 490,000, or 2.3 times the present, by the year 2000, when tertiary industries will represent 81%.

(3) Land Use

As population and economic activities have concentrated in the Metropolitan Area, the expansion of its urban area has been very rapid. The urbanized area, which is now about 2.5 times its size in the 1960's, is predicted to further expand from 12,800 hectares in 1980 to 20,000 hectares or 1.6 times by the year 2000. The inverted "T" formed by the Pan American Highway and the Transistmica Highway adjoining thereto at a right angle represents the pattern of spread of present land use in the Metropolitan Area. Future development efforts are to transform this inverted "T" to a triangular pattern through the outward expansion of the existing Panama Urban Area and through the Reverted Area development, thereby creating dwelling areas throughout the whole peripheral region.

PLANNED POPULATION

Area	Year	1980	1990	2000
Planning Area		707,725	987,000	1,298,800
Study Area		732,840	1,018,000	1,334,800

EMPLOYMENT IN THE STUDY AREA

Industrial Sector	Year	1980	1990	2000
Primary		8,155	7,155	6,430
Secondary (of which manufacturing)		49,020 (29,680)	67,755 (41,110)	87,410 (53,760)
Tertiary		162,355	265,550	400,320
Total		219,530	340,460	494,160

3. TRANSPORTATION CONDITION

(1) Person Trips

According to the person-trip survey conducted in 1981, person trips concerning the Metropolitan Area amounted to 1,470,000 trips in total, of which 96% were intra-area trips. The composition of the person trips (intra-area trips) by purpose is Home (43.6%), Work (17.9%), School (15.7%), Private (14.2%), Shopping (4.6%), and Business (4.0%). The modal composition, excluding walking, is Public Bus (43.9%), Car (34.5%), Truck (8.9%), Taxi (6.2%), Private Bus (5.7%) and others.

Trip behavior in the Metropolitan Area is characterized by the substantial gap between the average trip generation rate of 3.39 trips per day for members of car-owning families and 1.93 trips per day for members of non-car-owning families.

(2) Road Traffic

The long range traffic pattern concerning the Metropolitan Area is composed by two highways, namely, the Pan American Highway and the Transistmica Highway. Within the Panama Urban Area, heavy road traffic appears on east-west bound arterials, such as Via Simon Bolivar, Ave. Balboa, Via Espan and Via Ricardo J. Alfaro.

The recent increase in the number of vehicles has brought about serious traffic congestion at the main intersections during peak hours.

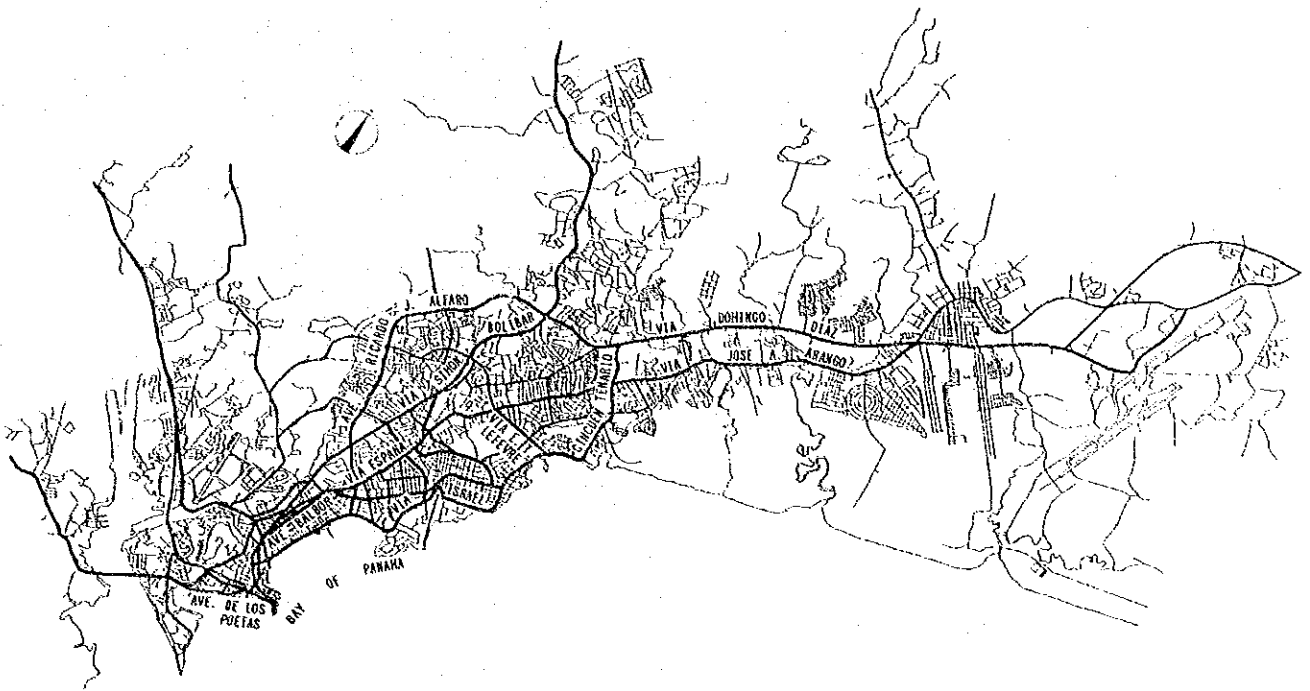
(3) Bus System

The demand for bus trips within the Panama Metropolitan Area is served chiefly by city buses. According to the DINTRAT's survey (1986), the total number of city buses registered is 1,385, and 988 of them were operational.

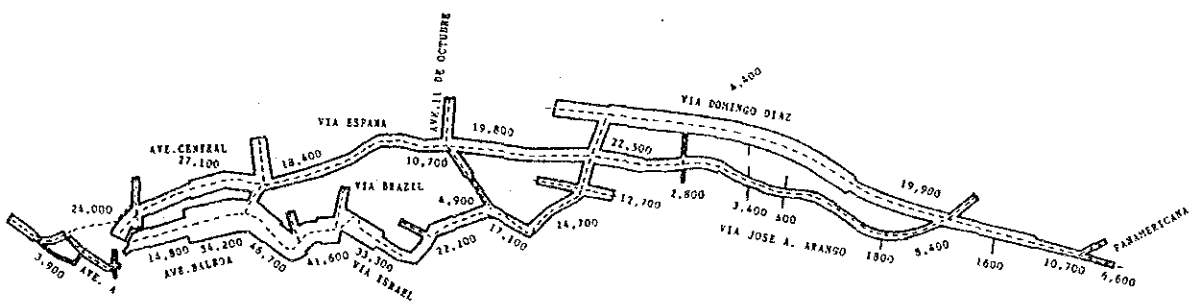
Among the public bus operation organizations, the largest one is SICOTRAC, whose buses represent more than 90 % of all city buses.

SICOTRAC is a syndicate of bus owners and drivers, which attempts to protect their interests by handling route applications, government negotiations for bus fare revisions and fuel supply service, and controls the order of bus arrivals to and departures from each "piguera" (the suburban bus terminal). Diverse arrangements are made between the bus owner and the driver, but under the most representative arrangement the bus is rented to the driver for a fixed fee and the driver defrays bus operation expenses, excluding the costs of repair and insurance. SICOTRAC prohibits the ownership of more than two buses by any individual member.

In view of the fact that most bus passengers are members of low-income, non-car-owning families, bus fares, which are government controlled, have been left unrevised for years. The average fare is 22 cents per ride.



EXISTING ROAD NETWORK



TRAFFIC FLOW DIAGRAM ON 12-HOUR SURVEY

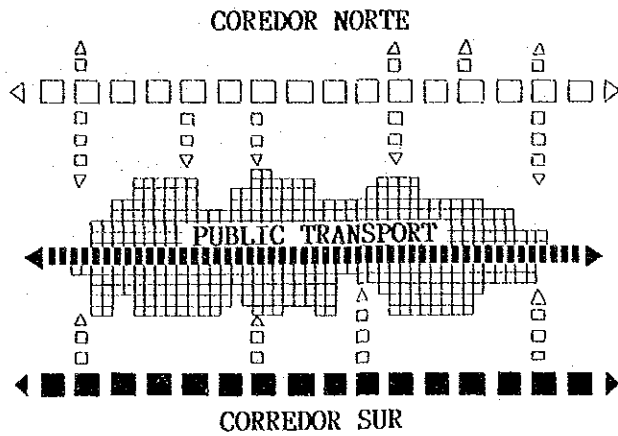
4. TRANSPORTATION NETWORK MASTERPLAN

The Transportation Network Masterplan for the year 2000 (known as the ESTAMPA Masterplan) was recommended as a result of the study on the four alternative networks in light of future land use and development patterns, population distribution, transport demand forecast, and other considerations. The future network pattern shall be a ladder shaped skeleton pattern formed by major east-west axes and north-south dispersion roads, thereby placing motor vehicle traffic axes outside the urban area and bus or rail transit axes in its center.

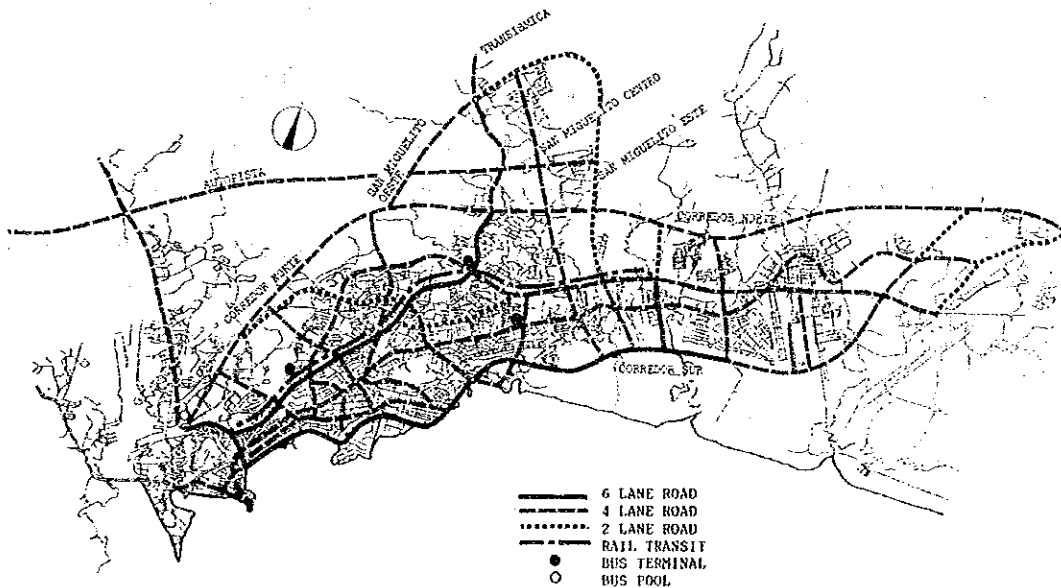
The ESTAMPA Network Masterplan, in terms of long distance traffic, shall consist of the Autopista, the Pan American Highway and the Transistmica Highway, and, in terms of urban traffic, shall be formed by;

- Corredor Norte, which will run east-west to the north of the urban area for the reaccommodation of motor vehicle traffic while serving as a development axis for the Reverted Area and which will extend to the eastern areas of Panama City.
- Corredor Sur, which will also run east-west but to the south of the urban area along the Bay of Panama, for the accommodation of motor vehicle traffic while serving as a development axis for diverse urban development projects.
- North-South direction arterials, such as Via Cerro Ancon, Via Brasil (Via El Paical), Via E. T. Lefevre (Via Once de Octubre).
- Future development skeleton for the San Miguelito area, such as Via San Miguelito Oeste, Via San Miguelito Centro, Via San Miguelito Este.
- The introduction of a rail transit system from Centro to San Miguelito Este and Juan Diaz traversing the center of the urban area.
- Improvement of the bus transport service with the construction of four bus centers and a bus maintenance center.

This transportation network is expected to be fully developed by the year 2000, with the investment of about 350 million dollars in roads and about 335 million dollars in public transport facilities including the rail transit system.



CONCEPT OF TRANSPORT NETWORK MASTERPLAN



TRANSPORT NETWORK MASTERPLAN IN YEAR 2000

5. TRAFFIC DEMAND FORECAST

Origin-Destination (O-D) trips are predicted to increase from the 1,430,000 in 1980 to 2,230,000 (1.5 times) and further to 3,140,000 (2.1 times) by the year 2000, as population increases and people's mobility rises as more people own cars. Trip increases will be small in the Panama Urban Area but impressive in suburban areas. As a mode, the passenger car utilization rate is expected to rise substantially as car ownership multiplies. Major flow of traffic will be from Juan Diaz, Tocumen, and other northern suburbs, as well as from San Miguelito, and Las Cumbres, and the volume of traffic will be 2.5 times the present at the threshold to the Panama Urban Area where these flows converge.

The method and simulation model of the ESTAMPA Masterplan and ESTAMPA II Study has been used for the traffic demand forecast on the road network for the year 2000 in this Study. The future OD table consists of 57 zones, in which 4 zones around the eastern part of Corredor Sur were subdivided into 16 zones in order to examine the proper alignment and the forecast of future land use.

Each future traffic demand estimate for Corredor Sur and the Main Access Roads in the year 2000 were estimated as shown below:

1). Corredor Sur

Section	Traffic Volume (pcu)*
I Maranon - Federico Boyd	56,000
II Federico Boyd - Brasil	55,000
III Brasil - E.T. Lefevre	59,000
IV E.T.Lefevre - Cincuentenario	86,000
V Cincuentenario - San Miguelito-Chanis	69,000
VI San Miguelito-Chanis - Ciudad Radial	79,000
VII Ciudad Radial - Pan American Highway	44,000

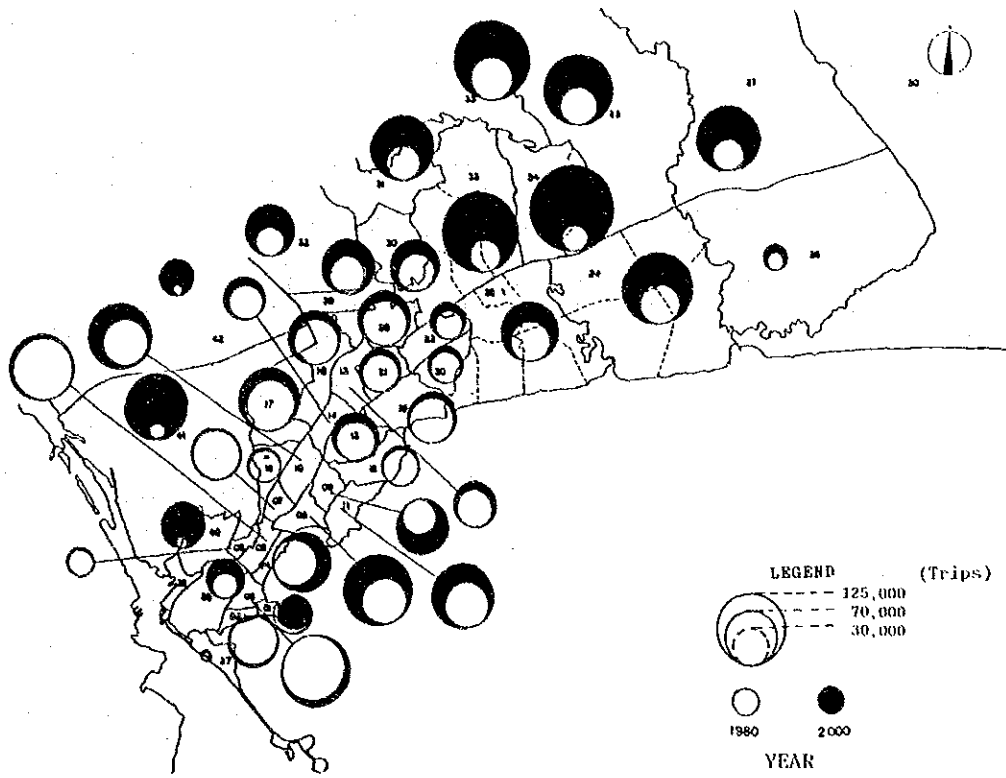
2). Main Access Roads

Access Roads	Traffic Volume (pcu)*
Via E.T. Lefevre	59,000
Via San Miguelito-Chanis	18,000
Via San Miguelito-Hipodromo	8,000
Via Juan Diaz	11,000
Via Ciudad Radial	25,000
Via Don Bosco	13,000

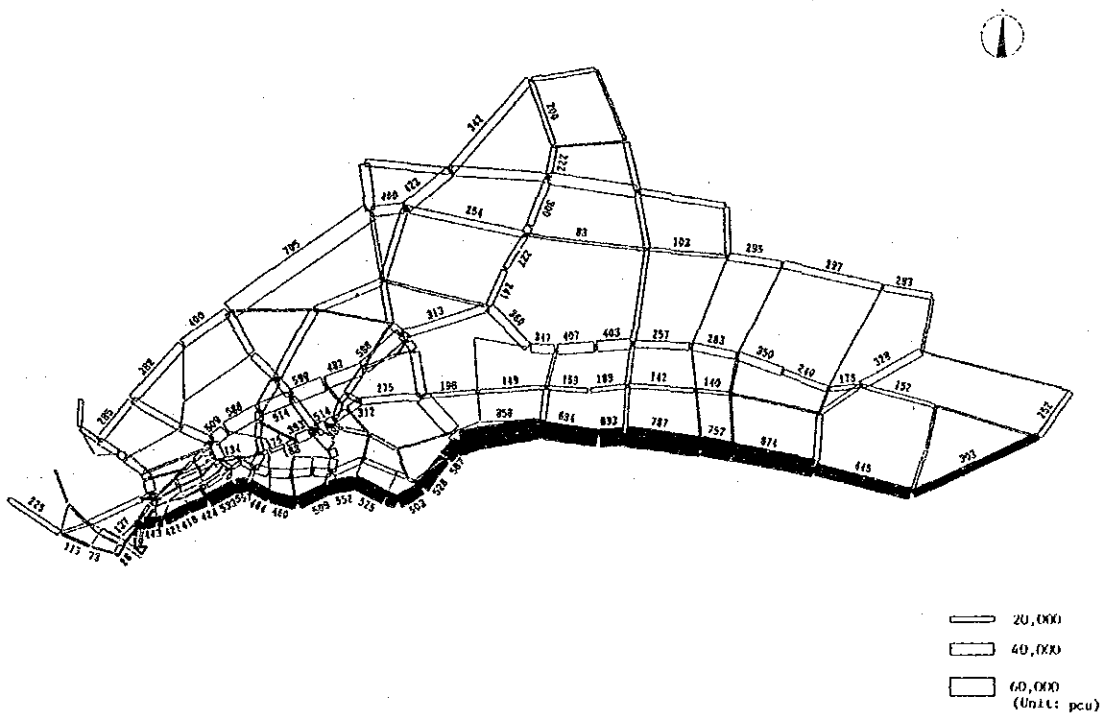
Corredor Sur Extension will connect the west end of Corredor Sur and the approach road to the American Bridge by way of Calle 14 Oeste and Ave. de los Poetas. The volume of traffic demand for Corredor Sur Extension was estimated to have 34,000 pcu at its maximum section.

* PCU: Passenger Car Unit

Conversion Rate: Car, Taxi = 1.0, Truck = 1.75, Bus = 2.0.



GENERATION OF PERSON TRIP



FUTURE TRAFFIC DEMAND IN YEAR 2000

6. ROAD FUNCTION

(1) Corredor Sur

The area where Corredor Sur will be aligned is divided into the built-up area and the suburban area. The former is improved by the widening of the Ave. Balboa, Via Israel and a part of Via Cincuentenario, and also by the new construction along the coast. The latter will be newly constructed and will run on the vacant area between Juan Diaz and the mangrove area connecting Panama Viejo with the Pan American Highway in Tocumen.

This road, which runs along the Panama Bay, must function as a principal arterial road which forms a part of the ladder network skeleton pattern. According to the result of the traffic demand forecast, a heavy traffic volume was assigned to this road. The perspective road function of each section by area is described below:

1). Built-up area

Provision of smooth traffic flow to and from the north-south direction arterial roads and also to and from feeder roads in order to accommodate multi-purpose traffic of activities such as commerce, business, commutation, and other private activities.

Provision of a beautiful coastal landscape which improves the existing vista along Ave. Balboa.

2). Suburban Area

Provision of a bypass with a high driving velocity for Via Domingo Diaz and Via Jose Agustin Arango.

Formation of a new axis for the development of the southern part of Juan Diaz and Tocumen.

(2) Main Access Roads

The Main Access Roads to Corredor Sur must function as north - south arterial roads in a ladder pattern, connecting in the future with east-west direction axes such as Corredor Norte.

Ave. E.T. Lefevre is located such that it will serve as one of the most important roads in the north-south dispersion arterial streets. The traffic demand is estimated to be over two times the present.

Via San Miguelito-Chanis, which will extend to the center of the San Miguelito area in the far future as Via San Miguelito Centro, is also expected to become an arterial street with heavy traffic in the Juan Diaz area.

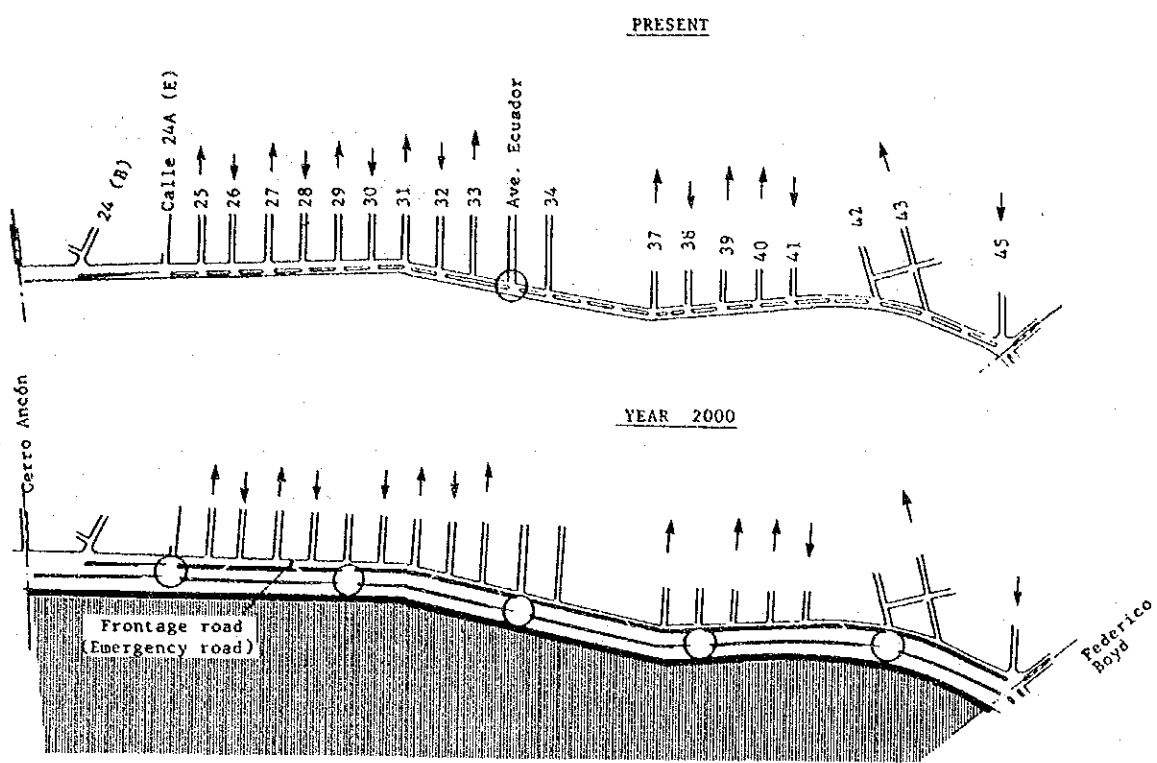
Via Ciudad Radial will be an arterial road which has rather heavy traffic in the north-south direction.

Other Main Access Roads such as Via San Miguelito-Hipodromo, Via Juan Diaz and Via Don Bosco have an important role as north-south direction dispersion roads.

(3) Corredor Sur Extension

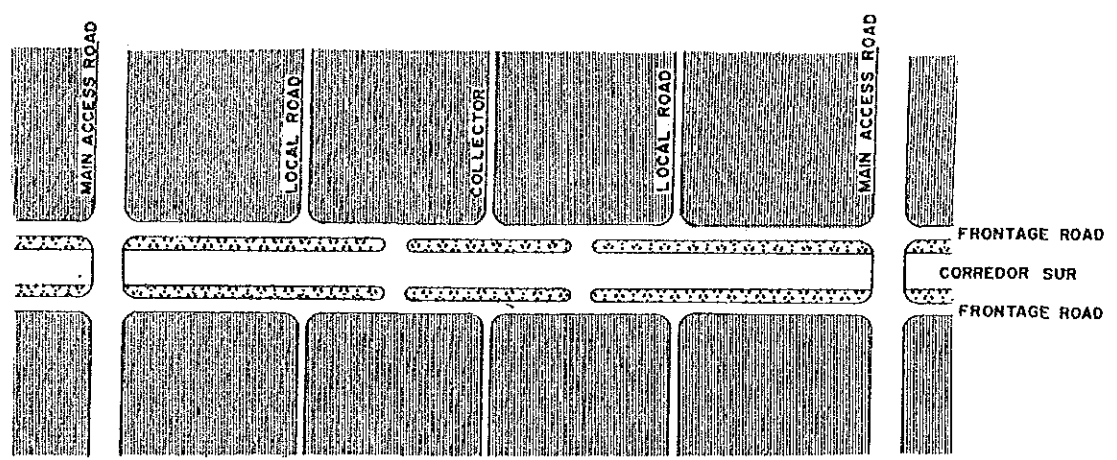
Corredor Sur Extension will serve as an arterial street in the narrow one-way network pattern in Centro (Santa Ana, El Chorrillo).

This street will not be used by the passing-through traffic; the main function of the road, however, is to control the generated/attracted traffic into or out of this area, and to accelerate the urban renewal.



FUTURE ACCESS CONTROL SYSTEM FOR CORREDOR SUR
(AVENIDA BALBOA SECTION)

- : Signalized Intersection
- ⌌ : Entrance & Exit for frontage road



CONCEPT OF ACCESS CONTROL SYSTEM FOR CORREDOR SUR
IN SUBURBAN AREA

7. ROUTE ALTERNATIVES

(1) Corredor Sur

The route alignment in the built-up area was examined under the principle of maximum use of the existing streets, Ave. Balboa, Via Israel and Ave. Cincuentenario. Concerning the following three sections, these alternative routes were proposed in the Study:

- i Near Marcos Gelabert Airport (Paitilla Airport)
- ii Between ATLAPA and Via E.T. Lefevre (near Parque Morelos)
- iii Between Via E.T. Lefevre and Rio Abajo

For the section close to the Paitilla Airport, three route alternatives were proposed. Route alternative 2 was selected at this section since it causes the least impact on the existing constructions along Corredor Sur, based on the removal project of the airport facilities which has been proposed by Aeronautica Civil.

For the section between ATLAPA and E.T. Lefevre, two route alternatives were examined. One is the widening of Via Cincuentenario and another is new construction at the seashore. Since the right-of-way of this section is narrower than that of other parts of Corredor Sur, the widening presents a difficulty under existing conditions. Route Alternative 2 was, therefore, selected for this section. In the meantime, this alternative will not bring about the compensation for and destruction of existing buildings.

Concerning the section between Via E.T. Lefevre and Rio Abajo, two inland alternative routes and one alternative route for new construction on the sea were examined in conjunction with the planning of the elimination of Via Cincuentenario near Panama Viejo proposed by IPAT. The marine route causes the destruction of the natural front view of Panama Viejo. The marine route was, therefore, eliminated. Alternative 2, which passes through an area with fewer existing buildings, was finally selected.

The route alignment in the suburban area, the east half of Corredor Sur, was considered in coordination with the existing and future surrounding urban development plan along Corredor Sur.

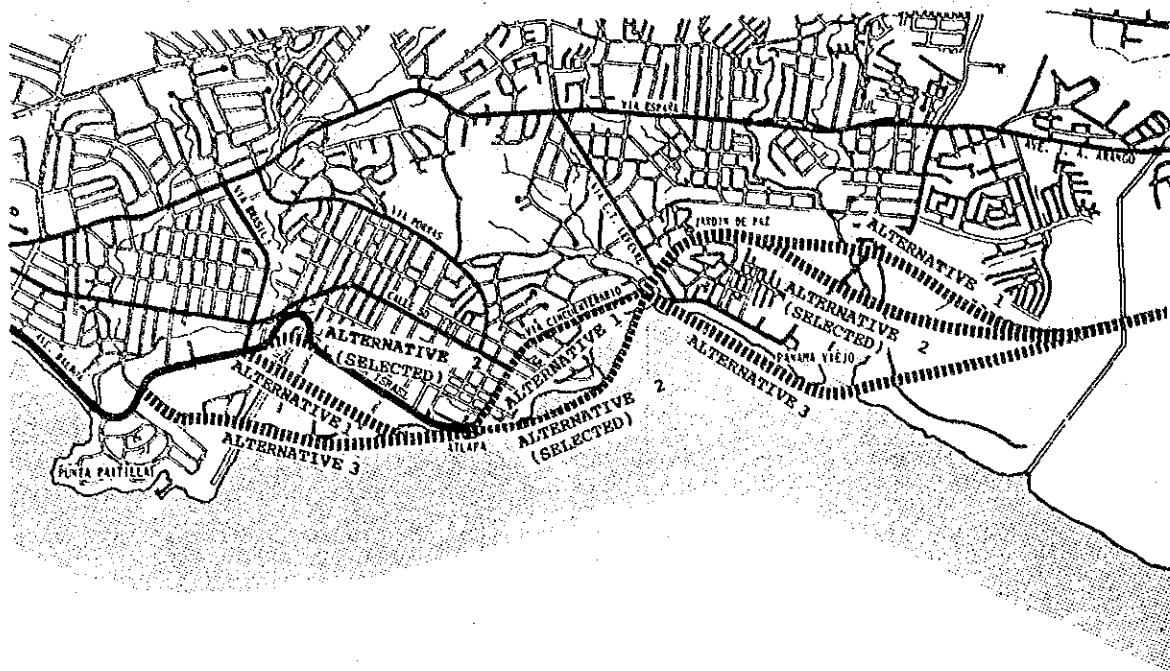
(2) Main Access Roads

The widening of the existing road was proposed at Via E.T. Lefevre, in the built-up area. Route locations for the other five access roads in the suburban area were proposed, considering such factors as geographical features, location of rivers, location of existing roads, land use and intervals of those main access roads, based on the future road network of the ESTAMPA Masterplan.

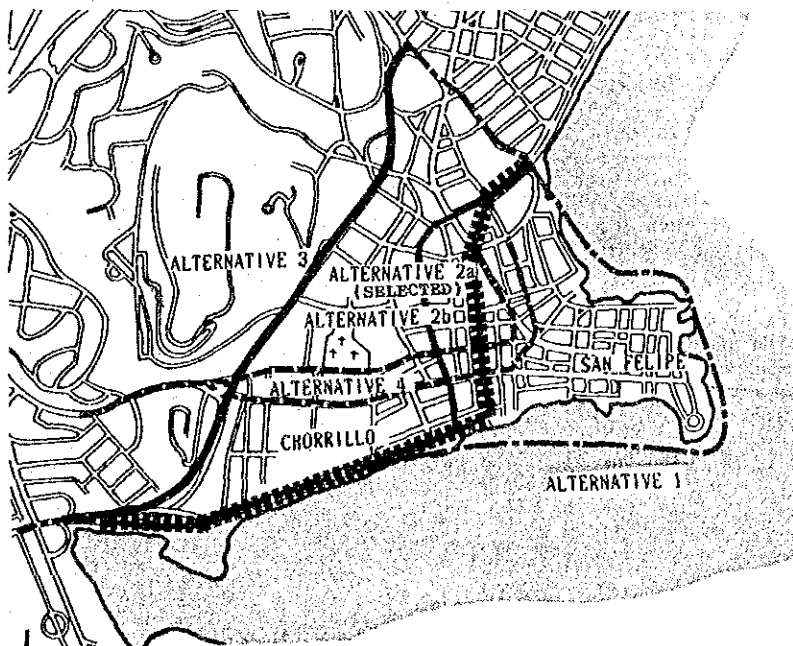
(3) Corredor Sur Extension

For the introduction of an arterial street into Centro, several route alternatives were examined herewith, such as the three alternatives (1, 2a, 4) proposed in the ESTAMPA Masterplan and the two alternatives (2b, 3) newly added in the Study.

As a result, Alternative 2a, which connects Calle 14 Oeste with Ave. de los Poetas, was selected in consideration of such road functions as traffic demand, future land use and the necessity of preserving historical assets.



ROUTE ALTERNATIVES BETWEEN PAITILLA AIRPORT ON PANAMA VIEJO



ROUTE ALTERNATIVES FOR CORREDOR SUR EXTENSION

8. BUS SYSTEM PLANNING

(1) Purpose of Bus System Planning

In the Study, the bus system planning study was conducted mainly in order to analyze the feasibility of the introduction of a bus route on Corredor Sur in the planning year 2000.

(2) Bus Network Alternatives

The bus service which should be added to the bus network in the year 2000, based on the network recommended in the ESTAMPA Masterplan for the year 1990, is a bus route serving the newly urbanized areas and bus routes to hard-to-reach areas.

This type of bus route is introduced so as to strengthen the ties between the areas which are difficult to reach using the bus routes recommended in the ESTAMPA Masterplan. These routes are introduced between the areas along Corredor Norte and the eastern areas.

According to the basic concept described above, the 10 additional bus route alternatives were considered for introduction after the year 1990.

The main point of consideration for the additional bus route alternatives was to strengthen the bus service to the eastern parts of the Metropolitan Area.

(3) Bus System Planning

The recommended alternative bus network was revised several times so as to maximize the total operational efficiency. In this way, the optimum bus network was finalized, so that 17 bus routes recommended by ESTAMPA Masterplan and 9 others proposed by the Study were selected. Some bus routes are scarcely profitable, but there are no alternative routes. The elimination of these bus routes would be very inconvenient to their users. So, these routes were adopted for the purpose of achieving their transportation mission.

(4) Characteristics

It was found to be clearly feasible enough to introduce bus routes on to Corredor Sur, both in the suburban area as well as in the built-up area. A maximum number of bus passengers is expected to use the routes between Calle 50 and Via Cincuentenario.

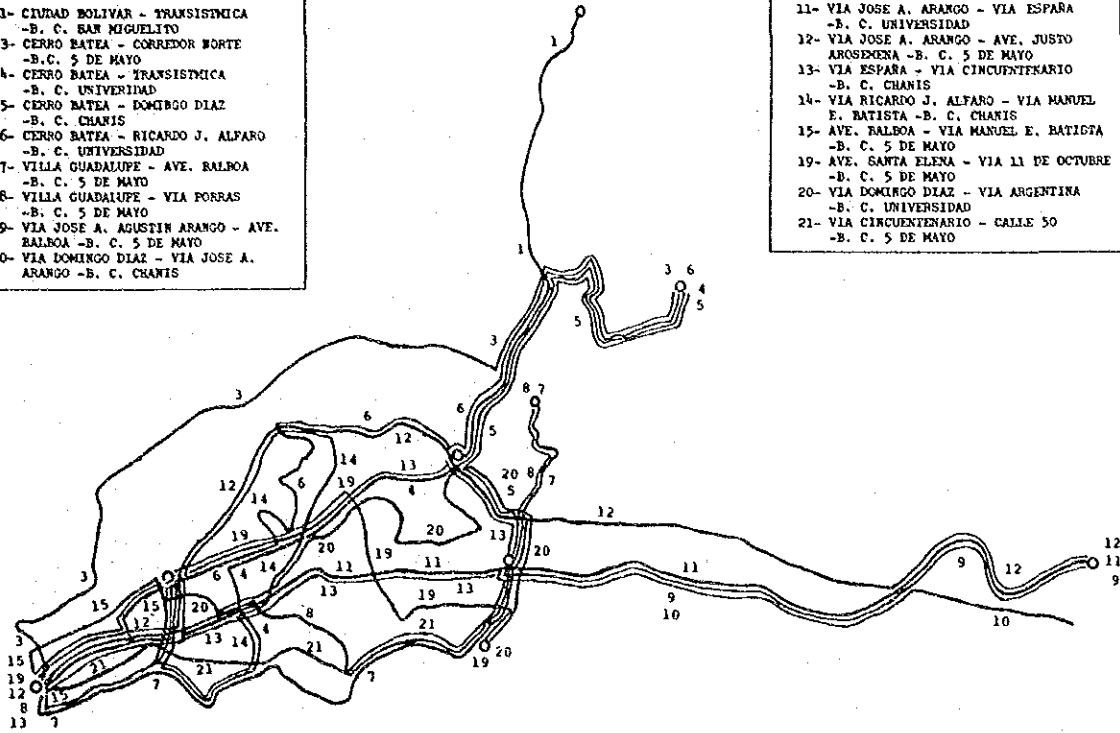
(5) Consideration of Rail Transit

The system planning in this Study was performed under the precondition of the non-existence of the rail transit service recommended in the ESTAMPA Masterplan, but this is not to deny the necessity of the said rail transit service. As shown in the ESTAMPA Masterplan, the traffic movement in Panama City has a characteristic which is suitable for the introduction of the rail transit service. That characteristic is the large volume of persons moving constantly in a particular direction. It is apparent that handling the increasing demand for public transport with buses only is very difficult. A rail transit system has certain characteristics that are much better than the bus service.

The introduction of the rail transit system will definitely influence the system providing the bus service. Needless to say, the separation of functions will take place establishing the rail transit service as the main type of transportation, with the bus service providing a feeder service transportation. To implement this separation of function smoothly, it is important to change gradually to the form which is suitable for the introduction of the railway-based transportation, and to minimize the resulting friction with the bus operating organizations.

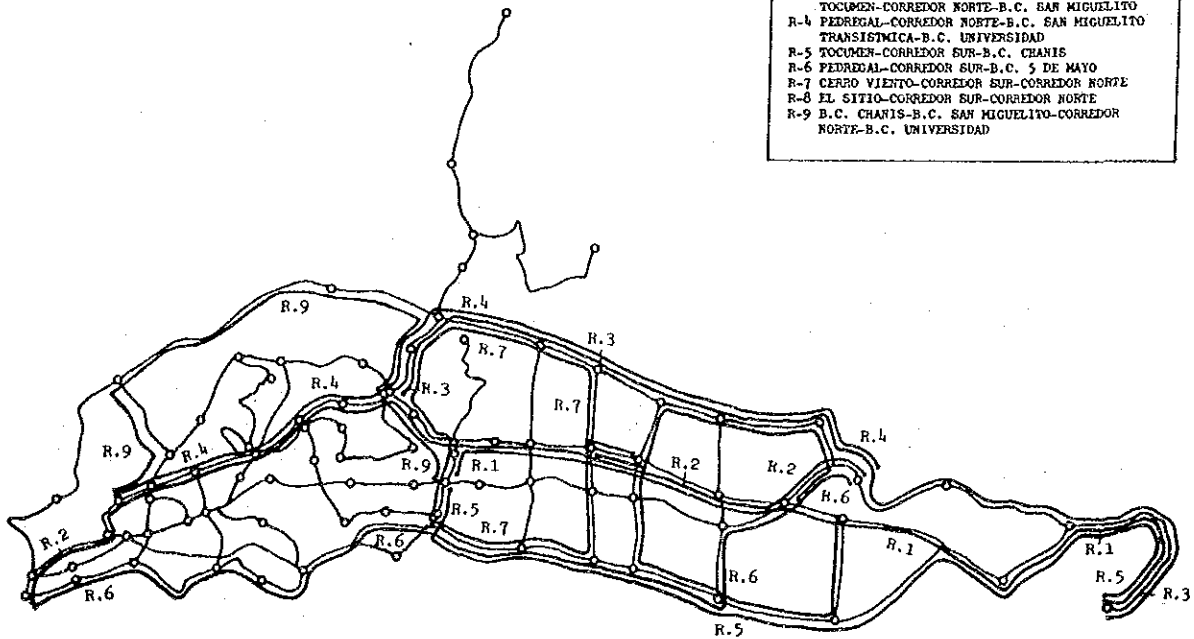
LEGEND	
1-	CIUDAD BOLIVAR - TRANSISTMICA -B. C. SAN MIGUELITO
3-	CERRO BATEA - CORREDOR NORTE -B.C. 5 DE MAYO
4-	CERRO BATEA - TRANSISTMICA -B. C. UNIVERSIDAD
5-	CERRO BATEA - DOMINGO DIAZ -B. C. CHANIS
6-	CERRO BATEA - RICARDO J. ALFARO -B. C. UNIVERSIDAD
7-	VILLA GUADALUPE - AVE. BALBOA -B. C. 5 DE MAYO
8-	VILLA GUADALUPE - VIA PORRAS -B. C. 5 DE MAYO
9-	VIA JOSE A. AGUSTIN ARANGO - AVE. BALBOA -B. C. 5 DE MAYO
10-	VIA DOMINGO DIAZ - VIA JOSE A. ARANGO -B. C. CHANIS

LEGEND	
11-	VIA JOSE A. ARANGO - VIA ESPARA -B. C. UNIVERSIDAD
12-	VIA JOSE A. ARANGO - AVE. JUSTO AROSENA -B. C. 5 DE MAYO
13-	VIA ESPARA - VIA CINCUENTENARIO -B. C. CHANIS
14-	VIA RICARDO J. ALFARO - VIA MANUEL E. BATISTA -B. C. CHANIS
15-	AVE. BALBOA - VIA MANUEL E. BATISTA -B. C. 5 DE MAYO
19-	AVE. SANTA ELENA - VIA 11 DE OCTUBRE -B. C. 5 DE MAYO
20-	VIA DOMINGO DIAZ - VIA ARGENTINA -B. C. UNIVERSIDAD
21-	VIA CINCUENTENARIO - CALLE 50 -B. C. 5 DE MAYO



FUTURE BUS ROUTE NETWORK (RECOMMENDED IN ESTAMPA II)

LEGEND	
R-1	TOCUMEN-DOMINGO DIAZ-B.C. CHANIS
R-2	PEDREGAL- DOMINGO DIAZ-B.C. SAN MIGUELITO
R-3	TRANSISTMICA-B.C. UNIVERSIDAD-B.C. 5 DE MAYO TOCUMEN-CORREDOR NORTE-B.C. SAN MIGUELITO
R-4	PEDREGAL-CORREDOR NORTE-B.C. SAN MIGUELITO TRANSISTMICA-B.C. UNIVERSIDAD
R-5	TOCUMEN-CORREDOR SUR-B.C. CHANIS
R-6	PEDREGAL-CORREDOR SUR-B.C. 5 DE MAYO
R-7	CERRO VIENTO-CORREDOR SUR-CORREDOR NORTE
R-8	EL SITIO-CORREDOR SUR-CORREDOR NORTE
R-9	B.C. CHANIS-B.C. SAN MIGUELITO-CORREDOR NORTE-B.C. UNIVERSIDAD



FUTURE BUS ROUTE NETWORK (ADDED IN THE STUDY)

9. BUS YARD AND BUS STOP PLANNING

(1) Bus Yard Improvement Planning

In the ESTAMPA Masterplan, 4 bus centers were recommended, and in the ESTAMPA II Study, 6 bus bases were recommended. To provide better bus service for passengers, it is desirable to establish the following as bus operating facilities:

- a. **Bus Center:** Bus Centers are established at the eastern and northern entrances to the urban area of the city from the suburban area, and at the center of the urban area. They will make it easier and more comfortable for passengers to wait and to transfer to other routes.
- b. **Suburban Bus Center:** Suburban bus centers are to be constructed at the main transferring points in the suburban areas. They will make it easier to transfer to other routes. They will also make it possible to reduce operating costs by being used as turning points between the route segments with larger demand, thus making it unnecessary to travel all the way back to the bus center. Also, they will make it possible to operate according to the demand.
- c. **Bus Base:** Bus bases are the main departure point for the bus routes of a given sector. In these bus bases, the departure time of buses will be arranged, minor mechanical checking will be done, resting facilities will be made available to bus drivers, and so on. Also, these bus bases will provide overnight parking space for the buses.
- d. **Satellite Bus Base:** Satellite bus bases will assist bus bases in establishing efficient bus routes in scattered demand areas, such as suburban areas.

To satisfy the above conditions, the following four locations were selected in the Study for bus yards related to Corredor Sur:

- . Pedregal (bus base)
- . Panama Viejo (bus base)
- . Pedregal Sur (suburban bus center)
- . Cerro Viento (suburban bus center)

(2) Bus Stop Planning

Bus stops should be placed every 300 to 500 meters and, in areas of low population density, this distance should be increased to as much as 800 meters.

The bus bay should be established at bus stops where the bus volume is larger than 40 buses per 30-minute period (1,600 buses per day) because, at volumes higher than this, the probability of waiting increases abruptly. Nevertheless, if the congestion rate is high, or the level of safety is low, then bus bays should be established even for bus volumes lower than 40 buses per 30-minute period.

Considering the service level required to smoothly dispose of 90% of the total number of buses in transit, the number of berths required shall be determined based on the following standards:

- | | |
|------------------------------|----------|
| (a) 1,600 to 2,000 buses/day | 2 berths |
| (b) 2,000 to 2,400 buses/day | 3 berths |
| (c) 2,400 buses/day or more | 5 berths |

Due to the high importance of bus service in Panama, it is necessary to provide a safer and more comfortable bus service, and, also, it is desirable to construct some facilities which will maintain or increase the status of the bus system, such as bus-stop shelters, pedestrian bridges, guard fences, etc.

10. CORREDOR SUR I (BUILT-UP AREA)

(1) Land Use

Present land use along Corredor Sur in the built-up area can be roughly divided into the following three sections such as the western part along Ave. Balboa, the central part along Via Israel and the eastern part on the new construction section. The land use along Ave. Balboa is characterized as a business and commercial area with beautiful vistas of green areas or the seashore. On the second section along Via Israel many schools and institutional buildings are located. The route alignment of the last section runs along the seashore and then through the housing area between Jardin de Paz and Panama Viejo.

The characteristics of the future land use along Corredor Sur I will not change drastically from the present.

(2) Geometric Design

The geometric design of Corredor Sur I can be characterized by the following 3 sections such as Maranon - Rio Mataznillo, Rio Mataznillo - ATLAPA and ATLAPA - Rio Abajo. The ATLAPA - Rio Abajo section will be subject to road construction.

ITEM	Maranon - Mataznillo	Mataznillo - ATLAPA	ATLAPA - Rio Abajo
Road Length (Km)	2.99	2.82	3.94
Design Speed (Km/h)	60	60	80
Number of Lane	6	6	6
Lane Width (m)	3.35	3.35	3.65
Shoulder Width (m)	1.35	1.35	2.7
Width of Median (m)	4.5	4.5	4.5
Width of Sidewalk (m)	5.0	5.0	6.6
Width of Right-of-Way (m)	53.6	37.3	45.0

(3) Intersection

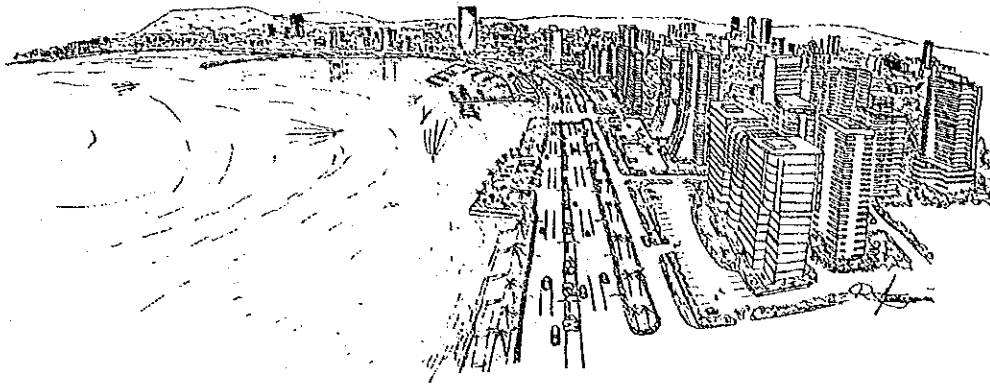
- Via Cerro Ancon Intersection 4 Legs at Grade
- Via Federico Boyd Intersection 3 Legs at Grade
- Monumento a la Madre Intersection 4 Legs at Grade
- Via Brasil Intersection One way (direction to Centro)
Grade Separated
- Via Cincuentenario and Via E.T. Lefevre Intersection Grade Separated

(4) Bridge

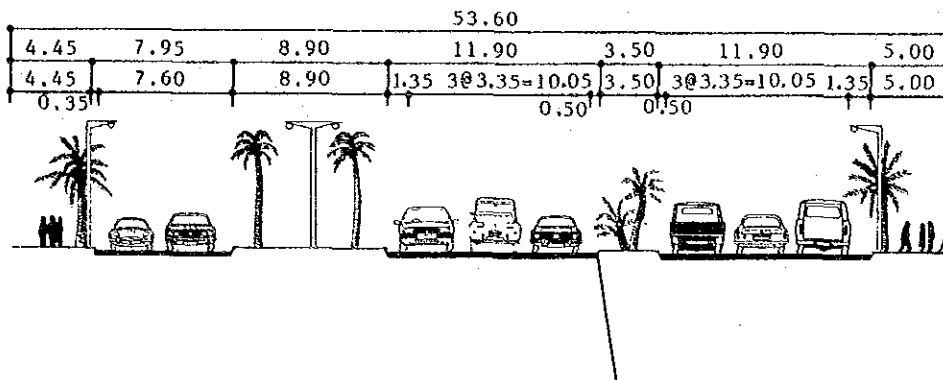
The bridge over the Rio Mataznillo river should be improved due to the widening of the road to 6 lanes from the existing 4 lanes. Its structure adopted rigid-type reinforced concrete to cope with the anticipated waterlevel. The bridge over Via Brasil intersection and the viaducts over Via E. T. Lefevre and Rio Abajo intersections have been planned with a structure of PC composite girder types.

(5) Project Cost

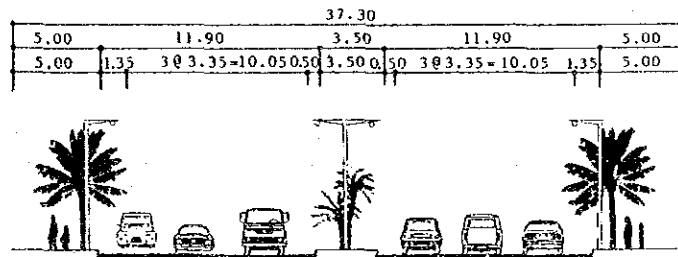
The construction cost of Corredor Sur in the built-up area is estimated at 54 million balboas, of which 59% will be in foreign currencies. The compensation cost and land acquisition cost are estimated at 31 million balboas, while the total project cost, including the compensation and land cost, will be 85 million balboas.



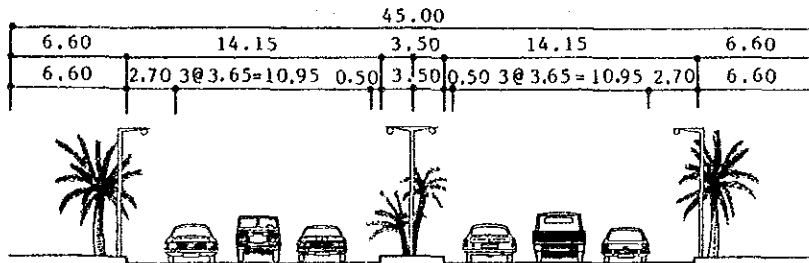
FUTURE IMAGE SKETCH OF CORREDOR SUR IN BELLA VISTA



TYPICAL CROSS SECTION OF CORREDOR SUR (MARANON - MATAZNILLO)



TYPICAL CROSS SECTION OF CORREDOR SUR (MATAZNILLO - ATLAPA)



TYPICAL CROSS SECTION OF CORREDOR SUR (ATLAPA - RIO ABAJO)

11. CORREDOR SUR II (SUBURBAN AREA)

(1) Land Use

The present land use along Corredor Sur in the suburban area is mainly vacant areas between the housing area and the mangrove area. Housing development has recently progressed from Via Jose A. Arango toward the southern area.

In the future, these vacant areas will be occupied mainly by housing development, but a large suburban type shopping center and a recreation core area is planned around the intersection with Via San Miguelito Hipodromo. On the other side of Ciudad Radial, an industrial area is planned and the mangrove area will be preserved as a measure of environmental conservation.

(2) Geometric design

The geometric design of Corredor Sur II will be characterized by the following 2 sections such as Rio Abajo - Ciudad Radial and Ciudad Radial - Pan American highway. Since the flood area has expanded at high tide due to the very low level of the existing ground, a two or three meter high embankment has been recommended in this section.

ITEM	RIO ABAJO -CIUDAD RADIAL	CIUDAD RADIAL - PAN AMERICAN HIGHWAY (TOCUMEN)
Road Length (Km)	6.04	5.67
Design speed (Km/h)	80	80
Number of Lanes	6	4
Lane Width (m)	3.65	3.65
Shoulder Width (m)	2.75	2.75
Width of Median (m)	4.5	4.5
Width of sidewalk (m)	5.0	5.0
Width of Right of Way (m)	60.0	60.0

(3) Intersection

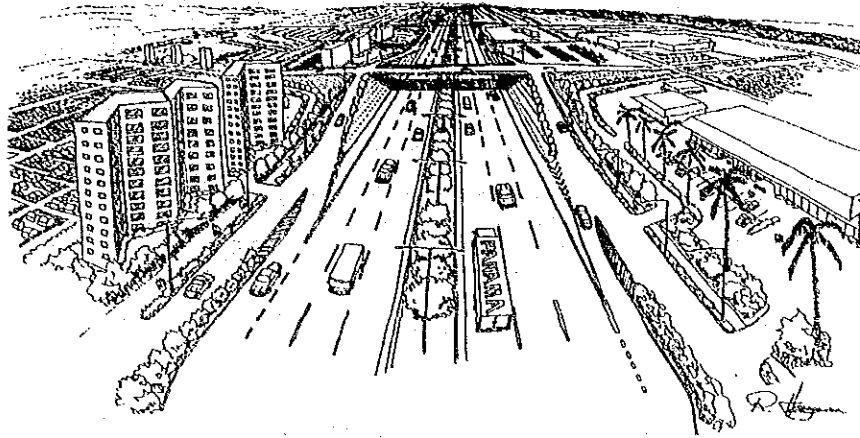
All intersections located at the connection with the Main Access Roads, such as Via San Miguelito- Chanis, Via San Miguelito-Hipodromo, Via Juan Diaz, Via Ciudad Radial, Via Don Bosco and Calle 102 E (near Rio Abajo), will be diamond type interchanges.

(4) Bridge

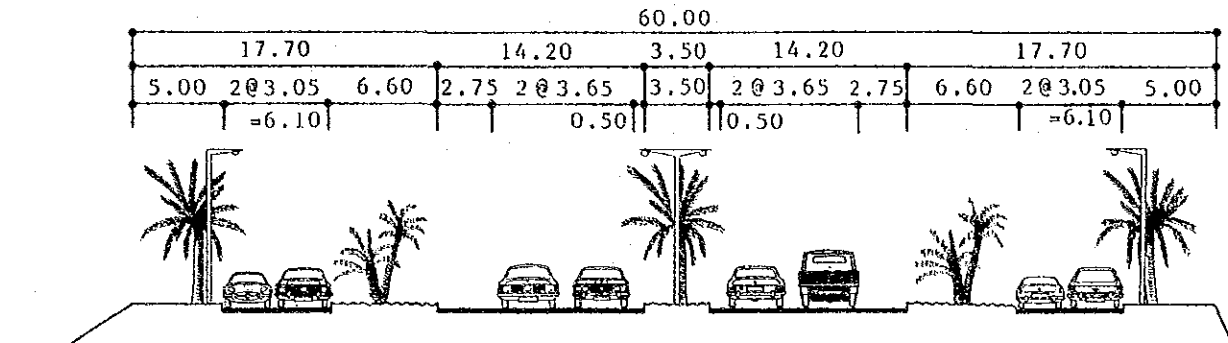
Three bridges will be constructed, over Rio Matias Hernandez, Rio Juan Diaz and over Rio Tapia. These bridge spans are 43 m, 105 m, and 30 m respectively. Five overpass bridges will be constructed over Corredor Sur at diamond type interchanges with the Main Access Roads. The PC composite girder type is recommended for the structure of all the above bridges.

(5) Project Cost

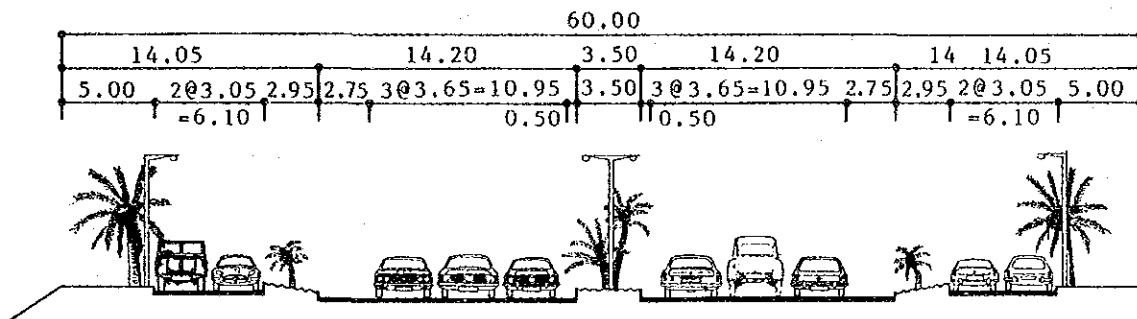
The construction cost of Corredor Sur in the suburban area is estimated at 75 million balboas, of which 64 % will be in foreign currencies. The compensation cost and land acquisition cost is estimated at 11 million balboas. The total project cost of this section, including compensation cost and land cost, will be 85 million balboas.



FUTURE IMAGE SKETCH OF CORREDOR SUR IN JUAN DIAZ



TYPICAL CROSS SECTION OF CORREDOR SUR
(RIO ABAJO - CIUDAD RADIAL)



TYPICAL CROSS SECTION OF CORREDOR SUR
(CIUDAD RADIAL - PAN AMERICAN HIGHWAY)

FINANCIAL PROJECT COST OF CORREDOR SUR

Unit: W. 1,000 1987 Price

Sections	Construction Costs			Compensation and Land Cost	Total Project Cost
	Foreign Portion	Local Portion	Sub-Total		
Corredor Sur I	31,868	22,007	53,875	30,888	84,763
Corredor Sur II	48,113	26,434	74,547	10,868	85,415
Total	79,981	48,440	128,422	41,756	170,178

12. MAIN ACCESS ROADS

(1) Land Use

Present land use along Via E. T. Lefevre is mainly a mixture of residential, commercial and light industry areas, and it is conceivable that future land use will be the same as that of the present. The present roadside land use of other Main Access Roads is mainly residential or vacant lands. However, industrial areas are dispersed around intersections with Via Domingo Diaz. In the future, these vacant lands will be occupied by housing developments. Commercial areas will be developed around intersections with Corredor Sur, Via Jose A. Arango and Via Domingo Diaz.

(2) Geometric Design

The geometric design of the Main Access Roads can be characterized by 3 types of cross sections, such as the one of Via E.T. Lefevre, in the built-up area, and two types used for other access roads in the suburban area.

ITEM	VIA E.T. LEFEVRE	VIA SAN MIGUELITO CHANIS VIA CIUDAD RADIAL	VIA SAN MIGUELITO HIPODROMO VIA JUAN DIAZ VIA DON BOSCO
Road Length (Km)	1.62	4.75	6.92
Design Speed (Km/h)	60	60	60
Number of Lanes	4	4	4
Lane Width (m)	3.35	3.35	3.35
Shoulder Width (m)	1.55	1.35	0.5
Width of Median (m)	3.5	0.50	0.6
Width of sidewalk (m)	5.0	5.0	2.5
Width of Right-of-Way (m)	30.0	26.6	25.0

(3) Intersection

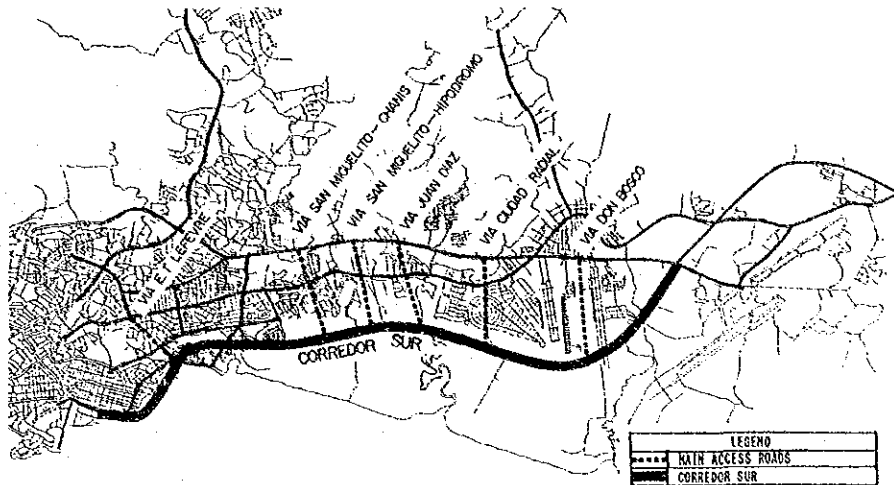
Both intersections will be grade separated by an overpass, at Via E.T. Lefevre with Corredor Sur and at Via E. T. Lefevre with Via Espana. The type of the former bridge is mentioned in the article on Corredor Sur I, and the type of the latter bridge has a curved 4-lane Via E.T. Lefevre passing over Via Espana. A diamond type interchange was adopted at all intersections of the Main Access Roads with Corredor Sur, while signal control at grade with 3-legs or 4-legs was introduced at other intersections of the Main Access Roads with Via Espana, Ave. Jose Arango and Via Domingo Diaz.

(4) Bridge

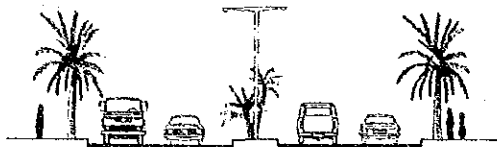
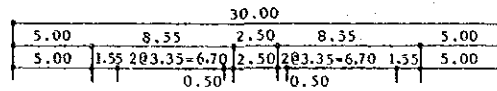
An overpass bridge structure will be constructed at the Via Espana intersection of Via E.T. Lefevre. Four bridges, with a span length between 20 m and 60 m, will be constructed: two bridges over Rio Matias Hernandez in Via San Miguelito-Chanis, one bridge over Quebrada Palomo in Via Juan Diaz and one bridge over Rio Juan Diaz in Via Ciudad Radial. The PC composite girder type was adopted for the bridge structure.

(5) Project Cost

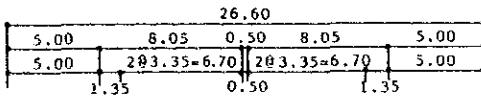
The construction cost of the Main Access Roads is estimated at 42 million balboas, of which 62 % will be in foreign currencies. The compensation cost and land acquisition cost is estimated at 18 million balboas. Hence, the total project cost, including the compensation cost and land cost, will be 60 million balboas.



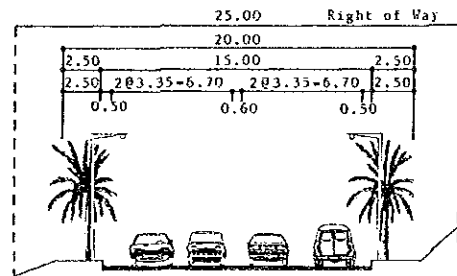
LOCATION MAP OF MAIN ACCESS ROADS



TYPICAL CROSS SECTION OF VIA E. T. LEFEVRE



TYPICAL CROSS SECTION OF VIA SAN MIGUELITO - CHANIS, VIA CIUDAD RADIAL



TYPICAL CROSS SECTION OF VIA SAN MIGUELITO - HIPODROMO, VIA JUAN DIAZ, VIA DON BOSCO

FINANCIAL PROJECT COST OF MAIN ACCESS ROADS

Unit: B/. 1,000 1987 Price

Road	Construction Costs			Compensation and Land Cost	Total Project Cost
	Foreign Portion	Local Portion	Sub-Total		
E.T. Lefevre	3,932	2,802	6,734	6,387	13,121
San Miguelito-Chanís	4,656	2,927	7,583	2,039	9,622
Hipodromo	4,262	2,324	6,586	3,510	10,096
Juan Diaz	3,839	2,266	6,105	2,263	8,368
Radial	5,211	3,060	8,271	1,989	10,260
Don Bosco	3,862	2,337	6,199	1,317	7,516
Total	25,763	15,716	41,479	17,505	58,984

13. CORREDOR SUR EXTENSION

(1) Land Use

The following land use can be seen along the Corredor Sur Extension, driving from the east: car workshops, high rise apartment buildings, retail stores, wooden parking garages, old wooden houses, and four-story dwelling units for the low income group, elementary and high schools, parks, etc. Urban renewal projects are being carried out in three areas of Santa Ana, El Chorrillo east and El Chorrillo west. Basically, future roadside land use of the Corredor Sur Extension was expected to become mid-to-high rise residential buildings, parks, public parking facilities, and commercial facilities, through the reconstruction of old houses.

(2) Geometric Design

The design speed of the Corredor Sur Extension was planned as 40 Km/h, because it will not serve the through traffic even though it is an important arterial street that runs through Centro. A 3.05m wide shoulder was proposed as a parking and loading zone.

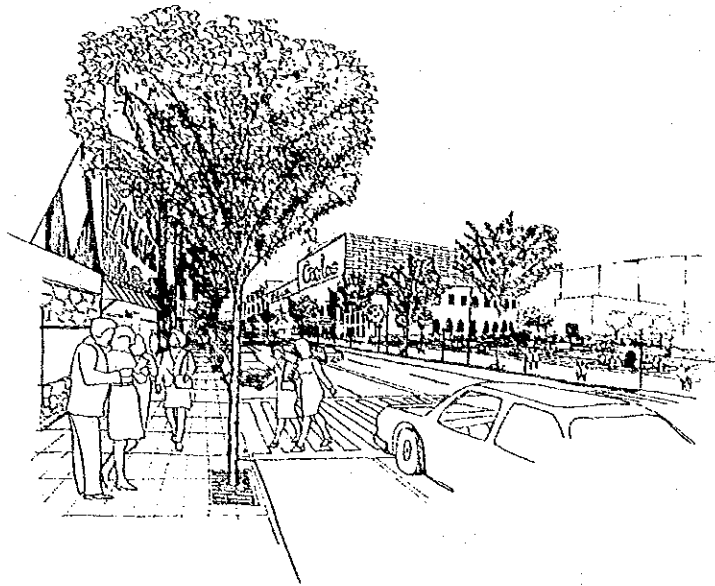
ITEM	MEASURES
Road Length (Km)	2.21
Design Speed (Km/h)	40
Number of Lanes	4
Lane Width (m)	3.35
Shoulder Width (m)	3.05
Width of Median (m)	0.5
Width of sidewalk (m)	5.0
Width of Right-of-Way (m)	30.0

(3) Intersection

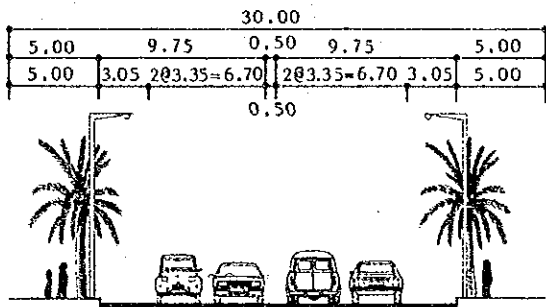
All intersections on the Corredor Sur Extension and with arterial roads, such as Ave. Central, Ave. A, Calle B and Ave. B, are controlled by traffic signals. And the intersections with local streets, which are presently part of a one-way system, will not be signalized in the future.

(4) Project Cost

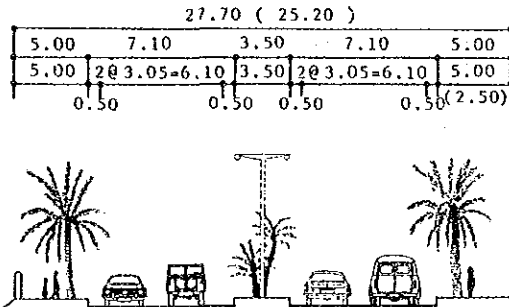
The construction cost of the Corredor Sur Extension is estimated at 5 million balboas, of which 62 % will be in foreign currency. However, the compensation cost and land acquisition cost is estimated at 24 million balboas. Hence, the total project cost, including the compensation cost and land cost, will be 29 million balboas.



FUTURE IMAGE SKETCH OF CORREDOR SUR EXTENSION IN SANTA ANA AREA



TYPICAL CROSS SECTION OF
CORREDOR SUR EXTENSION
(CALLE 14 OESTE)



TYPICAL CROSS SECTION OF
CORREDOR SUR EXTENSION
(SEASHORE SECTION)

FINANCIAL PROJECT COST OF CORREDOR SUR EXTENSION

Unit: B/. 1,000 1987 Price

Construction Costs			Compensation and Land Cost	Total Project Cost
Foreign Portion	Local Portion	Sub- Total		
3,203	2,110	5,313	23,621	28,934

14. IMPLEMENTATION PLAN

(1) Planning Conditions

The target year for the completion of the project, Corredor Sur, Main Access Roads and the Corredor Sur Extension, is the year 2000, on the basis of the ESTAMPA Masterplan. The whole project is estimated at 258 million balboas in year 1987 price. Introduction of some foreign funds will be inevitable based on the past experience of public investment capability.

The largest traffic volume was forecasted on the section of Corredor Sur between Via E.T. Lefevre and Via Ciudad Radial, and among whole sections of new road construction. Consequently, it is necessary to place a higher priority for initiating construction in this section.

(2) Construction Period

After the completion of this feasibility study, a preparatory period should be made available to set the construction schedule. The net construction period therefore will be about ten years. The construction will begin with the higher priority section of a certain road project. And its earliest completion will not take place until the middle of the year 1992.

In Panama, the dry season is usually from January to April and the rainy season from May to December. Due to this climate, earthwork and construction work of bridge foundations should be implemented during the dry season.

The work period by work section should be determined considering the time necessary for land acquisition, removal of houses and transmission lines, and so on.

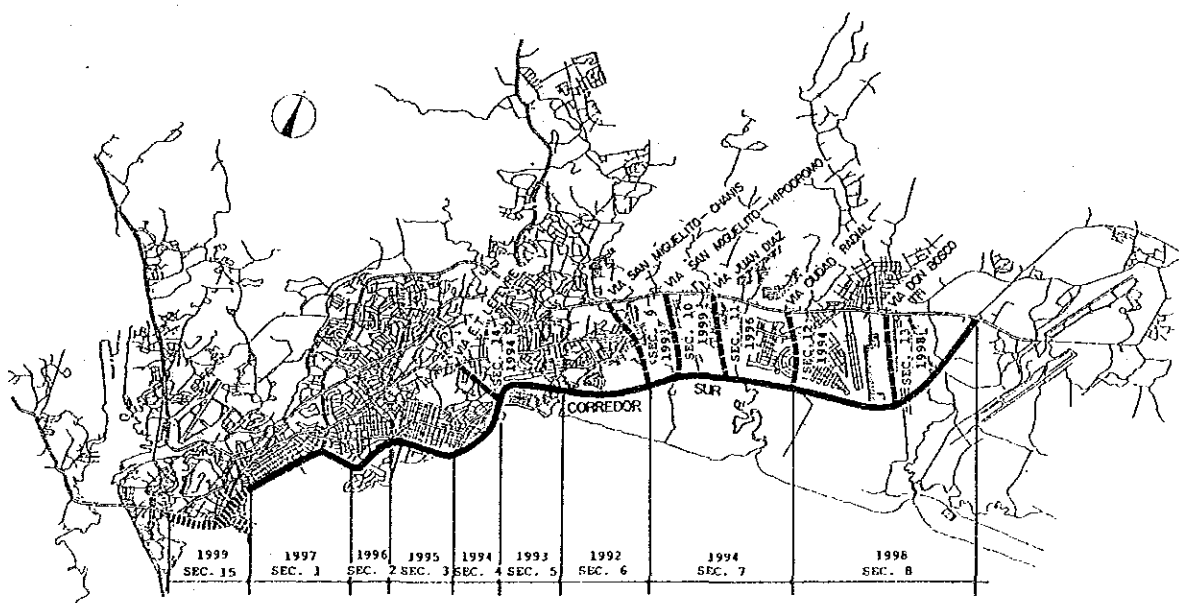
(3) Implementation Schedule and Investment Plan

The work sequence was examined in light of future traffic demand by work section. As a result, the construction at the section between ATLAPA and Ciudad Radial should be started with a higher priority. Other work sections were drawn in order of priority, as shown in the following figure.

The total construction cost excluding the costs for compensation and land acquisition is estimated at 175 million balboas, of which 74 % (129 million balboas) will be spent for Corredor Sur I and II. 62 % of the total construction cost will be the component of the foreign currency portion. The annual investment during the ten years beginning with the year 1990 will vary between 7 and 33 million balboas.

INVESTMENT PLAN FOR ROAD PROJECTS (FINANCIAL COST IN 1987 PRICE)

SECTION/YEAR	Unit: 1,000 Balbas												TOTAL	
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999		2000
CORREDOR SUR I														
SECTION- 1	372	372	0	0	0	0	0	2,559	7,620	7,620	0	0	0	18,544
SECTION- 2	99	99	0	0	0	3,032	3,032	2,035	2,035	0	0	0	0	10,333
SECTION- 3	107	107	0	0	1,679	3,357	3,145	2,933	0	0	0	0	0	11,328
SECTION- 4	416	416	854	4,260	6,814	6,814	0	0	0	0	0	0	0	19,574
SECTION- 5	259	3,720	6,922	6,116	5,319	2,655	0	0	0	0	0	0	0	24,983
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
CORREDOR SUR II														
SECTION- 6	377	2,030	5,515	7,725	3,652	0	0	0	0	0	0	0	0	19,509
SECTION- 7	679	679	0	0	1,973	13,888	13,888	0	0	0	0	0	0	31,107
SECTION- 8	680	680	0	0	0	0	0	0	5,590	13,924	13,924	0	0	34,799
SUB-TOTAL	1,735	3,389	5,515	7,725	5,625	13,888	13,888	0	5,590	13,924	13,924	0	0	85,415
TOTAL	2,991	8,105	13,290	18,101	19,638	29,746	20,065	7,527	15,245	21,544	13,924	0	0	170,178
MAIN ACCESS ROADS														
SECTION- 9	177	177	0	2,939	3,615	3,615	0	0	0	0	0	0	0	9,622
SECTION- 10	153	153	0	0	0	0	0	0	0	1,755	3,848	4,135	0	19,096
SECTION- 11	142	142	0	0	0	0	1,132	3,072	3,881	0	0	0	0	8,368
SECTION- 12	193	193	0	0	995	3,623	5,257	0	0	0	0	0	0	10,260
SECTION- 13	144	144	0	0	0	0	0	0	0	1,317	5,910	0	0	7,516
SECTION- 14	157	157	0	3,194	3,194	3,210	3,210	0	0	0	0	0	0	13,121
SUB-TOTAL	956	966	0	5,233	7,803	10,449	9,599	3,072	3,831	3,072	9,758	4,185	0	58,984
C.S. EXT. SECTION- 15	124	124	0	6	0	0	0	7,874	7,874	7,874	2,533	2,533	0	26,934
GRAND TOTAL	4,081	9,195	13,290	22,334	27,441	40,195	29,664	18,472	26,999	32,496	26,215	6,719	0	258,005



COMPLETION SCHEDULE OF CONSTRUCTION BY SECTION

15. ROAD PROJECT EVALUATION

(1) Method of Evaluation

The formulation and economic justification of the project are based on the quantification of the direct benefit to be derived by road users as follows;

- (a) vehicle operating cost savings
- (b) passenger time savings.

Vehicle operating cost savings were determined by comparing the vehicle operating costs of five types of vehicles (passenger car, truck, taxi, public bus and private bus) travelling on the road network with and without the proposed road being implemented. Estimates of vehicle operating costs were prepared based on the level of vehicle running speed.

Passenger time savings derived from reductions in travel time were computed for four types of vehicles (passenger car, taxi, public bus and private bus) on the basis of the average labor wage of 3.1 balboas per hour. Assuming that there is a substantial difference in labor wages between car-owning passengers and non-car-owning ones, the passenger unit time value was estimated at 5.58 balboas for passenger cars, 2.17 balboas for buses respectively. And the average value was applied for co-riders of passenger cars and for taxi cabs.

The time savings were considered only when travelling for business purposes: work and business. In conclusion, the unit time values were estimated at 1.93 balboas/veh.hr for passenger car, 0.41 balboas/veh.hr for taxi cab, 13.25 balboas/veh.hr for public bus and 3.56 balboas/veh.hr for private bus.

Derivation of the economic cost of the project was made through elimination of monetary transfers such as import tax and ITBM levied on their financial costs and the application of a shadow wage rate for a large portion of unskilled labor. In conclusion, the economic costs of the project are estimated at 246 million balboas (including the costs for the compensation and the land acquisition) in 1987 current prices.

(2) Results of Evaluation

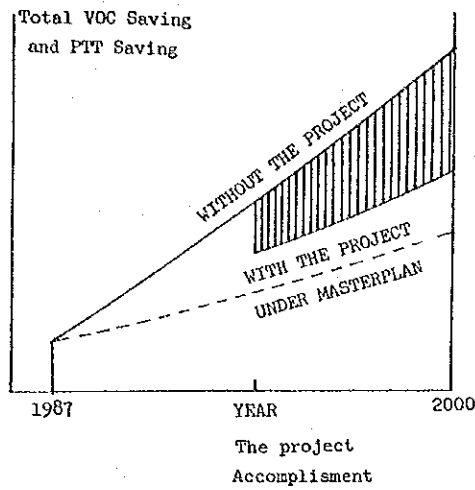
The implementation of the project is well justified, from an economic point of view, with an Economic Internal Rate of Return (EIRR) of 30.4%, considering both the vehicle operating cost savings and the passenger time savings. Under the discount rate of 12%, a Benefit Cost Ratio (BCR) is estimated at about 2.7, and a Net Present Value (NPV) is estimated at approximately 200 million balboas.

Of the aggregate benefits up to the year 2010, the passenger time benefits account for about 85% and the rest for the vehicle operating cost benefits. These results imply that the project will play an important role in increasing smooth traffic flow in the east-west direction of the Panama Metropolitan Area, and in bringing additional comfort, safety and punctuality for road users, including a large number of public transport vehicles.

In addition, the project will contribute to the savings of transport energy through reduction in vehicle operating costs, as well as the creation of the employment opportunities. Particularly, the project will assist, directly or indirectly, in the acceleration of the large urban development at the southern part of Juan Díaz and Pedregal Areas, and simultaneously in reducing the disorderly urban sprawl to the east.

After a detailed analysis of the project, it can be concluded that the construction of Corredor Sur is fully feasible, from not only a technical aspect but also from the viewpoint of the nation's economy.

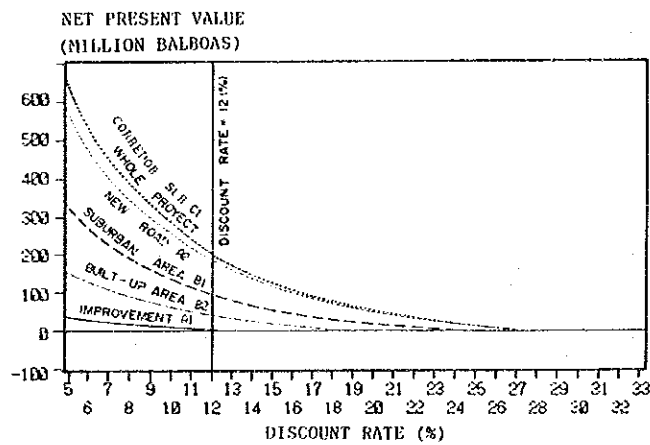
CONCEPT OF PROJECT'S BENEFIT



EVALUATION RESULTS OF PROJECT COMPONENTS

Case	Length (km)	Cost* 1000 Balboas)		EIRR (%)	Evaluation Indexes			
		Financial	Economic		NPV(1000 Balboas) (12%)	BCR (8%)	(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



RELATION BETWEEN INTERNAL RATE OF RETURN (EIRR) AND NET PRESENT VALUE

