c. Basic Configuration Policy

- To locate the bus terminal at the center.
- To allocate the relocation type land use in the south.
- To allocate the new introduction type land use in the north.
- To establish conservation area in the east.
- To install a river wharf in the Arriba Canal to facilitate market activities and to connect river transports with bus services.

5-5. Land Use Plan

Taking into consideration all the points described above, the land use plan is as shown in FIG. 5-1.

The overall characteristics of each land use are as follows:

5-5-1. Residential (34.9 Ha)

In the north-east a low-rise townhouse type zone is located, and in the central and east a middle or high-rise zone. In both cases, the social stratum of residents is targeted toward middle and above.

5-5-2. Commercial (16.5 Ha)

Mainly located in the south-west side of the area, it is in close proximity to the bus terminal. In this zone the existing public market is relocated and reorganized and most of the street vendors are relocated in the open market.

5-5-3. Business (13.4 Ha)

Business land use is located in the north-west to establish continuity with the existing business activities in the central district. Some blocks for business are mixed with housing.

5-5-4. Industrial (27.7 Ha)

The south-east corner blocks are for the relocation and organization of existing warehouses and micro-industries, and for the new installation of industrial use related to port activities. The industrial park (6.3 ha) is intended to change, in the long run, into higher industrial activities such as laboratories or research institutes with better environmental conformity to surrounding zones.

5-5-5. Bus Terminal (4.4 Ha)

A new bus terminal for both intermunicipal and urban service is constructed in the central part of the area with easy access to other land uses, especially to the market activities.

5-5-6. Park and Recreational facilities (17.1 Ha)

The site of the Mercado Canal is filled and converted to a group of parks. A recreational park with sports facilities is provided along Riverside Bypass near the residential zone.

5-5-7. Sewage Treatment Plant (3.5 Ha)

Along the Arriba Canal and on the east of the Riverside Bypass, a new sewage treatment plant is installed as a means of securing high sanitary conditions for the area.

5-5-8. Roads and Street (38.1 Ha)

High standard roads and streets including Calle 30 and the Riverside Bypass require much land, but the road and street area ratio to the total land area (158.8 ha) is 20.4%, which is rather normal in the central district of cities.

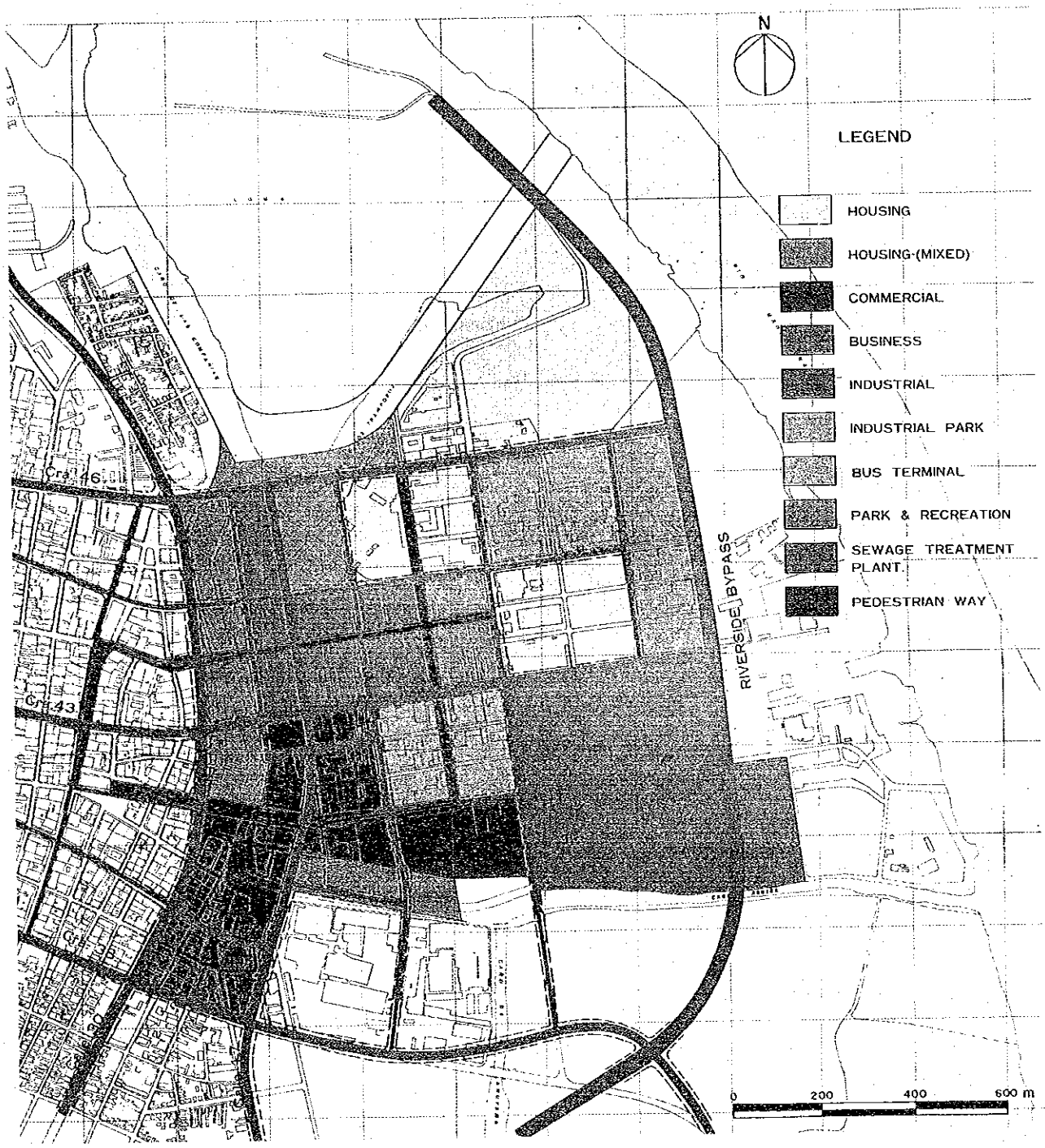


FIG. 5-1 LAND USE PLAN

5-6. Major Projects

The major 6 projects in this Study play a key role in the development plan and design for the area, and their features in terms of existing problems, planning issues, and the mutual relationship among those projects are tabulated in TABLE 5-1.

5-7. Development Staging

The proposed land use of the area is not realized all at once, and there is causal and logical relation among each land use component. The sequential order of this relation is explained as a staging of the development. The spatial staging is illustrated in FIG.5-2, and the explanation is as follows:

5-7-1. Stage 1: The initial stage is to lay the foundations for the overall development. For this purpose, the major concern is the relocation of existing land use, especially the market, warehouses, and micro-industries. The south part of the area has a considerable amount of vacant land and is suitable for this purpose. The bus terminal, which is one of the major factors in the revitalization of the area, and a sewage treatment plant are installed at this initial stage.

5-7-2. Stage 2: It is crucial, prior to the improvement of Calle 30, to reorganize street vendors in the central district.
For this, the provisions for an open market are required as well as the installation of parks on the filled area of the Mercado Canal.

5-7-3. Stage 3: The preceding stage makes it easy to improve the north part of Calle 30 and, together with its execution, a part of business and housing is newly introduced.

TABLE 5-1 MAJOR PROJECTS

ROJECT	EXISTING PROBLEMS	PLANNING ISSUES	RELATION TO OTHER PROJECTS
BUS TERMINAL	- THE PROJECT WILL CONTRIBUTE TO SOLVE THE EXISTING PROBLEMS OF LAND USE CONFUSION AND TRAFFIC CONGESTION IN THE EXISTING CENTRAL DISTRICT DUE TO DISORDERLY LOCATION OF INTERMUNICIPAL BUS TERMINALS.	- IN REGARD TO THE LARGE NUMBER OF THE TERMINAL USERS, THE PROJECT IS THE CENTER OF THE MOBILITY IN THE MAIN STUDY AREA, AND THE KEY FACTOR TO REALIZE THE REATIONAL LAND USE AND AN INTEGRATED TRANSPORT SYSTEM.	- ON THE BASIS OF INFRASTRUCTURE DEVELOPMENT THE PROJECT WILL BE CLOSELY CONNECTED WITH THE REORGANIZATION OF THE PUBLIC MARKET TO INTENSIFY THE UNIFIED DEVELOPMENT EFFECT. THE RIVERSIDE BYPASS WILL BE THE MAJOR ROUTE OF INTERMUNICIPAL BUS SERVICES.
PUBLIC MARKET	- THE PROBLEMS TO BE REARRANGED BY THIS PROJECT WILL BE NOT ONLY THE CORRUPTING MARKET ACTIVITIES BUT ALSO SURROUNDING STREET VENDOR ACTIVITIES CAUSING MUCH ENVIRONMENTAL DEGRADATION.	- IN TERMS OF VITAL ACTIVITIES OF THE MARKET, THIS PROJECT IS THE KEY FACILITIES OF THE MAJOR LAND USE IN SURROUNDING LAND USE AND WILL CONTRIBUTE MUCH TO THE IMPROVEMENT OF ENVIRONMENT.	- THE INFRASTRUCTURE DEVELOPMENT IS THE BASIS OF THIS PROJECT, AND THE CONNECTION WITH THE BUS TERMINAL WILL FACILITATE THE CREATING OF AN ACTIVITY CORE OF THE STUDY. THE URBAN PARK PROJECT WILL ANOTHER IMPORTANT FACTOR TO BE RELATED WITH THIS PROJECT TO GIVE A NEW ATMOSPHERE OF AN ACTIVITY CENTER.
URBAN PARK	- BY THIS PROJECT THE CONTAMINATION OF THE MERCADO CANAL THE PRESENT SCARCITY OF OPEN SPACE WILL BE AVOIDED. THE CREATION OF OPEN SPACE MAY CONTRIBUTE IN SOME WAY TO EASE THE PROBLEM OF SOCIAL SAFETY.	- THE REPLACEMENT OF THE CANAL IS THE MAJOR POINT OF SPATIAL RESTRUCTURING. THE PARK WILL BE AN IMPORTANT COMPONENT OF RATIONAL LAND USE AND WILL BE AN INDISPENSABLE FACTORS TO CREATE SOUND ENVIRONMENT IN THE CENTRAL DISTRICT.	- TOGETHER WITH THE IMPROVEMENT OF CALLE 30, THE FILLING OF THE CANAL IS AN ESSENTIAL BASIS FOR INFRASTRUCTURE DEVELOPMENT. THE PARK WILL BE CONNECTED WITH THE MARKET REORGANIZATION TO FACILITATE THE NEW IMAGE OF THE BARRANQUILLITA AREA.
CALLE 30	- THE WIDENING WILL CONTRIBUTE TO AMPLIFY THE TRAFFIC FLOW ON CONDITIONS THAT BETTER CONTROL OF STREET VENDERS IS REALIZED.	- CALLE 30 MIGHT BE AN IMPORTANT ELEMENT OF INTEGRATED TRANSPORT SYSTEM IN THE CENTRAL DISTRICT. HOWEVER, IT ALSO CAN BE AN OBSTACLE FOR EAST-WEST MOBILITY TO AND FROM THE BARRANQUILLITA AREA. CAREFUL ACCESS CONTROLS WILL BE REQUIRED IN THIS CONNECTIONS.	- THE IMPROVEMENT OF CALLE 30 IS CLOSELY RELATED TO THE INFRASTRUCTURE DEVELOPMENT FOR DRAINAGE TOGETHER WITH THE FILLING OF THE MERCADO CANAL. ON THE OTHER HAND, IT SHOULD BE INTEGRATED WITH THE IDEA OF PROVISION OF AN URBAN PARK FOR THE BETTERMENT OF THE ENVIRONMENT OF THE CENTRAL DISTRICT.
RIVERSIDE BYPASS	- THE PROJECT WILL CONTRIBUTE TO COMPLETE THE IDEA OF CIRCUNVALAR TO ENCIRCLE THE BUILT-UP AREA OF BARRANQUILLA AND AVOID THE THROUGH TRAFFIC IN THE CENTRAL DISTRICT.	- THIS BYPASS IS THE MAJOR ROAD OF AN INTEGRATED TRANSPORT SYSTEM. THIS MEANS ALSO IT WILL BE A PRINCIPAL COMPONENT OF SPATIAL RESTRUCTURING AND, AN IMPORTANT REGULATOR OF RATIONAL LAND USE.	- THE BUS TERMINAL PROJECT, AMONG OTHERS, IS RELATED WITH THIS PROJECT IN TERMS OF THE PROVISION OF INTERMUNICIPAL BUS ROUTES. FOR OTHER LAND USE SUCH AS INDUSTRY AND COMMERCE IN THIS STUDY WILL BE DEPENDENT ON THE RIVERSIDE BYPASS PROJECT.
INFRASTRUCTURE	- FILLING WORKS OF LOWER LAND IS HELPFUL TO SAVE THE LAND FROM INUNDATION, BUT AS A WHOLE, IT WILL RAISE THE LOW DEVELOPMENT POTENTIAL OF THE BARRANQUILLITA AREA TOGETHER WITH THE PROVISION OF URBAN UTILITIES.	- INFRASTRUCTURE DEVELOPMENT IS THE VERY BASIS OF THE DEVELOPMENT AND WILL BE GIVEN PRIORITY OVER OTHER PLANNING ISSUES.	- ALL KINDS OF INFRASTRUCTURE ARRANGEMENT ARE REQUIRED FOR THE CONSTRUCTION OF THE BUS TERMINAL, THE REORGANIZATION OF THE PUBLIC MARKET, AND THE PROVISION OF THE URBAN PARK.

5-7-4. Stage 4: The south half of Calle 30 is widened and improved. At the same time, the block along Calle 30 will be commercially redeveloped, and the zone in between the bus terminal and the existing central district is made into commercial center.

Those four stages comprise the former half of the development, and the development area is approximately between Calle 30 and Calle 6. Most of the streets in this area are constructed in earlier stages,and Calle 6 become the major access route of buses to the terminal.

5-7-5. Stage 5: The beginning of the latter half of the development is the arrangement of the low-rise housing in the north part of the area, and of the recreational park along the Riverside Bypass. Most of the resident population will have settled in the area by this stage.

5-7-6. Stage 6: The industrial park is altered for higher level activities such as research facilities or others, and more housing and industrial development is promoted according to the demand.

5-7-7. Stage 7: As a concluding stage of the development, the Riverside Bypa s is constructed, and services the whole development area. The intermunicipal bus system benefits much from this road.

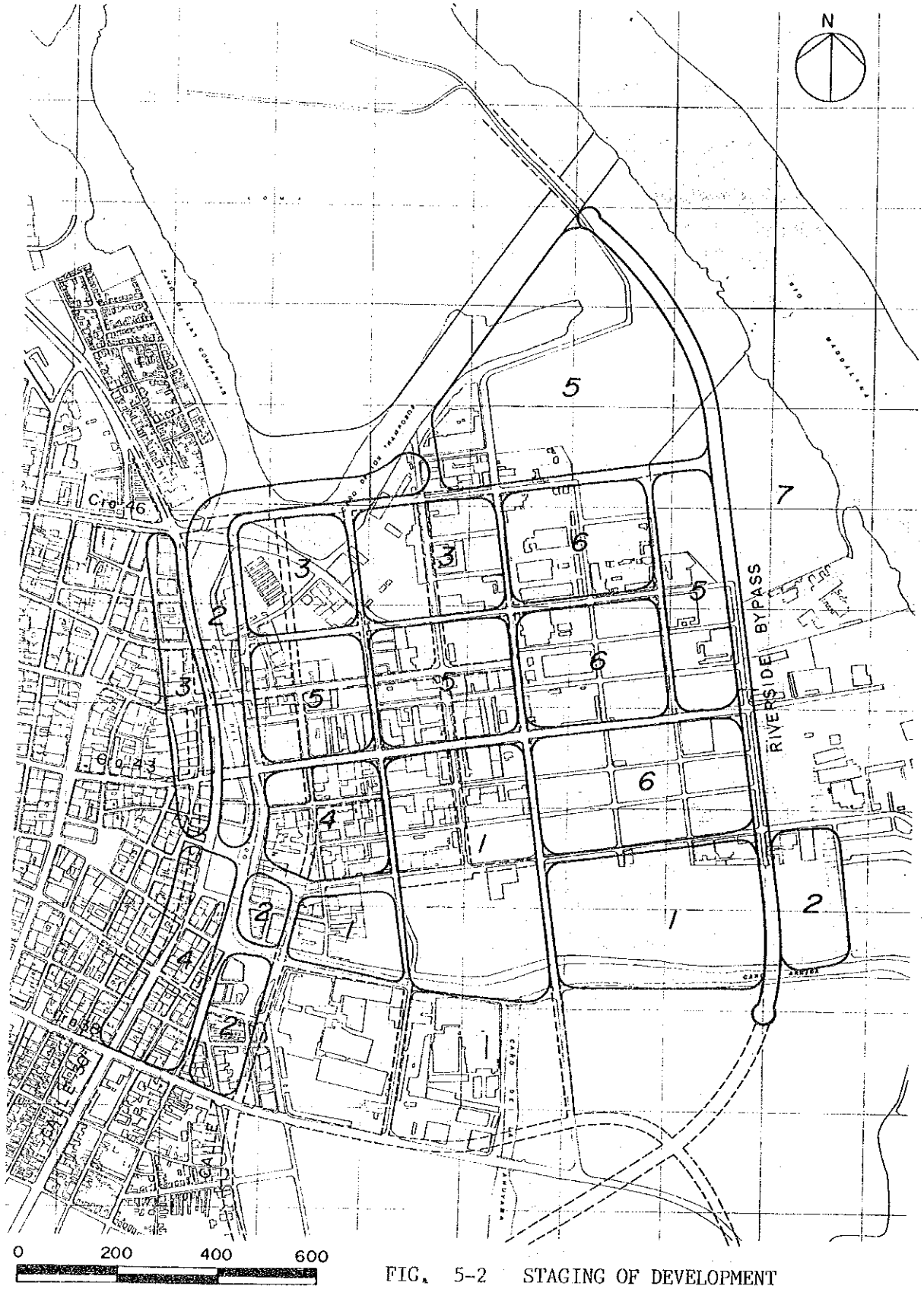


FIG. 5-2 STAGING OF DEVELOPMENT

Chapter 6

TRANSPORT DEMAND PROJECTION

6-1. General

6-1-1. Purpose of Review

Transport demand in the Barranquilla Metropolitan Region was forecasted in the Masterplan Study based on the person/trip survey conducted in 1983.

However, it is not appropriate to utilize it without review in this Feasibility Study stage, since;

a. The land use plan in the main study area has been revised in this Study.
b. The level of this Study requires a more detailed zoning system in the main study area.
c. The projection in the Masterplan Study did not explicitly include a study on pedestrian flow.

Hence, the transport demand projection is reviewed on the above aspects, and the result is to be used for the planning of road and street development, the bus terminal, and pedestrian facilities.

6-1-2. Estimation Procedure

The projection was made on the basis of the following planning conditions.

a. The projection year is assumed to be the year 2000.

b. The socio-economic framework of the Metropolitan Region for the year 2000 will be equivalent to the one employed in the Masterplan Study.

c. As for the framework of the main study area, it is presumably compatible with the revised land use plan.

d. The estimation model developed in the Masterplan Study will be employed wherever it is applicable.

The FIG. 6-1 is a flowchart indicating the steps taken for the review and revision of the projection during this Study.

Firstly, the person trips generated and attracted in the main study area are re-estimated in accordance with the new zoning system which divides and separates the zones in the main study area and increases the zones outside of Circunvalar.

Secondly, the O-D (origin-destination) table for the year 2000 prepared in the Masterplan Study is converted according to the new zoning system. All the elements of O-D table are replaced by the re-estimated person trips related to the main study area.

Finally, the O-D volume by each mode is assigned to the corresponding network.

6-1-3. Revised Zoning System

As stated above, the zoning system is revised to match the Study objectives; the Barranquillita and Boliche area is sub-divided (4 original zones are reconsidered as 10 new zones), and the areas outside of the Metropolitan Region are combined forming 10 new zones where there once were 31. As a result, the number of zones for vehicle traffic is reduced to 94 zones from 112 zones in the Masterplan Study.

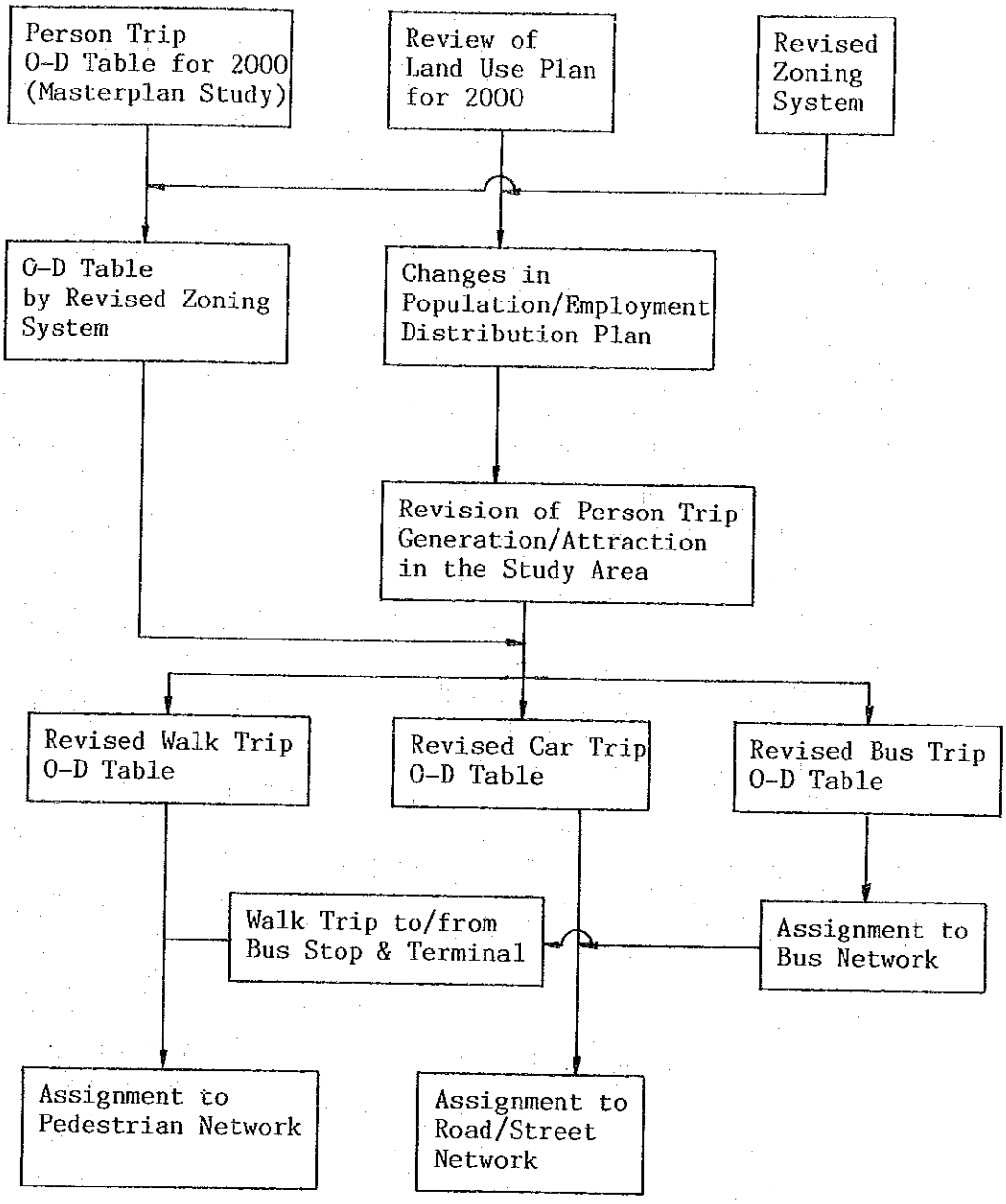


FIG. 6-1 PROCEDURE OF TRAFFIC PROJECTION

For pedestrians, further division of zones in the study area is required, since the trip length are much shorter compared with vehicular traffic.

The revised zoning system is shown in TABLE 6-1 and FIG. 6-2.

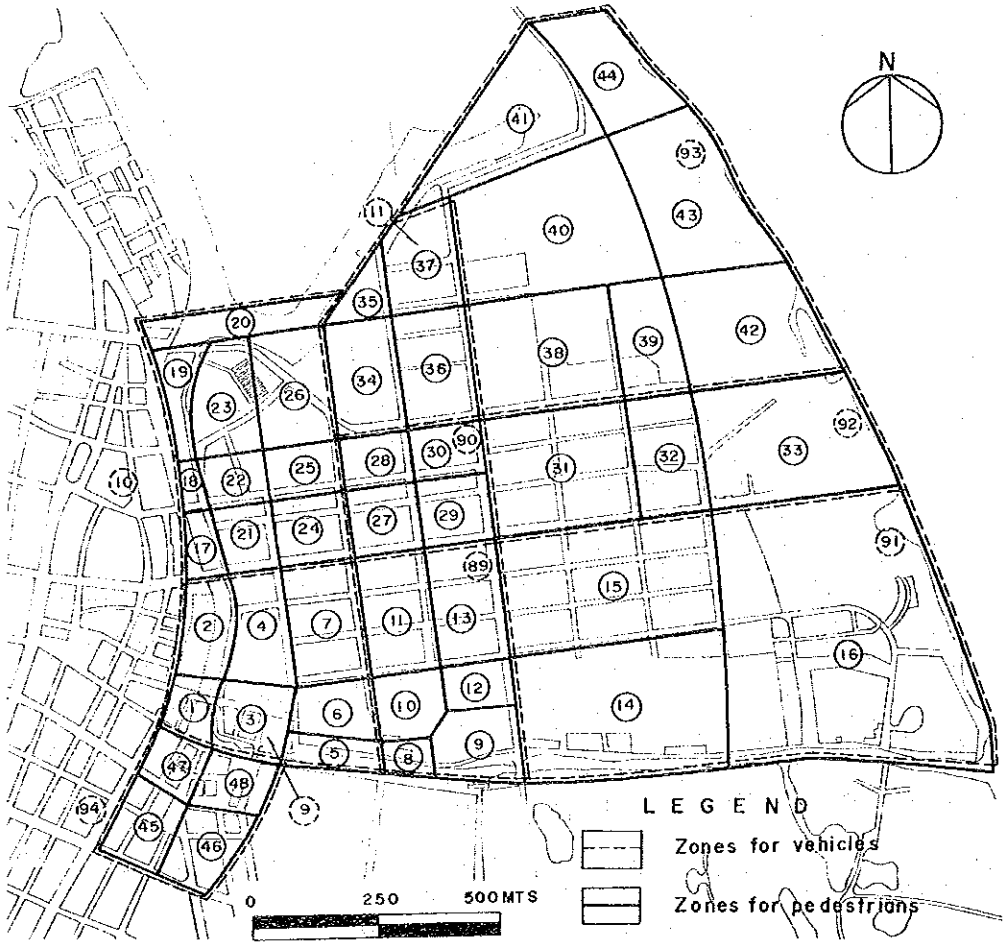


FIG. 6-2 ZONING FOR PEDESTRIAN

6-2. Vehicle Traffic

6-2-1. Trip Generation/Attraction in the Study Area

Based on the revised plan for population and employment distribution, the trip generation/attraction in the main study area is estimated as shown in FIG. 6-3.

TABLA 6-1 REVISED ZONNING SYSTEM FOR VEHICLE TRAFFIC

New Zone No.	Old Zone No.	Remarks	
9 89 91	9	Barraquillita	Main Study Area
10 90 92	10	Barranquillita	
11 93	11	Barranquillita	
94 19	19	Boliche Cerveceria Aguila	
80 81 82 83	82 83 84 85 91	Pto. Colombia Galapa Malambo Tubara Juan de Acosta	
84	86 90	Baranoa Sabanalarga	
85	87-89	Sabanagrande, Polonuevo Campo de la Cruz	
86	92-98 101-103 107-110	Magdalena Guajira, Cesar Santander, etc.	
87	99	Cartagena	
88	100, 111, 112 104-106	Bolivar, Surcre Antioquia	

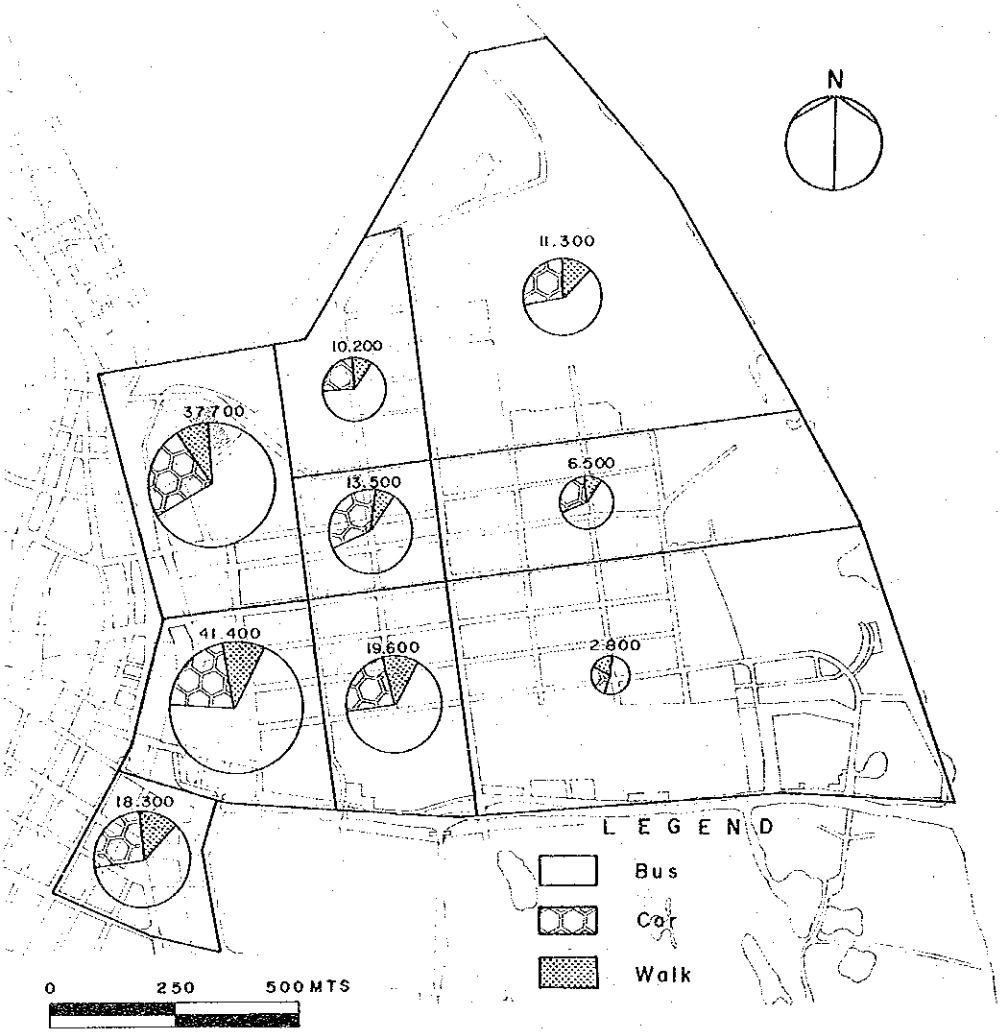


FIG. 6-3 PERSON TRIP GENERATION IN 2000

The total number of person trips generated/attracted in the main study area in the year 2000 is estimated to be 328,000 trip ends/day, which is about 1/3 of that in the central district. It is also noted that the zones characterized by commercial, business activities such as zone 9, 10, 89, 94 have a large number of generation/attraction.

The generation/attraction in zone 92, where the bus terminal is located, is considerably small, since the person trips are expressed in terms of linked trips.

6-2-2. Network for Assignment

1) Network for Private Car Use

The network for traffic assignment is prepared by modifying only the Barranquillita and Boliche part of the street network proposed in the Masterplan Study. FIG. 6-4 shows the network in the main study area.

This is based on the assumption that not only the streets in the main study area but all the proposed road projects should be completed by the year 2000. In other words, it implies that the road and street development in the Metropolitan Region might be carried out in accordance with the investment schedule shown in the Masterplan Study.
If the actual implementation does not follow the indicated schedule, a more unbalanced road system is expected.

2) Bus Network

As will be elaborated in FIG. 6-5, the network for bus traffic assignment is prepared as follows;

a. Intermunicipal buses come into Barranquilla through radial arterial streets up to the Inner Ring Road, then, using the Inner Ring Road and Riverside Bypass or Via 40, will reach the bus terminal located in Barranquillita.

b. As for urban buses, a circulation route is defined in Barranquillita; one is Cra 40 - Calle 9 - Cra 41 - Calle 8 - Cra 46 and the other is Cra 46 - Calle 6 - Cra 38.

The traffic volume on the Riverside Bypass ranges from 11,000 to 24,000 pcu/day. In the case of the Riverside Bypass, the left/right turn traffic is relatively small in the intermediate section when compared with those at the both ends.

The traffic related to Barranquillita is counted as about 20% of the total traffic at the most heavily travelled area of the Riverside Bypass, which shows the importance of it for the development of Barranquillita.

In addition, because a large amount of through traffic in the north-south direction is not related to the central district, the Riverside Bypass may also function as alternate route for avoiding it.

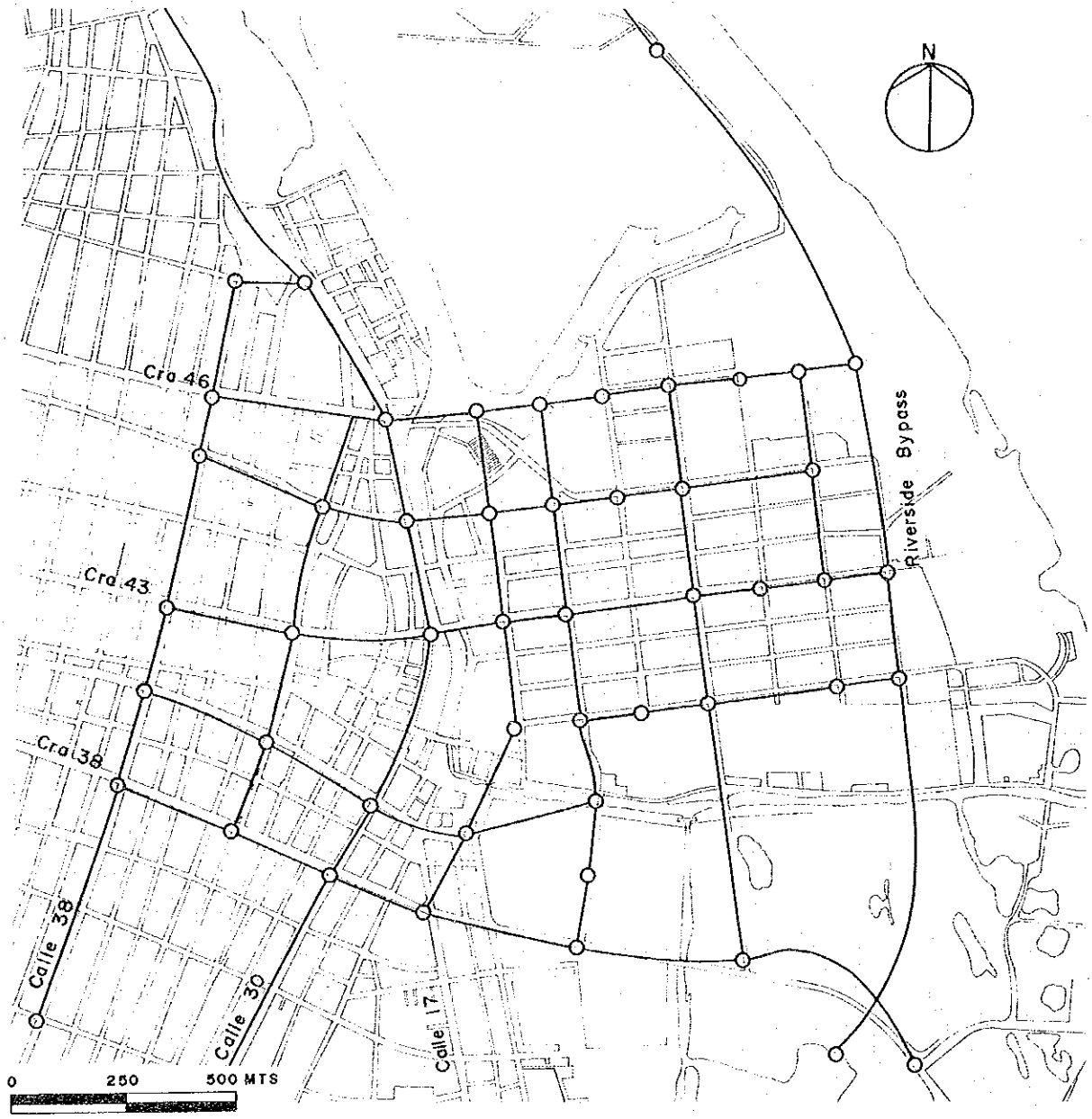


FIG. 6-4. ROAD NETWORK FOR TRAFFIC ASSIGNMENT

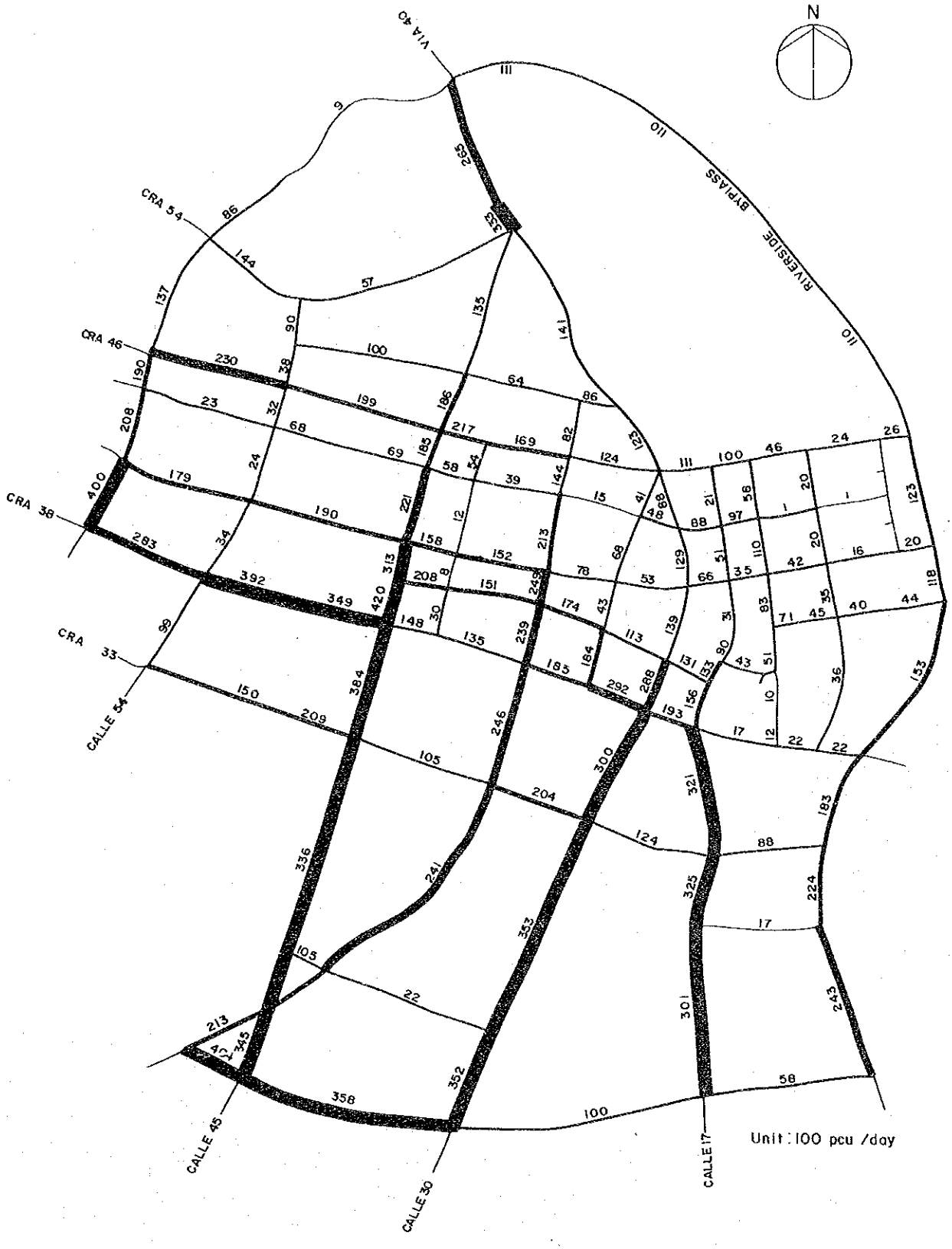


FIG. 6-5 TRAFFIC FLOW IN THE YEAR 2000

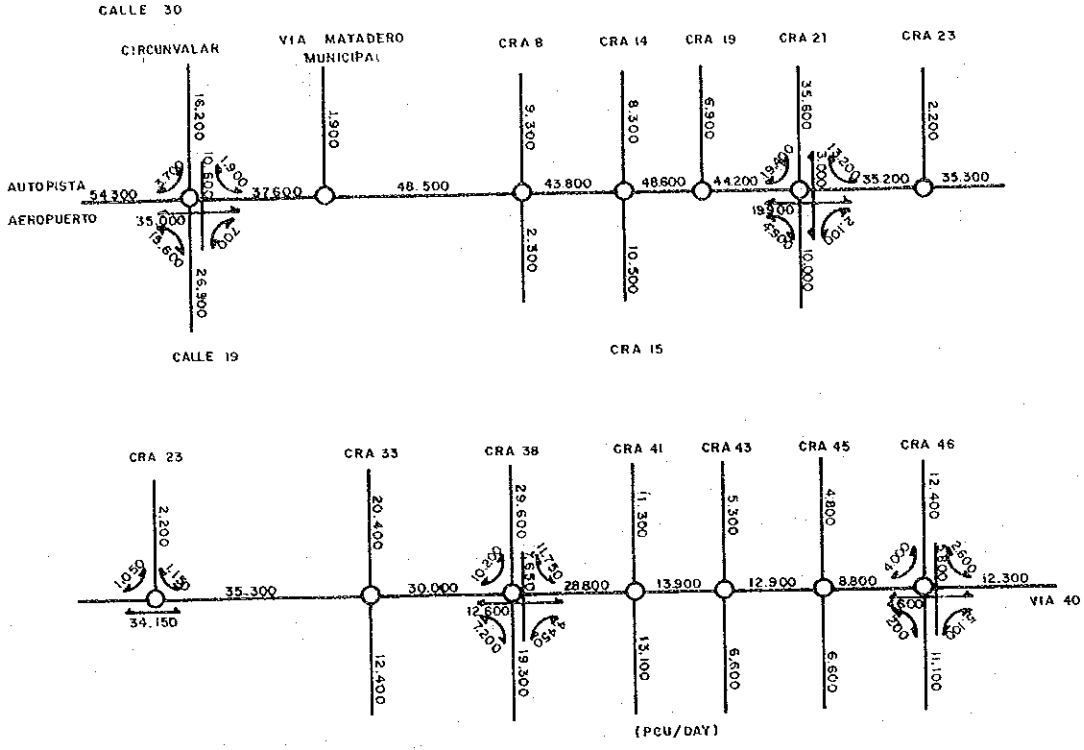


FIG. 6-6 TRAFFIC VOLUME ON CALLE 30 IN 2000

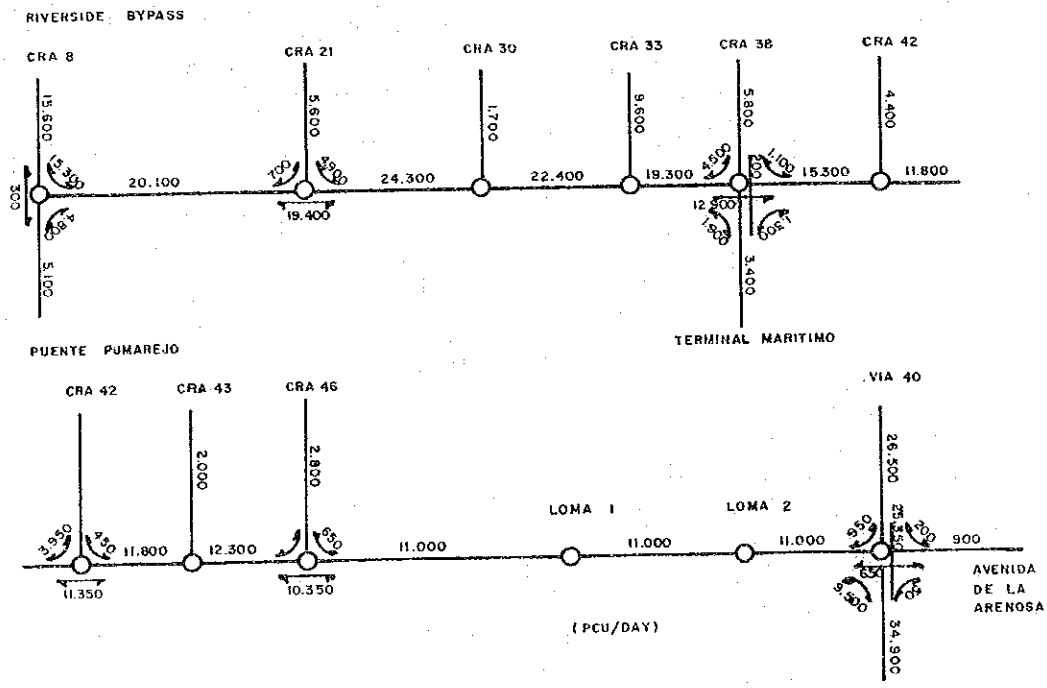


FIG. 6-7 TRAFFIC VOLUME ON RIVERSIDE BYPASS IN 2000

6-3. Pedestrian Trips

6-3-1. Estimation Method

Pedestrian trips are estimated by summing up the following types of pedestrians;

a. Walk trips included in the O-D Table for the year 2000.

b. Walk trips as an access to intermunicipal terminal.

c. Walk trips as an access to urban bus stops.

For estimating the first type of trips, the O-D Table is modified to take into account the pedestrian traffic to and from parks and greenery, since the trip attraction model cannot be applied for these facilities as it is expressed merely by zonal population or employment.

In dividing the O-D Table into small zones for pedestrians, unit trip generation rate by facility is employed, because trip generation may not be obtained without determining population and employment distribution among small zones. Unit trip generation rate by facility is estimated from the pedestrian survey shown in the TABLE 6-2.

For the second type of trips, only the O-D combination with walking as the means for accessing the intermunicipal bus terminal are picked up in accordance with the specifications in Chapter 8 (Bus Teminal).

The third type is identified as the walk trip from the zone center of each zone to the nearest urban bus stop. These stops are to be placed on the bus circulation route as mentioned above. The distance between neighboring bus stops is set as 50 to 150m.

These pedestrian trips are assigned on the minimum-time route of the pedestrian network.

TABLE 6-2 UNIT TRIP GENERATION RATE BY FACILITY

Facilities	Pedestrian Generation	Floor Area m2	Unit Generation Rate (person/m2 x day)
Civic Center	12,690	41,983	0.302
Business	54,060	147,516	0.366
Commercial	45,910	36,019	1,275
Industry	361	13,825	0.026
Urban Park	2,234	3,600	0.621

Source : Pedestrian Survey, Sept., 1986. JICA
Floor Area Survey, Oct., 1986. JICA

6-3-2. Network for Assignment

The network for pedestrian trips is formulated by adding several streets to the network. Those are Cra 44, Cra 42, Calle 7, Calle 28, etc.

6-3-3. Pedestrian Flow

The forecasted pedestrian flow is shown in FIG. 6-9. As seen, a large amount of pedestrian traffic is expected on the following streets:

a. Calle 28 (walks trips between commercial zones)
b. Carrera 42 (walks along commercial zone and to bus terminal)
c. Calle 7 (walks to bus terminal)
d. Carrera 44 (walks along commercial and business areas)
e. Carrera 45 (walks between bus stops)
f. Carrera 46 (walks between bus stops and residential area)

Among them, the pedestrian flow on Cra 46 are those between residence and urban bus stops. Therefore, the actual flow will not concentrate on this street but rather disperse to minor access streets.

As for the other streets, adequate pedestrian sidewalks should be developed.

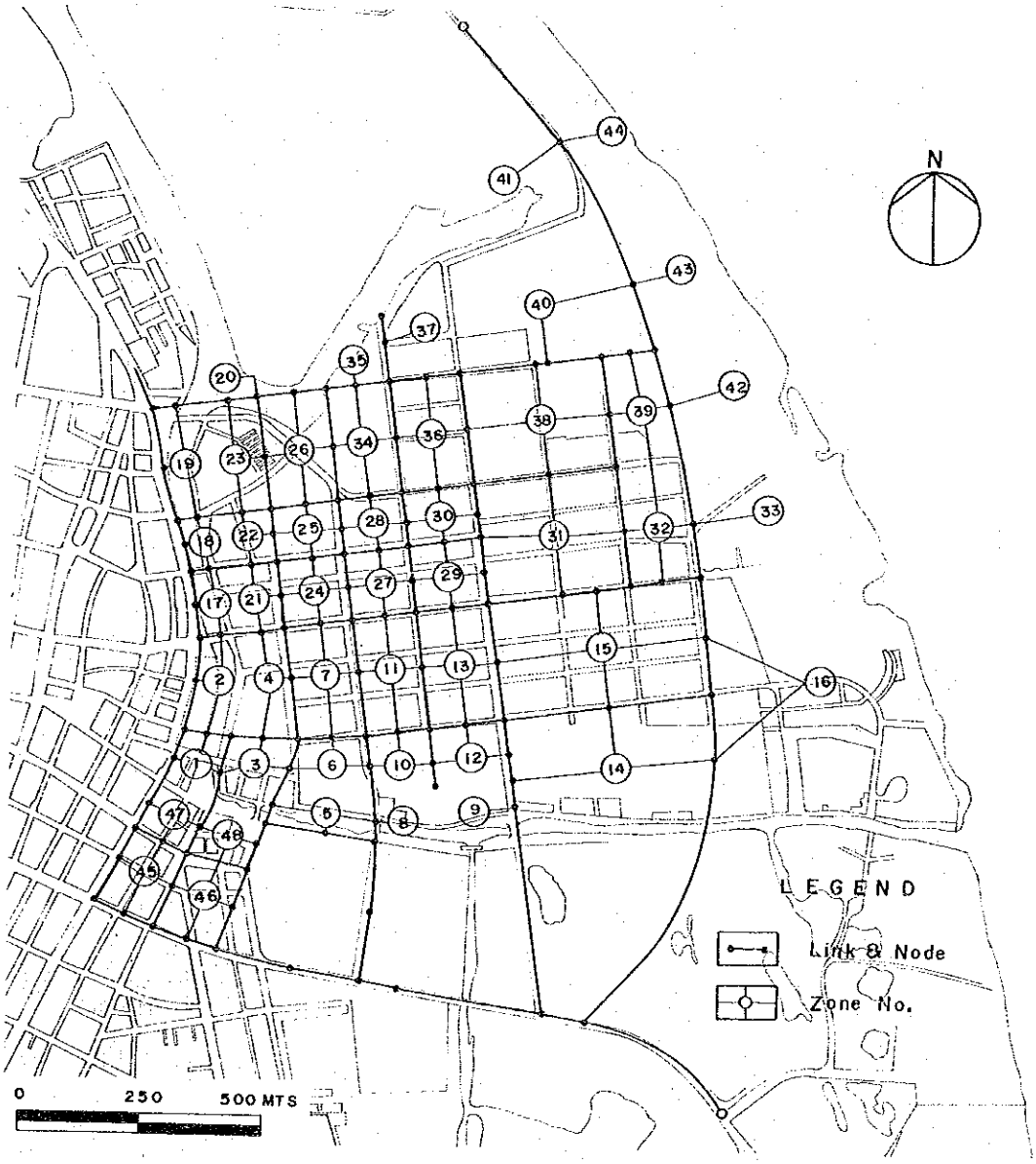


FIG. 6-8 NETWORK AND ZONE MODE FOR PEDESTRIAN TRAFFIC ASSIGNMENT

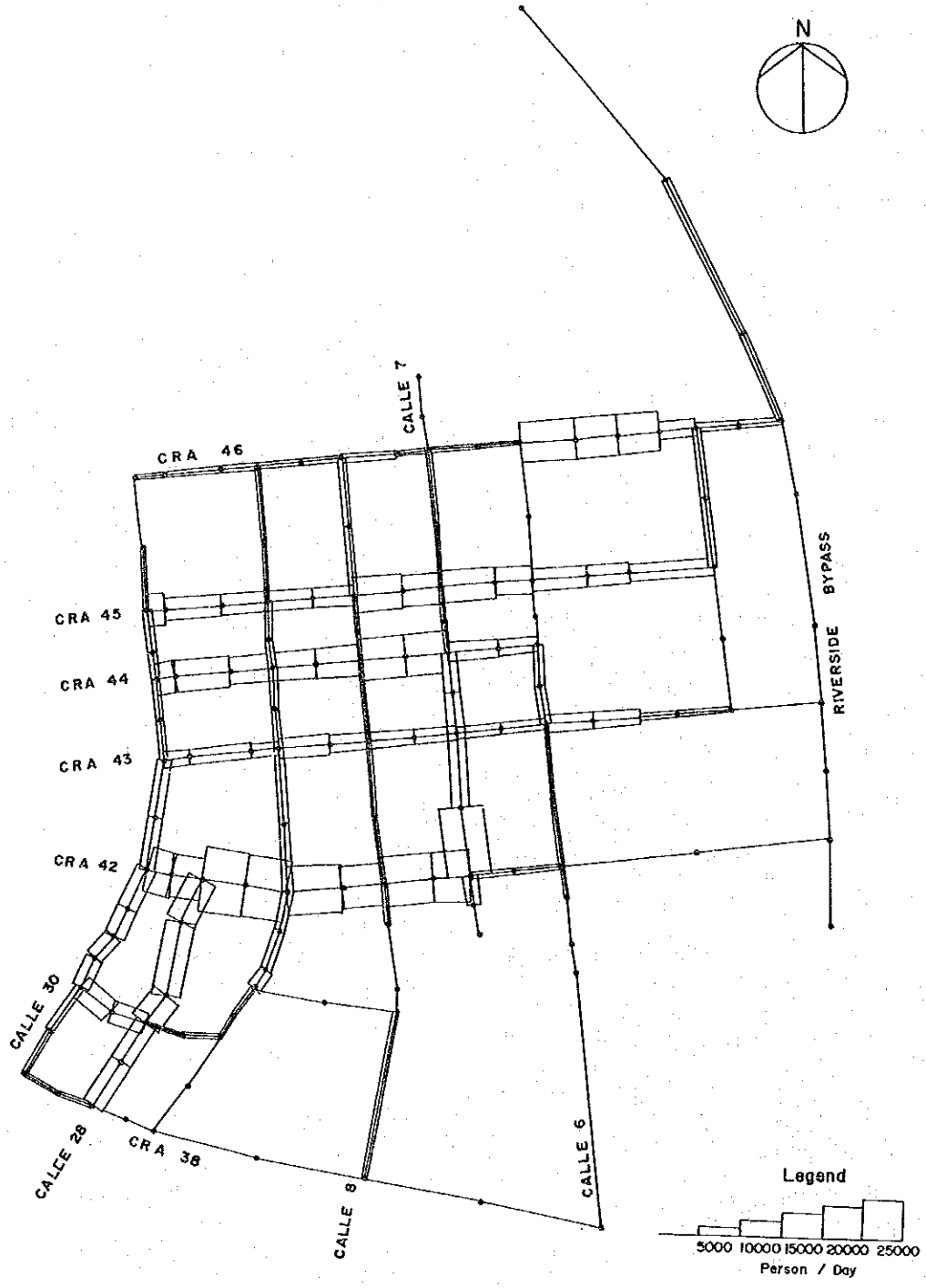


FIG. 6-9 PEDESTRIAN NETWORK

Chapter 7

ROADS AND STREETS

7-1. General

The roads to be studied in this chapter are Calle 30 and the Riverside Bypass which are the major north-south access routes to the Study area. On the other hand, the streets are those to be improved or constructed in the main study area excluding Calle 30 and the Riverside Bypass. The streets outside the main Study Area are presumably considered to be developed as proposed in the Masterplan Study. These roads and streets are illustrated in FIG. 7-1.

The Masterplan Study has given high priority to the road construction and/or improvement projects of Calle 30, Riverside Bypass, Via Central de Abastos and Via Soledad 2000. It has been proposed that these projects should be completed by 1990 to mitigate traffic congestion in the central district and to improve the north-south transport corridor of the Barranquilla Metropolitan Area.

Calle 30 and the Riverside Bypass are arterial roads connecting major traffic generation points in the future road network of Barranquilla. The improvement of Calle 30 and the creation of the Riverside Bypass are vital factors in the redevelopment of the central district. Therefore, these road development projects are considered separately as two of the six major projects proposed in the Study.

The street network plan in this Study is formulated by modifying the plan proposed in the Masterplan Study to make it compatible with the revised land use plan and major urban facilities development plans. For the purposes of this Study, the streets outside the main study area are considered to be developed as proposed in the Masterplan Study.

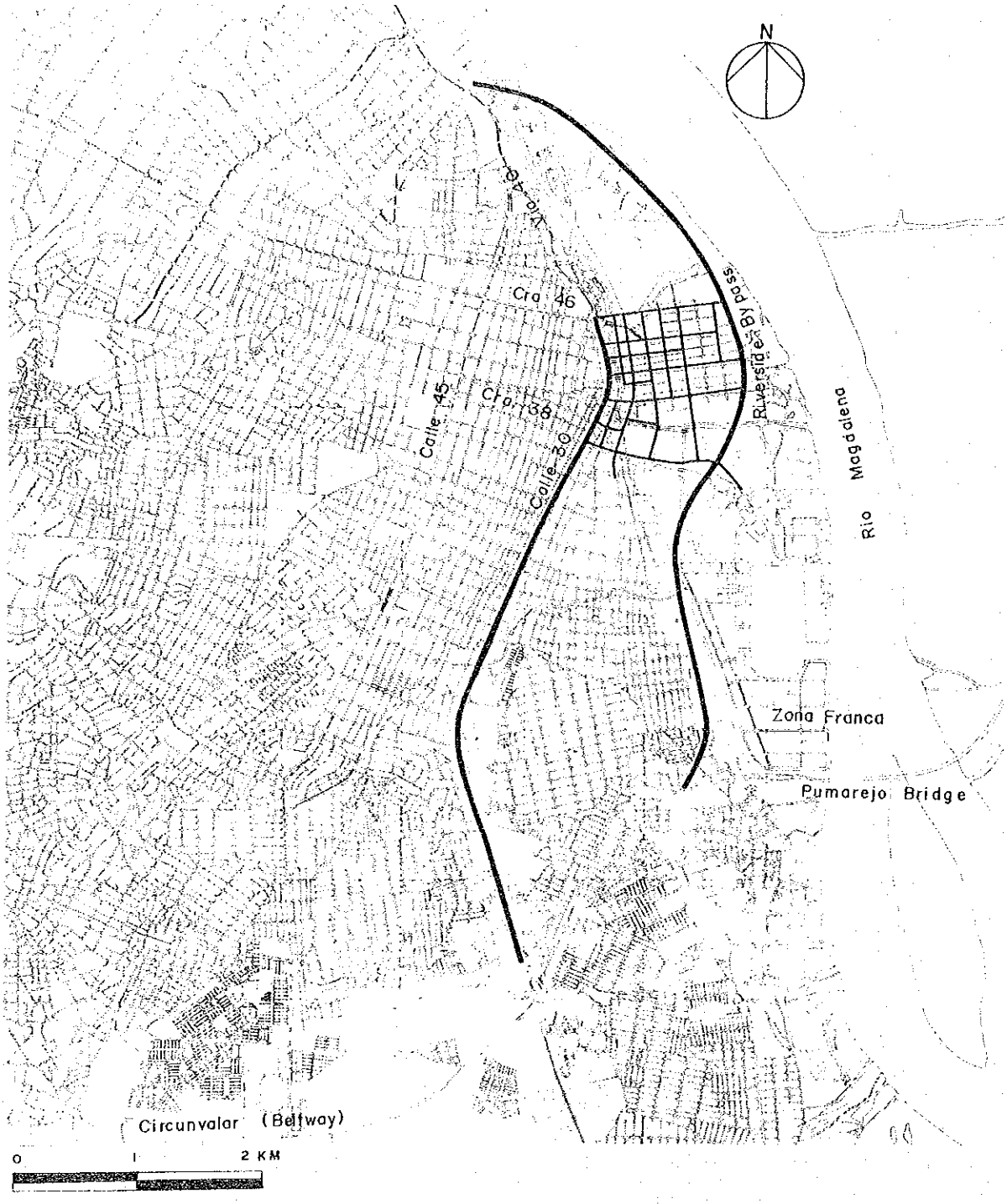


FIG. 7-1 ROADS AND STREETS

7-2. Calle 30

7-2-1. Existing Conditions

Calle 30 runs south to north from the Circunvalar interchange to its intersection with Cra 46, passing through El Limón, Los Trupillos, Montes, and the central district. The total distance is 5.90 km. The land on either side of Calle 30 is flat. However, Calle 30 runs parallel and close to the foot of a gentle hill to its west, and when the rains come, water flows down in its direction. The flow of drainage water is one of the existing conditions which becomes a planning factor. Additional planning factors are the widths of the road and land usages on each side of it. These existing conditions change on its route, therefore, for the planning and design of the road, Calle 30 is divided into three sections.

Section I (Cra 1F - Cra 21: 2.63 km)

The road in this section is of rural type with 4 lanes, a 4.0 m wide median and 2.5 m wide shoulders on the both sides. Sidewalks are not provided. The surface of the traffic lanes and shoulders is paved with asphalt concrete. The land use along this section is mainly industrial consisting of factories and warehouses. Five arroyos (water drainage routes) cross the road through culverts: Don Juan, Cra 4, Cra 4B, Cra 8 and Rebolo.

Section II (Cra 21 - Cra 38: 2.08 km)

The road is of urban type with 4 traffic lanes, a 2.0 m wide median, with 1.5 m wide shoulders and less than 3.0 m wide sidewalks. The pavement is cement concrete and the Arroyo Hospital crosses the surface of this section.

Several old and poorly maintained houses are located along the both sides of the road, and the major building use is wholesaler stores, factories and small stores. The control points of the improvement design are San Roque Church on the west side and Modern Football Stadium on the east side.

Section III (Cra 38 - Cra 46: 1.19 km)

This section runs through the central district, and the worst road conditions of Calle 30 are found here. This section can be observed according to the following subsections:

- Subsection between Cra 38 and Cra 41
  This subsection has neither a median nor shoulders. The part between Cra 38 and Cra 40 has a 20.0 m wide traffic lane and 3.0 to 3.5 m wide sidewalks on both sides. In the part between Cra 40 and Cra 41, the width of traffic lane is only 15.0 m. All along this section retail stores are located in poorly maintained buildings.

- Subsection between Cra 41 and Cra 42
  This subsection is the narrowest section of the road. It is only 8.0 m. wide between Cra 41 and Cra 42. In spite of its width here, the road is full of street vendors leaving space for only a single traffic lane.

- Subsection between Cra 42 and Cra 44
  This subsection has four traffic lanes but has no median. Two-story old and badly maintained buildings are located along the west side of the road, most of which are occupied by grain wholesalers. On the other side of the road is the Mercado Canal with its fully contaminated water. The space in between the canal and Calle 30 is filled with street vendors.

- Subsection between Cra 44 and Cra 46
  In this subsection, the road has six traffic lanes with a 4.0 m wide median. A shoulder of 7.5 m in width and the sidewalk of 3.0 m wide are

provided on both sides of the road. It is notable that the EPM buildings and the municipal prison are on the west side of the road.

7-2-2. Proposed Improvement

According to the Masterplan Study, the maximum traffic volume on the links of Calle 30 is estimated to be 48,600 pcu/day in the year 2000. On this basis, the improvement of Calle 30 is fundamentally to provide six lanes for traffic flow all through the road, and to up-grade it to meet the standards in terms of geometrical design, structure and materials.

In sections I and II, the major task is widening the road along the present alignment.

In section III, however, the alignment has two alternatives described as follows:

Alternative A : To trace the present alignment

Alternative B : To set a new alignment to the west of the present alignment

In the subsection between Cra 38 and Cra 42, building demolition is required no matter which alternative is chosen, since the present width of the road is not enough for 6-lanes of traffic flow. However, in the section between Cra 42 and Cra 46, the west side of the road is mostly occupied by poorly maintained low-rise buildings, and the east side is very close and open to the Mercado Canal.

Normally, the widening to the east (Alternative A) is easier, but in this Study Alternative B was selected taking into consideration the following:

a. The present alignment consists of several horizontal curves, and even if the improvement of the curves can be done, it is still questionable whether the curved arrangement is suitable as the arterial road

road in the central district.

b. The curved realignment is on the east side of the road. This reduces the land area of the proposed parks on the filled Mercado Canal.

c. The westside of the road is occupied by badly maintained buildings. Alternative A does not affect those buildings and they may stay as they are. On the other hand, Alternative B requires demolition of the buildings and land acquisition. Therefore, Alternatives B is a more expensive arrangement.

d. It is said that among those aged and poorly maintained buildings some are of historic value and are objects of conservation. However, the assesment of the value together with the general idea of areal conservation is still under study.

e. The Study is for the overall redevelopment of the central district, therefore, the selection of the alternatives has to be made not from the viewpoint of the improvement of an individual road alignment.

f. Thus, taking into account all those points, Alternative B was selected in the hope that the new alignment would be an incentive to the redevelopment of the westside of road.

7-2-3. Geometric Elements of Design

The following are the basic consideration in the decision of geometric design of Calle 30, and the general standards are of Colombia based on AASHTO (American Association of State Highway and Transportation Officials).

a. The road has 6 traffic lanes. This is based on the futuretraffic demand analyzed in the Masterplan Study.

b. The minimum median width is 3.0 m. This is to secure traffic safety as well as to leave room for the possible future installation of a transit system proposed by the Masterplan Study.

c. The sidewalk width is 3.0 m in the sections I and II, but in the section III it is 4.5 m due to a large number of pedestrians.

d. L-type gutter is installed as a drainage system inside the shoulder on the edge of sidewalk.

e. The downstream drainage facilities are planned from the terminal drain in the right-of-way of the road, although the cost is excluded in this Study.

The geometric elements of proposed Calle 30 are summarized in TABLE 7-1, and the typical cross section of sections I, II and III are illustrated in FIG. 7-2.

TABLE 7-1 GEOMETRIC ELEMENTS OF CALLE 30

Design Speed :	60 km
Traffic Lanes :	6
Lane Width :	3.25 m
Median :	3.0 - 4.0 m
Shoulder :	0.75 m
Sidewalk :	3.0 - 4.5 m
Horizontal curvature :	more than 500 m
Vertical grade :	max. 5.0%
Vertical curve length crest :	more than 140 m
Vertical curve length sag :	more than 100 m
Sight distance :	more than 75 m
Superelevation :	2.9% - 10% (max.)
Superelevation Runoff :	1/125

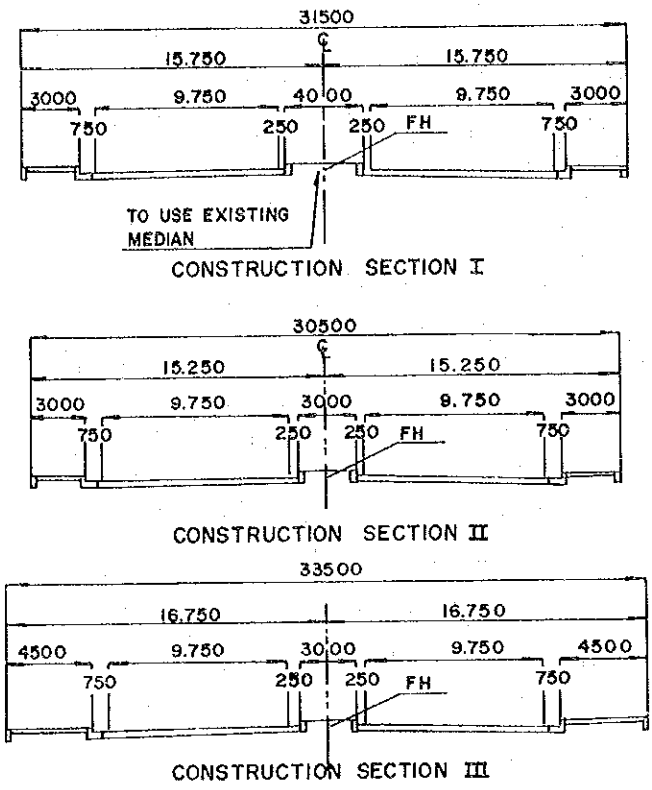


FIG. 7-2 CONSTRUCTION SECTION OF CALLE 30

7-2-4. Design

a. Section I

This section is provided enough space for widening of the road within the right-of-way. The road improvement is, therefore, only to expand the width to both sides based on the existing center line providing shoulder and sidewalk. The existing median is adopted intact except some portions such as improved curved sections and intersections. As a result, the right-of-way is 1.0 m wider than that of the section II. As for the horizontal alignment, a circle (radius R= 500 m) and a spiral transitional curve (parameter A= 250 m) are used between the section STA 1 + 814.00 and STA 2 + 264.50.

There are five arroyos crossing the road in this section. They are provided with box culvert.

b. Section II

Calle 30 is a urban type road in this section, but the existing width is notenough to meet the planned cross section of 6-lanes with a median, shoulder and sidewalk. Thus, the planned horizontal alignment is set to correspond wiht those conditions avoiding Lux Cola bottling factory, Modern Football Stadium and San Roque Church as the control points.

The downstream facilities of arroyo from the terminal drainage system are linked with existing Arroyo Rebolo and newly planned Arroyo Hospital route.

Arroyo Hospital is one of the critical points of Calle 30. In spite of its importance with a large amount of stornwater flow, Arroyo Hospital has no crossing facilities under Calle 30. Therefore, a water collector and a box culvert are planned as arroyo measure in Cra 35.

The pavement construction conditions in this section are as follows:

All the old median is removed. Existing concrete pavement is removed only partially where the proposed pavement hight is more than the existing pavement level. Exception is the case of overlaying asphalt concrete on the old one for the protection of new pavement against the effect of stagnant water. To prevent pavement cracks by reflectional actions, the sub-base of newly paved portion is of concrete just like the existing concrete pavement.

c. Section III

As this section is in the central district, the width of sidewalk is designed as 4.5 m considering a large number of pedestrians.

The horizontal alignment of the road is to introduce a straight line

as a north-south axis of the central district, connecting two points where Calle 30 in Section II intersects with Cra 38 and Via 40 with Cra 46. The 700 m radius curves are inserted as a transmission curve between center lines.

The proposed height of pavement is in accordance with the level of land preparation of the Study.
All of pavement in this section is of asphalt concrete.

All the downstream terminal of the pavement drainage system joins with the drainage system in the central district related with the land preparation plan in the Study. A part of drainage system of Calle 30 is connected with the proposed box culvert for Arroyo La Paz.

7-3. Riverside Bypass

7-3-1. Existing Conditions

The Riverside Bypass starts from the access road to Pumarejo bridge and reaches Via 40 passing through the westside of the Ahuyama Canal, Barranquillita, Loma I, and Loma II. Along the route, there are lower-class houses, a large swamp used as a timber yard, a large sawmill, the national stockbreeding institute, a local broadcasting station, an asbestos factory for construction materials. Zona Franca is located on the opposite side of the Ahuyama Canal.

The geographical condition of these areas are mostly flat and canals are well developed such as Ahuyama, Arriba, Los Tramposos and Las Compañias B and C.
Geologically, these areas are composed mainly of sandy soil. However, 1.0 to 4.0 m thick soft soil of organic materials stays under 5.0 to 6.0 m thick well-compacted surface soil.

7-3-2. Proposed Idea of Route Alignment

The alignment of the Riverside Bypass is to meet the basic requirement as a bypass to mitigate the future through traffic volume in the central district. Moreover, it is expected that the new construction of the Riverside Bypass will contribute to future industrial development of the city as it pass through and connect the major industrial zones of the city: Zona Franca, the Port and the factories located in the north part of the city along Via 40.

In this regard, two alternatives are worked out and studied:

Alternative A : The alignment is in accordance with the proposed network in the Masterplan Study. The road runs along the west bank of Ahuyama Canal, beside the large swamp and a large sawmill.
Many curves are introduced to keep away from those control points, and the intersection with Cra 38 requires some device to avoid acute angle crosisng.

Alternative B : The route is straight line in the horizontal alignment from the point near the access road to Pumarejo bridge to Calle 3 in Barranquillita. This passes through Zona Franca and the entrance of the Port. The structure in those areas is a viaduct and a trampet type interchange is planned for access to those areas.

The comparative study of these alternatives revealed the following:

a. Functionally, Alternative B is preferable because its straight alignment meets the basic requirement as a bypass.
b. Alternative B can be an incentive to presently stagnant port activities and Zona Franca providing better access to the north industrial zone and to Pumarejo bridge.

c. On the other hand, there is some institutional difficulties to pass through Zona Franca as it has to be an independent and separate zone.
d. The preliminary cost comparison of those alternatives shows that the cost of Alternative B is several times higher than that of Alternative B.

Considering the feasibility of the Riverside Bypass and its earlier implementation, Alternative A is the final selection for this Stusdy.

7-3-3. Geometric Elements of Design

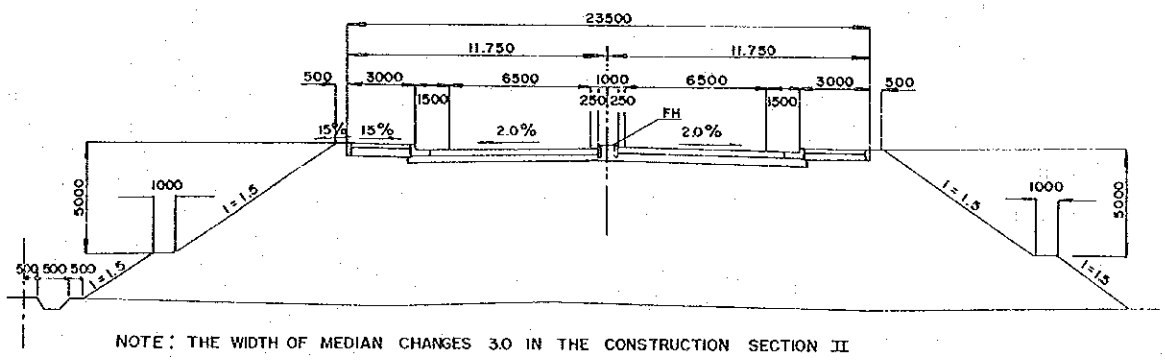
The characteristics of geometric elements are described below, and the general standards are the same as Calle 30.

a. The width of a traffic lane is 3.25 m provided the design speed is 60 km/h.
b. The number of traffic lane is 4 lanes.
c. The width of median is 1.0 m for sections I and III where there is no main intersection with channelization, while 3.0 m for Section II where left-turn lanes are set at main intersections.
d. The width of shoulder is 1.5 m outside of traffic lane to prevent the decrease of road capacity.
e. The sidewalk width is 3.0 m for the both side of the road except the section between Diagonal 5 and Cra 30.
f. The side-strip is 0.25 m for the both side of the median and 0.5 m for the outside of the traffic lanes.
g. The proposed hight of the road is higher than 1.8 m ; the high water level of the Magdalena river.
h. The vertical clearence between the high water level and the bottom of beams for each bridge is the same or higher than the existing clearence. The clearence of the Tramposos bridge is 5.0 m, while that of the Compañias bridge 13.0 m.
i. The embankment slope 1:1.5. To prevent erosion by rain water, all of embankment slope is covered by pass.

The summary of geometric elements is shown in TABLE 7-2, and the typical cross section is illustrated in FIG. 7-3.

TABLE 7-2 GEOMETRIC ELEMENTS OF RIVERSIDE BYPASS

Design Speed :	60 km
Traffic Lanes :	4
Lane Width :	3.25 m
Median :	1.0 - 3.0 m
Shoulder :	1.5 m
Sidewalk :	3.0 m
Horizontal curvature :	more than 500 m
Vertical grade :	max. 5.0%
Vertical curve length crest :	more than 140 m
Vertical curve length sag :	more than 100 m
Sight distance :	more than 75 m
Superelevation :	2.0% - 10% (max.)
Superelevation Runoff :	1/125



NOTE: THE WIDTH OF MEDIAN CHANGES 3.0 IN THE CONSTRUCTION SECTION II

FIG. 7-3 CONSTRUCTION SECTION OF RIVERSIDE BYPASS

7-3-4. Design

To facilitate the planning and design of the road, it is divided into three sections.

a. Section I (Access road to Pumarejo bridge - Cra 38: 3.08 km)
The horizontal alignment is layed by a reversed curve and a spiral transition curve (parameter A= 240 m) at the crossings of Ahuyama Canal and Cra 38. As a result of this arrangement, a part of existing Cra 38 alignment has to be changed due to undesirable acute intersection of the both roads.

The major structures in this section are;4.0 m long RC bridge for Arroyo Rebolo, 91.0 m long PC skew bridge for Ahuyama Canal and six box culverts for Arroyo La Chinita, Arroyo Nieves, Cra 17B, Cra 20, Cra 30 and Cra 32.

b. Section II (Cra 38 - Cra 46: 1.45 km)
The intersections wiht Cra 38, Cra 42, Cra 43 and Cra 46 are important east-west access points to Barranquillita and the central district.
Since Cra 43 is supposed to be major intermunicipal bus routes, the intersection with Cra 43 is provided with left-turn lane within the median of 3.0 m.

The formation hight of the bypass is in harmony with the proposed land preparation hight, and the boundary between the bypass and land preparation is located at the outer edge of the sidewalk.

The only main structure in this section is the Arriba Canal PC bridge.

c. Section III (Cra 46 - Via 40: 2.83 km)
In thissection the alignment of the Riverside Bypass passes through Loma I and II which consist of sandbank. The ground level is mostly

flat and in some parts, especially when crossing canals Los Tramposos, Las Compañias B and C, the area is swampy and/or of soft ground.

The vertical alignment is affected by the required clearence for navigation at canals. The horizontal alignment has large curves for smooth vehicle rolling. The end of the bypass alignment connects with the point near the intersection of Via 40 and Calle 58.It isdifficult to connect directly to Calle 58 due to the location of the navy base.

7-4. Bridge and Structure

7-4-1. General Conditions

a. Location of Structures

The selection of favorable location of streem and canal crossings is decided by closer site investigations along the porposed Riverside Bypass alignment.

b. Hydrologic Conditions

The capacity of waterway openings should be large enough to avoid floods which may cause serious damage to property in adjoining areas or loss of costly structures. Therefore, an adequate waterway opening for each arroyo is determined for the design of the structure, and is shown in TABLE 7-3.

The maximum high water level is set up at 1.8 m in accordance with the record in 1973 at the Terminal Maritimo station.

c. Soil Condition

Boring test data for structure design along the Riverside Bypass are obtained from the report "Estudios de Prefactibilidad del Control de Caños de Barranquilla" (August 1971, MOPT). Those data show that there is a hard coral stratum at 6 to 10 m underground level, so that pile foundation has to be applied to each bridge structure.

TABLE 7-3 REQUIRED WATERWAY OPENING EACH ARROYO

Arroyo	A (ha)	L (km)	Vi (m/s)	V1	T2	T	I (mm/h)	Q (m^3/s)	V2 (m/s)	QA (m^2)
La Chinita(Cra8)	350	4.2	4	5	18	23	122	83	6	13.8
Las Nieves(Cra15)	210	3.0	4	5	13	18	130	53		8.8
Cra 17 B	60	1.8	4	5	8	13	138	16		2.7
Cra 20	60	1.8	4	5	8	13	138	16		2.7
Cra 30	10	1.0	4	5	4	9	144	3		0.5
Cra 32	14	1.0	4	5	4	9	144	4		0.7
Rebolo	675	5.5	4	5	23	28	166	152		25.3
Hospital	310	4.5	4	5	19	24	121	73		17.2

Where A : Rainfall Area
L : Length of flow
V1: Velocity of flow (average)
T1: Rainfall period
T2: Rainfall detension period
I : Rainfall Intensity
Q : Volume of flow
V2: Velocity of flow at construction site
OA: Required opening area

$Q = 1/360 \times C \times I \times A$

$I = 91 \times 10^3/(t + 100)1.375$ (for 10years)

$C = 0.7$

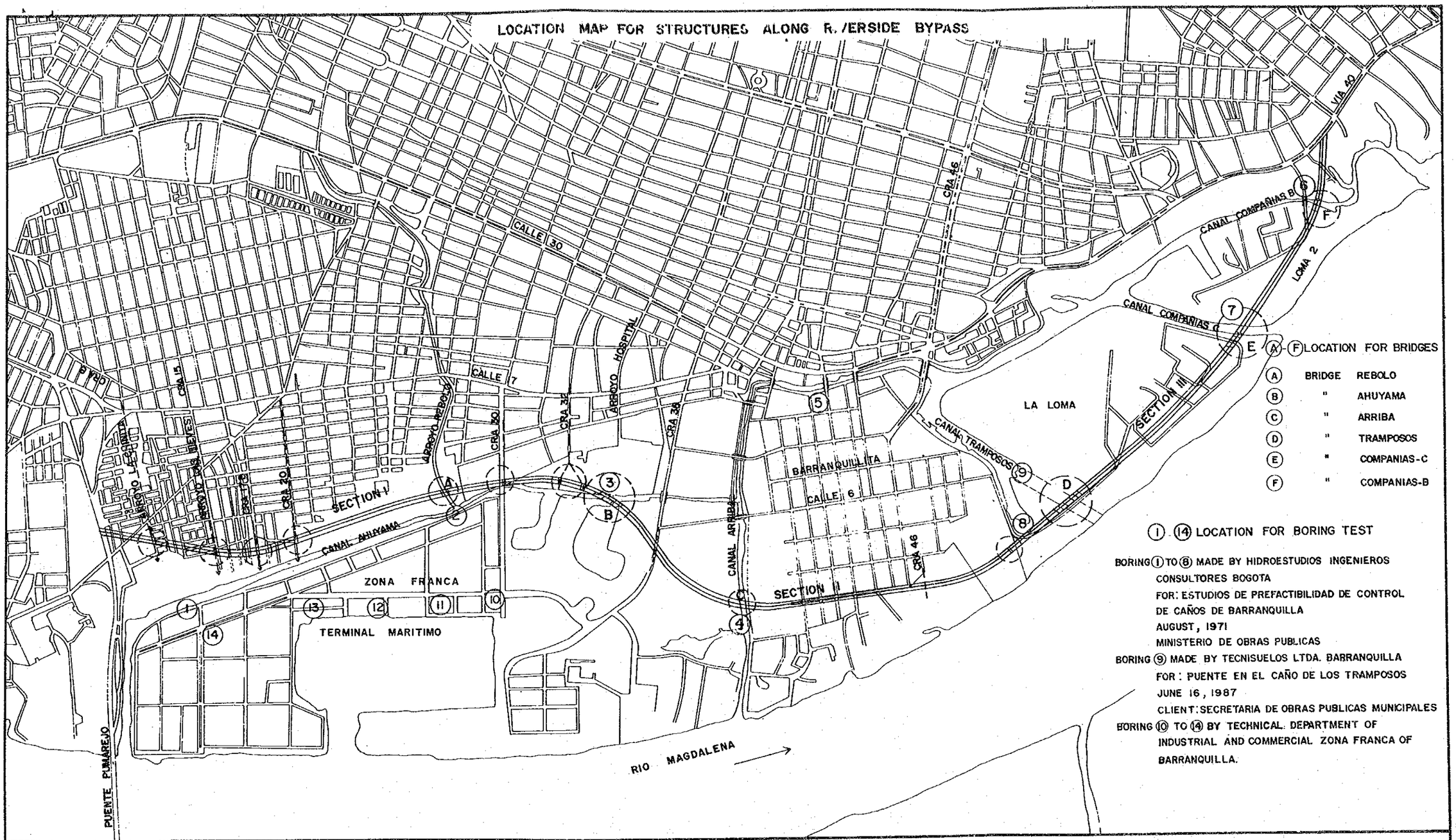


FIG. 7-4 STRUCTURES ALONG RIVERSIDE BYPASS

d. Navigational Clearence and Width

According to INTENDENCIA FLUVIAL DEL RIO MAGDALENA (MOPT), the Compañias Canal will be used a navigable waterway and a river port for boats to and from the Magdalena River. The authorities set up the required navigational clearence and width of the Tramposos Canal and of the Compañias Canal, which are shown in FIG.

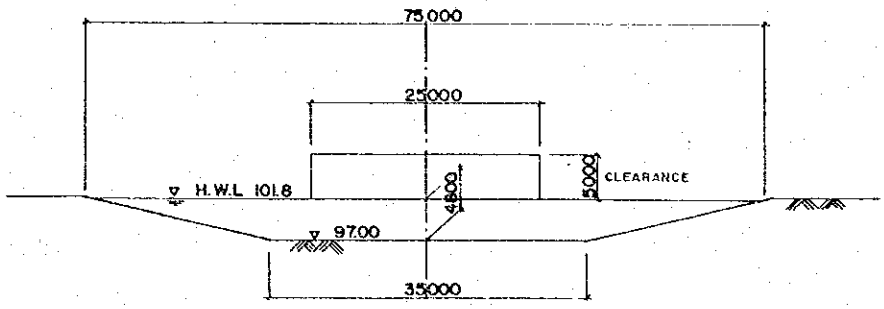


FIG. 7-5 REQUIRED CLEARENCE FOR TRAMPOSOS CANAL BRIDGE

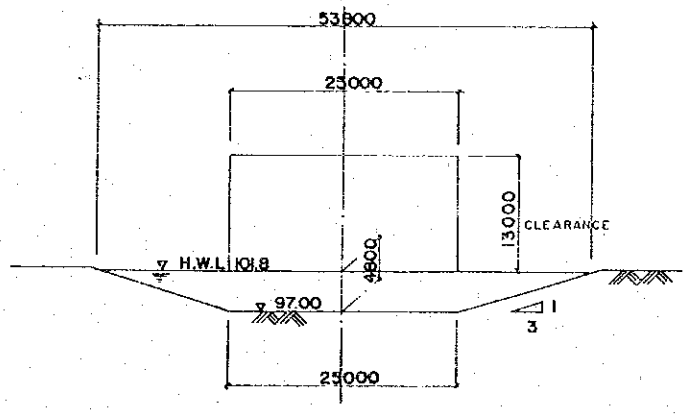


FIG. 7-6 REQUIRED CLEARENCE FOR COMPAÑIAS CANAL BRIDGE

7-4-2. Standard Design of Structure

Several standard design structures are applied to the structural planning of this Study. Some of them are designed by MOPT, and others are from preliminary design studies. With rough cost estimation for bridges of which center span less than 40 m, cost of steel bridges are more than two times than cost of prestressed concrete bridges in Colombia.
From the reason above steel bridges are out of consideration for the planning in this Study.
The loading condition for each structure is in accordance with Hs-20-44 of AASHTO.

a. Prestressed Concrete "I" Girder Superstructure (P.C.I.G.)
Prestressed concrete bridges are used for those bridges requiring over 25.0 m of center span, and those center span length of 27.0 m, 30.0 m, 35.0 m and 40.0 m are standarized.

b. Reinforced Concrete Deck Girder (R.C.D.G.)
This is applied to those bridges with span length from 10.0 m to 22.0 m in accordance with the standard design of MOPT.

c. Substructure
The quantity of bridge substructures are worked out on the basis of preliminary design layout of each bridge proposed in the Study.

d. Box Culvert
Box culverts used in the Study are in accordance with the design by MOPT. Three types of box culverts are applied to each arroyo crossing.

7-4-3. Construction Material

Concrete, reinforcement bar and PC cable are mainly used for planning of structure.

Specifications of each materials are as follows:

a. Concrete Strength

P.C.I.G. Superstructure	350 kg/cm^2 at 28 days
R.C.D.G. Superstructure	210 kg/cm^2 at 28 days
Substructure	210 kg/cm^2 at 28 days

b. Reinforcement Bar

Yield point stress	Fy = 3000 kg/cm^2

c. PC Cable Fy = 8000 kg/cm^2

7-4-4. Construction Method for Superstructure

R.C.D.G. are assumed to be constructed by all staging method for which support are used during the construction. Election girder construction method are hypothesize to set PC girder at the site.

7-4-5. Structure for Each Site

Structures along river side bypass are planned as shown in TABLE 7-4.

TABLE 7-4 STRUCTURES ALONG RIVERSIDE BYPASS

Section	Site	Type of structure	Dimension (m)
	Arroyo La Chinita	Box culvert	4.0x3.0x2x28.3
	Arroyo Las Nieves	"	3.0x2.0x2x22.8
	Arroyo Cra 17B	"	3.0x2.0x2x21.4
	Arroyo Cra 20	"	3.0x2.0x2x21.4
I	Arroyo Rebolo	R.C.D.G.	21.0 x 21.6
	Arroyo Cra 30	Box culvert	3.0x2.0x2x55.0
	Arroyo Cra 32	"	3.0x2.0x2x24.9
	Canal Ahuyama	P.C.I.G.	(30.7x3) x 24.5
II	Canal Arriba	P.C.I.G.	27.7 x 24.5
	STA 8 + 20	Box culvert	4.0x3.0x2x24.9
	Canal Tramposos	R.C.D.G.+P.C.I.G	(21.0x4+35.8)x24.5
III	Canal Compañias C	R.C.D.G.+P.C.I.G	(21.0x6+40.8)x24.5
	Canal Compañias B	R.C.D.G.	(22.0x3) x 24.5

7-5. Streets

7-5-1. Street Network

The concept of street development plan in the main study area is shown in FIG. 7-7. The network shows a grid pattern with two main axes in each direction.

The classification of streets is made by considering the following functions and characteristcs.

a. Connection between the study area and other areas.
b. Land use of the area along the street.
c. Composition rate of heavy vehicles.
d. Pedestrian volume.

As a result, the streets in the main study area are classified as;

a. Arterial street (excluding Calle 30, Riverside Bypass)
Cra 46, Cra 38

b. Semi-arterial street
Calle 17, Calle 19, Cra 43

c. Collector
Cra 40, Cra 41, Cra 42
Cra 45, Cra 50, Cra 42D
Calle 4, Calle 6, Calle 8, Calle 10

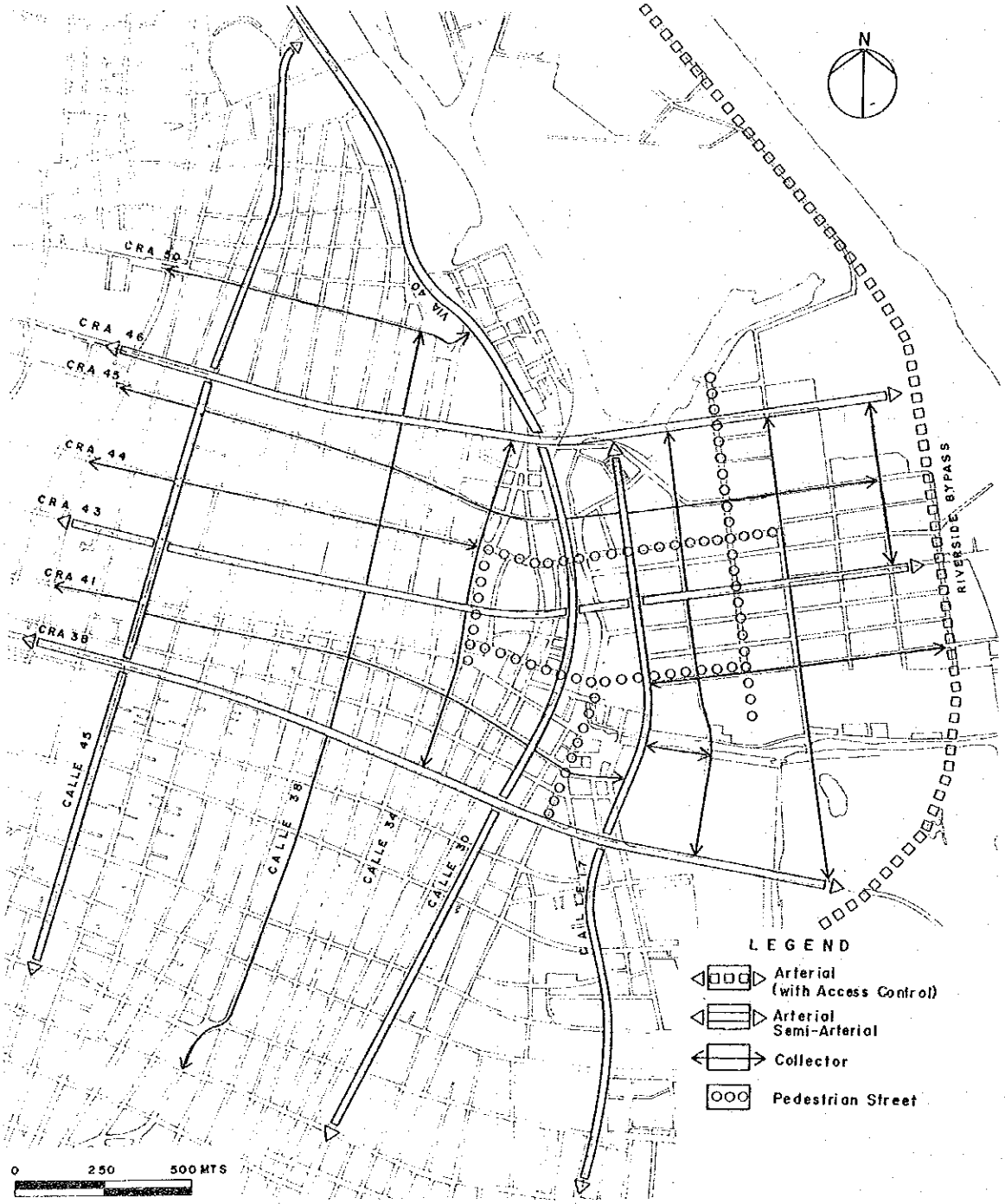


FIG. 7-7 CONCEPT FO STREET NETWORK

FIG. 7-8 STREET NETWORK PLAN

2) Typical Cross Section of Streets

Typical cross section of each street is determined by taking into account the future traffic volume and the functions expected.
The level of service is planned to be the level A or B defined in the Highway Capacity Mannual, where v/c ratio is less than 0.7

FIG. 7-9 and 7-10 show the typical cross sections of planning streets.

a. For Cra 46, Cra 45, Calle 8, Calle 6, the number of lanes can be reduced to 2 lanes, according to the level of service.
However, they are planned as a 4 lane street, considering the traffic management aspect, because they constitute the circulation route of urban buses in Barranquillita.

b. Cra 42 is determined as a 2 lane street, taking into account the higher priority to the pedestrian for shopping at the roadside rather than the services for vehicle traffic. Hence, a wide space of 7.5m in width is provided in both directions for pedestrian use.

c. As for exclusive pedestrian streets such as Cra 44, Calle 7, Calle 28, etc., the minimum pedestrian width required for the level of service A in H.C.M. is estimated to be 4.0m by calculating v/c ratio. Taking the side clearance of 1.5m at the both sides additionally, the minimum width in one direction is obtained as 7.0m.
Further more, a belt of roadside trees in 3.0m width is provided at the both sides.

As shown in TABLE 7-5 the pedestrian v/c ratio is found to be less than 0.6 at all the pedestrian streets.

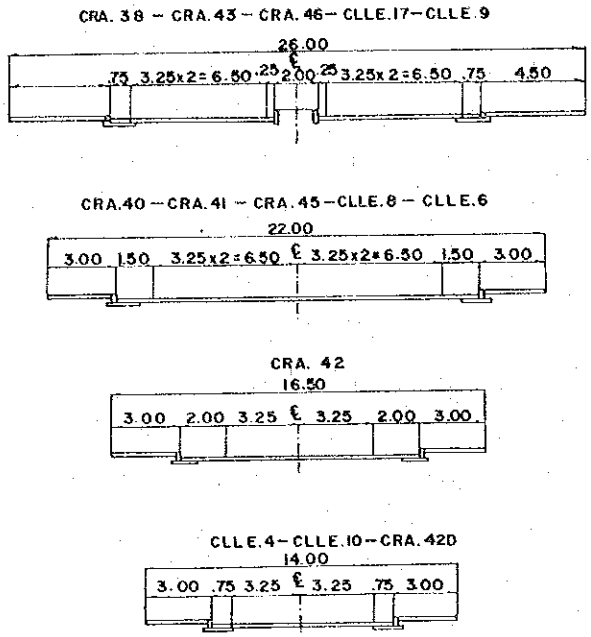


FIG. 7-9 TYPICAL CROSS SECTION OF PLANNING STREET

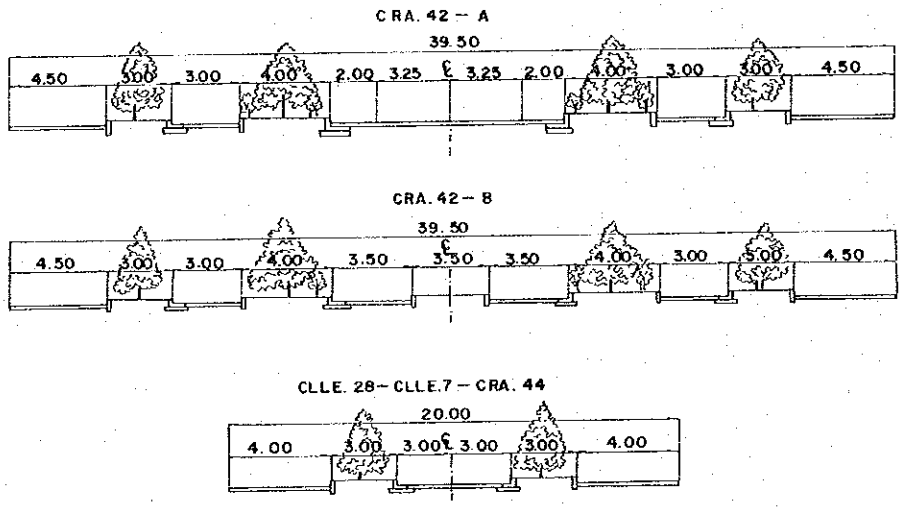


FIG. 7-10 TYPICAL CROSS SECTION OF PEDESTRIAN STREET

TABLE 7-5. PEDESTRIAN VOLUME AND CAPACITY ON PEDESTRIAN STREETS

Street	Land Use Along Street	Peak Hour Volume	Capacity (person/hr)	v/c
Cra 42	Commerce	4,840	9,300	0.52
Cra 44	Business	3,100	8,000	0.39
Calle 28	Commerce	2,400	5,250	0.46
Calle 7	Terminal & Mixed	3,240	8,000	0.40

Note: Peak rate: 20%
Directional Coefficient: 0.6
Capacity = 3,600 x k x s x w

where k (density): 0.3 person/m^2
s (speed) : 1.08 m/sec (shopping)
1.65 m/sec (business)
w (width for pedestrians) in meter.

7-5-3. Incidental Facilities

1) Parking Facilities

In accordance with the urban development in Barranquillita and Boliche, car parking facilities also should be developed.
Car parking demand is estimated by using the following formula.

$$Qto = \int A(t) \times p(to - t)\, dt$$

Where Qto :Number of parking vehicles at time to
A(t) :Vehicle attraction at time t
p(to - t):Possibility of parking duration longer than (to - t)
p(0) = 1

A(t) and p(t) change from time to time during a day, and their variation patterns depend on the characteristics of socio-economic activities in the surrounding area of the corresponding parking lot.

As an example, the hourly variation patterns of A(t) and p(t) in a business area are shown in FIG. 7-11 and FIG. 7-12.

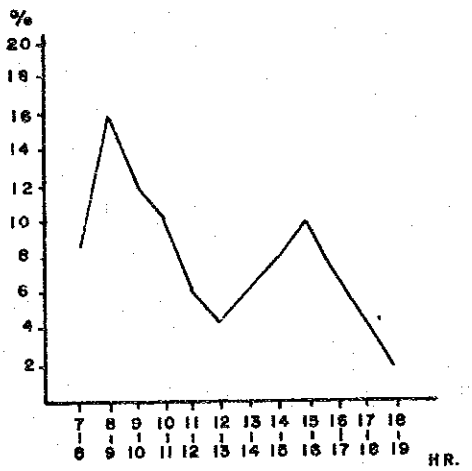


FIG. 7-11 HOURLY VARIATION OF CAR ARRIVAL FOR PARKING (B.D.)

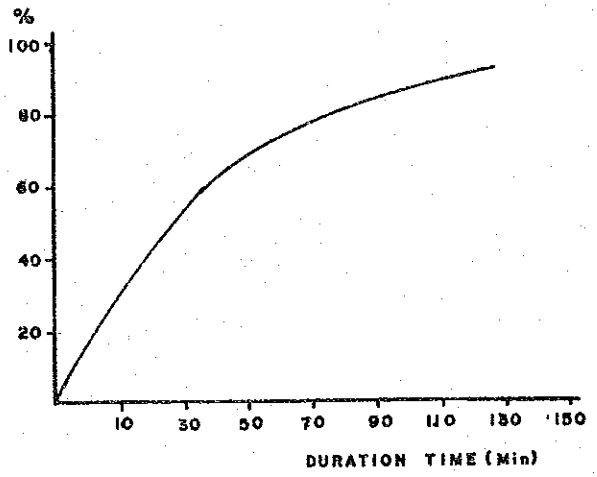


FIG. 7-12 PARKING DURATION (B.D.)

Accordingly Qto also varies by time and the maximum gives the parking space development needs.

The estimation result is shown in the TABLE 7-6 and FIG. 7-13.

Taking into account the parking spaces developed by building obligations, the total parking space development needs in the Study Area is estimated to be about 900 parking lots.

TABLE 7-6 PARKING SPACE DEVELOPMENT NEEDS

Zone No.	Car Attraction (Veh./day)	Parking Space Demand (Veh.)	Obligatory Parking Space (Veh.)	Parking Space Development Needs (Veh.)
9	4,012	365	110	225
10	5,322	570	260	310
11	499	39	39	0
89	1,836	167	80	87
90	1,710	183	100	83
91	274	79	79	0
92	275	54	54	0
93	376	109	109	0
94	2,176	198	40	158
Total	16,480	1,764	871	893

Note: 1) Car attraction is excluding the trips "to home" and "to school".

2) Parking space is assumed to be 30 m^2/car.

3) Parking spaces developed by building obligation are assumed to be 2% of the floor area.

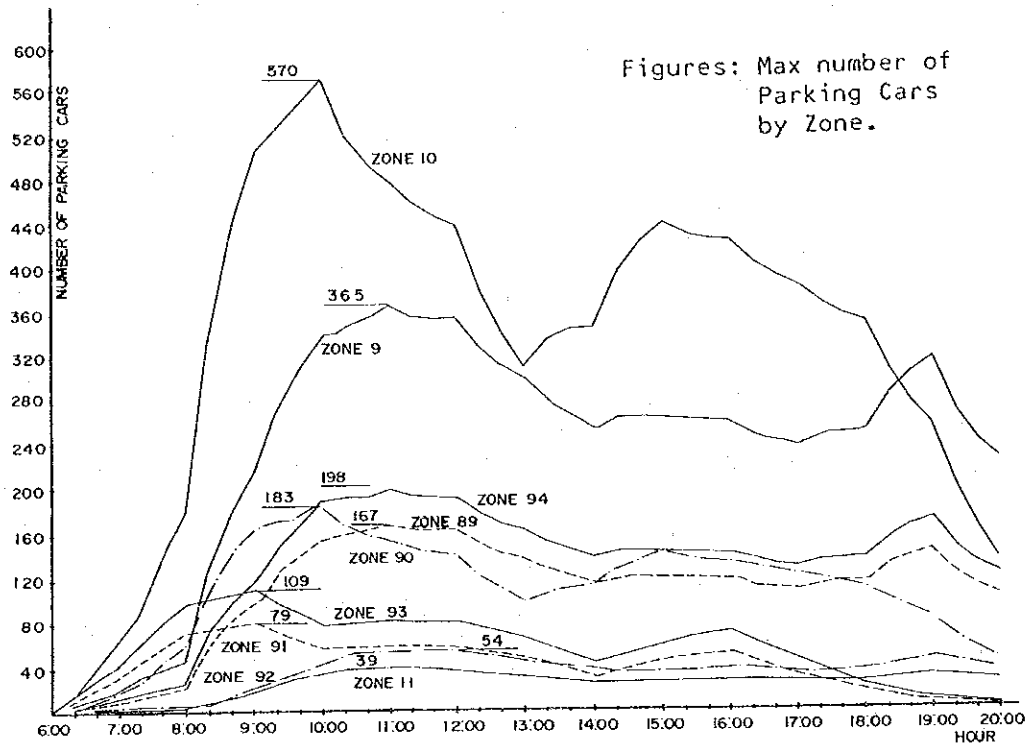


FIG. 7-13 DISTRIBUTION OF PARKING CARS

2) Intersections of Pedestrian Streets

In designing intersections of pedestrian streets, a special attention should be paid to creating smooth pedestrian flow as well as traffic safety.

As stated above, Cra 42, Cra 44, Calle 28 and Calle 7 are identifies as a pedestrian street. Among them, Cra 42 will be the most important pedestrian street, since it will directly connect Barranquillita with Centro, which is one of the basic development policy in this Study, and th largest number of pedestrians is forecasted. Accordingly construction of a pedestrian deck is proposed at the intersections of Cra 42 with arterial/semi-arterial streets, is Calle 30 and Calle 17.

At the intersections among pedestrian streets, such as Calle 7 - Cra 44, a consideration to enhance the urban amenity will be required. In this study a monumental landmark is proposed to be constructed.

3) Street Lighting

For the purpose of traffic safety and social security, lighting poles are recommended to be installed on the main streets, particularly, arterial streets and pedestrian streets. They will be installed at the road side or median depending on the street conditions.

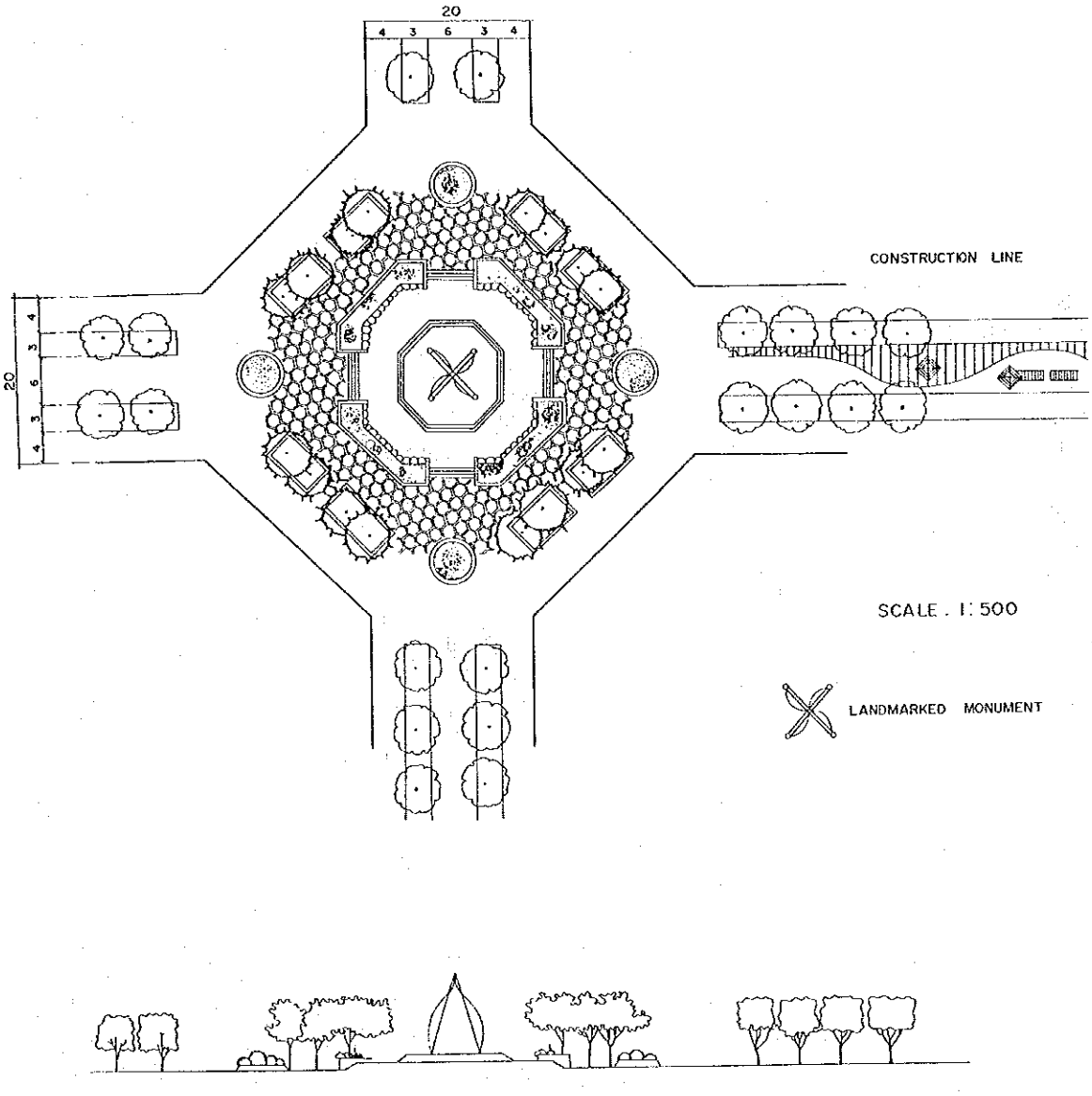


FIG. 7-14 LANDMARK FOR INTERSECTION OF PEDESTRIAN STREETS

Chapter 8

BUS TERMINAL

8-1. Background

During the Masterplan Study stage, two bus terminals were proposed; one was the interdepartamental bus terminal and the other intermunicipal.

As for the interdepartamental bus terminal, the new or temporary site had been under study by the Municipality when the Masterplan Study started. This terminal had been adopted as a strategic project for the development of the southern subcenter in Barranquilla. This terminal is expected to be implemented in an early phase of the development.

An intermunicipal bus terminal was not being considered by the Municipality of Barranquilla at the beginning of the Masterplan Study. However, in the interim, traffic congestion in the project area has become a major problem. The increased congestion is due to buses using the streets of the Study Area as dispatching points and terminal space. These centers of bus activity result in delays, congestion, and provide little opportunity for effective management. An improved and organized system is required to end the problem and to increase vehicular efficiency.

Because of the poor organization of the existing system, an intermunicipal bus terminal was proposed as one of the strategic development projects of Barranquillita.

In planning the locations for both the intermunicipal bus terminal and the reorganized market facilities, it was clear that usage of both facilities would increase if they were located in close proximity to each other. In turn, their easy access to each other via pedestrian walkways became a guiding factor in site determination. The center of

Barranquillita (the south west corner of the intersection of Calle 8 and Cra 42) was selected as the most strategic site for the terminal, and the location of the market area was proposed to be relocated and improved just south of the terminal.

The intermunicipal bus terminal will provide bus service for major towns inside Atlantico Department and small towns in neighboring departments as a point of origin and destination.

The intermunicipal bus terminal and the urban bus terminal will be built side by side and concurrently so both terminals may be used for easy access to the surrounding market and central district functions.

8-2. Dimensions of the Terminal

The terminal should allow efficient vehicular and pedestrian traffic flow for the number of buses and bus passengers using it.

8-2-1. Future Intermunicipal Bus Terminal Demand

Future bus demand was estimated as an element of the future transportation demand. It is estimated that in the year 2000 approximately 50,000 people will make 2 trips on the intermunicipal buses each day. This is approximately an increase of 1.8 times the 1984 ridership of approximately 27,000 travelers/day. Consenquently, approximately 100,000 trips will be made per day by commuters to and from the terminal.(See FIG. 8-1 and TABLE 8-1).

In the future, more than half of the total bus passengers (approximately 26,600 persons) will travel between Barranquilla and Sector 81/84 including Galapa, Baranoa, Sabanalarga and so forth.

Sectors 80 and 82/85 have secondary weight in terms of bus passengers with about 12,000 and 10,000 persons/day respectively.

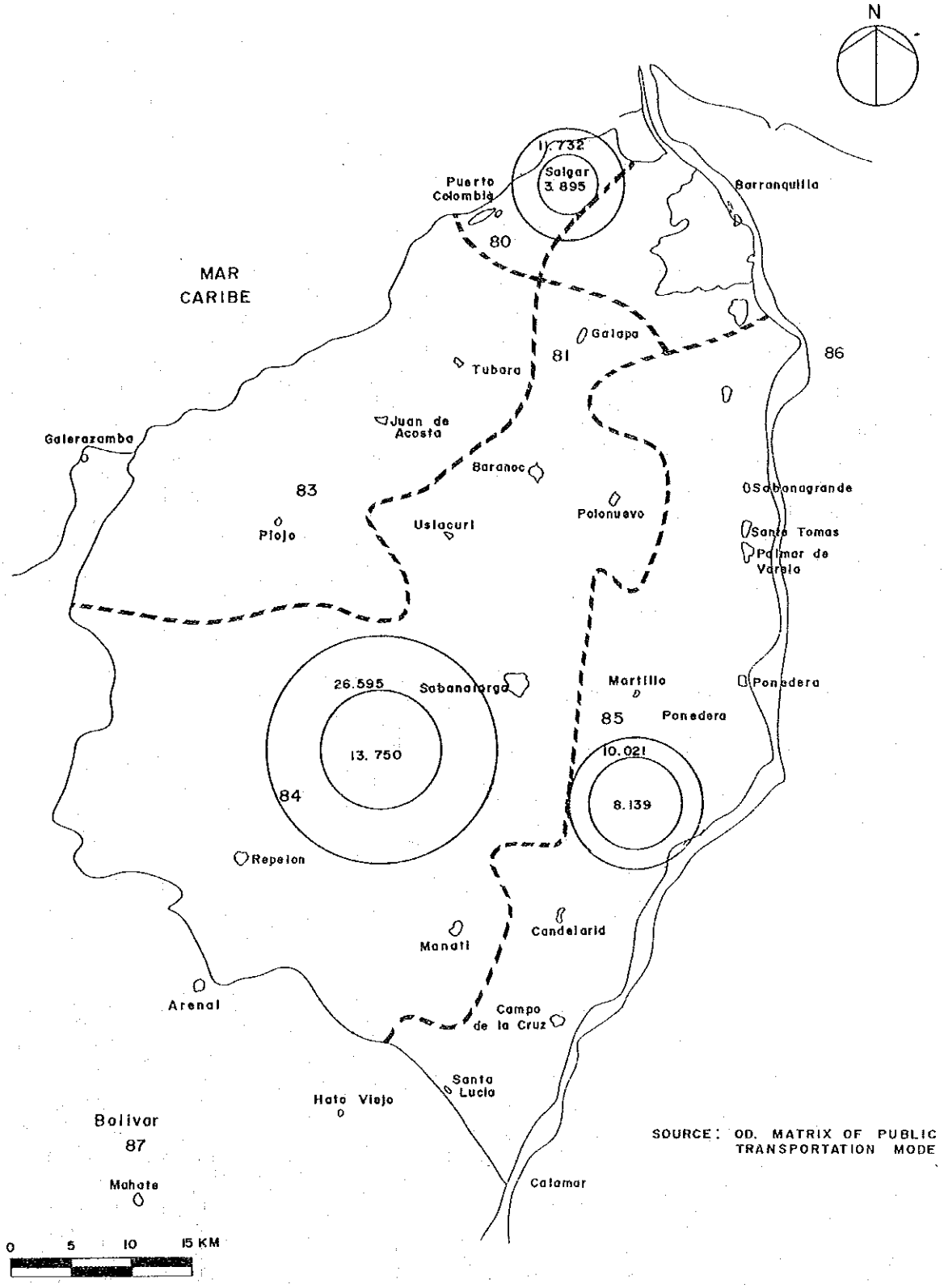


FIG. 8-1 NUMBER OF INTERMUNICIPAL BUS PASSENGERS GENERATED IN 1984 AND 2000

TABLE 8-1 O-D MATRIC OF INTERMUNICIPAL BUS PARSSENGERS (2000)
(EXCLUDING MALAMBO)

(Passengers/day)

ZONE	SEC 80	SEC 83	SEC 81/84	SEC 85	TOTAL
A 1	1,755	763	6,281	2,615	11,414
A 2	670	139	2,873	1,401	5,083
A 3-1	28	0	91	45	164
3-2	335	25	713	348	1,421
3-3	132	13	949	512	1,606
3-4	48	12	244	191	495
Subtotal	543	50	1,997	1,096	3,686
A 4-1	472	67	832	451	1,822
4-2	517	109	1,687	667	2,980
4-3	116	19	1,146	244	1,525
4-4	326	69	1,531	875	2,801
Subtotal	1,431	264	5,196	2,237	9,128
A 5-1	5,881	136	2,228	922	9,167
5-2	628	412	1,126	274	2,440
5-3	360	56	5,158	385	5,959
5-4	464	152	1,736	1,091	3,443
Subtotal	7,333	756	10,248	2,672	21,009
Total	11,732	1,972	26,595	10,021	50,320

TABLA 8-2 O-D MATRIX OF INTERMUNIPAL BUS PASSENGER (1984)
(EXCLUDING MALAMBO)

(Passengers/day)

ZONE	SEC 80	SEC 83	SEC 81/84	SEC 85	TOTAL
A 1	817	576	3,649	2,477	7,519
A 2	313	103	1,336	1,322	3,074
A 3-1	0	0	116	8	124
3-2	68	44	481	276	869
3-3	126	29	696	144	995
3-4	33	14	216	229	492
Subtotal	227	87	1,509	657	2,480
A 4-1	151	33	542	295	1,021
4-2	378	55	854	450	1,737
4-3	116	32	920	416	1,484
4-4	526	55	1,551	764	2,896
Subtotal	1,171	175	3,867	1,925	7,138
A 5-1	471	154	1,173	486	2,284
5-2	269	108	538	225	1,140
5-3	318	59	972	200	1,549
5-4	309	167	706	847	2,029
Subtotal	1,367	488	3,389	1,758	7,002
Total	3,895	1,429	13,750	8,139	27,213

8-2-2. Terminal Users

Intermunicipal bus passengers will not always use the bus terminal proposed in Barranquillita, hence, an estimation is made for the number of bus passengers who use the terminal (hereinafter referred to as T-users).

The intermunicipal bus passengers are classified into T-users or non T-users considering the following passenger behaviors:

a. The passengers who debark before the bus arrives at the terminal.
b. The passengers who transfer buses at the terminal to reach their destinations.
c. The passengers who walk from the terminal to their destination located near the terminal.

These classifications are summarized in TABLE 8-3.

By applying the above classifications of passengers, those who will transfer or debark at the terminal will number approximately 23,000. In order to arrive at this number the current number of commuters who would use a terminal if it existed had to be hypothetically assessed. It was determined. (See TABLES 8-4 and 8-5) that T-users would increase approximately 1.6 times by the year 2000.

According to the classification mentioned above, T-users are further classified into those who transfer to the urban buses and into those who walk to and from the terminal. (See the O-D matrix shown in TABLE 8-4.)

The table shows that about 12,000 passengers will transfer between intermunicipal and urban bus services at the terminal, and about 11,000 passengers will walk before and after using intermunicipal bus.

On the other hand, non terminal users of intermunicipal bus passengers are estimated to be 26,000. Among them, those who walk from the bus stop are about 16,000 passengers, and those use urban buses as feeder services are about 10,000 passengers.

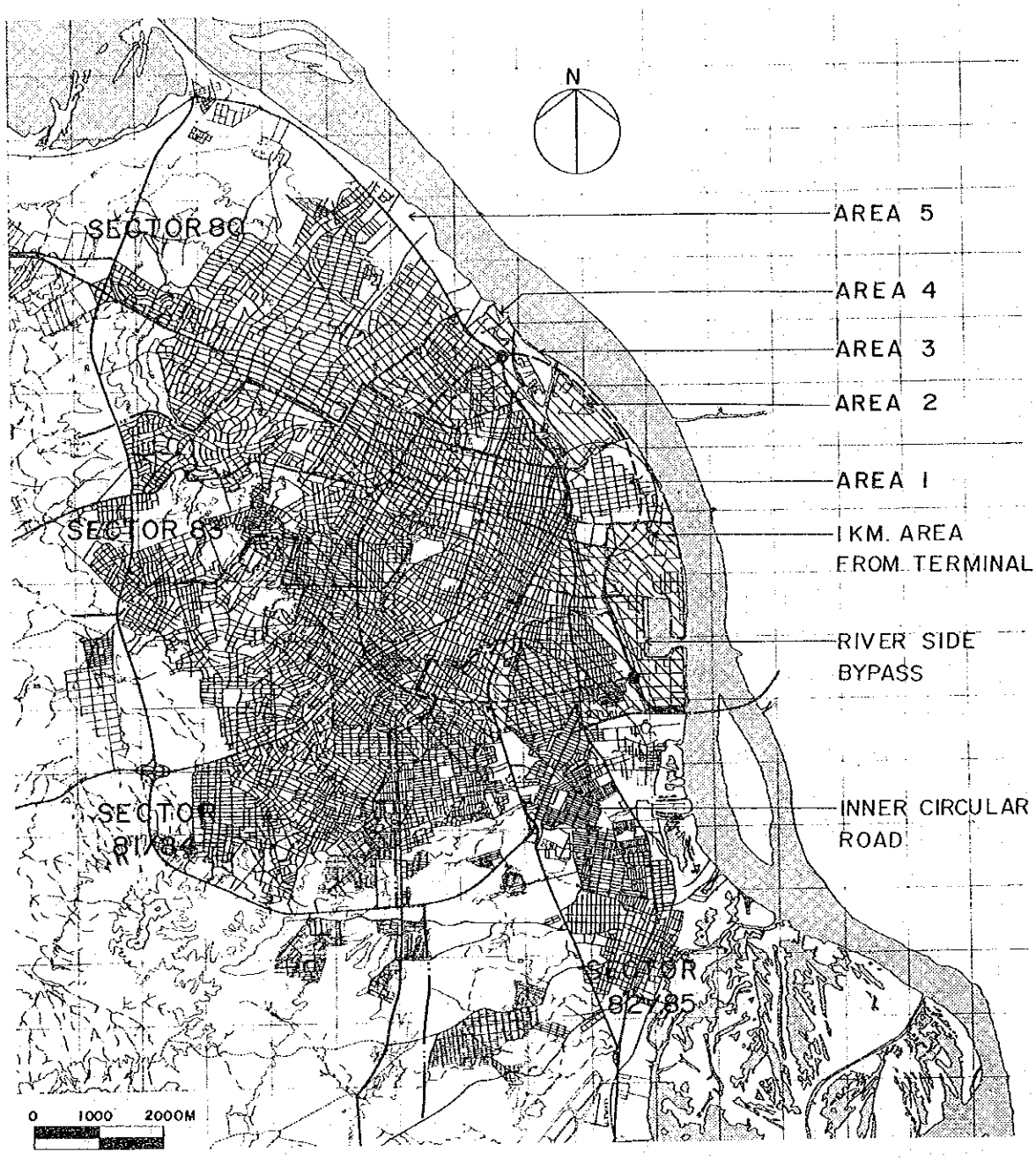


FIG. 8-2 DEFINITION OF AREA

TABLE 8-3 USAGE OF TERMINAL BY TYPE OF PASSENGERS TRIP, AND TYPE OF FEEDER TRANSPORTATION MODEL

	AREA 1	AREA 2	AREA 3				AREA 4				AREA 5			
			80	83	81/84	82/85	80	83	81/84	82/85	80	83	81/84	82/85
SECTOR 80	T W	T UB	W	T UB	T UB	T UB	W	UB	UB	UB	W	UB	T UB	T UB
SECTOR 83	T W	T UB	T UB	W	T UB	T UB	UB	W	UB	UB	UB	W	UB	T UB
SECTOR 81/84	T W	T UB	T UB	T UB	W	T UB	UB	UB	W	UB	T UB	UB	W	UB
SECTOR 82/85	T W	T UB	T UB	T UB	T UB	W	UB	UB	UB	W	T UB	T UB	UB	W

- T : Using Terminal
- W : Walk
- UB : Urban bus as feeder service

TABLE 8-4 O-D MATRIX OF INTERMUNICIPAL BUS PASSENGER (2000)
(EXCLUDING MALAMBO) T-USERS WITH WALK AND URBAN BUS

ZONA	SEC 80	SEC 83	SEC 81/84	SEC 85	TOTAL
A 1	1,755 *	763 *	6,281 *	2,615 *	11,414 *
A 2	670	139	2,873	1,401	5,083
A 3-1	-	-	91	45	136
3-2	335	-	713	348	1,396
3-3	132	13	-	512	657
3-4	48	12	-	-	304
Subtotal	515	25	1048	905	2,493
A 4-1	-	-	-	-	0
4-2	-	-	-	-	0
4-3	-	-	-	-	0
4-4	-	-	-	-	0
A 5-1	-	-	2,228	922	3,150
5-2	-	-	-	274	274
5-3	360	-	-	-	360
5-4	464	152	-	-	616
Subtotal	824	152	2,228	1,196	4,400
Walk as Feeder Transp.	1,755	763	6,281	2,315	11,414
Urban bus as Feeder Transp.	2,009	316	6,149	3,502	11,976
Total	3,764	1,079	12,430	6,117	23,390

Note: * indicates the passengers who walk from the terminal.

TABLA 8-5 O-D MATRIX OF INTERMUNICIPAL BUS PASSENGER (1984)
(EXCLUDING MALAMBO) (T-USERS WITH WALK AND URBAN BUS)

ZONE	SEC 80	SEC 83	SEC 81/84	SEC 85	TOTAL
A 1	817	576	3,649	2,477	7,519
A 2	313	103	1,336	1,322	3,074
A 3-1	-	0	116	8	124
3-2	68	-	481	276	825
3-3	126	29	-	144	299
3-4	33	14	216	-	263
Subtotal	227	43	813	428	1,511
A 4-1	-	-	-	-	0
4-2	-	-	-	-	0
4-3	-	-	-	-	0
4-4	-	-	-	-	0
A 5-1	-	-	1,173	486	1,659
5-2	-	-	-	225	225
5-3	318	-	-	-	318
5-4	309	167	-	-	476
Subtotal	627	167	1,173	711	2,678
Total	1,984	889	6,971	4,938	14,782

(Note : The figures in the Tables are generated or attracted number of person trips, therefore, actual number of bus passengers is considered as double of the above figures.)

8-2-3. Bus Service Frequency and Number of Bus Berths

The bus service frequency and the necessary number of bus berths can be estimated by employing the following three alternative methods.

Alternative (1) : (Present Service Frequency) x (Increased Rate of Bus Passengers of OD Table).

Alternative (2) : (Improved Occupancy Ratio at Peak Time) x (Increased Rate of Bus Passengers of OD Table)

Alternative (3) : (Passengers of 2000)/(Average Number of Bus Passengers)

The results of the estimation are shown in TABLE 8-6.

TABLE 8-6 NUMBER OF BUS BERTH BY ALTERNATIVE METHOD

SEC	ZONE	ALTERNATIVE (1) SF/D E*D	ALTERNATIVE (1) SF/H F*D	ALTERNATIVE (2) SF/D E*D	ALTERNATIVE (2) SF/H OR=1.2	ALTERNATIVE (3) SF/D B*L	ALTERNATIVE (3) SF/H B*K/M
80	80	90.9	12.9	90.9	18.3	86	12.2
83	83	34.7	7.8	34.7	10.3	22.8	5.1
81/84	81					0	0
	84					0	0
Subtotal		429	103.7	428.9	153.3	267.6	64.7
82/85	82						
	85	325	56.3	324.9	73.2	199.7	34.6
Subtotal		325	56.3	324.9	73.2	199.7	34.6
G-Total		905	183.5	904.9	256.2	593.8	120.4
No. of Berths		(1) 19	(2) 19	(1) 19	(2) 26	(1) 12	(2) 13

(1) : (SF/D)/(5*10)
(2) : (SF/PH)/10

According to alternative (1), 19 bus departure berths are required, but it is based on the present service frequency which is estimated under the condition that the number of urban bus passengers using intermunicipal buses are included. Consequently, the result may be slightly overestimated.

Alternative (2) gives about 20 (from 19 to 26) bus departure berths. Although the improved occupancy ratio (1.2 for the peak hour)is employed, the present service frequency, as mentioned above, is still used.

In the case of alternative (3), 12 or 13 bus berths are required. The result does not include berth for demands which are additionally expected for special reasons.

Based on this estimation, it is concluded that 15 bus departure berths will be a planning condition of the intermunicipal bus terminal.

(Note: major indicators required for estimation are summarized in TABLE 8-7).

8-3. Urban Bus Passengers

The number of person trips using public transport mode in the year 2000 was estimated as a part of transport demand projection as explained in 6-2.

The urban bus demand related to Barranquillita is identified as follows:

a. Total bus passengers attracted to the central district and Barranquillita: 343,400 persons/day
b. Total bus passengers to Barranquillita: 98,400 persons/day
c. From sector 80 to Barranquillita: 12,600 persons/day

TABLE 8-7 ESTIMATION OF BUS TERMINAL CAPACITY

SEC	ZONE	T-USERS (w/o Mallambo) 1984 A	2000 B	INC. RATIO (1) C:B/A	(2) D	BUS SERVICE(86) SF /D E	SF /H F	PHR % G	AVE.NO /PASS H:A/E	PASSENGER(86) PASS /D I	PASS /H J	PHR % K:I/J	AVE.PASSS/BUS /D L:I/E	/H M:J/F	OCCUP RATE /D N:L/45	/H O:M/54
80	80	1984	3764	1.88	1.62	56	8	0.1	35.43	2439	364	0.15	43.55	45.50	0.968	0.843
83	83	889	1079	1.16	1.12	31	7	0.2	28.68	1404	342	0.24	45.29	48.86	1.006	0.905
81/84	81					72	23	0.3	0.00	3889	618	0.16	54.01	26.87	1.2	0.498
	84					205	44	0.2	0.00	8917	2318	0.26	43.5	52.68	0.967	0.976
S-TOTAL		6971	12430	1.77	1.55	277	67	0.2	25.17	12806	2936	0.23	46.23	43.82	1.027	0.811
82/85										0	0					
	85	4938	6117	1.23	1.17	277	48	0.2	17.83	8442	2390	0.28	30.48	49.79	0.677	0.922
S-TOTAL		4938	6117	1.23	1.17	277	48	0.2	17.83	8442	2390	0.28	30.48	49.79	0.677	0.922
G-TOTAL		14782	23390	1.57	1.41	641	120	0.2	23.06	25091	6032	0.24	39/14	46/40	0.87	0.859

Note : INC. RATIO (1) : (SF/D)/(5 buses/berth x 10 hrs)
INC. RATIO (2) : (SF/PH)/10 buses/berth

d. From sector 83 to Barranquillita: 13,700 persons/day
e. From sector 81/84 to Barranquillita: 36,200 persons/day
f. From sector 82/85 to Barranquillita: 35,900 persons/day

Major assumptions to convert from the number of passengers to the bus service demand are as follows;

a. Bus capacity : 50 persons/bus
b. Average bus occupancy ratio : 90 %
c. Peak hour ratio in terms of number of passengers : 15 %
d. Occupancy ratio in peak hour : 120 %

The total number of urban buses arriving at Barranquillita will number about 2,200: about 280 from sector 80, about 300 from sector 83, and about 800 from both sector 81/84 and sector 82/85. (Refer to TABLE 8-8)

Besides the above mentioned demand, about 3,400 passengers which are equivalent to 74 bus services/day, will arrive from the central district.

In addition, the urban bus users who will transfer to the intermunicipal bus service as a feeder service from the terminal are estimated to be about 12,000 which requires about 260 bus services/day.

Consequently, the total number of urban buses arriving/departing at/from Barranquillita in the year 2000 will be approximately 2,500 buses/day.

FIG. 8-3 illustrates major origins and destinations of urban bus demand in total compared with Barranquillita including the demand for other transportation service from the terminal. (See TABLE 8-9).

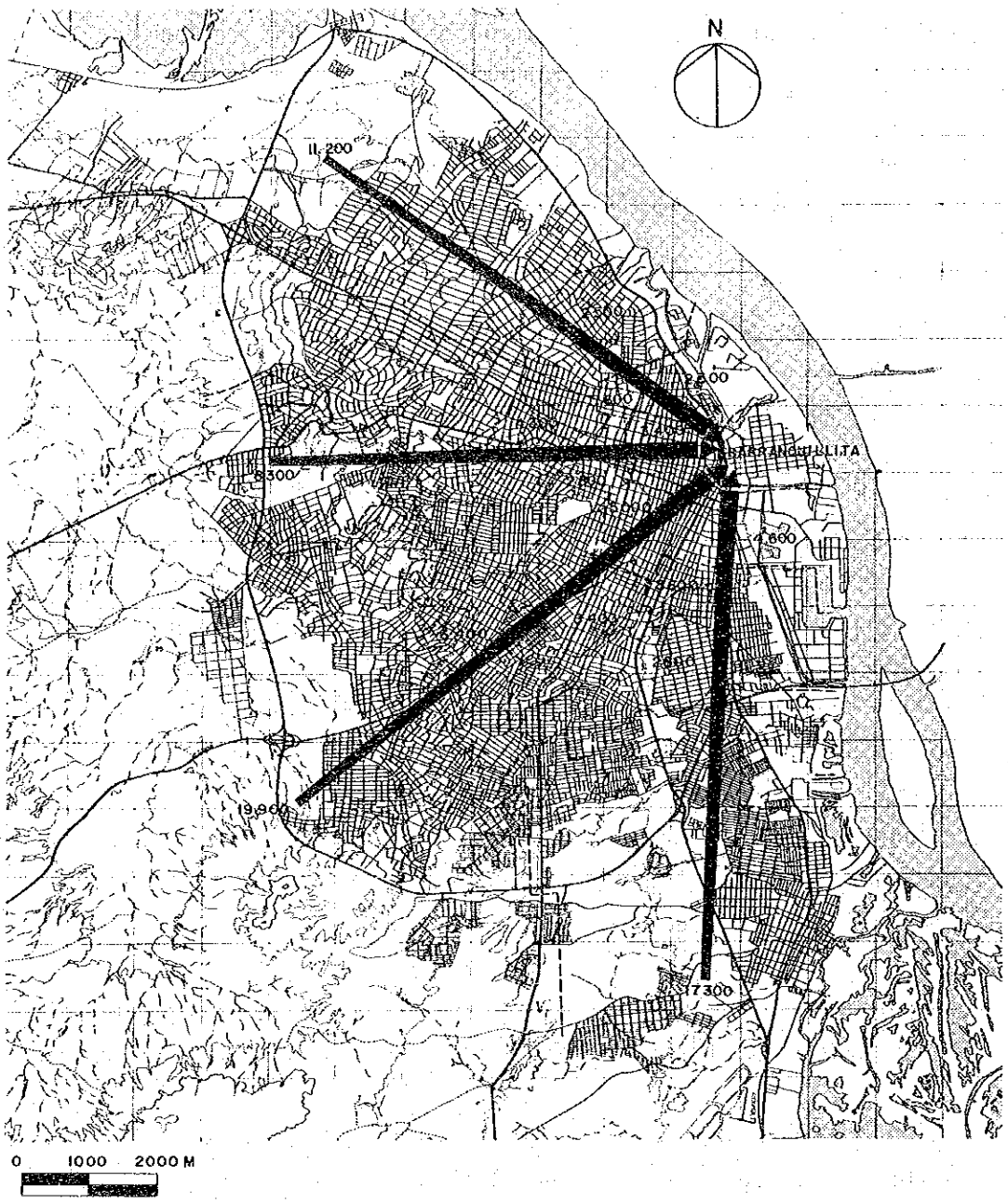


FIG. 8-3 URBAN BUS PASSENGERS TO BARRANQUILLA

TABLE 8-8 DEMAND FOR URABAN BUS SERVICE

No. of Passengers (persons/day)

	CENTRO	BARRANQUILLITA	TOTAL
Sector 80	26,400	12,600	39,000
83	35,700	13,700	49,400
81/84	106,100	36,200	142,300
82/85	76,800	35,900	112,700
TOTAL	245,000	98,400	343,400

Daily Service Frequency (buses/day)

	CENTRO	BARRANQUILLITA	TOTAL
Sector 80	587	280	867
83	793	304	1,097
81/84	2,358	804	3,162
82/85	1,707	798	2,505
TOTAL	5,445	2,186	7,631

Service Frequency in Peak Hour (buses/hr.)

	CENTRO	BARRANQUILLITA	TOTAL
Sector 80	66	32	98
83	89	34	123
81/84	265	90	355
82/85	192	90	282
TOTAL	612	246	858

TABLE 8-9 URBAN BUS USERS TO BARRANQUILLITA IN 2000

(passengers/day)

Origins	Urban Bus Passengers	Urban Bus Use As Feeder Service of Intermunicipal Bus Passengers	Total
Centro	3,411	-	3,411
Barranquillita	4,380	-	4,380
A 2-1	1,634	914	2,548
A 2-3	2,486	2,542	5,028
A 2-4	2,989	1,627	4,616
A 3-1	477	136	613
A 3-2	1,411	1,396	2,807
A 3-3	7,720	657	8,377
A 3-4	3,304	304	3,608
A 4-1	2,496	-	2,496
A 4-2	4,276	-	4,276
A 4-3	6,381	-	6,381
A 4-4	12,873	-	12,873
A 5-1	8,022	3,150	11,172
A 5-2	8,004	274	8,278
A 5-3	19,571	360	19,931
A 5-4	16,722	616	17,338
Total	106,157	11,976	118,133

8-4. Bus Terminal Plan and Design

The site for the bus terminal is delineated by Cra 43, Calle 6, Cra 42, and Calle 8, which is an area of 5.2 Ha. The main purpose of the terminal is to serve the intermunicipal bus system, but it also serves as the core of the urban system for the Barranquillita and Boliche area as well as for the existing central district. The terminal is in close proximity to the open and public market complex, commercial area, and business, industrial, and residential zones. The layout of the terminal area should be planned to facilitate public access to these areas; additionally, the layout must also provide efficient bus circulation to avoid bus traffic congestion in these surrounding areas. The planning standards of this terminal correspond to representative examples of terminals already constructed in Colombia.

8-4-1. Planning Premises

The major considerations in the planning process are:

A) Provisions for efficient passenger bus circulation.
B) Provisions for efficient passenger circulation in the intermunicipal terminal building.
C) Provisions for efficient pedestrian access to and from the surrounding areas.
D) Provisions for environmental amenities.

1) Provisions for Efficient Bus Circulation

a. The major access route for the intermunicipal bus system vehicles to the terminal is Calle 6.
b. Calle 8 provides the most direct access for the urban bus system.
c. Arrival and departure areas should be separated from traffic flow.
d. The entrances and exists for both terminal areas should be located at least 30 m from street intersections.

2) Provisions for Efficient Circulation in the Intermunicipal Terminal Building.

a. Passenger waiting areas should be provided.
b. Passengers should be directed easily to boarding areas and exits.
c. Space must be provided to avoid congestion.
d. Access between urban and intermunicipal bus terminal arrival and departure areas must be facilitated.

3) Provisions for Efficient Pedestrian Access to and from the Surrounding Areas.

a. Stores are to be included in the intermunicipal terminal area.
b. The commercial facilities along the pedestrian way of Cra 42 should lead to the stores in the bus terminal block.
c. Although Calle 7 will no longer be used for vehicular traffic, provisions must be made for pedestrians who must cross Cra 43.

4) Provisions for Environmental Amenities

a. Strong shelter is required against high velocity winds.
b. High temperatures must be taken into consideration.
c. Pleasant waiting accommodations should be provided.

8-4-2. Planning Premises Applied to Preliminary Planning Process with Proposed Design Elements

The preliminary plans for the spatial layout of the bus terminals are guided by the planning premises. In addition to the premises requiring provisions for efficient usage and circulation of buses and pedestrians in and around the terminal areas, additional factors are considered during this phase of the planning and design process.

1) Provisions for Efficient Bus Circulation

In addition to the planning premises, determining factors in planning for bus access and circulation of the terminal areas are: existing access routes, transportation usage both current and projected, and the space limitations set by existing roads which form the perimeters.

By using all of the above criteria, four alternative access and circulation plans were devised (See FIG. 8-4)

Although all plans meet the determining factors, the third alternative best meets the criteria required by the overall planning premises. The third alternative makes access to the urban bus terminal efficient from Calle 8 and includes two traffic flows (inner and outer circles) to double the usage; and intermunicipal bus arrivals from Cra 43 and departures to Cra 42 help to control traffic congestion due to buses on Calle 6.

Alternative 3 also provides the smoothest traffic flow; buses will rarely have to cross each other's routes.

The layout also provides the most land area uninterrupted by bus traffic to allow for all planning premises dealing with spatial factors.

After the basic circulation pattern is adopted the arrival and departure areas are planned.

In addition to the planning premise for providing arrival and departure areas separated from the traffic flow, the number of passengers and peak hour traffic are considerations.

Additional factors and preliminary design proposals follow:

(1) Arrival and Departure Circulation Factors

a. Passengers traveling in the intermunicipal bus system are estimated at 23,000 persons/day, some 12,000 of which transfer to the urban bus system.

b. 110,000 persons/day are estimated to be using the urban bus system.

c. The average arrival to departure time for each vehicle should be approximately six minutes at peak commuting times

(2) Arrival and Departure Preliminary Design Proposal

a. Intermunicipal bus terminal arrival area should be located in close proximity to the urban bus terminal area.

b. One-way traffic flow to provide arrival debarkation followed by departure embarkation.

c. 7 arrival berths for the intermunicipal terminal area arranged parallel to each other.

d. 20 berths for both arrivals and departures for the urban bus system arranged parallel to each other.

e. 15 departure berths arranged as docks with no through-traffic lane for the intermunicipal bus terminal.

(See FIG. 8-10 for an illustration of the bus circulation routes).

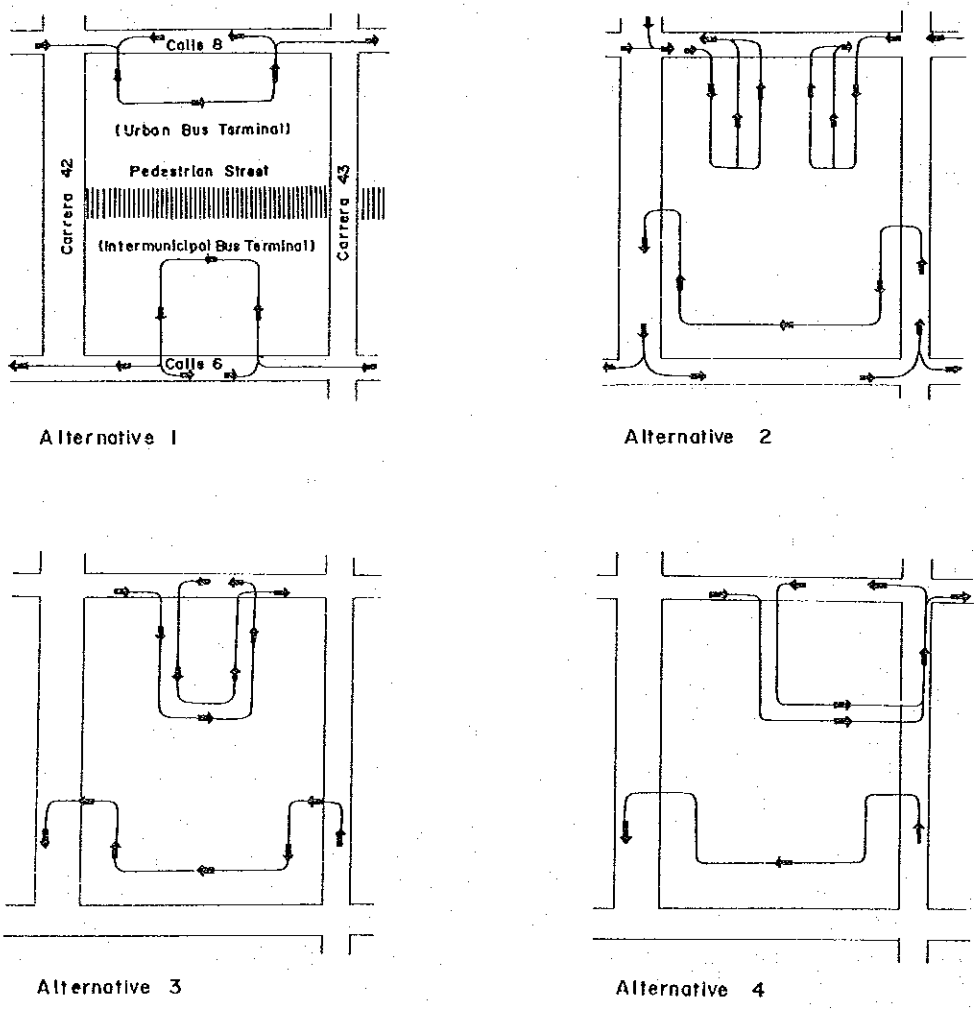


FIG. 8-4 ALTERNATIVE OF BUS ACCESS AND CIRCULATION

2) Provisions for Efficient Passenger and Pedestrian Circulation in the Intermunicipal Terminal Building.

Once the bus circulation routes are established the other facilities may be planned. Although the urban bus terminal will be an area without a building structure, as is planned for the intermunicipal bus system, both areas require pedestrian circulation direction.

The embarkation area of the intermunicipal bus terminal will be provided with waiting space for passengers who have passed through a ticketing office. Each departure berth will have a designated waiting area and departure door. The debarkation area of the intermunicipal bus terminal will lead passengers into the terminal building.

Passengers who are transferring to the urban bus service or will be walking to any of the other surrounding areas will be walking to any of the other surrounding areas will be directed to their destinations from within the large open area of the terminal.

The terminal will be a two story structure: those passengers transferring to the urban terminal may use ground floor exits for outer circle departure or will be directed to the second floor for existing to either the inner or outer circle departure areas via a pedestrian deck and bridge. The bridge will join the two terminal areas.

Passengers who require taxi service from the terminal area will also be directed to the second floor to exit to the bridge. A taxi stand is located within the inner circle of the urban bus terminal area, and it has entrances and exits independent from the bus traffic flow.

Passengers who will be using another intermunicipal bus service wil be directed to the ticketing area.

Passengers who will be exiting the terminal to any of the surrounding areas become the pedestrians referred to in the next section and they,

also are directed to exits on the second floor.

Passenger debarking in the urban bus system may choose to enter the intermunicipal bus terminal via the connecting bridge.

3) Provisions for Efficient Pedestrian Access to and from the Surrounding Areas

The large intermunicipal bus terminal building will not only direct bus passengers; it also will facilitate pedestrian traffic for those people who will walk to and from the surrounding areas.

From either the intermunicipal or urban bus debarkation areas, access to the commercial, market, business, industrial, or residential zones is facilitated by a network of pedestrian decks and bridges. The bridges lead pedestrian across Cra 43 (toward business, industrial and residential areas) to Calle 7, or across Cra 42 to the market area.

The commercial area may be reached from the intermunicipal terminal in a number of ways: pedestrians may opt to enter some stores from within the terminal and exit to the street from the stores; others may choose to walk to other stores via a pedestrian bridge and staircase from the main pedestrian deck to Cra 42; still others may opt to approach the commercial area using the bridge connecting the intermunicipal and urban terminal areas.

From the urban bus terminal area pedestrians may easily access the commercial and market areas. Crosswalks are provided on Calle 8. Additionally, the commercial area begins on Cra 42 and a raised area close to the Arrival and departure area provides adequate space for shoppers to walk in the commercial area without the added congestion of bus passengers. Stores here may be entered form the platform and exited on street level. From the street, pedestrian may cross Cra 42 to the market area or Calle 8 to more of the commercial area.

4) Provisions for Environmental Amenities

The urban and intermunicipal bus terminal complex is planned as an efficient facility with ample space to accommodate the great number of passengers. Not only is the facility required to provide space for the avoidance of congestion, it also will offer a pleasant waiting area environment.

Shops are provided for passengers who wish to make purchases but do not have time to leave the terminal before their departure. Waiting areas have benches with built-in planters for greenery and flowers. The main waiting area on the first floor is close to the ticketing offices. However, some people may prefer to wander while they wait and the balcony on the second floor provides a mezzanine from which passengers by may watch the action on the first.

Bus terminal administration offices, maintenance rooms, bus company office spaces, public information offices, restaurants, phones, and employee relaxation areas are provided on the perimeters of the building surrounding the open waiting and passenger dispersing area.

Additionally, storage areas and changing rooms are provided for terminal users.

See FIG. 8-6 through 8-9 for facility layout and illustrations.

Building specifications follow:

SPECIFICATION OUTLINE FOR FACILITIES

Name of Facility	Bus Terminal
Floor Area	First floor: 6,704m^2
	Second floor: 5,592m^2

1. Construction

1)Structure	Reinforced concrete frames with bricks walls
2)Roof	Libbed metal roofing and reinforced concrete slab with waterproof material
3)Window	Aluminum frames with glass and adjustable glass louvers
4)Door	Steel flush door, aluminum framed door with glass and grating
5)Floor	Reinforcedconcreteslab(2nd floor) Concrete slab on calich (1st floor)
6)Steps & balustrade	Reinforced concrete slab, brick wall and steel pipe

2. External Finishes

1)Column, beam	Concrete
2)Wall	Mortal or cement plaster with paint
3)Floor (balcony)	Quarry tile or non-slip terazzo tiles
" (pedestrian deck)	the same

3. Internal Finishes

1)Ceiling	Plaster with paint
2)Wall (brick wall)	Mortar or cement plaster with paint finish
" (partition)	Plywood
" (kitchen, w.c)	Ceramic tiles (H=2.0m)
3)Floor	Terazzo tiles
4)Door	Wood flush

4. Service

1)Air conditioning	No service available for a central system (optional for each room)
2)Sanitary fittings	Complete
3)Gas service	L.P.G.
4)Electric service	Lighting, receptacle outlets, telephone

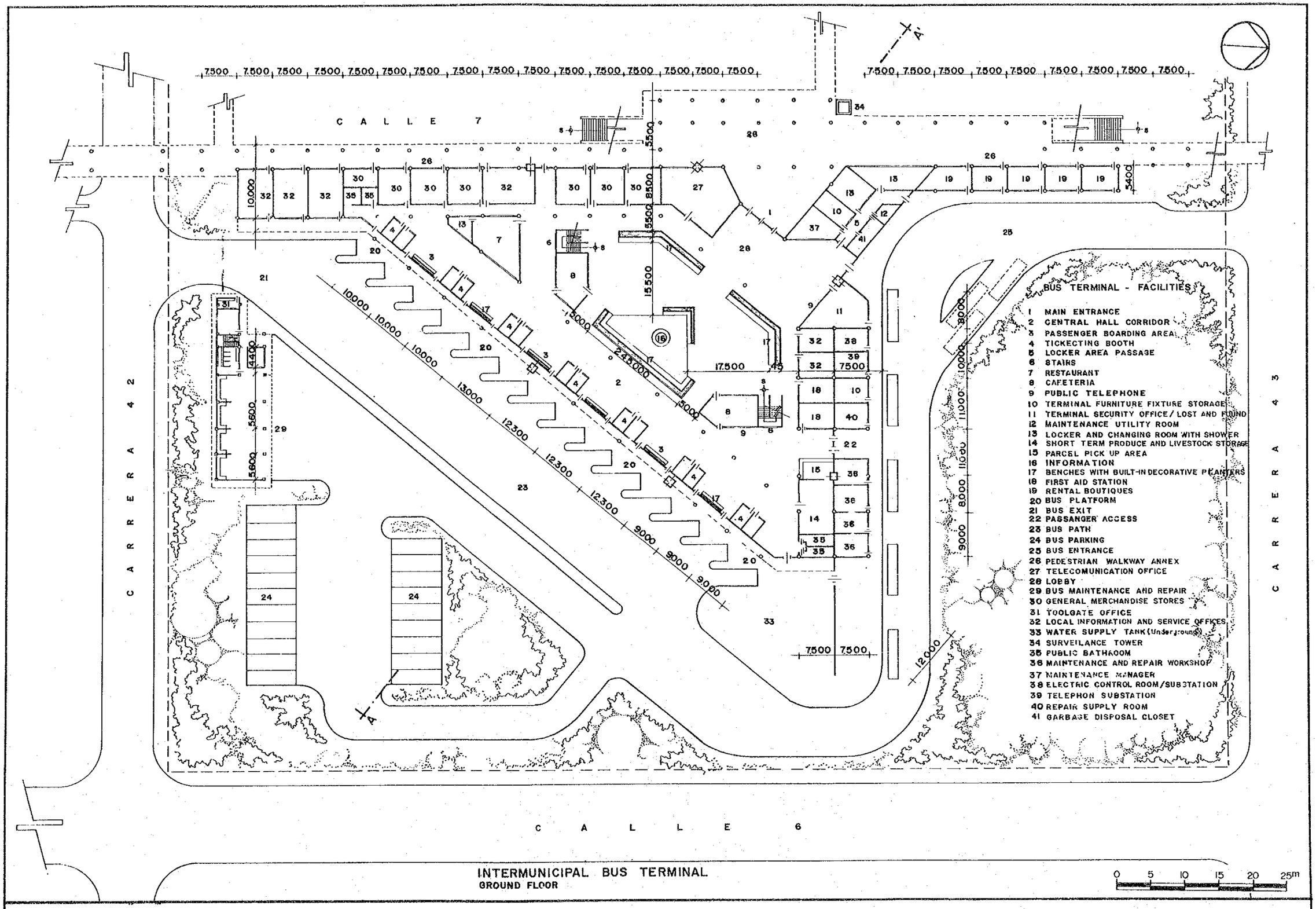


FIG. 8-5 FIRST FLOOR PLAN OF INTERMUNICIPAL BUS TERMINAL

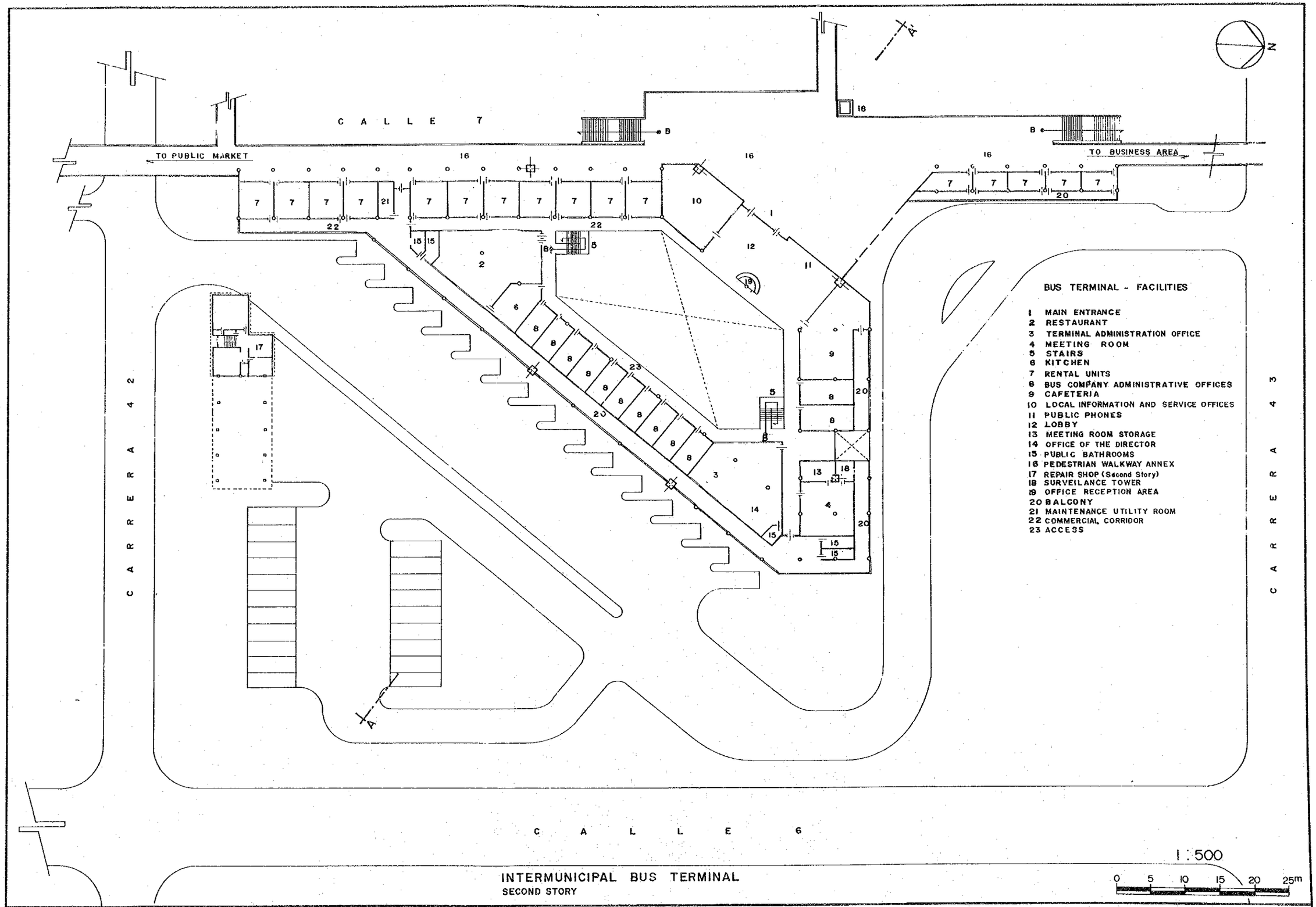
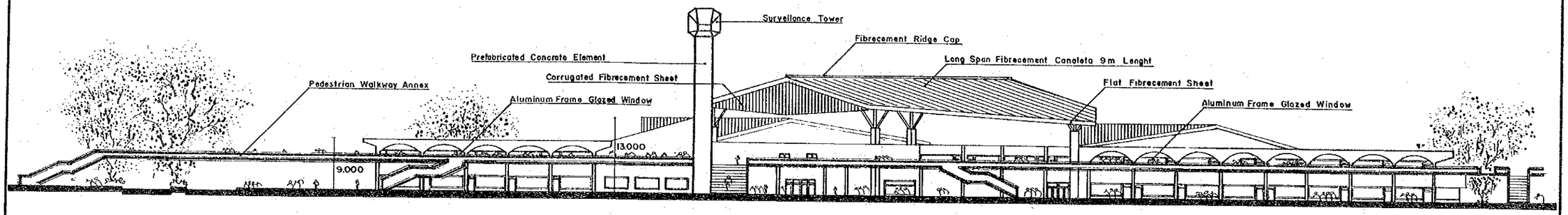
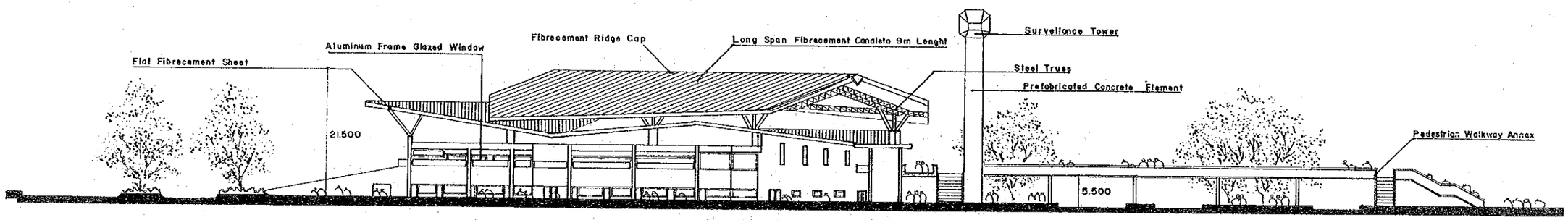


FIG. 8-6 SECOND FLOOR PLAN OF INTERMUNICIPAL BUS TERMINAL



INTERMUNICIPAL BUS TERMINAL
EAST ELEVATION

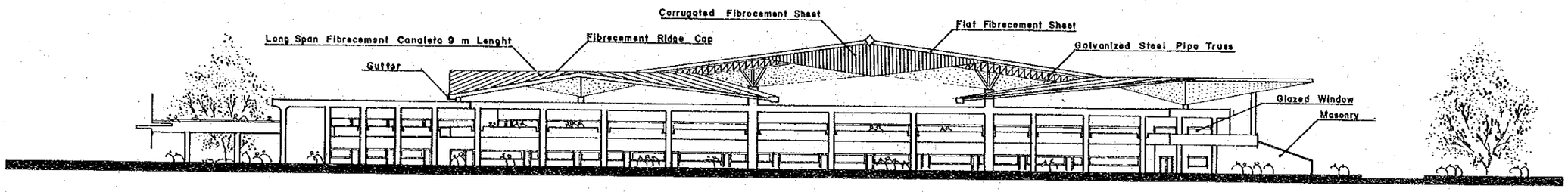


INTERMUNICIPAL BUS TERMINAL
NORTH ELEVATION

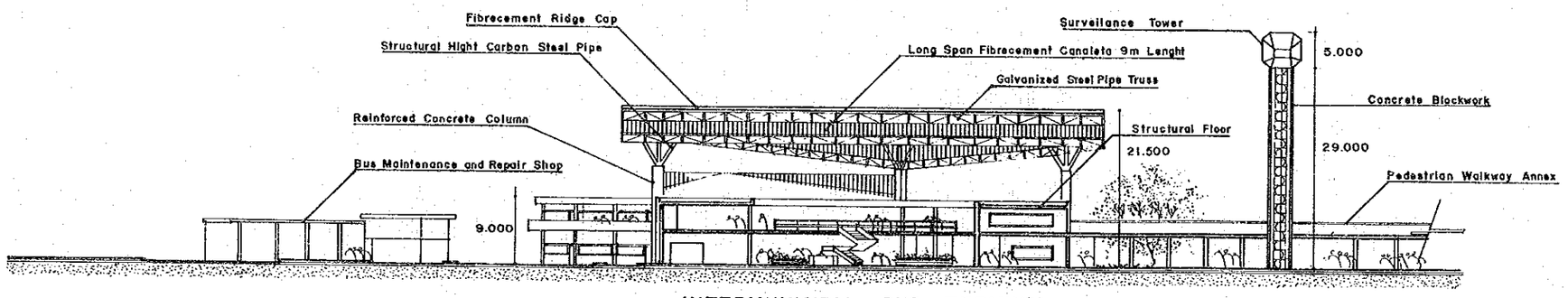
1 : 500

0 5 10 15 20 25m

FIG. 8-7 ELEVATION PLAN OF INTERMUNICIPAL BUS TERMINAL



INTERMUNICIPAL BUS TERMINAL
SOUTH-EAST ELEVATION



INTERMUNICIPAL BUS TERMINAL
A ~ A' SECTION

1 : 500

0 5 10 15 20 25m

FIG. 8-8 ELEVATION AND SECTION PLAN OF INTERMUNICIPAL BUS TERMINAL

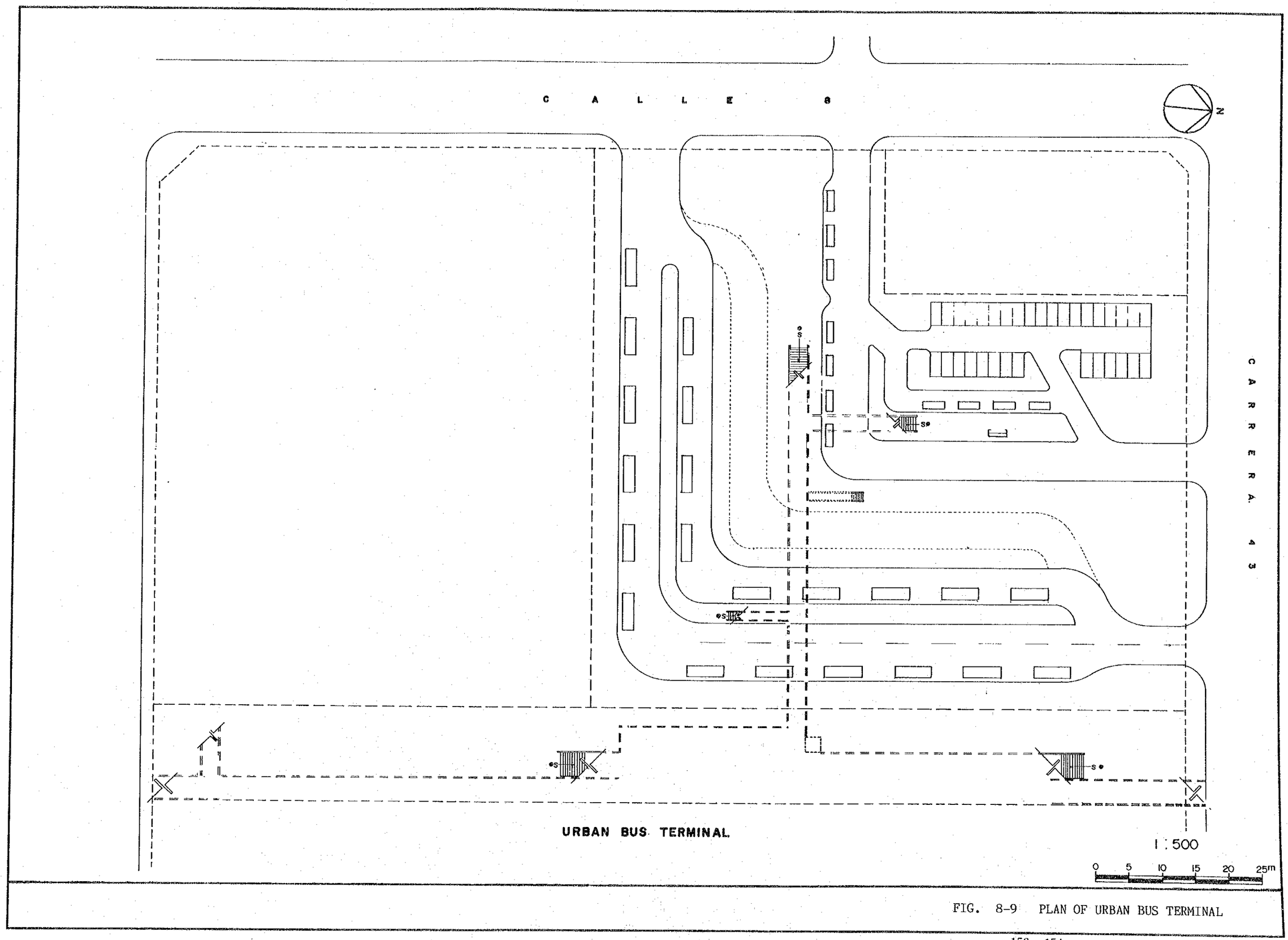


FIG. 8-9 PLAN OF URBAN BUS TERMINAL

8-5. Bus Routes and Traffic Control

8-5-1. Intermunicipal Bus Route

In order that the bus terminal may be utilized most effectively and efficiently, embarkment and disembarkment of bus in the area around the terminal are restricted.

More discussion may be necessary before determining the area of the restricted zone. As a proposal, the area enclosed by the inner circular road proposed in the Masterplan Study and encircling the subject area can be considered as the restricted zone. After improvement of this circular road, adequate urban bus service will be provide along its routes for the convenience of intermunicipal bus passengers.

Accordingly, it is proposed that the intermunicipal buses enter the inner circular road along main radial streets and follow the inner circular road to the Riverside Bypass to access the new terminal in Barranquillita.

During the period before the completion of the Riverside Bypass, the intermunicipal bus route may be on Calle 6, Cra 38 and Cra 46 to ensure a smooth traffic flow in Barranquillita.

8-5-2. Urban Bus Route

The urban bus service to and from Barranquillita should be provided in accordance with the demand which is represented by the number of urban bus passengers estimated in the section 8-2.

The major origins and destinations of urban bus passengers to Barranquillita are sectors 81/84 and 82/85, specifically, the south and south-west part of Barranquilla.

These urban bus routes can be newly established without affecting much influence on the other urban bus routes mainly destined for the central district.

For the sake of transfer passengers' convenience, all the urban buses destined for Barranquillita are planned to debark in the urban bus terminal. In order to ensure a smooth traffic flow around the bus terminal, an urban bus route in Barranquillita is also proposed. As shown in FIG. 8-10 the proposed urban bus route around the terminal are as follows;

a. Cra 40 (or Calle 17) - Calle 9 - Cra 41 - Calle 8 - Terminal - Calle 8 - Cra 45.
b. Cra 46 - Calle 6 - Terminal - Calle 6 - Cra 38.

Within the Barranquillita area, bus flow is assumed to be always one way so as to minimize the disturbances to the other traffic flow on the bus routes, where ordinary bus stops are placed at intervals of 50 to 150m. Hence, some buses may detour around the bus terminal.

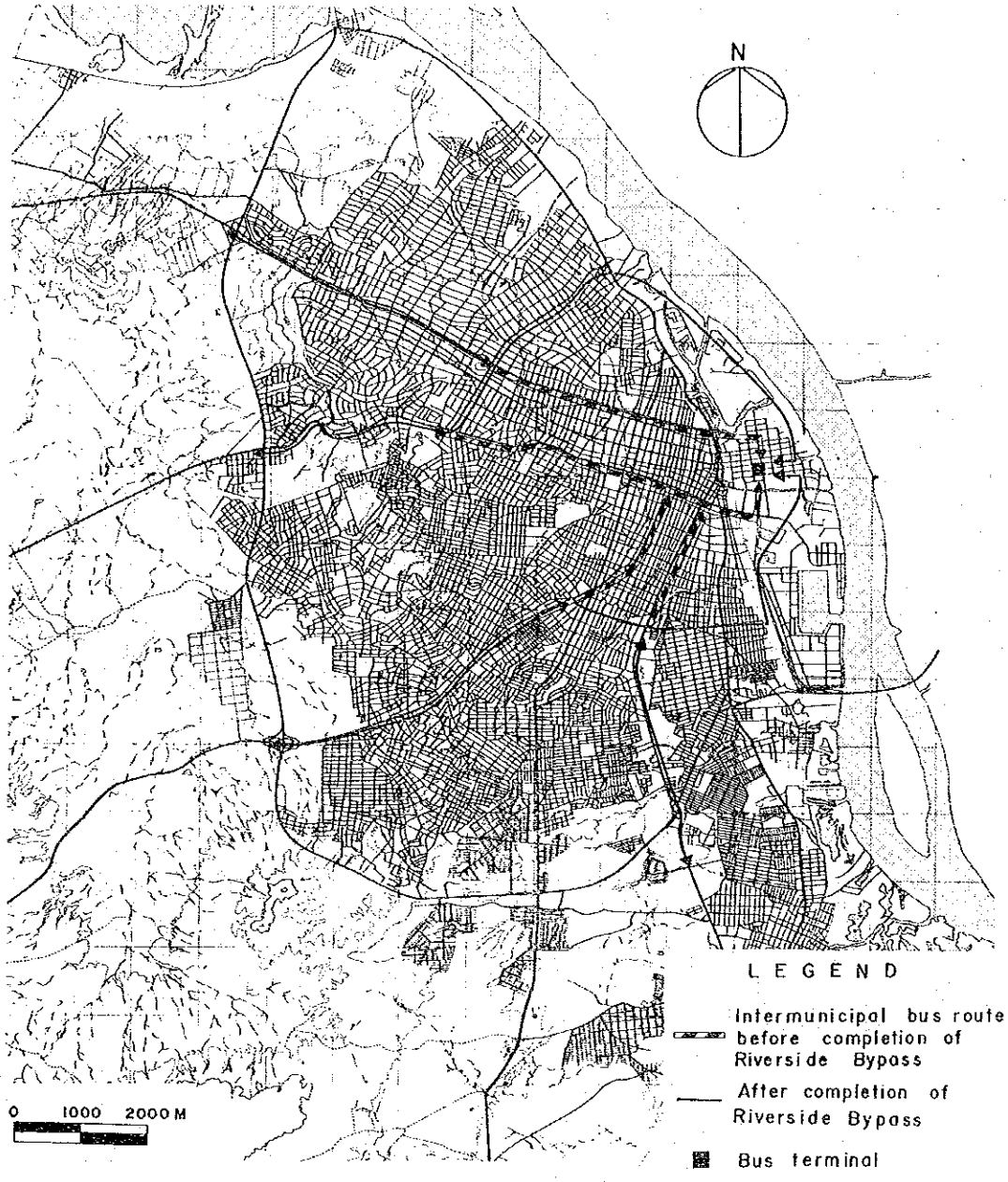


FIG. 8-10 INTERMUNICIPAL BUS ROUTE

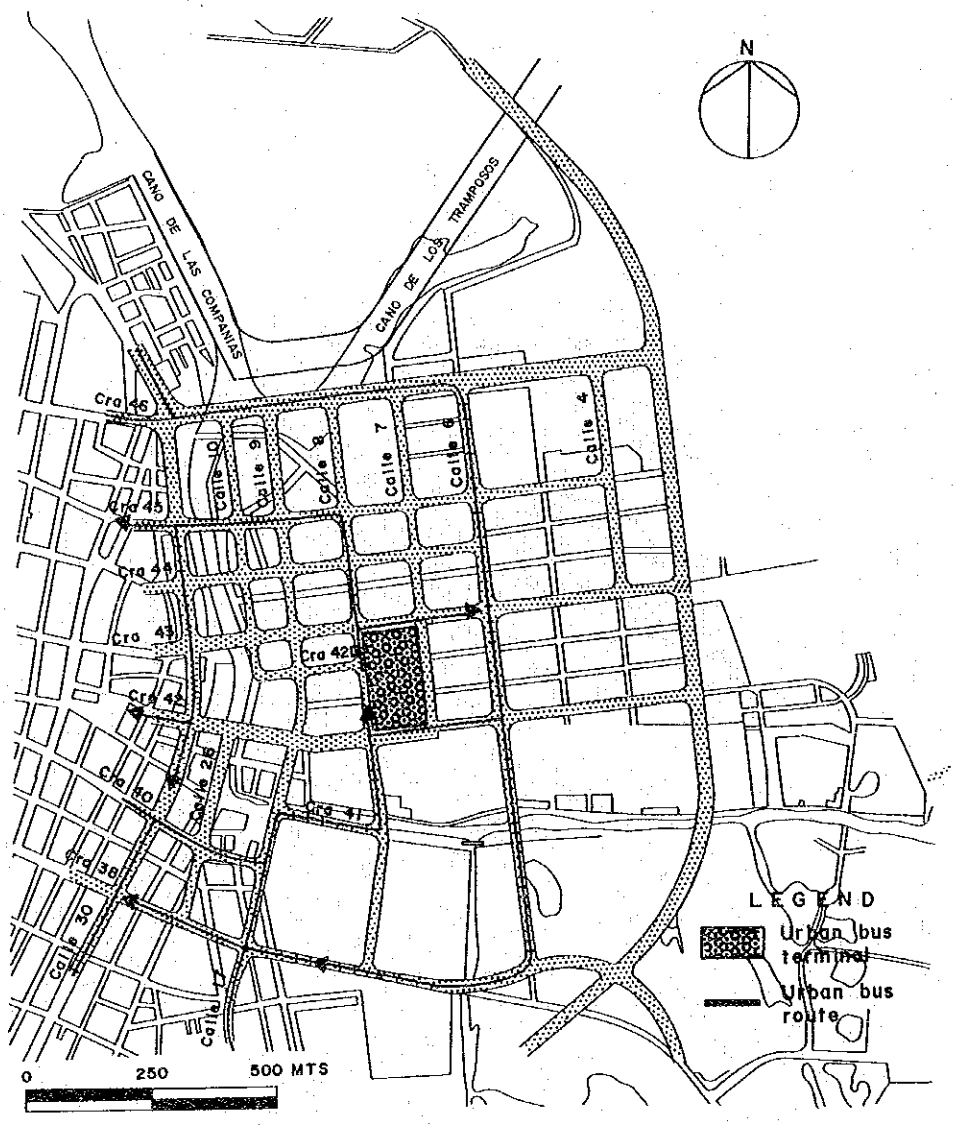


FIG. 8-11 URBAN BUS ROUTE