

* REPUBLIC OF PARAGUAY *

THE URBAN
TRANSPORT STUDY
IN
ASUNCION
METROPOLITAN AREA

PROGRESS REPORT I

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ASUNCION METROPOLITAN AREA OF
THE REPUBLIC OF PARAGUAY

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Introduction

This report covers the progress of our study started in August 1984, when the Inception Report was submitted, and ended in October 1984, totalling a period of two and a half months. Main work in this stage can be divided into the following three;

- (1) Collection and review of the existing data and reports;
- (2) Trips and other road traffic surveys relating to the Project; and
- (3) Mapping of the city of Asuncion and its vicinity.

Chapter 1: Progress of the Study

1-1 Organization

The organization for the study is described in the Inception Report . In the current study period (August-November 1984) 11 Japanese staff (including 7 topographic surveyors) were sent by JICA. Their eight counterparts were appointed by the Municipality of Asuncion, Paraguay.

Coordination	1 person
Traffic planning	1 person
Traffic survey	1 person
Road planning	1 person
Mapping	2 persons
Land Use	2 persons

In early September a Coordinating Committee was officially established. Composed by eight representatives of the following organizations, the Committee makes it a rule to meet once a month.

M.C.A.	3 persons
M.O.P.C.	2 persons
A.N.D.E.	2 persons
I.G.M.	1 person

Shown below are the full and abbreviated names of the organizations contacted during the study period. Such organizations will herein after be referred to by their abbreviated names.

Organization	Abbreviation
1. Municipalidad de la Ciudad de Asunción	M.C.A.
2. Municipalidad de la Ciudad de Asunción Dirección de Tránsito	TRANSITO
3. Ministerio de Obras Públicas y Comunicaciones	M.O.P.C.
4. Administración Nacional de Electricidad	A.N.D.E.
5. Instituto Geográfico Militar	I.G.M.
6. Ministerio de Hacienda Dirección Gral. de Estadística	M.H.D.E.
7. Ministerio de Industria y Comercio	M.I.C.
8. Ferrocarril Central del Paraguay	F.C.F.C.A.L.
9. Administración de Transporte Eléctrico	A.T.E.
10. Administración Nacional de Navegación y Puertos	A.N.N.P.
11. Organización Paraguaya de Cooperación Intermunicipal	O.P.A.C.I.
12. Instituto de Desarrollo Municipal	I.D.M.

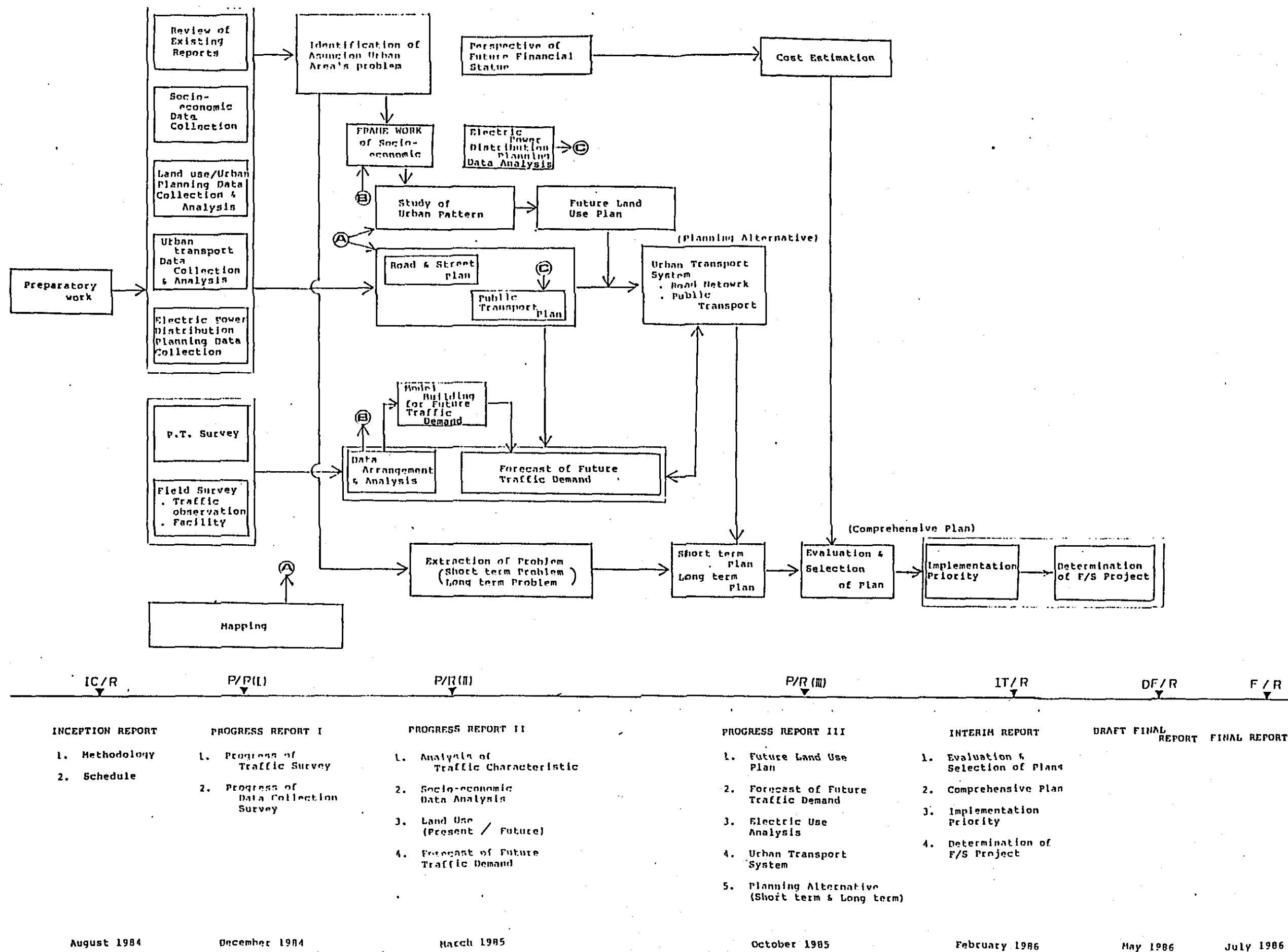


Figure I-1 WORK FLOW OF STUDY

1-2 Working Schedule

The Working Schedule is based on the Work Flow of study shown in the Inception Report. (See Fig.1-1) The period covered by the Progress Report I is mainly a period of field work such as collection of relevant data, traffic survey and mapping. Analysis results will be contained in Progress Report II.

1-3 Brief Work Progress

The details of the work progress will be described with respect to each item in and after Chapter 3. Here the principal work results are summed up.

- 1) Collection of the Existing Data and Reports
The data and reports collected so far are listed in Table 1-1.
- 2) Road and Traffic Surveys

TABLE 1-1 DATA AND INFORMATION LIST

ORGANIZATION	INFORMATION	REPORT
MCA	1. Present Land use	A. General Urban
	2. Municipal Budget Plan (1983)	Transport Planning
	3. Socio-Economics data	1. MT-GEIPOT (Brasil)
	4. Pavement Conditions	Estudio de Transporte Urbano de Asunción 1982 - 1984
		2. BID
		Base para la Implantación del Plan de Desarrollo del Area Metropolitana de Asunción (1981).
		B. Trolley Bus
		3. BCEOM (France)
		Area Metropolitana de Asunción Estudio del Transporte Público Eléctrico (1983)
		4. SOCIMI (Italy)
		La Estructuración del Sistema del Transporte Público Urbano de la Ciudad de Asunción - Proyecto "Trolley Bus 2000" (1983)

TRANSITO	1. MCA Vehicle Registration 2. Signal Types and Location 3. Tax System for Vehicles (including Bus) 4. No. of Bus Service by routes and relative personnel 5. Bus Fare	1. Reglamento de Tránsito (1982)
MOFC	1. Road Conditions for National Highway and Inter Municipal Roads 2. Long Distance Bus	1. Plan Nacional de Transporte, 1983 - 1986 (1983). 2. -do-, 1984-1988 (1984)
ANDE	1. Listado de Usuarios de ANDE	1. ANDE Reports (Power Supply System, Tariff System, etc).
IGM	1. National Triangulation Stations and National Bench Marks	
MHDE	1. Maps related the National Census (Catastral Maps).	1. Anuario Estadístico del Paraguay (1982).
FCPCAC	1. Past Record and Present Conditions -Annual Budget -Route -Fare -Traffic (Passenger and Cargo).	
ATE	-do-	
ANNP		1. Memoria y Balance 2. Navegación y Puertos.
OPACI	1. Car Registration other than MCA 2. Control System for Car Registration and Drivers License 3. Regulation and Law related to Municipality (Tax system, etc).	1. Boletín Informativo de OPACI

Road and traffic surveys can be divided into a Person-Trip (PT) survey, supplementary surveys and Road and Traffic surveys related to the Project. Preparations (including presurveys) for, and execution of, these surveys will be made mainly in the three months from September to November. The contents of the surveys are:

- (1) Person-trip survey
- (2) Supplementary survey
 - Screen line survey
 - Cordon line survey
 - Goods distribution survey
 - Enterprises interview survey
 - Public transport survey
(buses, railways, train, taxis)
- (3) Road and traffic surveys related to the Project
 - Road inventory survey
 - Traffic volume survey
 - Parking zone survey
 - Travel time survey

3) Field Survey for Mapping

The results of an aerial survey (1:10,000 and 1:40,000) conducted by the Municipality of Asuncion City in the Asuncion Metropolitan Area in May 1984 were used to control station surveying, leveling and classification in about two months following mid-August to prepare a 1:5000 map covering the area to be described later.

Fig. I-2 PROGRESS CHART OF THE MAIN WORK ITEMS

Work Item	Aug.	Sept.	Oct.
1. Existing Reports and Data Review			
2. Field Survey			
1) PT Survey			
2) Screen Line Survey			
3) Cordon Line survey			
4) Goods Distribution Survey			
5) Establishment Survey			
6) Public Transport Survey			
7) Road Inventory Survey			
8) Traffic Volume Survey			
9) Parking Survey			
10) Travel Time Survey			
3. Mapping			
1) Field Survey			
2) Mapping			

* work in Japan

Chapter 2: A Review of the Existing Survey and Plans

As described in Chapter 1, the Municipality of Asuncion, Paraguay, received reports from the B.I.D., GEIPOT and I. B. R. F. 's in the past five years. These reports analyze the current state of problems relating to the cities and transport in the Asuncion Metropolitan Area and propose future plans. The work of the I. B. R. F. 's project team is still in progress, but it is schedule to be completed by the end of this year. In mid-October the I. B. R. F. 's survey team visited Asuncion City for an evaluation of the proposed project.

In the same five years, private consultant firms from Italy, France, etc. submitted urban transport reports mainly dealing with trolley buses. On October 31, 1984, an Italian Government mission visited Asuncion City and offered to implement an urban transport project for effective utilization of electricity.

It can be seen from the above that projects relating the urban transport in the Asuncion metropolitan area have been very actively carried out. A brief description of the contents of the principal reports is given below.

2-1 B.I.D. Report

This report was submitted in 1981 following a study from 1978 to 1980. The 1973-1979 period studied for forecast purpose was a period when the Paraguayan economy grew rapidly. For this reason, the result of the forecast now looks too easy.

2-2 GEIPOT Report

The GEIPOT drew up two reports in 1982 and 1984 under the project "Estudio de Transportes Urbanos de Asunción."

(1) 1982 Report

This report had the following three objectives and covered the Centro district alone:

- Reduction of fuel consumption
- Improvement of environmental conditions.
- Increase of safety and smooth the traffic flow

To prepare the report, the GEIPOT surveyed traffic volumes at 87 intersections in the Centro district and parkings, road sings, traffic lights and also road conditions in the area. On the basis of the findings, the report pointed out problems and proposed improvement plans.

Regarding Av. Palma, in particular, the report showed a bird's eye view giving priority to pedestrian's space.

(2) 1984 Report

This report had the same objectives as the previous report, but it placed particular emphasis on "improvement of public transport facilities," particularly on the bus. The survey area covered by the report was the same as ours, that is, the Asuncion Metropolitan Area. The GEIPOT's home interview survey of 1983 used a sample of 6,306 households in the five cities of Asuncion, Lambare, Fernando de la Mora, Luque and San Lorenzo. The sampling ratio was 4,78 percent.

Buses were found to account for 73 percent of 644,860 weekday motor vehicle trips. Most of the purposes of the bus trips were "going to work" and "going to school." At the same time with the home interview survey, consciousness for buses was surveyed.

On the basis of the results of those surveys, the report proposed a bus route system with aims Shorter trip time, Route rationalization and Lower fares. For this purpose the report proposed to classify the bus route system in the Asuncion Metropolitan Area into the following four systems, and to be served by trolley buses and diesel buses:

- Diametrical System (direct service to and from Barrios)
- Radial system
- Circular system
- Suburban system

Here is a summary of the details of the working plan for trolley buses:

- | | | |
|-----|---|-----------------------------|
| (1) | Project years | 17 years from 1984 to 2001. |
| (2) | Number of buses | 253. |
| (3) | Routes and their distances | |
| | - Eusebio Ayala | 39.8 km. |
| | - España | 25.3 km. |
| | - Fernando de la Mora | 22.5 km. |
| | Total | 87.6 km. |
| (4) | Demand at morning peak hour (year 2001) | 10,715 |
| | persons (one-third of total bus demand) | |
| (5) | Total cost B/C and IRR | |
| | - Total cost (in 1984 unit cost) | Q5,029,860,000 |
| | | (US\$3,143,725,000: |
| | | (US\$1.00 = Q160) |
| | | (discount rate 12%) |
| | - B/C | 1.19 |
| | - IRR | 17.1% |

2-3 Private Firms' Trolley Bus Report

Reports submitted by two firms are summed up in Table II-1. They differ widely in content and cost.

Table II-1 Trolley Bus Reports by Private firms

Item	SOCIMI *	BCEOM *
1. Target Year	2000	Unknown
2. Vehicle No. to be Introduced	Phase I 150 Phase II 350 Total 500	145 (Capacity: 165 pass./each)
3. Route	Inside of Centro: 2 routes Outside of Centro: 12 routes	Route 1: Sajonia-San Lorenzo 17.5 Km. Peak Hour Pass. : 5000 - 7000 Route 2: Colón-Lambare 6.8 Km. Peak Hour Pass. : 3.000 - 4.000
4. Cost	Phase I : US\$ 72 M. Phase II: US\$ 168 M. Total : US\$ 240 M.	6,115 M. (US\$ 8,196 M.) (US\$ 1.00 = 6 160)

* SOCIMI, BCEOM : Private Trolley Bus Firms.

2-4 Our Attitude Toward these Reports

According to our agreement with the Municipality of Asuncion, we will take account the conclusions of the above reports, but our own report will not be bounded by them. We shall propose what is considered important from our experience. At the present moment, however, we are not in the position to evaluate those reports, because not all necessary information for such evaluation is available.

Chapter 3: Person Trip Survey

3-1 Zoning.

1) Survey Area Selection

The Asunción Metropolitan Area is composed by eleven (11) cities, ten (10) in the Central Department, and one (1) in Presidente Hayes Department.

Outside the Metropolitan Area there are nine cities including Capiatá (46,000 persons), Itá (28,000 persons) and Itauguá (26,000 persons). Excluding Capiatá, all these cities are so far away that is considered unnecessary to include them in the survey area. As regards Capiatá, the following consideration is given.

In Capiatá, particularly its area along Route No. 2 is affected by a remarkable urbanization of San Lorenzo City. It is considered a matter of time that the two cities will become connected. This urbanization is mainly under way in the form of a transition to a residential district and many people in this district work in Asunción city. Therefore, it is virtually impossible to draw a line of demarcation between Capiatá City, outside the Metropolitan Area and San Lorenzo City inside it. It was therefore put forward as a subject for consideration whether or not it was advisable to include Capiatá City's area lying along Route No. 2 in the Metropolitan Area.

We conducted an observation of the traffic volume on Route No. 2 in Capiatá City to determine the current traffic there. An estimate based on the results of this observation showed that the total of trips generated in Capiatá City (excluding pedestrians) accounted 0.7 percent of the total of the Metropolitan Area as a whole. Therefore, we concluded that it was not necessary to include Capiatá in the study area.

The projected Person-Trip survey covers the 11 cities shown in the Table III-1.

Table III-1 Outline of the Cities in the Metropolitan Area.

City	Population	Male	Female
Asunción	457,210	214,430	242,780
Fdo. de la Mora	66,450	32,120	34,330
Lambaré	67,180	33,130	34,050
Limpio	15,461	7,703	7,754
Luque	62,761	31,004	31,757
San Lorenzo	74,240	35,530	38,890
M.R. Alonso	14,442	7,241	7,201
Nemby	12,014	6,098	5,916
San Antonio	8,296	4,140	4,156
Villa Elisa	12,044	6,066	5,918
Villa Hayes	18,860	9,650	9,210
TOTAL	808,958	386,936	422,022

Source: 10% Sampling in 1982 Census

2) Basic Approach to Zoning

Zoning was based on the Sections used in the National Census. This is because the number of households and population obtained by the census are precise enough to permit the study.

The Sections was segmented in the following cases:

- (1) When there are clear differences in land use within a Section.
- (2) When land use is expected to change remarkably in the future.
- (3) When a zone is possible to so large that is posible to considered plural regional units.

3) Segmentation of the National Census Section in Asunción

In the present survey the Section was segmented in the following:

- (1) Centro area
- (2) Area adjoining the Centro area
- (3) Colón and Barrio Obrero area
- (4) Zevallos-Cué, Loma Pytá and Primer Presidente area

For the Centro district, the following two analysis levels can be set:

- (1) Transport planning for Asuncion Metropolitan Area as a whole.
- (2) Transport planning for Centro district.

The Centro district, the core of the Metropolitan Area, shows a remarkable concentration of commercial and business activities. It is also an area where traffic problems are concentrated. Therefore, this district should be kept in good and vitalized conditions for the future as well. In this area small units of analysis are desirable.

On the other hand, a transport plan well balanced not only in the Centro district but also in the whole Metropolitan Area requires a good balance in zone size between the Centro district and the other areas.

From the above two viewpoints, the Centro area is divided into the following three on the analysis level mentioned under (1) above:

- (a) Gral. Díaz
- (b) Catedral
- (c) Micro Centro

On the basis of analysis level (2), Micro Centro is subdivided into the following three according to area characteristics:

- (a) Western area
- (b) Central area
- (c) Eastern area

Details are shown in Fig. III-1. Segmentation of the Sections other than the Centro district was executed on the analysis level of transport planning for the whole Metropolitan Area.

. Area adjoining the Centro area

Widely different in land use, this area is divided into a commercial district, a residential district, a combined commercial-residential district and military area by their entirely difference in character. This Section was divided into three zones from the above viewpoint.

. Colón and Barrio Obrero area

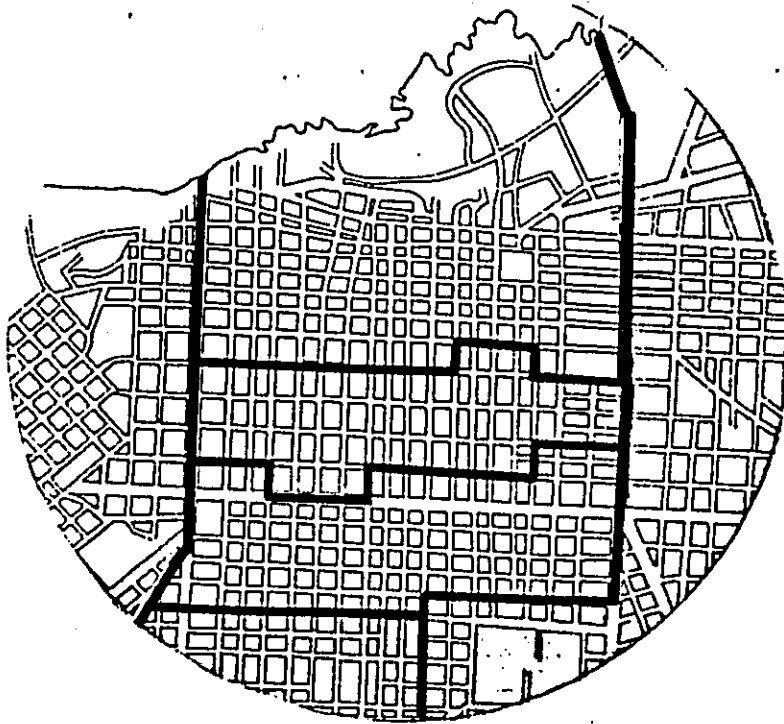
This area is developing as a residential area. Because of its adjacency to the Centro, residential density there is very high. This area was divided into two zones along the two main roads: Av. Colón and Av. Estados Unidos.

. Zevallos-Cué, Loma Pytá and Primer President area

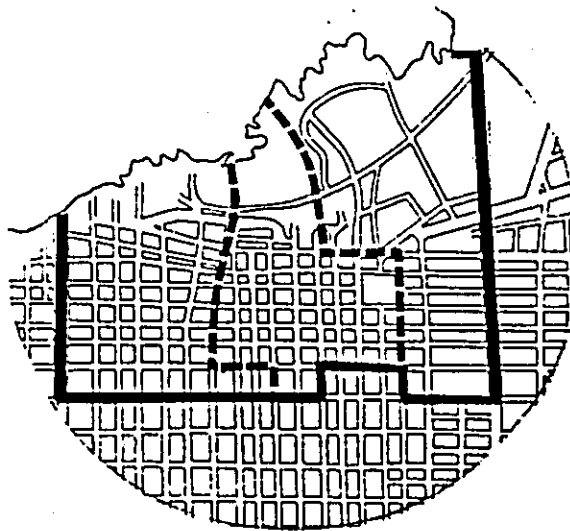
This Section covers such as a large area that was divided into three zones to achieve a balance with the other zones. In Zevallos-Cué, Loma Pytá and Santa Rosa area residents use the Av. Artigas via Ruta Transchaco. The areas are divided by the railway.

The Mbocayaty and Primer Presidente area are regional units which utilizes Av. S. Trinidad. The other areas, Manorá and Villa Victoria, use Av. General Genes-Av. Aviadores del Chaco. The above areas were made into two zones.

As a result, Asuncion City was divided into a total of 22 zones. However, as zoning of the Centro area for detailed analysis will be divided in 24 zones. Asuncion City zoning is as shown in Fig. III-2.



(1) ZONES IN CENTRO AREA



(2) SUBDIVIDED ZONES

Fig. III-1 DIVISION OF CENTRO ZONES

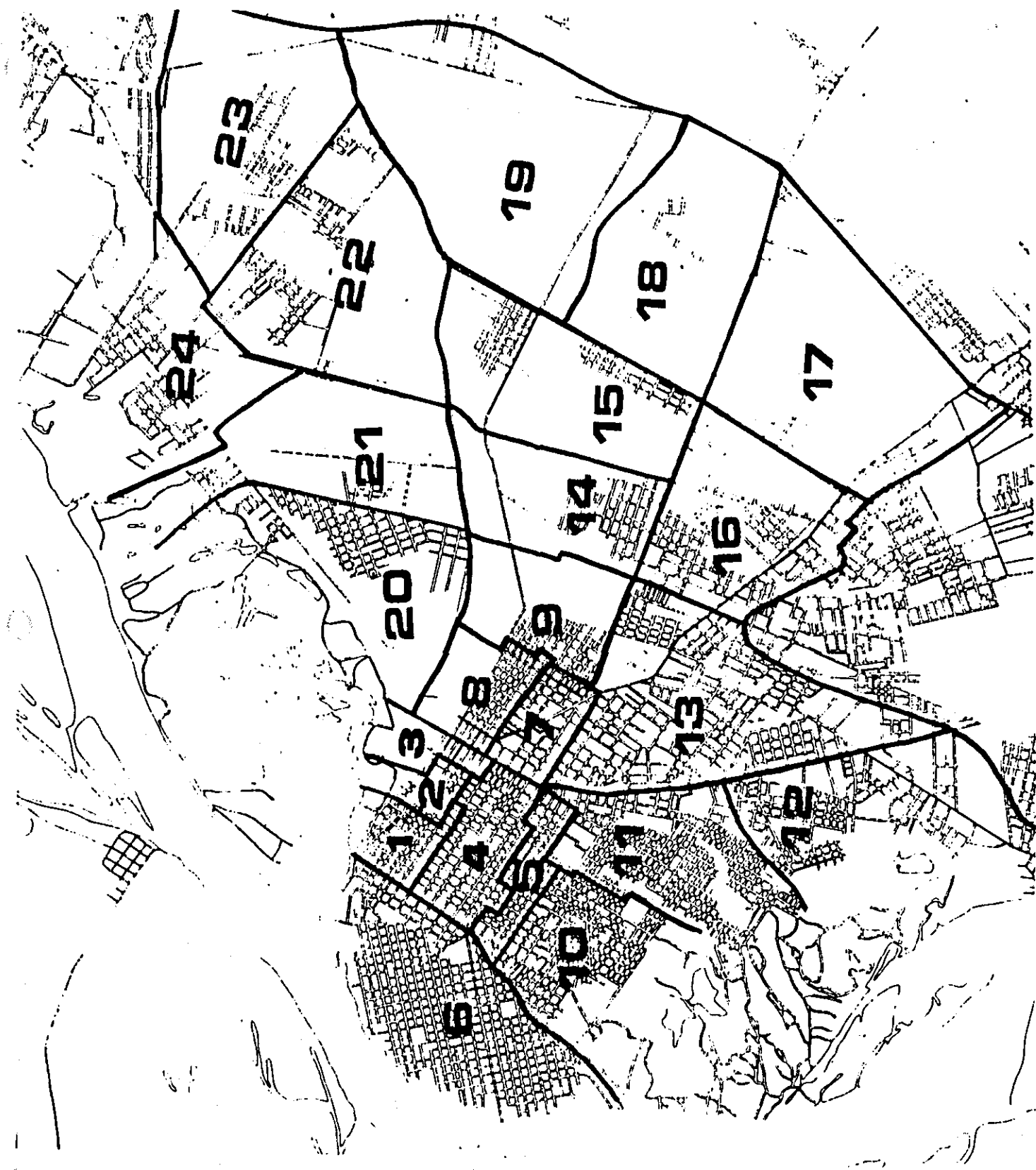


FIG. III- 2 ZONES IN ASUNCION

Table III-2 Zone Code in Asuncion

Code	Zone Name	Contents
01	Encarnación	Encarnación
02	Catedral Este	Catedral
03	San Roque Norte	San Roque, Catedral, San Blas
04	Catedral Oeste	Encarnación, Catedral, Gral. Díaz San Roque
05	Gral. Díaz	Gral. Díaz, Tacumbú
06	Carlos A. López	Sajonia, Itapytapunta, San Antonio, Dr. Francia, Carlos A. López
07	San Roque Sur	San Roque, Pettirossi
08	San Roque Este	San Roque, San Blas
09	Las Mercedes	Las Mercedes, Mcal. López, Gral. Caballero, Ciudad Nueva
10	Tacumbú	Tacumbú, Gral. Díaz, Obrero R.L. Pettit
11	Obrero	Obrero, R.L. Pettit, Gral. Díaz
12	Republicano	Republicano, Bañado Santa Ana Itá Enramada
13	Pettirossi	Pettirossi, San Vicente, Pinosá
14	Mburicaó	Mburicaó, Mcal. López, Recoleta
15	Recoleta	Tembetary, Recoleta, Villa Morra
16	Vista Alegre, Nazareth	Vista Alegre, Nazareth
17	Pte. Stroessner	Terminal, Hipódromo, Pte. Stroessner
18	Villa Aurelia	Mcal. Estigarribia, Los Laureles, Villa Aurelia
19	Ycuá Satí	San Cristóbal, Ycuá Satí, San Jorge, Ytay, Luis A. Herrera, Sta. María
20	Jara	San Blas, Las Mercedes, Jara, Mcal. López
21	Bella Vista	Bañado Cara Cará, Tablada Nueva, Virgen de Fátima, Mcal. López, Bella Vista, Sta. Rosa, Virgen del Huerto, Virgen de la Asunción
22	Santo Domingo	Santo Domingo, El Mangal, Las Lomas, Manorá, Mburucayá, Madame Lynch, Salvador del Mundo
23	Mburucuyá	Santísima Trinidad, Mburucuyá, Madame Lynch, Mbocayaty, Nú Guazú, Salvador del Mundo
24	Botánico	San Rafael, Botánico, Zevallos Cué, De la Residenta, Loma Pytá

4) Zoning of the Metropolitan Area (outside Asuncion)

In zoning the areas outside Asuncion City, in principle the cities areas were treated as single zones. However, the following cities areas were segmented based on the Sections in view of differences in land use and the progress of urbanization.

(1) Lambaré

It was divided into the following three zones:

- (a) The area demarcated by Arroyo Lambaré where the urbanization of Asuncion is in progress.
- (b) The existing urban center of Lambaré using Av. General Máximo Santos.
- (c) The area which is being and will be developed as a residential area using Defensores del Chaco.

(2) Fernando de la Mora

It was divided into the following two zones:

- (a) The area Route No. 2 (Av. Mariscal Estigarribia.)
- (b) The area using Av. Mariscal López.

(3) San Lorenzo

It was divided into the following three zones

- (a) Urban center
Is an area where urbanization is now rapid progress.
- (b) Northern area (demarcated by Arroyo San Lorenzo)
- (c) Southern area
The other two areas have not yet undergone much development, but they are expected to develop remarkably in the future.

Except the above three cities, each city form a zone, as shown in Fig. III-3. The area outside of the Metropolitan Area are shown in Fig. III-4 and III-5. Zone codes are given in Table III-2.

Table III-3 Zone Code outside of Asuncion

Code	Municipality	Department
01-24	Asunción	Central
25-27	Lambaré	Central
28-29	Fdo. de la Mora	Central
30	Luque	Central
31	Mariano R. Alonso	Central
32	Villa Hayes (Urban)	Central
33	Limpio	Central
34-36	San Lorenzo	Central
37	Neemby	Central
38	San Antonio	Central
39	Villa Elisa	Central
40	Areguá	Central
41	Capiatá	Central
42	Ypané	Central
43	Itaguá, Ypacaraí	Central
44	Guarambaré, Itá	Central
45	Villeta, Nueva Italia	Central
46		FRESIDENTE HAYES, ALTO FARAGUAY, BOQUERON, NUEVA ASUNCION, CHACO
47		CONCEPCION, AMAMBAY, SAN PEDRO, CANENDIYU
48		CORDILLERA, CAAGUAZU, ALTO PARANA
49		PARAGUARI, GUAIRA, CAAZAPA, ITAPUA, MISIONES, NEEMBUCU



Fig. III-3 ZONES IN METROPOLITAN AREA

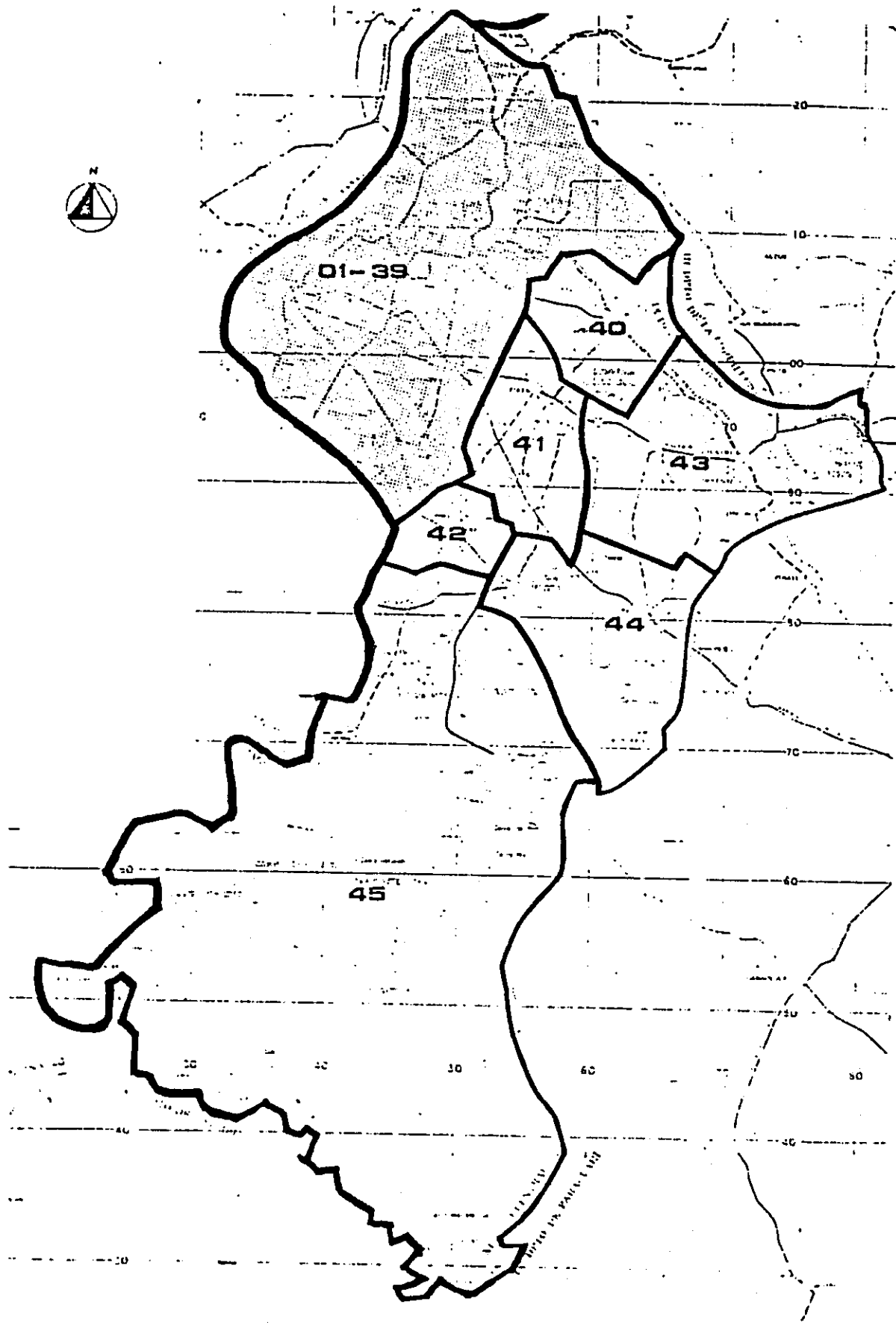


Fig. III-4 ZONES IN CENTRAL DEPARTMENT

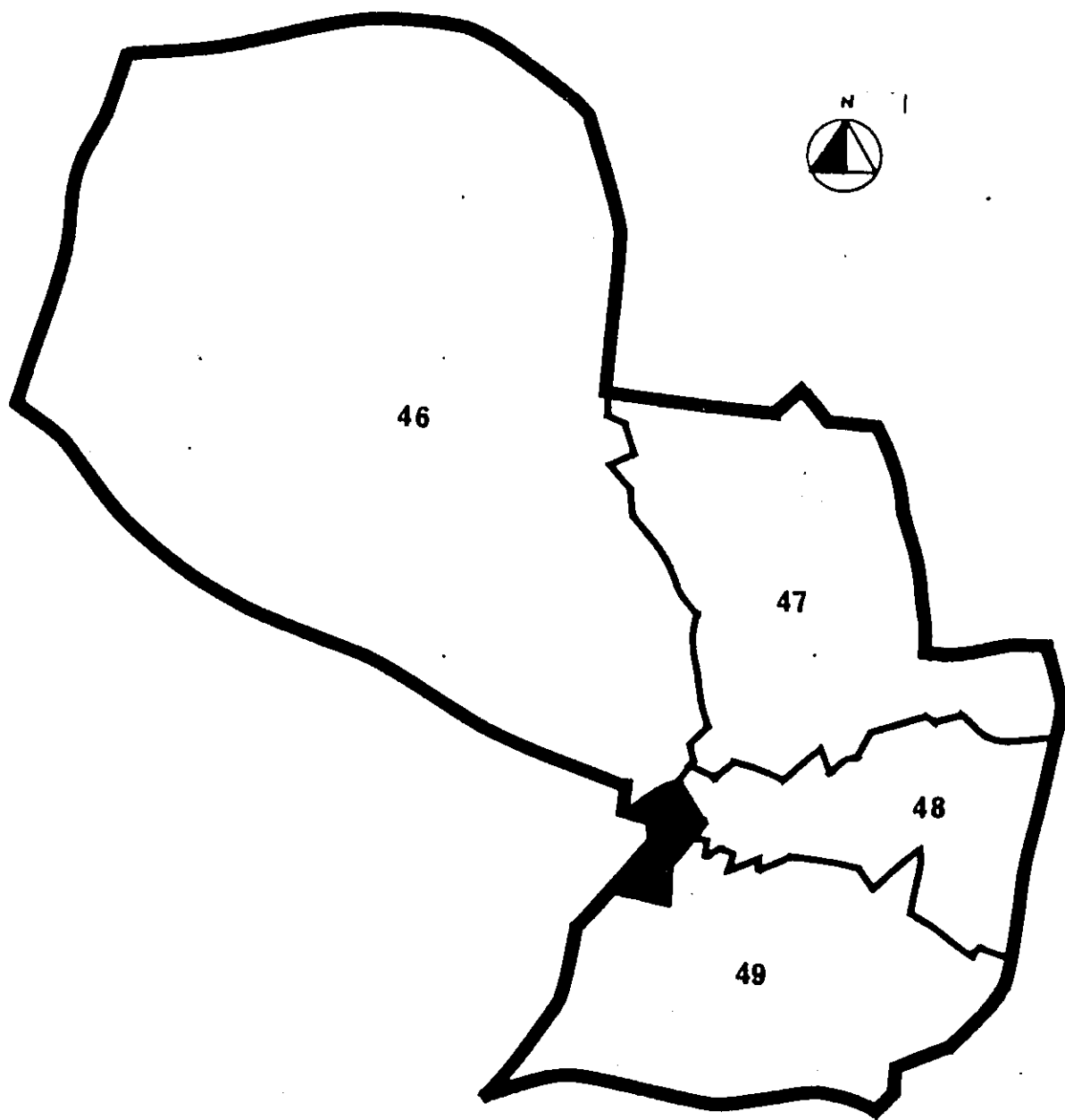


Fig. III-5 ZONES IN PARAGUAY

3-2 Survey Flow and Schedule

(1) Survey Flow

The overall survey flow chart is as shown in Fig. III-6.

(2) Sampling Design

Sampling methods, sampling registration, sampling work procedures and the necessary materials for sampling work were carefully studied. Setting the sampling ratio at 6.7 percent, the sample rate of one household out of every 15 is decided. All six-year-old or older members of the sampled households were covered by this survey.

(3) Working Survey Design

Survey methods and questionnaires, were carried out based on the opinion of our Paraguayan counterparts and HMDE census people, and presurveys.

(4) Input Design

As regards data input and data coding to follow field surveys, we based our input design on the opinions of tabulation personnel and Paraguayan punching firm staff.

(5) PR

In order to get respondent's cooperation, we used the following 6 (six) medias:

- (a) Newspapers
- (b) Television
- (c) Radio
- (d) Posters
- (e) Letter of request for cooperation
- (f) T-shirts

(6) Execution

During mid-October-mid-November period the Home Interview survey was conducted. During the survey period, an interviewer will visited each of the sample households for a personal interview. The interviewers were trained on the basis of a manual in early October.

(7) Data Checklist Preparation

Computers will be used to find out input and punching omissions and logical contradictions in input contents. This checklist includes warning errors to improve data-accuracy.

(8) Transfer-stop Coding

In dealing with trips using buses, tramway and railways, the nearest stops and stations were codified.

(9) Data registration

The questionnaires were registered in diskets

(10) Data check

The errors in the computer were checked based on the data check method. At the same time the wrong datas were corrected and registered again based on the questionnaires.

The original file were made up repeating this process until the error disappeared.

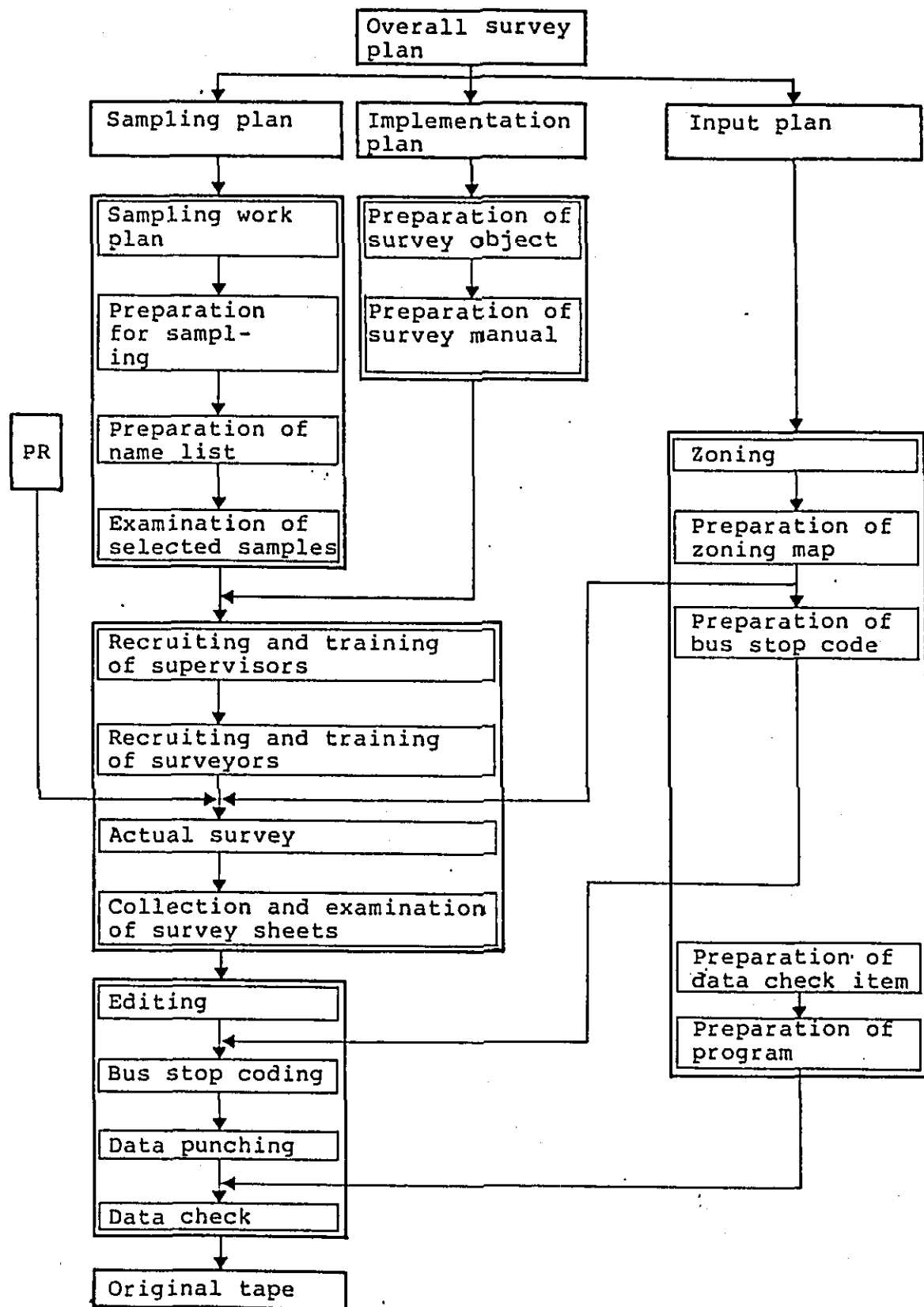


Fig. III-6 SURVEY IMPLEMENTATION PROCESS

(2) Survey Schedule

The original schedule and current progress are shown in Fig. III-7. The field survey period was begun two weeks earlier than originally planned and the present schedule was established for four weeks, from mid-October to mid-November, in view of the fact that schools and enterprises vacations are scheduled to start in mid-November.

Grand item	Work item	Sept.				Oct.			
		1	2	3	4	1	2	3	4
Sampling	1. Planning of sampling work	-----							
	2. Preparation for sampling		-----						
	3. Sampling work			-----					
	4. Preparation of name list				-----				
	5. Examination of extracted samples							-----	
Preparation for actual survey	1. Planning of actual survey work	-----							
	2. Preparation of object of actual survey		-----						
	3. Preparation of actual survey manual			-----					
	4. Setting of object of actual survey				-----				
	5. Pre-survey				-----				
PR	1. Posters							-----	
	2. Mass-communication media							-----	
Actual survey	1. Recruiting and training of supervisors		-----						
	2. Recruiting and training of surveyors			-----					
	3. Actual survey							-----	
	4. Collection and examination of survey sheets								-----
Input	1. Planning of input work							-----	
	2. Preparation of zone map and bus stop code							-----	
	3. Editing								
	4. Coding								
	5. Punch								
	6. Error check								

Original ———
Actual - - - -

Fig. III-7 SURVEY SCHEDULE

3-3 Sampling

1) Sample Rate Determination

Sample Rate will be set by Relative Error, which is calculated by the following formula. Conditions to determine the rate are: Confidence coefficient of 95% and Relative Error of less than 20%.

$$RSD = K \times [(ZK-1) - (1-r) / \times (1/N)]^{(1/2)}$$

where RSD: Relative Error

K: Confidence coefficient (1.96)

ZK: Number of category (30 zone x 30 zone)

r: Sampling Rate (4%, 5.4% and 6.0%)

N: Population parameter (700,000 x 3 trips=2,100,000)

The "r" were reduced to 3 because the target relative error was within 20 percent at a maximum, and because there was no problems in implementation. The results of calculations based on the three different rates are shown in Table III-4.

Table III-4 SAMPLING RATE AND RELATIVE ERROR

	Sampling Rate (%)	Survey Rate (%)*	Relative Error
CASE 1	5.0	4.0	19.9
CASE 2	6.7	5.4	17.0
CASE 3	7.5	6.0	16.0

* NOTE. 80% of Effective Response is assumed

Among the three, Case 1 may exceed a relative error of 20 percent when it fails to achieve an effective response rate of 80 percent, while Case 3 does not improve much in accuracy even when the sample rate is increased. Therefore Plan 2 was adopted with a sample rate of 6.7 percent and a survey rate of 5.4 percent.

2) Sample List

Conceivable sample lists from which to choose a sample for our survey were (1) original sheets of the 1982 original National Census, (2) the ANDE customer list, (3) housing maps and (4) Police lists. The original National Census was already discarded. Other conceivable sample lists had the following problems:

(1) ANDE customer list: It is not a list of nighttime dwellers, and includes factories and business offices as well. It

therefore permits no accurate determination of the population parameter, making it impossible to amplify each zone.

(2) Housing maps: Whether or not the houses shown are nighttime residences is not clear from the maps. Data on the whole survey area are not available. It is hard to specify particular households to interviewers.

(3) Police lists: It is not permitted to make use of these lists.

After all, we decided to use the results of National Census and the ANDE customer lists which permit population parameter determination and expansion.

3) Sampling Methods

(1) Sampling Materials

(a) National Census: This Census was carried out in 1982 and its results are being tabulated now.

The National Census data used as sources for this survey were: area maps, the number of households, and male and female population that figures in each survey area. The terms denoting areas in the National Census are as follows:

- Section: The city of Asuncion was divided into 19 Sections; each of the other cities is regarded as forming one Section, totalizing 29 Sections.
 - Sector: Each Section was divided into Sectors, each of which was in the charge of a supervisor at the time of the National Census. Asuncion had 430 Sectors while other cities had 180 Sectors each one. The total runs up to 710 Sectors.
 - Area: The Sector is subdivided into Areas, each of which is taken charge of by an interviewer at the time of the National Census. An Area generally contains 20 households on an average. Asuncion has 4065 Areas and the other cities 2584 each one. The total works out at 6649
- (b) ANDE Customer List: This contains the addresses, Manzanas and house numbers of all its customers.

(2) Sampling Method

In sampling, the number of sample households for each Area is computed and sampled at random from the corresponding Manzana of the ANDE. Finding the addresses and house numbers of the sample household from the ANDE's list, they are posted to the sample list.

However, in slum areas of Asunción's (Chacarita), where no electric power is available, and in the rural areas of seven cities which are Luque, Mariano R. Alonso, Villa Elisa, Neembý, Limpio, San Antonio and Villa Hayes, where neither addresses nor house numbers are indicated although electric power is available, we specified the number of sample households in each Area and sent supervisors there. After random sampling, they drew up maps of such households in order to use them as household sample list.

4) Sampling Results

Sampling results in each city or zone were as shown in the Table III-5.

Table III-5 SAMPLING RESULTS

MUNICIPIO	ZONA	NO de Vi - vienda	Población (NO de vivienda)	Índice d/ muestreo	MUNICIPIO	ZONA	NO de vi- vienda	Población (no de vivienda)	Índice de muestreo
Asunción	01	69	883	7.8	Asunción	24	250	3,796	6.6
"	02	27	318	8.7	"	25	490	7,306	6.7
"	03	134	1,849	7.2	Total Asun.		6,106	91,836	6.7
"	04	97	1,419	6.8	Lambaré	26	453	6,750	6.7
"	05	138	2,026	6.8	"	27	127	2,001	6.3
"	06	545	8,189	6.7	"	28	395	5,727	6.9
"	07	127	1,918	6.6	Lambaré Tot.		975	14,428	6.7
"	08	86	1,233	7.0	Fdo.de/La Ho ra	29	703	10,742	6.5
"	09	213	3,169	6.7	"	30	235	3,410	6.9
"	10	263	4,156	6.3	" Total		938	14,152	6.6
"	11	417	6,201	6.7	Luque	31	875	12,728	6.9
"	12	303	4,494	6.7	M.R.Alonso	32	193	2,886	6.7
"	13	466	7,080	6.6	Villa Hayes	33	93	1,390	6.7
"	14	142	2,041	7.0	Limpio	34	225	3,192	7.0
"	15	228	3,497	6.5	S.Lorenzo	35	222	3,135	7.1
"	16	146	2,136	6.8	"	36	541	8,376	6.5
"	17	171	2,624	6.5	"	37	257	3,552	7.2
"	18	424	6,376	6.6	" Total		1,020	15,063	6.8
"	19	241	3,568	6.8	Neembý	38	166	2,340	7.1
"	20	397	5,982	6.6	S. Antonio	39	147	1,747	8.4
"	21	294	4,900	6.0	Villa Elisa	40	162	2,394	6.8
"	22	273	4,070	6.7	Tot/A.Metrop.		4,794	70,370	6.8
"	23	165	2,595	6.4	TOT/General		10,900	162,206	6.72

The number of sampled households in the whole Asuncion Metropolitan Area was 10,918 households or 6.73 percent of the total households of 162,206.

In each zone, the sample rate was about 6.7 percent. The particularly high sample rate of 8.5 percent in Asuncion's Zone 02 was attributable to the fact that the number of residents there, which had been diminished by a flood disaster at the time of the National Census, but increased again later being necessary a supplementary sampling for them. The rates of 8.4 percent in San Antonio's Zone, 39 and 7.6 percent in Limpio's Zone 34 resulted a little bit high due to the arithmetic process of rounding for determining the number of households per Area. The sample rate for Asuncion's Zone 21 became 6.0 percent because people who had dwelt there at the time of the National Census no longer live there.

3-4 Questionnaire (Fig. III-B)

1) Design Policy

In questionnaire design, attention was paid to the following points:

- All necessary survey items should be covered.
- The questionnaire should be easily comprehensible to the interviewers and not misleading to the respondents.
- Easy to check and code after the survey.
- Directly punchable and easy to store.

To satisfy these requirements,

- The respondent answers and the interviewer entries were printed differently in color from the questions.
- Personal attributes, household attributes and trip information were divided by bold lines one from another.
- A zone code and a transfer-stop coding column were included to prevent errors in coding and punching.
- In order that as many trips as possible can be entered on a single-sheet questionnaire, the space for a maximum of 10 trip entries were kept on both sides of the sheet.
- The questions were printed from left to right in conformity to the local custom of writing.

2) Survey Items

The person-trip survey in the Asuncion Metropolitan Area was designed to cover the following items and details:

(1) Basic Items

(a) Whether a trip or trips were made

A column for recording whether the respondent made a trip or trips on the date of the survey.

(b) Reference Numbers

Designed to identify each questionnaire form in an eighth digit number. As shown below, the first two digits indicate the zone of residence, the next two digits the Sector number, the next two digits the household number and the last two digits the personal number: The Sector numbers beginning from 01 to 25 are for 25 households in each zone.

One Sector is taken care of by an interviewer in a week. The household numbers, 01 to 25, are households in the same Sector. The personal numbers are for the individuals in the same household and given in serial numbers for the same household.

! Zona No. !	Sector No. !	Vivienda No. !	Persona No. !
! - !	! - !	! - !	! - !
! - !	! - !	! - !	! - !
! - !	! - !	! - !	! - !

Fig. III-9 REFERENCE No.

(c) Number of Trips

This column is for the entry of the number of trips of the respondent. It is used to find out errors in trip punching.

(d) Date of Survey

This is to indicate the date of reported respondent trips.

(2) Personal Attributes

(a) Sex

For the entry of the respondent's sex.

(b) Age

For the entry of the respondent's age.

(c) Occupation or No Occupation

For the entry of the number indicating any of the respondent's seven occupational statuses-whether the respondent has an occupation or not, whether the respondent is a housewife or a student, etc.

(d) Specific Occupation

The respondent with an occupation is required to indicate

which of the nine occupations shown he has.

(e) Type of Industry

The respondent is required to indicate which of the nine types of industry shown he is engaged in.

(f) Address of the Place of Work

When the respondent is employed, he is asked where he works, and it is recorded the address of his work place and the relevant zone code.

(g) Monthly Income

If the respondent has an income, he is asked about his monthly income and, assigning it to one of the ten income classes to make an entry.

(h) School

In the case of a schoolchild or student, it is recorded the address and zone code of the school.

(3) Household Attributes

(a) Family Size

It is recorded the number of family members including those who live with them. This is used to know the change from the 1982 National Census.

(b) Family Members Above Six

It is recorded the number of family members above 6. This is used for determining the population parameter and for checking the personal numbers.

(c) Car Ownership

It is recorded the numbers of the passenger car and trucks owned.

(d) Name of the nearest stop/station; time spent by walking from/to them.

It is recorded the bus stop or tramway stations name, and the time spent by walking from/to them.

(e) House ownership condition

It is recorded one of the three alternatives: owned, rented (paid) or borrowed (free of charge).

(f) House dimensions

This item is classified in 3: independent house, apartment and slam house, and each of them is also classified according the dormitories number in 7 alternatives.

(4) Trip information

(a) Departure place

When the departure place is : 1. home, 2. work place, 3. study place, it is recorded the corresponding number.

In other than these cases it is recorded the address and the zone code.

(b) Departure time

It is recorded the time when the trip begins.

(c) Arrival place

When the arrival place is: 1. home, 2. work place, 3. study place, it is recorded the corresponding number.

In other than these cases it is recorded the address and the zone code.

(d) Arrival time

It is recorded the time when the trip ends.

(e) Trip purpose

It is recorded one of the seven alternatives of the reasons why it was made the trip.

(f) Means of Transport

It is recorded the means of transport used for trips.

(g) Transfer stations/stops

In the case of a trip using bus, tramway or railway, it is recorded the stops/stations where the respondent get on or off such a vehicle.

(h) Driving

In the case of a trip using an automobile, it is recorded whether the respondent drive his own car.

(i) Number of passengers

When the respondent drive a car, it is recorded the number of passengers on the car.

(j) Parking

When the respondent drive a car for a trip, it is recorded which of the five alternative places choose for parking.

[illegible][illegible][illegible]

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00
01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00

3-5 Presurvey

1) Objective

Before conducting the survey of some 10,000 households that that means about 40,000 persons, we conducted a presurvey to find out problems and solutions. Here are the summary of presurvey objectives:

- (1) Determination of a mean outgoing frequency.
- (2) Determination of a mean trip frequency.
- (3) Determination of the degree of cooperation.
- (4) Determination of mean interview time and consideration of the number of households held in charge per week.
- (5) Consideration of the questions in the questionnaire.
- (6) Consideration of the wording of the questions.
- (7) Consideration of answer categories.
- (8) Consideration of the making check system.
- (9) Memory of the previous day's trips.

2) Presurvey Outline

The presurvey conducted in two days-on Wednesday, Sept. 19 and Saturday, Sept. 22. was as shown below in brief:

- (1) Interviewers: Eighth supervisors.
- (2) Sample households: 30 households sampled at random. Each supervisor took charge of the three or four households.
- (3) Survey area: A central shopping area, a general residential area, a high-class residential area and a suburban area.
- (4) Survey material used: A questionnaire.
- (5) PR: None.
- (6) ID card carried by each interviewer: An ID card issued by the Asuncion Municipal office.

3) Presurvey Results

The results of the presurvey were as shown in Tables III-5 through III-7.

(1) Response

The individual response rate was 72 percent.

The percentage was somewhat lower than the target of 80 percent mainly because the presurvey period was only two days and did not permit contact with "absent" people. An effective response rate of 80 percent should be possible in view of the fact that invalid responses included no cases of "reject".

TABLE III-5 Result of Pre-survey

Household	Person	Invalid	Valid	Reason of invalid		
				Absence	Reject	Others
30	136	98	38	32	-	6
	100(%)	72(%)	28(%)	24(%)	-	4(%)

(2) Trip Distribution and Average Trips

Ratio of going out: 85 percent.

Average number of trips: 3.0 (gross) or 3.6 (net).

The going-out ratio of 85 percent was almost the same as in previous studies. The average number of trips was a little higher but it was considered attributable to the custom of getting back home for lunch and "siesta" time. In the trip distribution, four trips were highest (36 percent), followed by two trips (33 percent).

Table III-6 Trip Distance Distribution

Distance(Km)	Trip No.
0 - 1	15
1 - 2	-
2 - 3	33
3 - 4	3
4 - 5	36
5 - 6	2
6 - 7	6
7 - 8	2
more than 8	3
TOTAL	98
Average (Gross)	3.0 Km
(Net)	3.6 Km

(3) Interview Time

The interview time for the effective return of 3,2 persons per household was about 35 minutes. But more than one hour was required for five interviews with large families or people with a lot of trips. Each interviewer interviewed four or five households a day without difficulty.

Table III-7 Interview Duration

Duration	Interview No.
less than 15 min.	5
16 - 30	4
31 - 45	10
46 - 60	6
more than 1hr.	5

4) Problems and Solutions in the Presurvey

(1) PR to Respondents

No PR activities were carried out for this presurvey, but the sampled households were cooperative. However, the lack of prior PR caused us to spend more than necessary time explaining the survey objectives, etc. If 150 interviewers are to be used for the projected survey, sufficient PR activity mainly in mass media is necessary.

(2) Consideration of Questions

Since students and housewives generally work also better data can be obtained by asking first whether they have or not an occupation and after that asking the kind of occupation. The question about the work place or school of the respondent and their address were separated as independent items.

About five percent of all respondents refused to answer the question about their monthly income, and even in the replayed cases the declared income probably was lower than the actual ones, fearing some connexion with income tax problems. Deciding that it was somewhat dangerous to determine the standard of living of a household only on the basis of its monthly income, we added two questions about "house ownership" and "the size of the house."

(3) Consideration of Codings

The questionnaire contained no item that misled or confused the respondents. The questionnaire was revised only on these points:

Question	Before revision	After revision
- Car ownership	Vehículo Comercial	Vehículo de Carga
- Departure and arrival place	Colegio	Estudio
- Means of transport	Carro propio Jeep Camión Bus Microbus	Coche Jeep Camión y Camioneta Omnibus

(4) Considerations of Response Categories

Because of the need to distinguish between returning- to-the-office and leaving-the-office, we added "regreso al trabajo," bringing the total purposes to seven.

In the classification of parking, which lacked "fuera de la vía," we classified "without charge" and "with charge" as "out of the road" and "on the road"; adding "stopping," we expanded the classification to five classes.

(5) Consideration of the "Making" Check System

Because we were unable to use the original National Census as the list of sample households, it was impossible to examine our sample for "making" by age, etc. Therefore, we sent an inspector to some of our sample households to find out whether they had been visited by an interviewer whether all the family members had been interviewed with respect to trips, etc.

(6) Memory of the Previous Day Trips

Each interviewed respondent was asked about his or her trips sequentially, beginning with his or her departure in the morning. Therefore, there was no problem with his or her memory. But answers about departure and arrival time were generally in terms of 10 minutes units.

(7) Dealing with Absence

Only 20 percent of all samples could complete the interview with all the household member in one visit. The interviewers were thoroughly instructed to revisit households when all members were not available in the first interview. At the same time, the interviewers were urged to visit households on Saturdays and Sundays when all households members were likely to stay at home.

3-6 Survey Preparations and Arrangements

1) Public Information

The person-trip survey calls for direct visits to homes. Therefore, it is necessary to publicize the objectives and significance of the survey in order to ensure a good understanding and their cooperation.

For this purpose, we carried out public information work using (1) A letter of request for cooperation, (2) newspapers (3) television, (4) radio, (5) posters and (6) T-shirts.

(1) Letter of Request for Cooperation

This letter explaining the purpose, etc. of the person-trip survey and the letter was handed to each sample household by a visiting interviewer. The letter was later recovered by a visiting inspector as one of the way to check the possible interviewer "makings". The letter is shown in Fig. III-10.

(2) Newspapers

Newspapers have such a great publicity effect that we held a press conference with the cooperation of the Municipality of the Asunción and the survey team.

In addition, we complied with news-gathering requests from newsmen and made every effort at publicity. We distributed reprints of news articles to all our interviewers so that they could show them to sampled household members to get their cooperation.

Table III-8 PR on Newspapers

Name of Newspaper	Date
Ultima Hora	Oct. 9, 1984 evening (Color, 1st page)
El Diario	Oct. 10, 1984 morning
Hoy	Oct. 10, 1984 morning
"	Oct. 21, 1984 morning
"	Oct. 24, 1984 morning
El Diario	Oct. 24, 1984 morning

(3) TV and Radio

For television and radio publicity, we held a news conference and complied with individual news-gathering requests as in the case of newspaper publicity. On Channel 9 we inserted in a movie program a telop "Please cooperate in our person-trip survey."

Table III-9 TV broadcasting

Channel No.	Date and Time
Channel 12	Oct. 3, 1984 12:00 and 20:00 on news
Channel 13	Oct. 9, 1984 12:00 and 20:00 on news
Channel 9	Oct. 9, 1984 12:00 and 20:00 on news
Channel 9	Oct. 17, 1984 12:00 and 20:00 on news

(4) Posters

Publicity in mass media has great effect, but this effect does not last. For this reason, we produced two posters for public relations during the survey period. The posters were displayed at the following places considered to make possible the greatest possible exposure:

- Bus stops
- Gas stations
- Schools and other public facilities.
- Supermarkets
- Inside buses.

The posters were displayed in all buses with the kind cooperation of the Transport Bureau.

(5) T-shirts

T-shirts bearing the symbol mark of the survey printed on them were produced and distributed to the interviewers, who wore them while working.

2) Materials Used for the Survey

In the field survey, surveyors carried the following materials;

- a. Traffic Survey Questionnaire
- b. List of Sample Households
- c. Letter of Request for Cooperation
- d. Zone Code List and Zone Maps



Municipalidad de la Capital

Oficina Desarrollo Urbano
C E T A
Comisión Técnica Paraguayo
Japonesa para el Estudio de
Transporte Urbano de Asunción
y su Área Metropolitana
• • •

Asunción, . Octubre de 1984

**SOLICITUD DE COLABORACION CON LA ENCUESTA SOBRE ORIGEN Y DESTINO
DE PERSONAS EN ASUNCION Y SU AREA METROPOLITANA.**

Por la presente, tenemos el agrado de saludarle e informarle que estamos ejecutando un estudio sobre el estado real de movimiento de personas, y la incidencia en la utilización de ómnibus, autos y otros medios de transporte terrestre. (Incluye también peatones).

Este estudio será de gran utilidad en el planteamiento de soluciones que se presentarán en el plan general de transporte. Por lo tanto, mucho le agradeceremos se sirva cooperar en esta encuesta.

Las personas a ser encuestadas son todos los miembros de la familia seleccionada al azar, mayores de 6 años de edad en adelante.

La información requerida es la siguiente:

INFORMACION PERSONAL:

1. Sexo
2. Edad
3. Ocupación
4. Tipo de Industria
5. Lugar de trabajo o estudio.

INFORMACION DE LA VIVIENDA:

6. Número de miembros de la vivienda.
7. Número de automóviles en el hogar.

INFORMACION DEL VIAJE DE UN DIA

8. Origen
9. Destino
10. Hora
11. Propósito del viaje
12. Medio de transporte
13. Lugar de parada
14. Maneja usted?
15. Cuántos pasajeros son incluyéndolo a usted?
16. Dónde se estaciona?
17. Otras informaciones que están especificadas en la boleta de encuesta.

Fig. III-10 LETTER FOR COOPERATION

- e. Interviewer ID Cards
- f. Interviewer Manual

3-7 Field Survey Organization

1) Placement of the Central Office.

The Central Office was placed in:
Eduardo V. Haedo No. 336, Asuncion City.

2) Organization

An echelon system was used for field survey control. The upper echelons controlled the lower echelons as shown below so that the survey will make smooth progress.

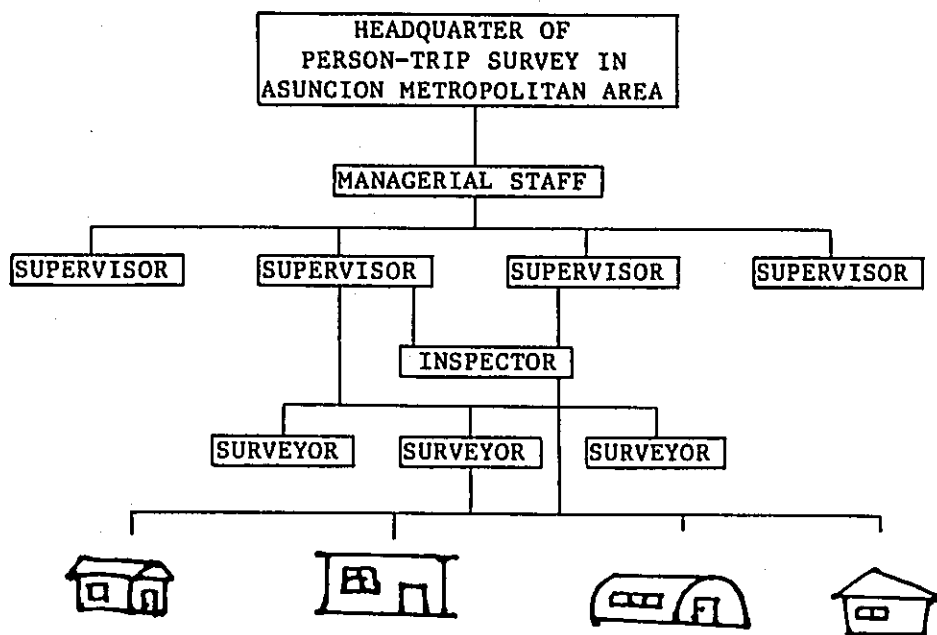


Fig. III-11 FIELD SURVEY ORGANIZATION

The role of each member is as shown below:

(1) Managerial Staff

The managerial staff managed person trip survey planning, the supervisors and the surveyors to make the survey progress smoothly. The staff is composed for 2 persons: one from the Japanese side and one from Paraguayan counterpart. The principal duties of this staff were as follows:

- a) Planning of the survey as a whole
- b) Draw up the plan of survey materials
- c) Surveyor recruitment and training; filling up vacancies
- d) Supervisor instruction and control
- e) Inspection and control of returned questionnaire form

(2) Supervisors

Supervisors controlled the progress of surveyor execution of field surveys, inspected the questionnaire cards, and dealt with imperfect entries. For survey management purposes, the Asunción Metropolitan Area was divided into 10 areas and one supervisor was assigned to each of such areas. Each Supervisor was in charge of 13 to 17 Surveyors.

(3) Inspectors

Under the direction of a Supervisor, an Inspector singled out two to four sample households in a Surveyor Sector and visited such households to investigate whether the survey was conducted in conformity to the given instructions, whether or not there was surveyor "makings". The Inspectors also carried out assistant work for the Supervisors.

The number of inspectors was five (1 inspector for 2 supervisors).

(4) Surveyors

They visited the households specified in the sampled household and interviewed the respondents about their activities on the survey date according to the survey items. Upon completion of each interview, they inspected the completed questionnaire cards for omissions and errors in entry and also took charge of zone coding of the respondents' work places or schools and starting points and destinations.

Each Surveyor was in charge of 25 households per week and brought the completed questionnaire cards to the Headquarters weekly for inspection by Supervisors.

2) Supervisor Recruitment and Training

The Supervisors were recruited through the Paraguayan members of the Managerial Staff and employed after personal interviews. Supervisor training was based on the Supervisor's Manual and the Surveyor's Textbook, which contains the following:

- a) The role of the Supervisor
- b) A general description of the person trip survey in the Asunción Metropolitan Area
- c) The work process of the survey
- d) The details of the Supervisor's work (Surveyor control and questionnaire examination)
- e) The details of the Surveyor's work.
- f) The necessary materials for the survey and how to use them.

3) Surveyor Recruitment and Training

The Surveyors were recruited and trained as shown in Fig. III-12.

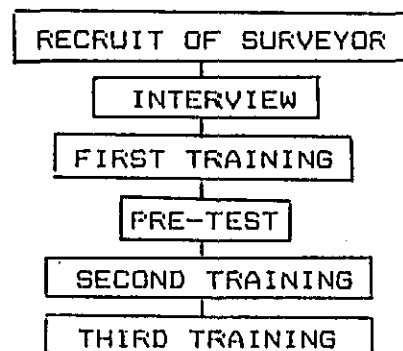


Fig. III-12 RECRUITING AND TRAINING PROCESS

(1) Surveyor Recruitment

The Surveyors were recruited through the municipal office, universities, the Paraguayan members of the Managerial Staff and the Supervisors. We recruited mainly the people who can work for three consecutive weeks, so that could make the survey efficient. Although the required number of Surveyors was 150, we secured not less than 180 applicants because of the possibility that some of them might be rejected in interviews, fail to attend the training, or drop out in the midway.

(2) Interviews with the Applicants

The Paraguayan member of the Managerial Staff interviewed

the applicants and decided whether or not to accept them. The following criteria were used for acceptance at the interviews:

- a) Ability to understand the survey contents
- b) Availability of sufficient work time
- c) A strong sense of responsibility.

(3) First Training

Based on the Surveyors Text, they were mainly trained in the contents of the questionnaire such as the purpose of the survey, an outline of the survey, the definition of the trip, the method of entry of answers to the items in the questionnaire. The first training was given to groups of up to 30 applicants.

(4) Pretest

Upon completion of the first training, each applicant was subjected to a pretest designed to make him learn the following by using three of his family members or friends:

- a) Entry into the questionnaire form.
- b) Answers to questions.
- c) Questionnaire inspection points.

(5) Second Training

Pretest results were reviewed to ascertain the degree of the trainees' understanding of the survey. Supplementary explanations were given them about misunderstood points. At the same time, they were trained mainly in survey work such as preparations for visits to households, inspections and corrections, liaison with the Supervisors, etc.

(6) Third Training

The third training remarked the most important points studied in the second training (survey date, trip content, sample), and the trainees were given an explanation about how to use the necessary materials for the survey. Then they were assigned to particular areas and received the above-mentioned materials. In the Surveyors assignment to particular areas was considered their places of residence. The number of applicants accepted as Surveyors was 152. (Table III-10)

Table III-10 Assignment for Supervisor

Supervise	Municipality	Zone No.	H/H	Surveyor
A	Asunción	01 -06	1,010	15
B	Asunción	07,08,09,21,22	993	14
C	Asunción	10,11,13	1,146	16
D	Asunción	12,14 - 17	990	14
E	Asunción	18,19,20	1,062	15
F	Asunción	23,24,25	905	13
	Mariano R. Alonso	32	193	3
	Villa Hayes	33	93	1
Subtotal			1,193	17
G	Lambaré	26,27,28	975	13
	Villa Elisa	40	162	2
Subtotal			1,137	15
H	Fdo. de la Mora	29,30	938	13
	San Antonio	39	147	2
Subtotal			1,085	15
I	San Lorenzo	35,36,37	1,020	14
	Neemby	38	166	2
Subtotal			1,186	16
J	Luque	31	875	12
	Limpio	34	225	3
Subtotal			1,100	15
Total			10,900	152

3-8 Field Survey

1) Definition of the Trip

A trip is defined as "the movement of a person from one place (place of departure) to another (place of arrival) for a certain purpose. One of such movement is counted as one trip. Here are concrete examples of trips:

[Example 1] An office worker

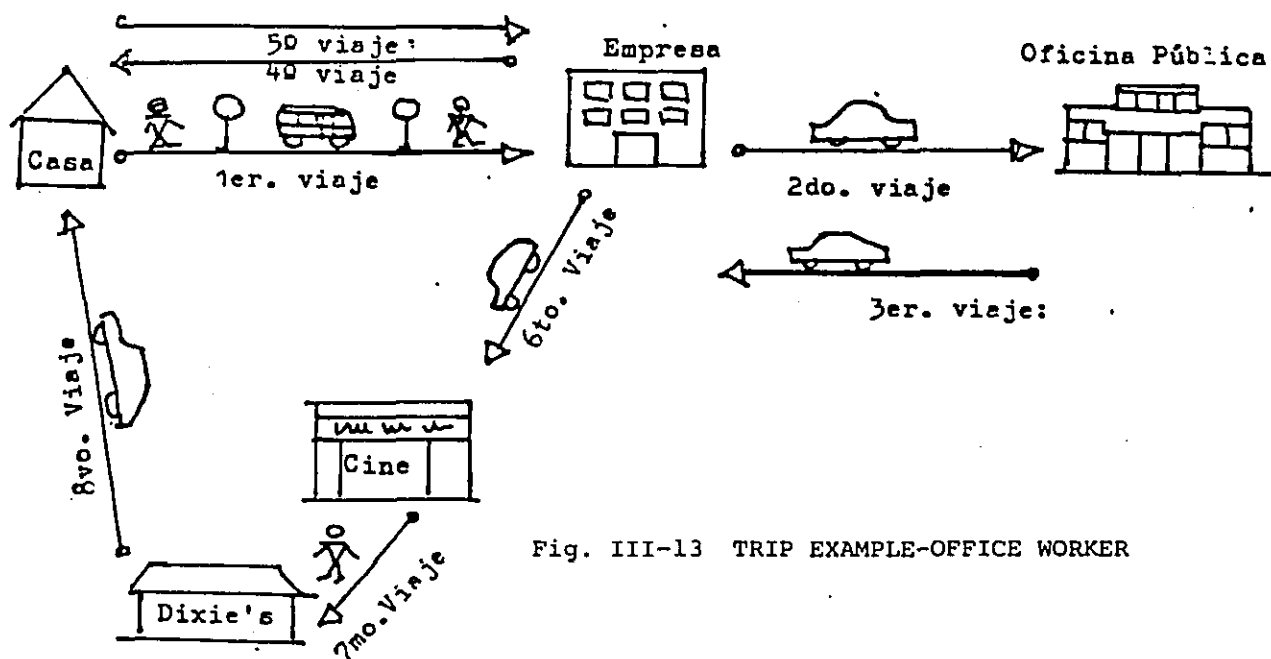


Fig. III-13 TRIP EXAMPLE-OFFICE WORKER

[Example 2] Trips for the same purpose in a narrow area

When a person moves around a narrow area for the same purpose as shopping, deliveries or some other work, the farthest point in the area is regarded as the place of arrival. Going to and returning from there are counted as two trips. The "narrow area" refers to a space of about 300 meter square, as a base.

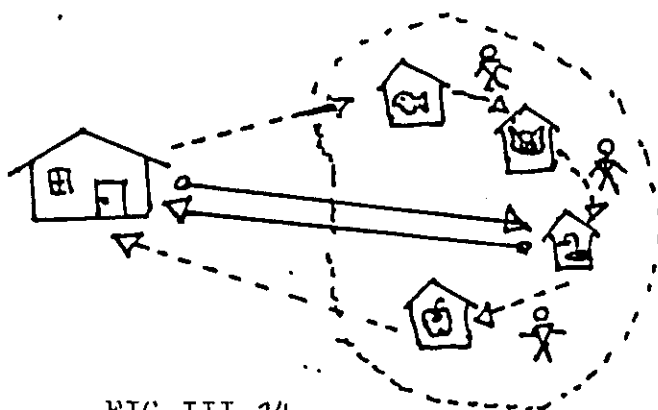


FIG.III-14

[Example 3] Repeated trips between the same places

When a truck makes repeated trips between the warehouse and the construction site, each trip between them is counted as one trip.

[Example 4] A trip without any particular destination

When a person has no particular destination as in the case of a stroll, jogging, pleasure driving, etc., the farthest place from the place of departure is regarded as the place of arrival. Going to and returning from this destination are counted as two trips.

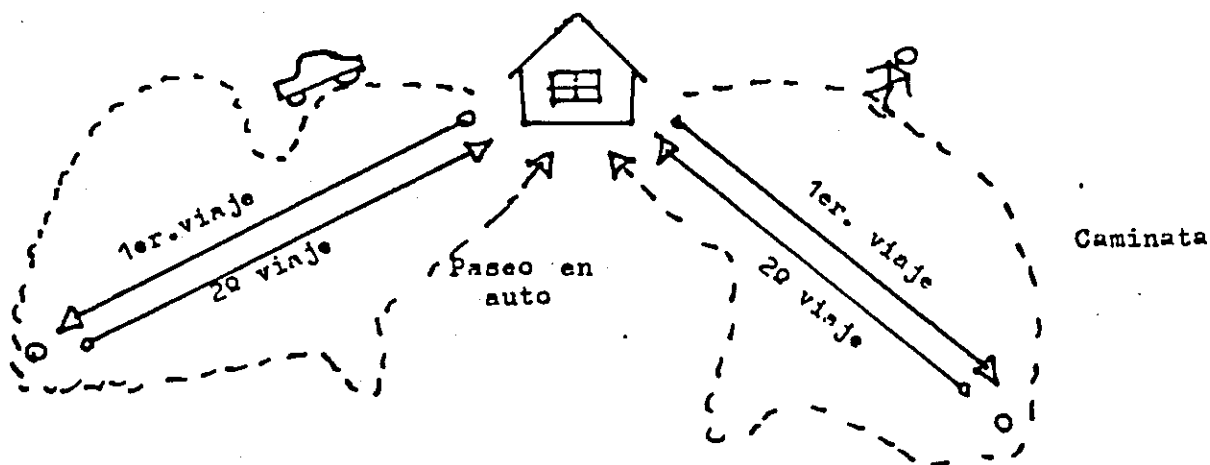


Fig. III-15 TRIP EXAMPLE-NO PARTICULAR DESTINATION

[Example 5] Trips to an outside area visited on business or for pleasure

When a respondent is outside the survey area on the survey date, his or her trips in the outside area visited are counted without omission. In the case of foreign travel or returning from abroad, the places of departure and arrival of an airliner passenger are the airports used, those of a ship passenger the ports used, and those of car users or any other means of overland transport, the national boundary towns concerned.

[Example 6] A trip at 4:00 on the morning of the survey date or of the next day.

When the time of departure is within the survey date (from 4:00 AM of the survey day to 4:00 AM of the next day), the respondent concerned is regarded as having made a trip even if the time of arrival is after 4:00 AM of the day after the survey day. However, a respondent who has departed before 4:00 AM of the survey day is not regarded as having made a trip even if the time of arrival is within the survey day.

2) Trips Excluded from the Survey

The following movements are not regarded as trips:

- (1) Movement in a building
- (2) Movement on the same site
- (3) Movement in a foreign country
- (4) Movement such as playing, shopping or the like on a nearby road
- (5) Movement as a driver or crew on a commercial vehicle. However, the movement of the driver of a commercial truck or bus is not excluded.

3) Survey Activities in Brief

Fig. III-16 shows the flow of Surveyor work. This work can be roughly divided into four stages: (1) preparations prior to visits, (2) actual survey, (3) questionnaire examination and ordering and (4) inspections and collection by a Supervisor. The details of these stages will be described below: 4) and after.

The surveyors were to carry out survey activities for about five weeks from surveyor training to questionnaire submission at the time of final collection of the questionnaires. During that period the surveyors were in charge of 75 sampled households visits.

The survey day was to be one of the weekdays, Monday through Friday. Monday was included in the survey days because we judged that one additional day would increase the response rate in the

case of a personal interview survey and that "movement" on Monday does not change much from any other weekday.

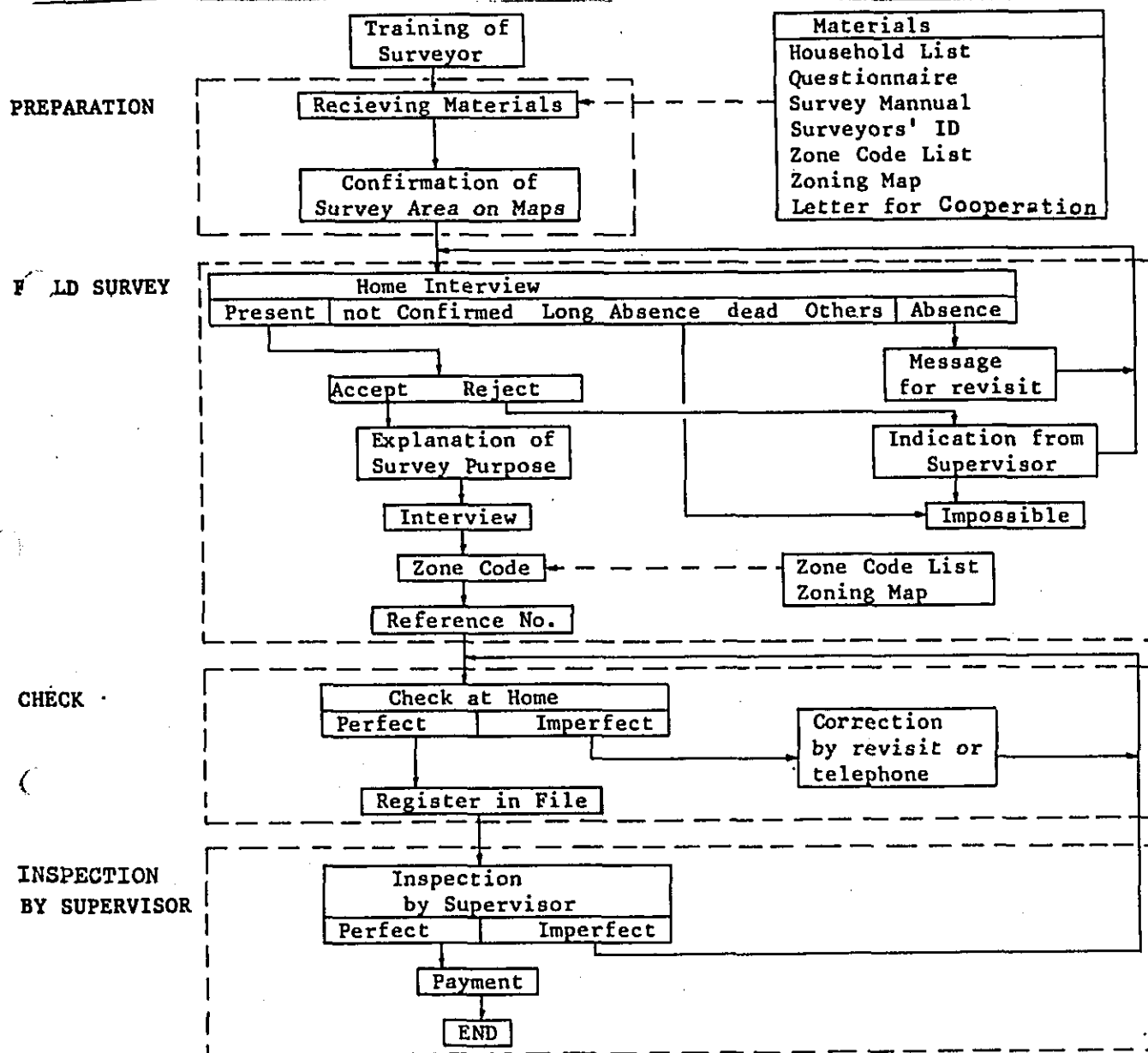


Fig. III-16 FLOW CHART OF SURVEYORS' ACTIVITY

4) Preparations Prior to Visits

The Surveyors made the following preparations prior to visits to the sampled households:

- (1) The locations of the sample households were confirmed by plotting them on maps.
- (2) Survey schedules were drawn up to distribute the survey days evenly.
- (3) The necessary materials for the survey were divided into sets for each household.

5) Actual Survey

The households listed on the sample households list were visited and interviewed according to the questionnaire. The interview at each household roughly followed the procedure shown below:

(1) Greeting

- a) Confirmation of the sample household
- b) Presentation of the Surveyor certificate
- c) Delivery of the letter of request, an explanation of the purpose of the survey, a request for cooperation

(2) Confirmation of the basic items

- a) Confirmation of the number of respondents (six or older)
- b) Confirmation of the survey data
- c) Confirmation of the number of household present members

(3) Interview

- a) Interview about the attributes of the individuals
- b) Interview about household attributes
- c) Interview about trips

(4) Leaving

- a) Promise of a revisit to absent respondents
- b) Thanks for cooperation

6) Questionnaires Inspection and Ordering

Recovered questionnaires were inspected and ordered by the Surveyors in their homes as shown below before submission to the supervisors:

- (1) Entry of reference numbers (in eight digits)
- (2) Entry of whether there was a trip or not
- (3) Entry into the trip number column of the number of trips entered in the questionnaire
- (4) Questionnaire re-examination making the collected questionnaires perfect
- (5) Entry into the sample household register of the number of effective and ineffective questionnaires per household and a breakdown of ineffective questionnaires
- (6) Stapling per-household effective questionnaires

7) Inspection and Recovery by the Supervisors

Upon completion of one week survey, the surveyors submitted the collected questionnaires to the supervisors for inspection.

The supervisors inspected them in conformity to the procedure described below and accepted them if no imperfections were found in them. If imperfections were found, the supervisors ordered the surveyor concerned to conduct the survey again and accepted the questionnaires only after their imperfections were eliminated.

- (1) Inspection as to whether all relevant households on the sampled household had been surveyed
- (2) Inspection as to whether the number of effective responses per household meet with the number of questionnaires
- (3) Inspection as to whether a reference number, the survey date, whether a trip had been made or not, and the number of trips were properly entered in each questionnaire
- (4) Inspection as to whether entries in the questionnaire were properly filled
- (5) Inspection as to whether or not there was no "making" or any other dishonest act on the part of the surveyor concerned

8) Matters Discretionally Dealt with During the Survey

The method of entry in the questionnaire and the definition of the term "trip" are described in the Supervisors' Manual and the Surveyors' Text, but they were not always sufficient. During the actual survey we encountered cases where we were in doubt how to handle.

In such a case, we worked out a unified interpretation and conveyed it to the Surveyors through the Supervisors. The principal matters dealt with in such a way were as shown below:

(1) Matters Relating to Monthly Income

- a) The monthly income of a person who was in military service and received no salary although he had an occupation was classified as answer category 01.

(2) Matters Relating to Purpose

- a) In the case of a person who had plural places of employment, the purpose of his trip to each such place was regarded as "going to work."
- b) When a child accompanied his mother on a shopping trip, the purpose of the child's trip was regarded as "shopping."

(3) Matters Relating to the Means of Transportation

- a) When an animal drawn car was used for a trip, the means of transportation was considered to fall into "Others."
- b) When a bus stop existed just in front of a home and required little walking time, the end trip was considered as walking.

(4) Matters Relating to Respondents

In the case of a live-in maid who returns home only on Saturdays and Sundays, it was decided to interview her at the place of work and exclude her from the survey at her home.

TABLE III-11
RELATION BETWEEN THE SAMPLE AND INTERVIEWED
PERSONS

ZONE	TOTAL PERSONS (1) (8 YEARS AND MORE)	SAMPLE	(3) INTERVIEWED PERSONS	NOT INTER- VIEWED	(3) (2) %	(3) (1) %
01	3.020	260	257	3	99	8,5
02	1.400	92	86	6	93	6,1
03	6.450	542	534	8	99	8,3
04	5.499	369	364	5	99	6,6
05	8.263	536	521	15	97	6,3
06	35.444	2.265	2.225	40	98	6,3
07	7.228	496	461	35	93	6,4
08	5.236	372	366	6	98	7,0
09	14.768	910	904	6	99	6,1
10	19.867	1.145	1.110	35	97	5,6
11	30.940	1.741	1.691	50	97	5,5
12	15.920	1.222	1.213	9	99	7,6
13	26.972	1.974	1.915	59	97	7,1
14	9.518	651	643	8	99	6,8
15	14.805	939	930	9	99	6,3
16	8.118	581	576	5	99	7,1
17	10.561	707	702	5	99	6,6
18	24.827	1.651	1.588	63	96	6,4
19	14.995	988	970	18	98	6,5
20	25.046	1.660	1.631	29	98	6,5
21	22.417	1.221	1.210	11	99	5,4
22	19.348	1.146	1.126	20	98	5,8
23	11.338	702	672	30	96	5,9
24	16.279	963	951	12	99	5,8
25	30.017	1.976	1.974	2	99	6,6
TOTAL ASUNCION	388.276	25.109	24.620	489	98	6,3
26	27.072	1.762	1.733	29	98	6,4
27	7.302	536	518	18	97	7,1
28	20.234	1.598	1.589	9	99	7,9
TOTAL LAMBAKE	54.608	3.896	3.840	56	99	7,0
29	41.961	2.817	2.804	13	99	6,7
30	12.661	995	994	1	99	7,9
TOTAL P. DE LA MOHA	54.622	3.812	3.798	14	99	7,0
31 LUQUE	49.126	3.403	3.337	66	98	6,8
32 MARIANO R. ALONSO	11.204	749	691	58	92	6,2
33 VILLA HAYES	5.967	345	345	0	100	5,8
34 LIMPIO	12.981	845	834	11	99	6,4
35	11.640	752	750	2	99	6,4
36	35.147	2.123	2.109	14	99	6,0
37	13.785	909	872	37	96	6,3
TOTAL SAN LORENZO	60.572	3.784	3.731	53	99	6,2
38 RENBY	9.868	643	639	4	99	6,5
39 SAN ANTONIO	7.083	566	566	0	100	8,0
40 VILLA ELISA	9.476	586	583	3	99	6,0
GRAN TOTAL	665.783	43.738	42.984	754	98	6,5

Chapter 4: Supplemental Surveys

Described in this chapter are surveys for determining the flow of goods that cannot be found by a Person-Trip Survey, and for obtaining the coefficients needed for analysis and planning using the results of a Person-Trip Survey. Such surveys are as follows:

- (1) Screen-Line Survey
- (2) Cordon-Line Survey
- (3) Screen-Line bus passenger Survey
- (4) Survey on the average number of route bus passengers
- (5) Survey on incoming and outgoing cargos at ports
- (6) Survey on large-scale business establishments
- (7) Railway passenger survey
- (8) Streetcar passenger survey
- (9) Taxi passenger survey
- (10) Long-distance bus survey
- (11) Survey on Mercado de Abastos

4-1 Screen-Line Survey

1) Survey Objectives

The Screen-Line Survey objective is to check whether the contents of the OD table based on FT survey findings faithfully reflects the reality. When the FT survey area is divided into two, it is possible to compare the quantity passing the boundary between the divided area with a similar traffic volume found by FT survey. A Screen-Line Survey is intended to obtain the former traffic volume.

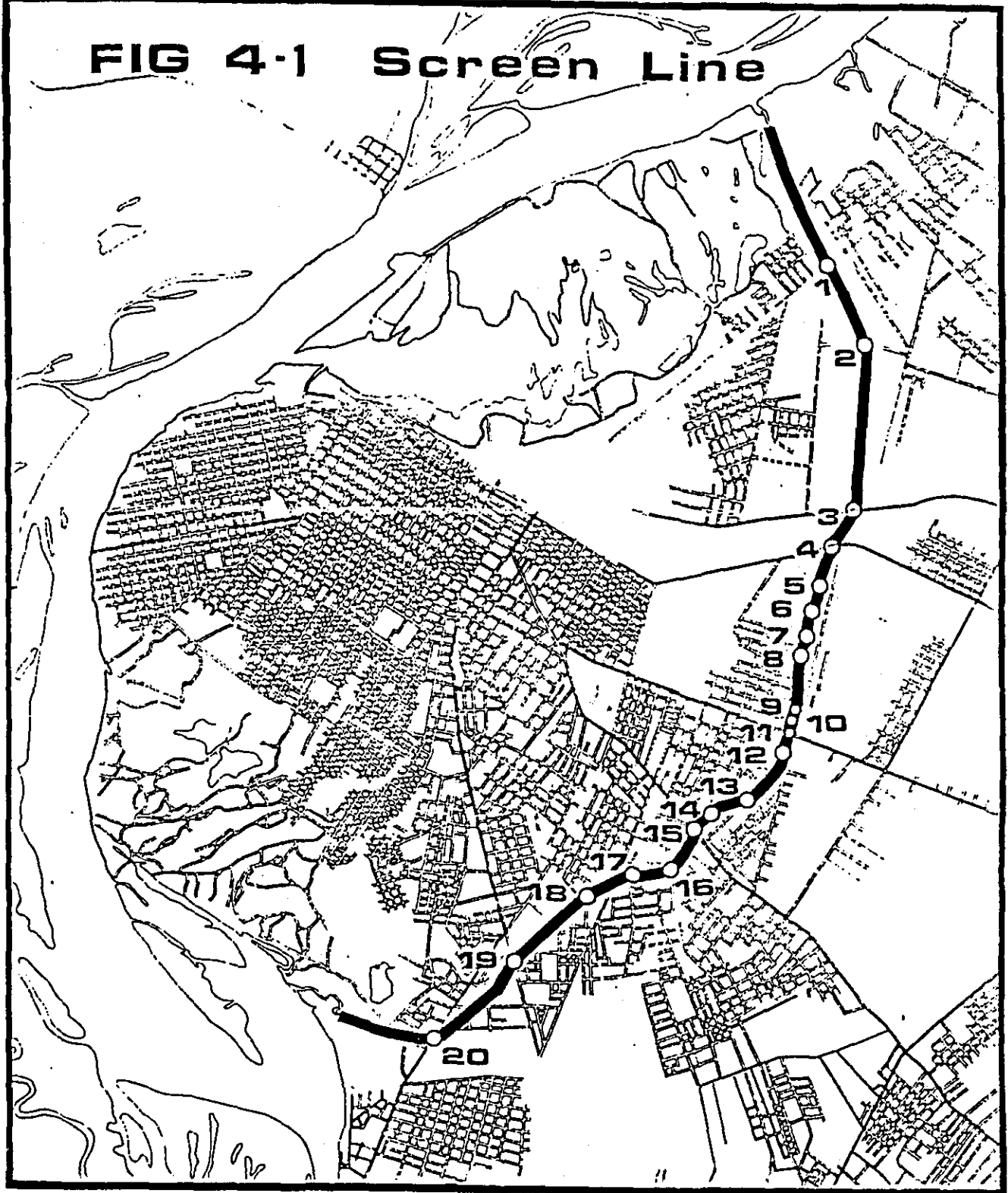
2) Survey Design

(a) Screen-Line Characteristics

A screen line divides the survey area into two. In determining the characteristic of the traffic volume, it is desirable that traffic between two areas be free from short-trip traffic. Generally, geographical or physical dividing lines such as rivers, mountains and railways are used for area division in most cases.

In the present survey, the screen line has been established by using two rivers, the Mburicao and Sosa. In one area where the two rivers converge, no physical dividing line can be used. Then, we put the screen line in the space between blocks of housing (Fig. IV-1).

FIG 4-1 Screen Line



In choosing the survey points, we conducted detailed on-the-spot investigations in advance to examine whether only those modes of traffic which would make possible the results to be obtained by the PT survey would be present there.

(b) Problems in Survey Execution

The quantity obtained by PT survey is a person-trip quantity (number of persons) while a screen survey produces results expressed by the number of motor vehicles. Therefore, it would be necessary to unify the units. In that case, the problem is the number of bus passengers. We found two problems:

- (i) Bus passengers are hard to count
As survey point 11, more than 220 buses pass in one direction in one hour. Because several buses pass in a group owing to traffic signals, no accurate count of passengers per bus is possible. To deal with this problem, a bus passenger count survey (Supplemental Survey 4) will be conducted separately at the same spot.
- (ii) Difference in the average number of bus passengers
The number of bus passengers or the average number of passengers used for conversion into the number of buses should be obtained as the average number of passengers passing the screen line. Therefore, a survey of the average number of passengers passing the screen line (Supplemental Survey 3) and a survey of the average number of passengers on each of the main routes within the city (Supplemental Survey 4) will be conducted.

There is a possibility of double count at a point which is located in an area not divided by a river and which is likely to be used as a shortcut between trunk roads (Survey point 13). At this point a shortcut traffic count survey supplementing the Screen-Line Survey will be conducted to correct observed values.

A 13-hour preliminary survey on September 27 to determine the number of field-staff members was conducted. The place of survey was observation point 11 near the intersection of Ave. Eusebio Ayala and Ave. Choferes del Chaco. Motor traffic volume there reaches 19,631 cars running both ways. This number can be converted (conversion coefficient: 1.3) into a 24-hour traffic of 25,000. We concluded from this that two persons for one direction would be enough for a survey even at the busiest point.

Traffic volume in 13 hours and 24 hours (estimate) are shown in Table IV-1.

Table IV-1 Traffic Volume

(1) 13 hr. Traffic

Direction	Type of Vehicle							Total
	Coche	Camio- neta	Camión	Omni- bus	Larga Dist Bus	Taxi	Moto	
Coming in	4,093	1,472	1,043	2,848	23	215	583	10,277
Going out	3,693	1,090	591	2,237	168	204	562	9,345
TOTAL	7,786	3,362	1,634	5,085	191	419	1,145	19,622

(2) 24 hr. Traffic

Direction	Type of Vehicle							Total
	Coche	Camio- neta	Camión	Omni- bus	Larga Dist Bus	Taxi	Moto	
Coming in	5,321	1,914	1,356	3,702	43	280	758	13,374
Going out	4,800	2,457	768	2,908	218	265	731	12,147
TOTAL	10,121	4,371	2,124	6,610	261	545	1,489	25,521

Source: Traffic Volume Survey on September 27.

3) Survey Plan

(1) Screen Line position

Described above.

(2) Screen Line Survey points

On a 1/25,000 map there are more than 30 roads that cross the Screen Line. However, field investigations have revealed that some of them are inexistent or unusable for vehicular traffic. We therefore limited the number of survey points to 20.

(3) Screen Line Survey items

The Screen Line Survey is designed to count the number of passing vehicles by types and hours.

It will be conducted for 13 hours from 6:00 AM to 7:00 PM. On the principal roads, however, traffic volume will be observed for 24 hours because patterns of change over time cannot be obtained from data. This 24-hour traffic volume observation will

be made at the following points:

- Point 1: Artigas y Vía Férrea
- Point 3: Generalísimo Franco y Santísimo Sacramento
- Point 4: Mariscal López y Sacramento
- Point 11: Eusebio Ayala y Choferes del Chaco
- Point 15: Fernando de la Mora e Internacional

Fifteen other points are for 13-hour traffic volume observation. They are:

- Point 2: Cervantes y San Salvador
- Point 5: Chaco Boreal y Choferes del Chaco
- Point 6: Carpinelli
- Point 7: Las Perlas y Choferes del Chaco
- Point 8: 25 de Mayo y Martínez Ramella
- Point 9: Manuel Domínguez y Martínez Ramella
- Point 10: Teniente Fariña y Martínez Ramella
- Point 12: Carios y Choferes del Chaco
- Point 13: Dr. Centurión y Mayas
- Point 14: Guarambaré y Luis de Bolaños
- Point 16: Dr. Centurión y Ponce de León
- Point 17: Calle 1449 y Calle 1447
- Point 18: San Rafael y Bruno Guggiari
- Point 19: Primero de Marzo
- Point 20: Av. General Santos y Calle 1351

Vehicles are classified as below:

- (1) Coche (including jeeps, light vans and wagons)
- (2) Camioneta (small trucks not more than 5 tons)
- (3) Camión (large trucks more than 5 tons)
- (4) Omnibus urbano (including school buses and route buses to and from Capiatá, and other peripheral cities)
- (5) Omnibus larga distancia (including sightseeing buses, long-distance intercity buses and international regular service buses)
- (6) Taxi
- (7) Moto (bikes) (bicycles excluded)

4) Survey Execution

The survey was conducted on Wednesday, November 5 through Thursday, November 8.

5) Survey Results

Traffic volume classified by vehicle types at each survey point is shown in Table IV-2.

TABLE 4-2 TRAFFIC COUNTS OF SCREEN LINE

ESTACION PUNTO DE CENSU- LO	COCHE	OMNIBUS URBANO	OMNIBUS INT. DIST.	TAXI	CAMIO- NETA.	CAMION mas de 5 ton.	CAMION pás de 5 ton.	NOTO	TOTAL
1	5.388	2.055	44	194	2.894	800	604	1.120	13.099
2	1.379	296		48	543	119	206	308	2.639
3	12.188	909	5	439	3.165	505	249	1.022	18.412
4	16.980	2.740	20	739	3.992	436	226	907	20.152
5	3.525	53		101	1.014	227	160	312	5.352
6	159	5		6	40	16	7	10	243
7	411	148		19	232	38	33	73	954
8	5.425	44		107	1.738	352	221	6.644	8.591
9	160	12	8	3	120	21	24	30	378
10	5.020	37	4	176	2.122	517	234	626	8.736
11	9.202	6.745	41	515	4.276	1.354	1.083	1.033	24.253
12	478	345	64	52	176	85	60	86	1.346
13	256	177		14	172	64	46	42	771
14	282	15	3	23	122	40	58	76	619
15	8.430	1.496	174	879	3.630	1.162	947	1.397	18.165
16	674	524		28	332	116	55	173	1.902
17	88	155	2	2	62	38	19	70	436
18	319	347	1	10	148	50	20	105	1.008
19	2.769	596	4	131	1.202	310	217	614	5.349
20	1.490	948		85	812	128	316	220	4.059
TOTAL	74.623	17.691	370	3.631	26.142	6.502	4.785	8.930	143.374

4-2 Cordon Line Survey

1) Survey Objectives

The Person Trip Survey is conducted among the residents of the Asunción Metropolitan Area. This survey catches the movements of such residents, but does not cover the people dwelling outside the Metropolitan Area.

This Cordon Line Survey complements the Person Trip Survey in the above respect. By examining the starting points and destinations of traffic crossing the boundary of the Metropolitan Area, the Cordon Line Survey grasps the movement within the area of people residing outside the area.

The fact that inflow from cities outside the Asunción Metropolitan Area is increasing with the progress of the urbanization of the area, and that there is much traffic between the capital city of Asunción and cities outside the area adds significance to the Cordon Line survey.

2) Cordon Line Characteristics

An important point in the character of the Cordon Line is that it is desirable that the area surrounded by the Cordon Line be a land space closed as much as possible. In other words activities in the survey area should almost complete themselves within this area surrounded by the Cordon Line when an allowance is made for the present and future urbanization of the area. This is the significance of the survey area and the characteristic of the Cordon Line.

The Cordon Line was set on the boundary of the Asunción Metropolitan Area that forms the survey area.

3) Survey Items

The survey covers motor vehicle users who, within the Metropolitan Area, account for most of the movement of people residing outside the survey area. The survey is mainly OD survey, namely, motor vehicles are stopped to interview their drivers about their starting points and destinations. At the same time, a traffic volume survey will also be conducted to count the whole motor traffic. The results of this survey will be used as control totals for the vehicle types in different times and zones.

The number of roads crossing the Cordon Line has been limited to seven after field investigations (Fig. IV-2).

The map depicts the Paraguayan Chaco region, centered around the confluence of the Rio Paraguay and Rio Uruguay. Key locations include Asuncion, Villaherminosa, Villalba, and Villita. The map is overlaid with a grid of latitude and longitude coordinates. Various military units and companies are indicated, including the 1st, 2nd, 3rd, 4th, 5th, and 6th Divisions, and the 1st, 2nd, 3rd, 4th, 5th, and 6th Companies. The map also shows the locations of the 1st, 2nd, 3rd, 4th, 5th, and 6th Divisions, and the 1st, 2nd, 3rd, 4th, 5th, and 6th Companies. The map is marked with a grid of latitude and longitude coordinates.

The survey is divided into a 13-hour survey and a 24-hour survey. The latter will be conducted at three points on National Routes 1, 2 and 9 to Argentine, the three principal trunk roads with much motor traffic. The 13-hour survey will be carried out at five points on other national routes and auxiliary trunk roads.

The 13-hour survey was originally planned as a 12-hour survey, but one hour has been added so that the peak traffic volume in the morning and evening can be included as much as possible. The 24-hour survey is necessary because there is much freight transport to and from areas outside the Metropolitan Area at night and in the early morning, and also because the daytime/nighttime rate should be calculated.

The survey points are shown in Table IV-3.

Table IV-3 Cordon Line Survey Points

Point No.	Location	Survey duration
1	Remanso Castillo y Falcón	24
2	Ruta 9 Villa Hayes	13
3	Ruta 3 Limpio	13
4	Luque, Arroyo, Areguá, Patiño	13
5	Ruta 2, San Lorenzo-Capiatá	24
6	Ruta 1, San Lorenzo-Capiatá	24
7	San Antonio-Ypané	13

13 hours from 6:00 to 19:00

The survey items are as follows:

Roadside OD survey

- Place of residence
- Starting and destination point of the trip
- Purpose of the trip
- Type of the vehicle used
- Time of passage
- Number of passengers

Roadside survey of traffic volume

- Traffic volume classified by time, zones and vehicle types

4) Survey Execution and Method

The Cordon Line Survey is scheduled for November 27 and 28. The number of people to be stationed at each survey point varies with the traffic volume. By converting the obtained figures into

24-hour traffic on the assumption that the daytime/nighttime rate is 1.3, we obtained the figures shown in Table IV-4. The number of people to be assigned to each survey point will be decided on the basis of the above figures to execute the survey with the cooperation of the organizations concerned.

TABLE IV-4

VOLUMEN DE TRANSITO AUTOMOTOR EN LA LINEA CORDON

(13 horas)

Pues to nº	Tipo de vehícu lo	COCHE	CAMIO NETA.	CAMION	OMNIBUS URBANO	OMNIBUS LARG. DIST.	TAXI	MOTO	TOTAL
1		516	185	139	-	42	7	40	929
2		145	126	242	1	51	2	49	616
3		29	38	430	23	21	2	11	554
4		274	333	159	118	3	2	76	965
5		1.984	1.401	2.067	495	641	24	401	7.013
6		1.146	1.058	1.161	808	255	21	359	4.808
7		310	340	260	91	-	3	55	1.059

VOLUMEN DE TRANSITO AUTOMOTOR EN LA LINEA CORDON

(24 horas)

Pues to nº	Tipo de vehícu lo	COCHE	CAMIO NETA	CAMION	OMNIBUS URBANO	OMNIBUS LARG. DIST.	TAXI	MOTO	TOTAL
1		671	241	181	-	55	9	52	1.209
2		189	164	315	1	66	3	64	802
3		38	49	559	30	27	3	14	720
4		356	433	207	153	4	3	99	1.255
5		2.579	1.821	2.687	644	833	31	521	9.116
6		1.490	1.375	1.509	1.050	332	27	467	6.250
7		403	442	338	118	-	4	72	1.377

4-3 Port Survey

1) Survey Objective

The inland water transport on Paraguay River as well as land transport plays a significant role in the transportation between the Asunción Metropolitan Area and other areas or other countries. The Person Trip Survey can not cover the goods and vehicle movement at the port. Therefore, the objective of the Port Survey is to supplement those informations.

2) Survey Items

A survey on the following items by interviewing the drivers of trucks entering or leaving the port area was conducted.

(1) Freight items

- (i) Agricultural, forestry and marine products
- (ii) Food, industrial products
- (iii) Mineral products
- (iv) Textile products
- (v) Light industry products
- (vi) Chemical industry products
- (vii) Pharmaceuticals
- (viii) Petrochemical industry products and
- (ix) Others

(2) Means of transport

- (i) Camionetas (truck-passenger car combination)
- (ii) Camiones pequeños (trucks 5 tons or less)
- (iii) Camiones grandes (large trucks: more than 5 tons)
- (iv) Contenedor (container car)

(3) Capacity tonnage

(4) Ownership

- (i) Owned by truck owner
- (ii) Entrusted by transport company
- (iii) Others

(5) Starting point or destination

Along with this truck survey, we counted all motor vehicles entering or leaving the port classified by type and time.

3) Survey Execution

The survey was conducted on Friday, October 26. On that day the gate for international freight was open from 7:30 AM to 6:00 PM. The survey proceeded smoothly with the cooperation of the port authorities. The drivers were very cooperative.

4) Survey Results

The number of incoming or outgoing trucks is as shown in Table IV-5.

Table IV-5 Incoming and Outgoing Traffic

Gate No.	Direction	Coches	Camiones (less than 5 tons)	Camiones (more than 5 tons)	Camionetas	Total
1	Entrada	95	18	64	34	211
2	Salida	94	22	74	53	194
3	Entrada	28	28	16	40	112
4	Salida	41	30	16	43	130

4-4 Survey of Large Business Establishments

1) Survey Objective

Like other surveys on goods distribution, this survey aims supplemental data on the transport movements of goods distribution which are hardly obtainable by the Person Trip Survey. Since this Person Trip Survey is conducted among the residents of the Metropolitan Area, it does not make it possible to collect sufficient information on transportation related to distribution production phases, warehousing or storage.

This survey was executed in order to get actual data on transportation from 100 large business establishments located in and around Asunción City.

2) Survey Items

Chosen for the survey were 100 major business establishments sampled from the Commerce and Industry Ministry's business establishment list, and those located along Ave. Artigas, Ave. Mariscal López and Ave. Fernando de la Mora.

Here is a breakdown of the sample establishments by type of industry:

(a) Agriculture and Fishery industry	10
(b) Food industry	19
(c) Chemical industry	9
(d) Textile industry	9
(e) Light industry (including miscellaneous industries)	8
(f) Pharmaceutical industry	2
(g) Carrier	38
(h) Petrochemical industry	3
(i) Market	1
(j) Construction industry and related industry	4
(k) Others	2
Total	100

The survey items were as follows:

(1) Types of establishments

(i) Agriculture, forestry or fishery, (ii) Food industry, (iii) Mining and construction, (iv) Textile industry, (v) Light industry, (vi) Chemical industry, (vii) Pharmaceutical industry, (viii) Petrochemical industry, (ix) Transportation and warehousing, (x) Others.

(2) Number of employees

(3) Principal items of freight; average monthly transport quantity

(4) Number of trucks owned

(5) Forms of transport

(a) Truck (i) owned by truck driver's company, (ii) entrusted by transport company, (iii) leased, (iv) others

(b) Freight (i) container, (ii) general loading, (iii) mixed loading, (iv) others

(6) Incoming freight

(a) Average tonnage of freight on incoming trucks (average quantity of incoming freight)

(b) Principal items and tonnage of incoming freight

(7) Actual incoming trip OD and quantity on the survey day

(B) Outgoing freight

(a) Average tonnage of freight on outgoing trucks (average quantity of outgoing freight)

(b) Principal items and tonnage of outgoing freight

(9) Actual outgoing trip OD and quantity on the survey day

3) Survey Execution

The survey was executed in this way: an interviewer visited each sampled establishment and interviewed the person in charge. A total of 20 interviewers worked during five days, October 15-19, with a follow-up period until October 25. On Friday, October 12, prior to the survey, the interviewers received explanation of the content and method of the survey, on the basis of a manual, to be prepared for the survey. The questionnaire used was as shown in Table IV,6(A)-(C).

TABLE IV-6 SHEETS OF LARGE ENTERPRISES SURVEY

INVESTIGACION DE LAS GRANDES EMPRESAS

1) <u>Denominacion de la empresa:</u>	
2) <u>Localizacion:</u>	
Cargos del informante: Nombre:	
3) <u>Tipo de actividad:</u>	
1	4
2	5
3	6
7	8
9	10
4) <u>Cantidad de empleados:</u> personas	
5) <u>Productos que elabora:</u>	6) <u>VOLUMEN DE EXPLICACION</u> (UNIDAD DE MEDIDA)
1	1
2	2
3	3
4	4
5	5
6	6
7) <u>Unidad de vehiculos para transporte de carga</u>	
1. MENOR O IGUAL QUE 5 TONELADAS ()	
2. MAYOR QUE 5 TONELADAS ()	
3. VEHICULOS ESPECIALES ()	
_____ ()	
_____ ()	
_____ ()	

(A)

TABLE IV-6

8) Modalidad del transporte	
1. RODADOS PROPIOS	a. Contenedores
2. CONTRATACION DE EMPRESAS TRANSPORTADORAS	b. Carga suelta
3. ALQUILER	c. Mixto
4. OTROS	d. Otros

9) Entrada de materiales	Volumen promedio de cada entrada
ARTICULO (TONELADAS)	() ton.
1	
2	
3	
4	
5	
6	

Obs: volumen de carga promedio por rodado.

Origen y destino principales (anual, mensual y/o diario)

ARTICULO	1	2	3	4
VIAJE				
1 • ORIGEN				
• VOLUMEN				
• UNIDAD				
2				
3				
4				
5				

(Continúa)

(B)

TABLE IV-6

10) Expedición de materiales		Volumen promedio de carga por expedición () ton. Obs: volumen promedio por rodado
ARTICULO	(TONELADAS)	
1	()	
2	()	
3	()	
4	()	
5	()	
6	()	

Origen y destino principales (anual, mensual y/o diario)

ARTICULO VIAJE	1	2	3	4
1				
2				
3				
4				
5				
6				
7				

(C)

4-5 Railway Passenger Survey

1) Survey Objective

The Person Trip Survey is considered to provide little information on railway transport as a particular mode of transport for the reasons described below. Therefore, a Railway Passenger Survey was conducted to obtain supplementary information for a better consideration of railways as a mean of transportation.

The main reasons for the survey are as follows:

- (1) Poor frequency of trains.
- (2) Mainly intended for intercity transport, railway service within Asuncion City is considered poor.
- (3) Intercity railway service within the Metropolitan Area include those between Asuncion and Luque, but railways are used more frequently for international trips and service between the Metropolitan Area and outside areas
- (4) Railway service is limited to a certain area and therefore to limited passengers.
- (5) From what has been pointed out above, it can be conjectured that the Person Trip Survey gives little information on the use of railways from the respondents living in the Metropolitan Area. It produces similar results as the Cordon Line Survey because obtainable information concerns passengers residing outside the Metropolitan Area.

2) Survey Items

The survey was conducted with the cooperation of the Ferrocarril Central del Paraguay. Surveyors interviewed passengers getting on or off trains and counted the number of passengers at the gates.

The survey items were as follows:

- (1) Station of departure or arrival
- (2) Purpose of railway trip
- (3) Starting point and destination of the trip
- (4) Means of transport to/from the station from/to the departure/arrival place.
- (5) Walking time to/from station from/to the departure/arrival place.

3) Survey Execution

The survey was executed on Tuesday, October 23 with respect to a domestic train arriving at 6:30 AM, a domestic train departing at 12:15 AM and an international train departing at

8:00 PM.

Many of the passengers getting off the arriving train went out to the street directly from the platform instead of passing through the gate. As a result, not many interviews were possible. In the case of departing trains, there was enough time for interviewing passengers at the gate or in the train and a considerable number of interviews could be held.

4) Survey Results

The number of passengers getting on or off the trains is as shown in Table IV-7.

Table IV-7 Passengers at Asuncion Station

Time	Direction	Adults	Children	Total
6:00	Arr.	121	8	129
12:15	Dep.	109	11	120
20:00	Dep.	422	106	528

4-6 Streetcar Survey

1) Survey Objective

The streetcar line in Asuncion City is much shorter than any bus line and has a limited service area. However, it is necessary to determine the use of streetcar service because the streetcar line passes through the Centro area and is used as frequently as bus service. For the reasons mentioned above, Person Trip Survey was considered insufficient to produce such data on the number of streetcar passengers. The Streetcar Survey is intended to supplement the Person Trip Survey by obtaining data on the use of streetcar to contribute to an analytical study.

2) Survey Items

This survey considers two points: (1) the number of passengers and (2) how they use the streetcar service. In the survey designed to obtain data on (1), a streetcar was chosen at random. The places at which the streetcar stopped between its starting point and destination and the number of passengers getting on or off the streetcar at each such stop were recorded. After the survey, the passengers in the inter-stop sections were totaled as follows:

- (i) Station of departure and destination
- (ii) Purpose of streetcar trip
- (iii) Means of transport to/from station from/to the departure/destination place.
- (iv) Walking time to/from station from/to the departure/destination place.

3) Survey Execution

The survey was executed on Wednesday, October 24, from 6:00 AM to 6:00 PM. 1745 passengers on 74 cars were counted.

4-7 Taxi passenger Survey

1) Survey Objective

How far the movement of commercial motor vehicles can be determined by the Person Trip Survey, which limits the respondents to individuals residing in the Metropolitan Area, is not clear. Some such cars are certainly owned by individuals, but the real whole picture is not clear. This survey is intended to obtain data on the average number of trips and movements of taxis to supplement the results of the Person Trip Survey. In short, the survey aims at gathering data conducive to an analysis of the use of taxis.

2) Survey Items

This survey consist of two types: (1) the drivers of taxis at taxi stands (there are no cruising taxis in Asuncion City; all have to wait for passengers at particular stands allotted to them) are asked to record their frequency of movement and the number of passengers on the survey day; (2) passengers are interviewed about the details of their taxi trips.

The interview items are as follows:

- (1) Starting point and destination of trip
- (2) Purpose of taxi trip

3) Survey Execution

There are 64 taxi stands in and around Asuncion City and a total of 898 taxis are always waiting for passengers there. Of these, 24 taxi stands and 257 taxis were surveyed on Thursday, October 25. In this survey, efforts were made to secure taxi driver cooperation also with regard to their trips made upon telephone request.

4-8 Screen Line Bus Passenger Survey

1) Survey Objective

The volume of motor traffic at the Screen Line is an important figure for checking the results of the Person Trip Survey. However, it is necessary to check also the number of passengers of buses. Figures will change widely depending on the average of passengers.

For this reason, the number of passengers was counted to know the average number of passengers on buses crossing the Screen Line. It is desirable to make such counting as part of the Screen Line Survey, but in this case it would require more than twice as many surveyors.

2) Survey Items

In this survey, the number of passengers on urban buses crossing the Screen Line was counted at an intersection or bus stop near the Screen Line so that such count could be made easy. However, it was impossible to count the passengers on long-distance buses (international or sightseeing buses) because their window glasses were colored darkly to guard against the sunshine. Therefore, we conducted a separate survey of long-distance buses at their terminal.

3) Survey Execution

The survey was executed on Wednesday, October 10, and Thursday, October 11. We were able to cover almost all urban buses that crossed the Screen Line between 6:00 AM and 7:00 PM.

4) Survey Results

The total of 13,503 passengers, out of which 6,654 passengers to Asuncion and 6,909 passengers from Asuncion were counted.

4-9 Route Bus Passenger Survey

1) Survey Objective

This survey is intended to determine the average number of route buses passengers (including those intercities buses functioning as urban buses) in and around Asuncion City in all its route sections.

The results of the Person Trip Survey do not include data on

the average number of bus passengers (although data on private passenger cars are included). The results of this survey can be used also for estimating the number of buses.

2) Survey Items

In this survey, a surveyor got on an urban bus on each route at its starting point and recorded the number of passengers getting off or on the bus at each stop. The Centro district has specified bus stops, but in other places out of the Centro district, sometimes, almost all points of the route functions as bus stop. Therefore, the location and names of some bus stops are not clear. But the survey sheet was designed in such a way as to make it possible to count the number of section passengers on the basis of the number of passengers getting on or off the bus under survey at each stop where a passenger or passengers got on or off the bus. The survey was also designed to make it possible to count the number of passengers at intervals of 10 minutes.

3) Survey Execution

The survey was conducted on Thursday, October 18, and Friday, October 19, from 6:00 AM to 7:00 PM. Urban buses on 39 of the total of 46 routes were covered by the survey. The survey, takes into account the peak and nonpeak hours. and its direction 8,009 passengers were surveyed.

4-10 Long-Distance Bus Survey

1) Survey Objective

Long-distance buses to be surveyed are mainly those on international routes leading to Brazil, Argentina and Uruguay. Unlike route buses, they are large buses whose window glasses are colored darkly to protect the passengers from the direct solar rays, a fact which makes it impossible to count the passengers from outside.

Since roadside observation of the passengers inside buses is impossible, it is necessary to count the number of passengers at a long-distance bus terminal.

2) Survey Items

In this survey, the passengers on long-distance buses in their berth were both counted and interviewed. The interview survey items were as follows:

- (i) Starting point and destination of the trip
- (ii) Purpose of the trip
- (iii) Nationality and occupation

3) Survey Execution

The survey was executed on Monday, October 29, at the long-distance bus terminal and the long-distance bus stop on Av. Fernando de la Mora. Long-distance bus stop roughly divided into international buses and domestic (but non Metropolitan Area) intercity buses. Since international bus trips require customs clearance formalities, etc., nearly all passengers use the terminal. The passengers of domestic long- or medium-distance intercity buses tend to board the buses at bus-stops on Av. Fernando de la Mora or in San Lorenzo. The number of passengers who use the terminal is said to account for about 50 percent of all passengers.

In the survey of the passengers of domestic long- or medium-distance buses, the survey registered also the route number, bus vehicular number and plate number because a lot of passengers tend to use bus stops other than the above mentioned bus terminal. In actual practice, however, the survey at the bus stop on Av. Fernando de la Mora virtually failed to produce effective results because it was tens of meters away from the intersection and also because long-distance buses struggle with urban's when reaching or leaving the bus stop and are irregular in the time of departure and arrival.

On the other hand, the survey at the terminal can be said to have produced better results thanks to the full cooperation of the terminal authorities. The number of passengers is being statistically processed at the terminal itself. There a personal computer is being used to obtain data on the number of passengers classified by dates, bus companies and buses.

4-11 Survey on Mercado de Abasto

1) Survey Objective

When we investigated Asuncion's Mercado 4 on the occasion of the survey of large establishments, we were told by an official there that most of the products brought to the Municipal Mercados come from the Mercado de Abasto. We therefore considered necessary to investigate the Mercado de Abasto with regard to the movement of goods related to the Mercados. A survey was conducted with a view to knowing the movements of goods entering or leaving the Mercado de Abasto.

2) Survey Items

As shown in Fig. VI-3, all goods reaching the Mercados as part of distribution organization are first brought to the Mercado de Abasto by the producers and carried out from there by other Mercados, individuals or stores.

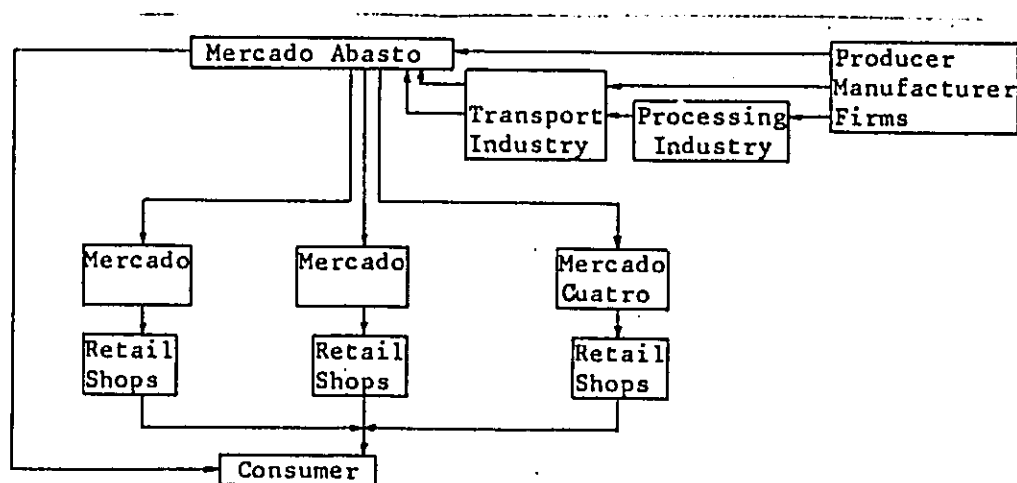


Fig. IV-3 FUNCTION OF MERCADO DE ABASTO

- a The survey items were as follows:
 - (a) Items and tonnage of freight
 - (b) Starting point and destination of the trip
 - (c) Type and ownership of truck
 - (d) Type of industry
- b Freight is classified as below:
 - (a) Agricultural, forestry products
 - (b) Food industry product
 - (c) Textile industry product
 - (d) Light industry product
 - (e) Chemical industry product
 - (f) Others
- c Types of trucks are classified as below:
 - (a) Taxi truck (5 tons or less)
 - (b) Taxi truck (over 5 tons)
 - (c) Truck-passenger combination
 - (d) Truck (5 tons or less)
 - (e) Truck (over 5 tons)
- d Types of industry are classified as below:
 - (a) Agriculture, forestry or fishery
 - (b) Food industry
 - (c) Textile industry

- (d) Light industry
- (e) Chemical industry
- (f) Market (mercado) or supermarket
- (g) Transportation or warehousing
- (h) Commerce (wholesale or retail)
- (i) Others (hotels or others)

3) Survey Execution

The survey was executed from 10:00 PM, Tuesday, October 23, to 10:00 AM, Thursday, October 24, because goods were brought to the Mercado de Abasto mainly at night. The number of cars which passed during survey period are shown in Table IV-8.

Table IV-8 Observed Cargo Traffic

Type		Numbers
Taxi Carga	Large	86
	Small	127
Small Truck		1,110
Large Truck	5 tons or less	168
	over 5 tons	232
Market-owned bus		7
Total		1,730

Note: Taxi cargas: Truck operating as taxi
Market-owned bus: both for passenger and cargo

Chapter 5: Road and Transport Facilities Survey

5-1 Road Inventory Survey

1) Road Network

The road network in the Asuncion Metropolitan Area is formed by radial roads: Av. Eusebio Ayala and Av. Mariscal Lopez linked to National Route 1 and 2; four other radial roads: Av. Fernando de la Mora, Av. España, Av. Artigas and Av. F. Bogado, seven loop roads including Av. Peru, Av. General Santos and Av. Defensores del Chaco (Madame Lynch). The Centro District at the center of Asuncion City and the area surrounding the district are covered by checkboard-like network of roads lying at intervals of 80 to 100 m. The radial roads lead from the district.

2) Structure of the Principal Roads

The Road Inventory Survey includes a Road Structure (cross-section) Survey. Road structure observation has been completed at about 85 points and the findings are now being put in order. Here some of the standard cross-sections of the principal roads are shown in Fig. V-1, (1)-(4).

The roads here shown are beautiful and well-maintained (particularly in the case of radial roads). In addition, each of them has four lanes divided by central walks. In some sections of Av. Mariscal Lopez and Av. España, streetcars are in operation. These roads and Routes 1 and 2 become two-lane roads beyond San Lorenzo. Most other roads are two-lane roads all the way.

The loop roads including Av. Peru shown in Fig. V-1, (4) are in process of improvement. The outermost loop road Defensores del Chaco and Av. Madame Lynch are not yet in good shape in spite of heavy traffic.

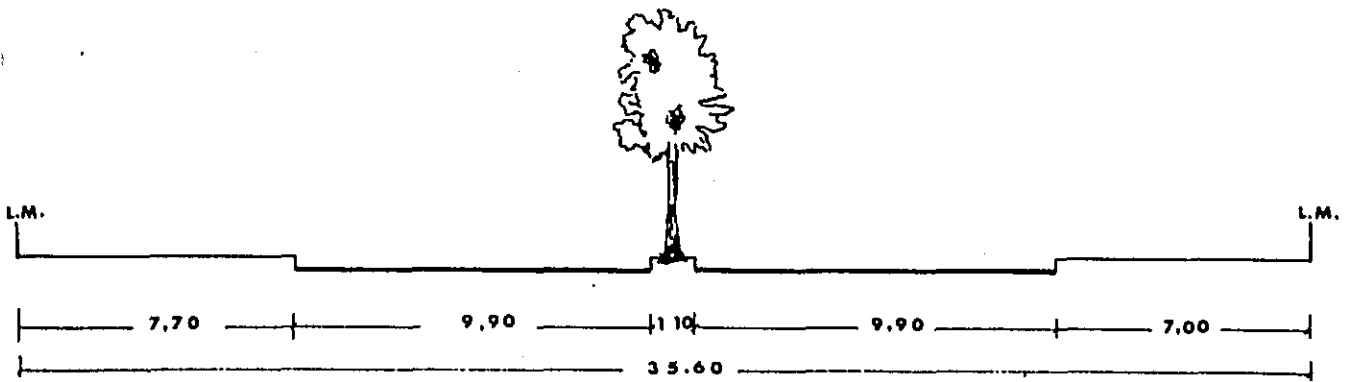
The intercities roads linking the peripheral cities of Limpio, Luque, San Lorenzo and Nemby are unpaved bad roads.

3) Traffic Signals and Traffic Regulation

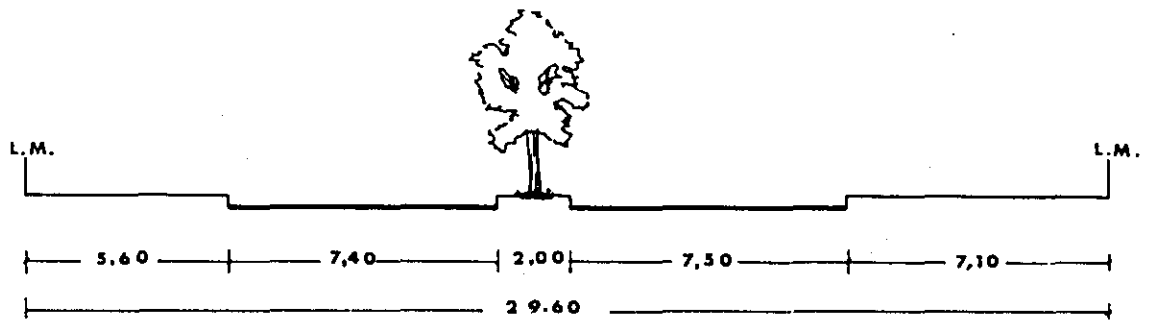
Almost all traffic signals in the Asuncion Metropolitan Area are located in Asuncion City. As shown in Fig. V-2, they are installed at 138 places. These signals are controlled by the Signal Bureau of the Municipal Office. A maximum of 150 intersections can be controlled by this Bureau.

The installation of traffic signals began in 1974, as shown in Table V-1. Initially, signals were mainly installed in the Centro district. On the radial roads of Av. Mariscal Lopez, Av.

AVDA. EUSEBIO AYALA



AVDA. FERNANDO DE LA MORA



AVDA. MCAL. LOPEZ

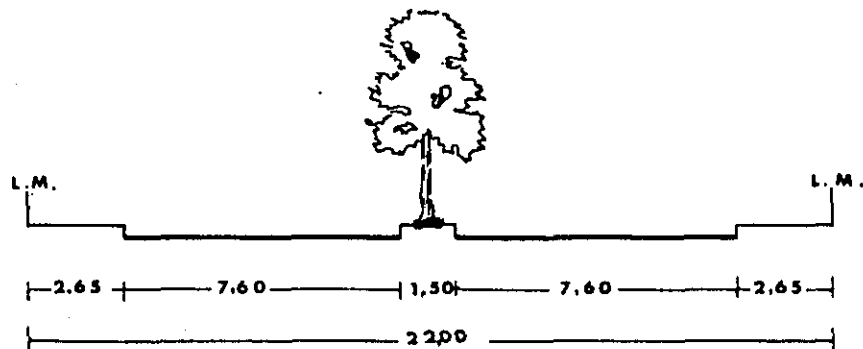
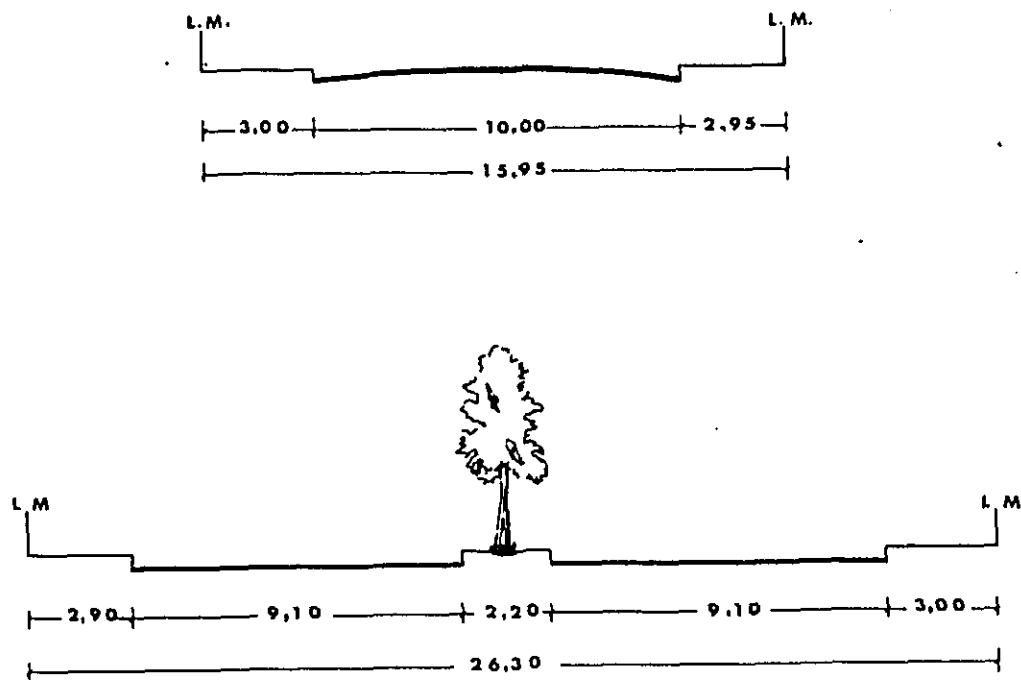


Fig. V-1 CROSS SECTIONS OF MAJOR ROADS (1)

AVDA. ESPAÑA



AVDA ARTIGAS

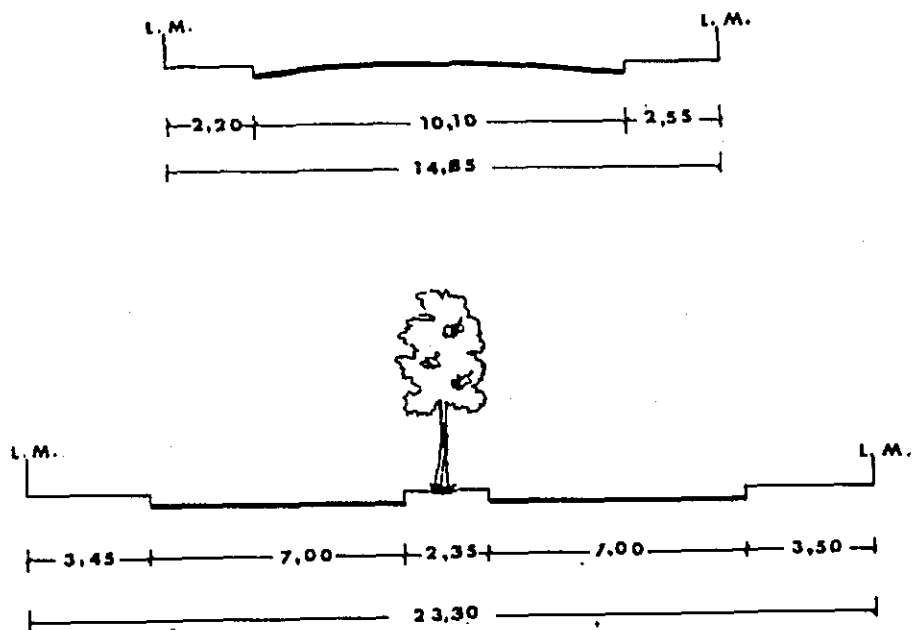


Fig. V-1 CROSS SECTIONS OF MAJOR ROADS (2)

AVDA. FELIX BOGADO

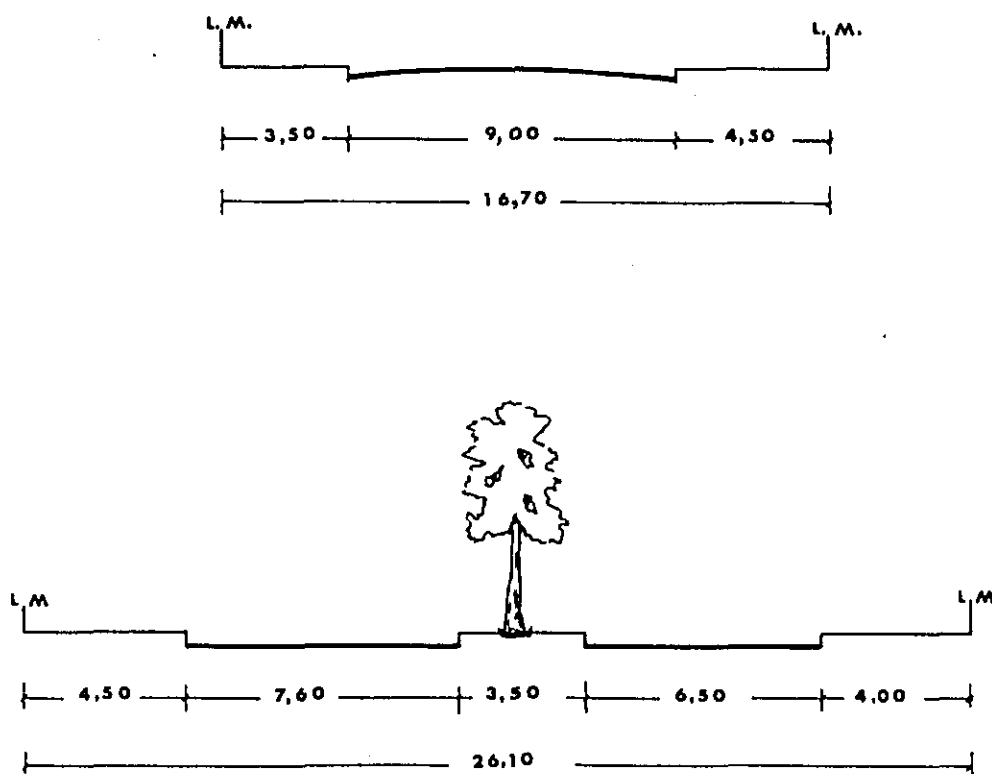


Fig. V-1 CROSS SECTIONS OF MAJOR ROADS (3)

AVDA PERU

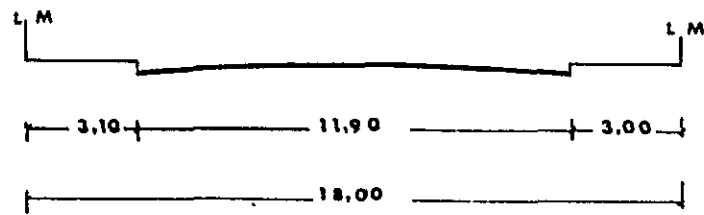
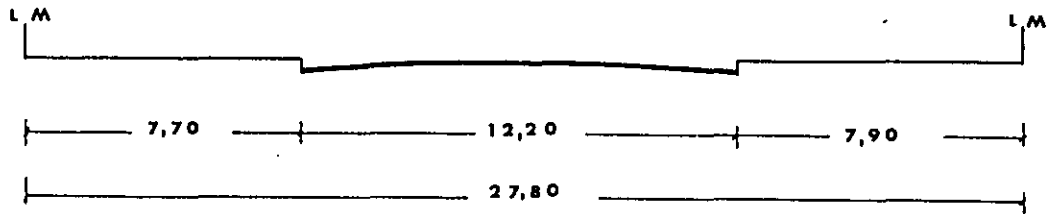


Fig. V-1 CROSS SECTIONS OF MAJOR ROADS (4)

España and Av. Eusebio Ayala, traffic signals were installed at four, five and six points, respectively. Later, signals increased mainly in the surroundings of the Centro district and trunk roads.

Regarding traffic regulations, one-way traffic regulation is taken up here. It is mainly enforced in the Centro district, but it is extended to the loop roads of Av. General Santos and Av. Uruguay. As shown in Fig. V-3, the regulation is imposed on some 150 roads.

Table V-1 SIGNALIZED INTERSECTION

Year of Installation	Number
1974	60
1977	7
1979	30
1980	19
1982	4
1983	18
Total	138

5-2 Traffic Volume Survey

The objective of this survey count the number per unit time of motor vehicles passing a particular cross-section of a road. It is conducted to know the quantity of motor vehicles that use a road by type of vehicle.

The survey was carried out at certain points at intersections (the numbers of motor vehicles entering the intersections) and on road stretches (certain cross-sections of the roads between intersections).

1) Survey Point Selection

If the current road transport characteristic of Asuncion Metropolitan Area is to be determined, appropriate survey points should be selected. For this purpose, we had made adequate field investigations since early October and selected the following points for the survey:

- (1) Intersections of important radial roads and loop roads.
- (2) Points of entrance to the Centro district.
- (3) Excluding (1) and (2), points characterized by a unique traffic flow.

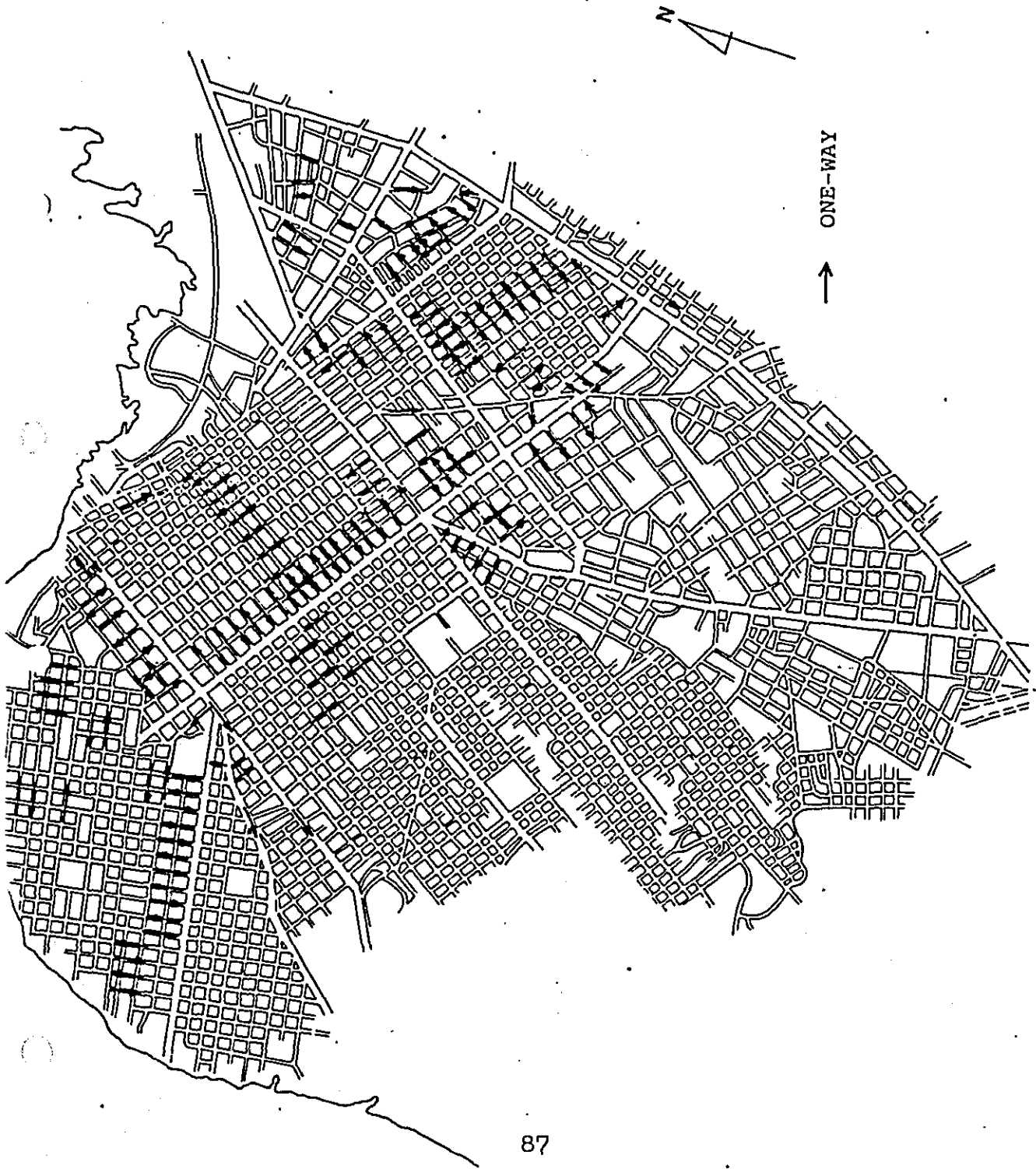
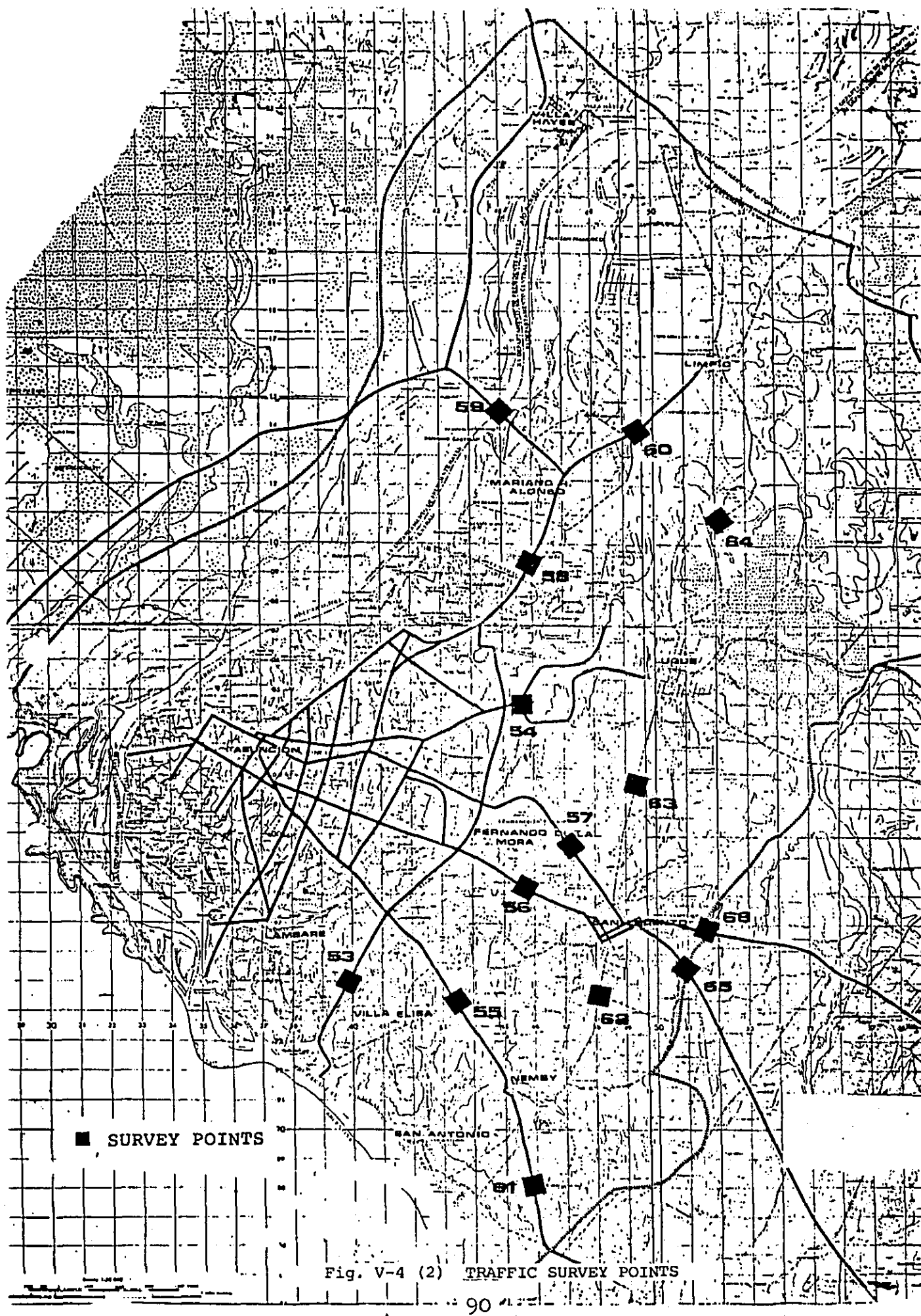


Fig. V-3 ONE-WAY SYSTEM

- (4) Typical points on intercity roads.
- (5) Points which should be investigated in connection with future road planning.

We selected a total of 66 points comprising 52 intersections and 14 on road stretches, as shown in Fig. V-4. These points were divided into those for a 14-hour survey and those for a 24-hour survey. The latter were chosen as points which make possible to determine the standard daily characteristic of the Asuncion Metropolitan Area. For the area outside Asuncion City, we decided to make effective use of results of the Cordon Line survey.



2) Survey Execution

The survey was scheduled for three weekdays, November 6, 7 and 8, 1984. The survey was divided into a 14-hour survey from 6:00 AM to 8:00 PM and a 24-hour survey from 6:00 AM to 6:00 AM. Of the 66 survey points, 55 are for the 14-hour survey and the remaining 11 for the 24-hour survey. The traffic volume at intersections and road sections was observed every hour and classified by the following four types of cars:

- (1) Passenger car
- (2) Bus
- (3) Large truck
- (4) Small truck

At intersections and on road sections, observation was made in each direction. Of the 55 points at intersections, 29 were traffic light-equipped intersections and 26 signalless intersections as is indicated in Fig. V-5.

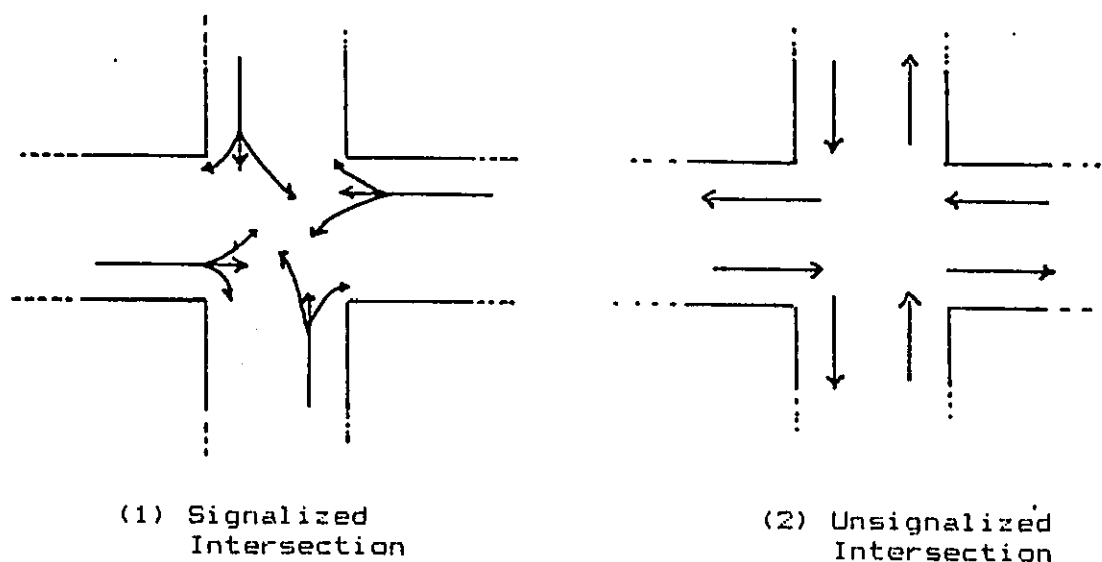


Fig. V-5 TRAFFIC SURVEY DIRECTIONS AT INTERSECTIONS

3) Survey Results

The results of observation at the above 66 point are being tabulated. Rough values of daily traffic on the principal radial roads linked to Asuncion City have been obtained and are shown in Table V-2.

Table V-2 Brief Daily Traffic on Major Roads

Road	Daily Traffic	Point No.
Av. Eusebio Ayala	23,000	49
Av. Mcal. Lopez	9,000	50
Av. España	12,000	51
Av. Fdo. de la Mora	11,000	48
Av. Artigas	7,000	52
Av. Felix Bogado	9,000	26

For point No., see Fig. V-4

5-3 Parking Survey

"Parking" means that the driver keeps his car for a relatively long time while he leaves the car for a business talk, loading/unloading, attendance at his company's office, shopping, etc. Parking at parking facilities or grounds is called "off-street parking" and "on-street parking" when parking at the sidewalk side. This classification is generally accepted because the two modes of parking are considered to differ in purpose and duration.

The results of the PT Survey enable us to obtain data on the following items in particular:

- (1) Purpose and parking duration
- (2) Parking demand

Therefore, we conducted this survey particular to know parking capacity, parking consciousness, parking fees, etc. The survey was made in Asuncion City concentrating this survey in the Centro Area.

The survey results are now in the tabulation and the compilation stage. For this reason, only part of the results of the off-road parking survey are reported here.

1) Off-Road Parking Localization.

The Study Parking Spaces of Asuncion City was carried out focusing the Centro Area, inside Av. General Santos, as shown on Fig. V-6, totalizing 74 places (53 roofed and 21 unroofed). Thirty percent of them are located at Centro Area.

2) Off-Road Parking Fees

There are hourly, daily and monthly parking fees, as shown in Table V-3. Most hourly fees are 100 guaraníes per hour. It can be seen from the table that monthly and daily fees vary from

one parking place to another. Parking fees vary with the type of car in only a few cases. Fees are mostly uniform for all passenger cars or all type of cars.

Table V-3 Parking Tariff Rate Unit: ₤

Roofed Parking						Unroofed Parking					
Hourly		Daily		Monthly		Hourly		Daily		Monthly	
₤	Nos.	₤	Nos.	₤	Nos.	₤	Nos.	₤	Nos.	₤	Nos.
70	1	350	1	3,000	1	100	31	200	1	3,000	5
100	19	500	1	4,000	1	150	2	250	1	4,000	2
150	1	600	2	5,000	5			300	3	5,000	15
		1,000	1	5,500	1			400	2	6,000	8
				6,000	7			500	5	7,000	5
				7,000	3			600	6	7,500	1
				12,000	1			700	3	8,000	4
								1,000	1	10,000	1
								1,250	1	12,000	1
										12,500	1

3) Parking Capacities of Off-Road Parking Places

The total parking capacity of 74 parking places (Fig. V-6) amounts to some 3,000 cars. A breakdown of this capacity by zones is as shown in Fig. V-7. It can be seen that the Centro area and the adjoining area have a large parking capacity.

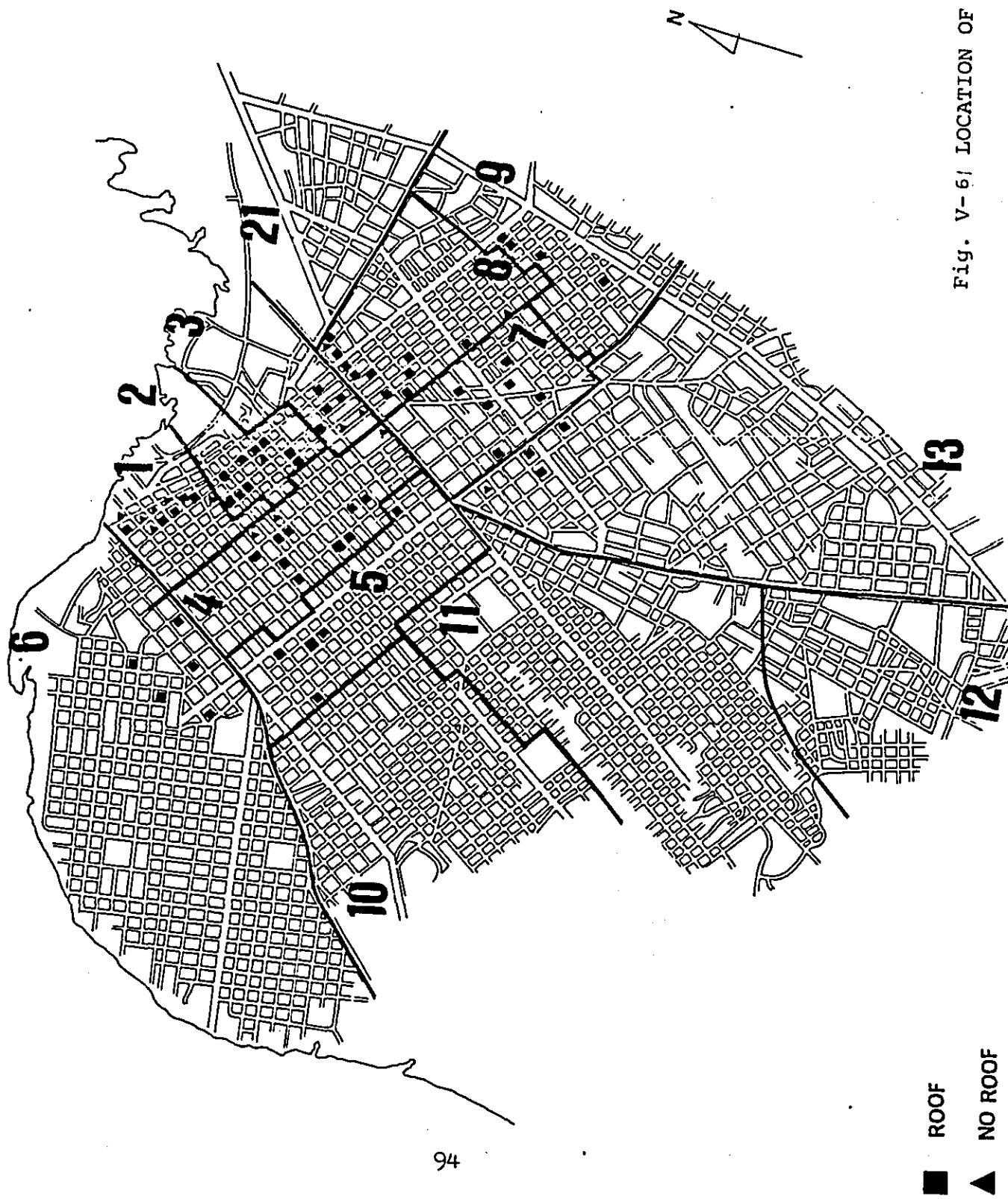
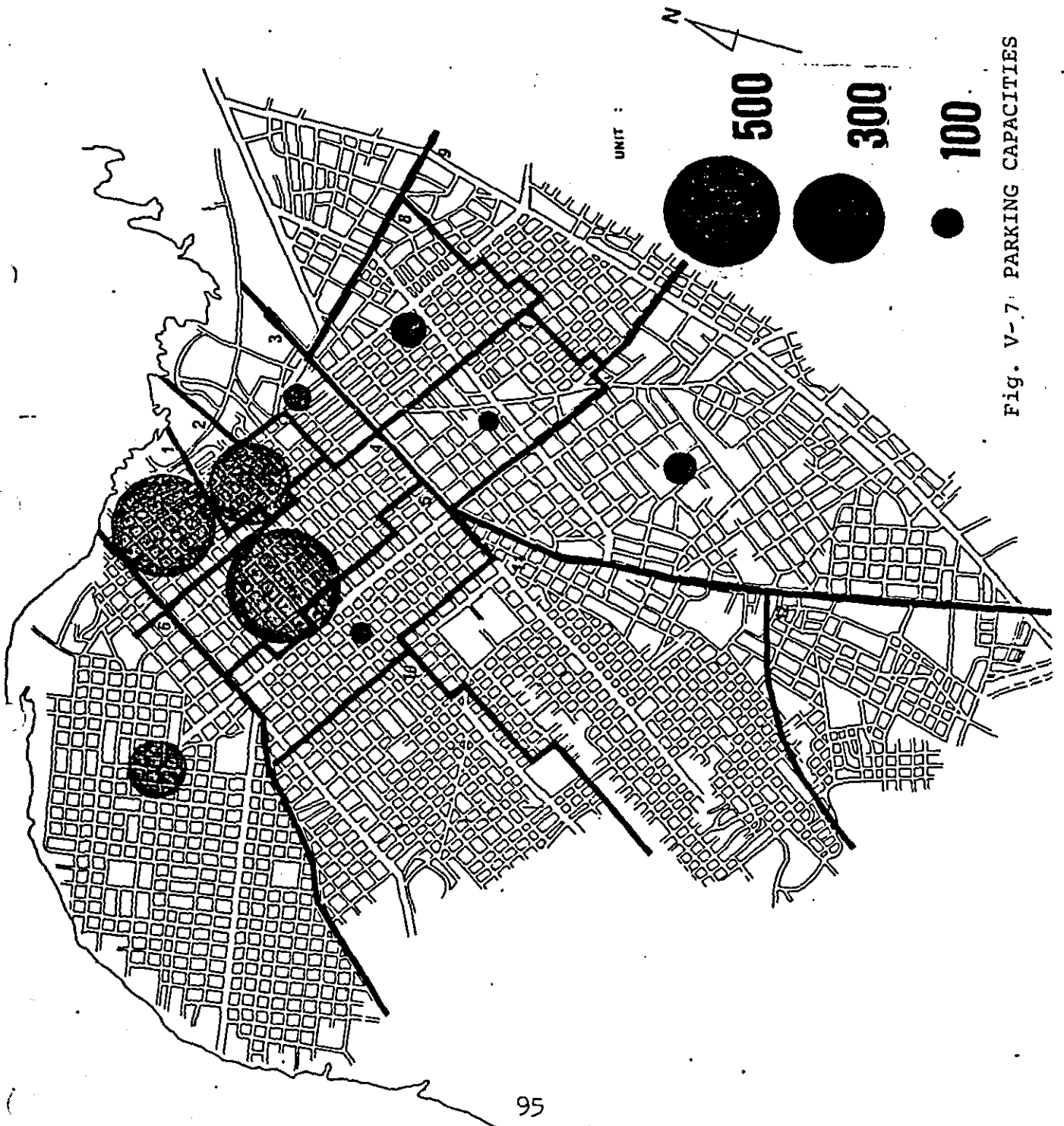


Fig. V-6/ LOCATION OF PARKINGS



5-4 Travel Time Survey

This survey aims at measuring the time which a motor vehicle (usually a passenger car) needs to cover certain distance by running along a certain route.

This survey was conducted on the road network in Asuncion Metropolitan area largely because of the following needs:

- (1) The need to determine the level of service provided by the road or its certain section under survey.
- (2) The need to obtain the information necessary for traffic control and its improvement.
- (3) The need to obtain basic data for the work necessary for road transport planning (traffic volume distribution, etc.).

17 routes comprising six radial routes including Av. Eusebio Ayala and 11 loop roads including Av. Peru were surveyed. The results of the survey are being tabulated and compiled. Shown in Table V-4, therefore, is the trend of travel speed on the principal radial roads.

Table V-4 Travel Speed (km/h)

Route	Inside Asuncion	Outside Asuncion	Average
(1) 7:00 AM - 9:00 AM			
(a) Av. Eusebio Ayala to National Route 2			
from Centro	36	37	37
to Centro	35	41	38
(b) Av. Mcal. Lopez to National Route 1			
from Centro	26	25	26
to Centro	36	28	31
(c) Av. Fernando de la Mora			
from Centro *	19	32	27
to Centro **	19	40	31
(2) 2:00 PM - 4:00 PM			
(a) Av. Eusebio Ayala to National Route 2			
from Centro	31	32	32
to Centro	32	32	32
(b) Av. Mcal. Lopez to National Route 1			
from Centro	33	31	32
to Centro	34	30	32
(c) Av. Fernando de la Mora			
from Centro *	37	39	38
to Centro **	30	36	34

NOTE: * via Av. Pettirossi

** via Av. Gaspar Rodriguez de Francia

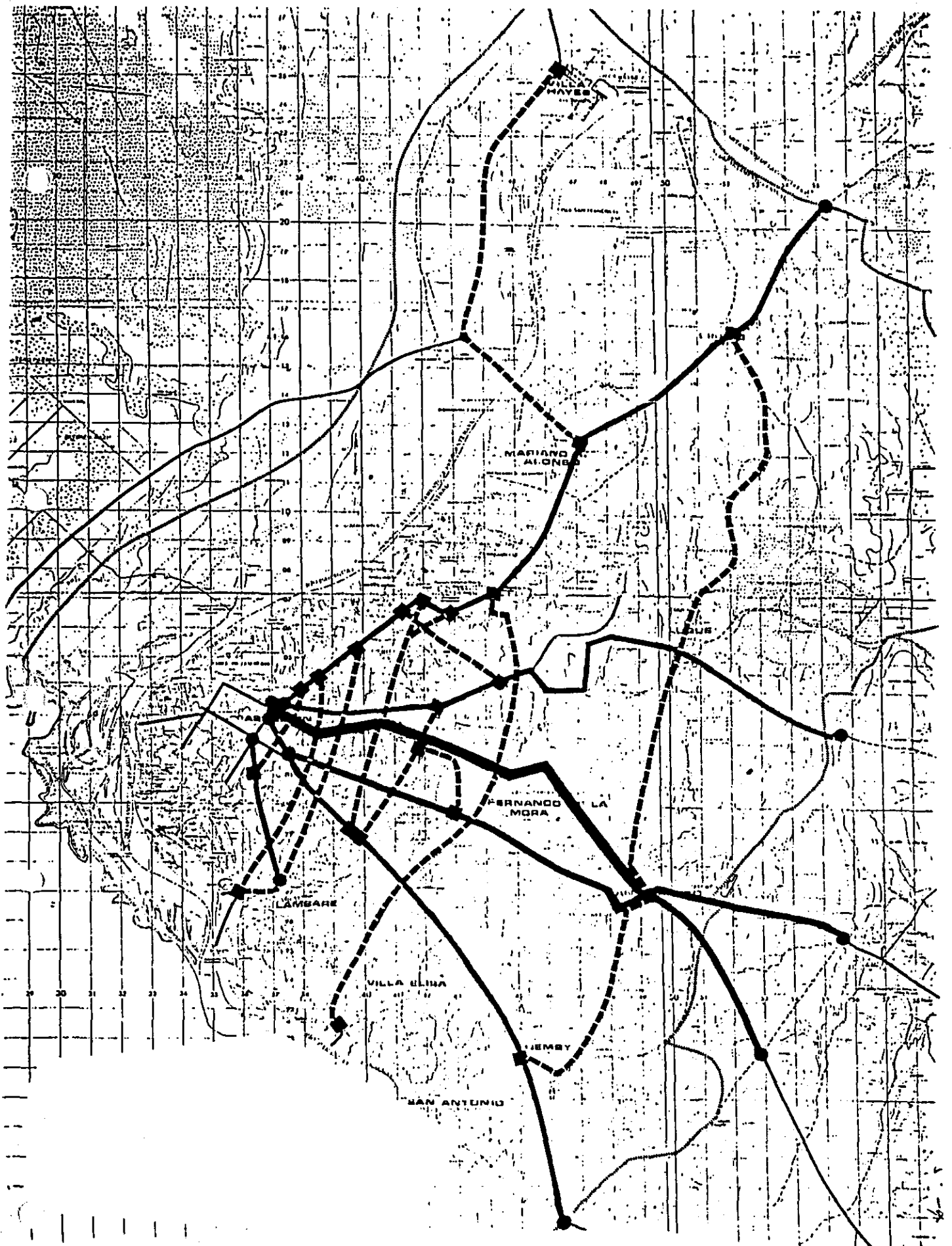


Fig. V-8 TRAVEL TIME SURVEY ROUTS

Chapter 6 Topographic Survey

6-1 Outline

The purpose of mapping work is to prepare topographical maps of scale 1/5,000 (main contour line interval 5 meters) necessary for the Urban Transport Improvement Project survey.

The work is roughly divided into two parts: preparation and collection of necessary data in Paraguay and final compilation of the maps in Japan. The work period started in mid-August 1984 and will end in six months, when the topographical maps will be completed. Field work in Paraguay is conducted by a team of seven Japanese survey experts and counterpart Paraguay members. The survey was completed in mid-October 1984, and work in Japan is currently progressing according schedule. The work progress is given in Fig. VI-1.

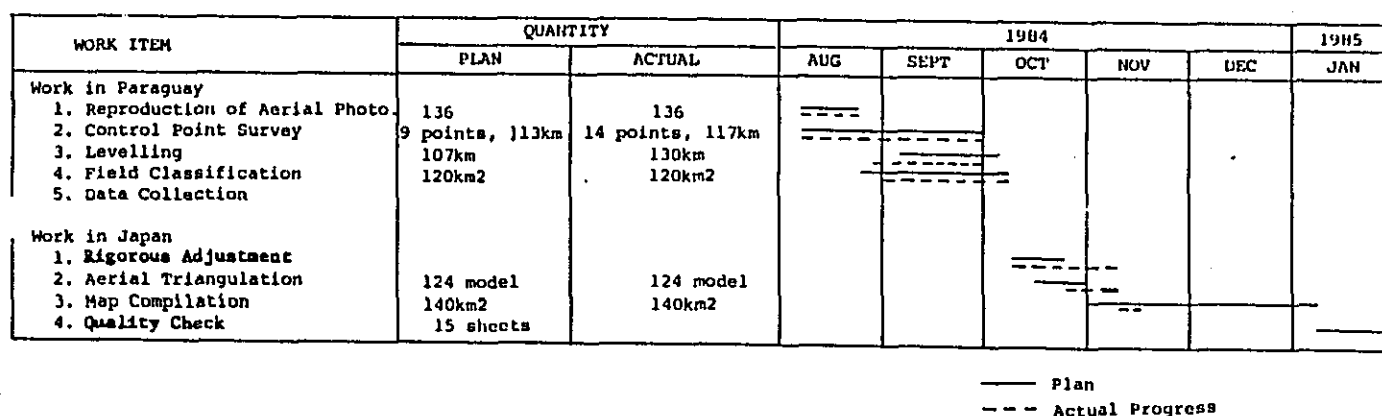


Fig. VI-1 WORK PROGRESS AND SCHEDULE FOR TOPOGRAPHIC SURVEY

6-2 Preparation and Collection of Data in Paraguay

1) Reproduction of Aerial Photographs

Aerial photographs taken by a private Brazilian company in May and June 1984, under consignment from Municipality of Asuncion, were used. For the survey, the 1/10,000 aerial photograph which covers about 80% of the area mapped and a 1/40,000 aerial photograph which covers all the area were used. The camera used to take these photographs was WILD RC-8 (focal length, 152.67mm; Picture plane 23cm x 23cm). Reproduction work was consigned to a private Brazilian company (Terea Foto Co.).

- a) Identification number and quantity of photographs reproduced. (Fig. VI-2) Total utilized photographs was 136 pcs.

- b) Types of reproductions made (using the above photographs)

Diapositive film	1 set
Contact print	2 sets
Two times enlargement photograph	1 set

2) Control Station Survey

The horizontal control necessary for aerial triangulation was established by the traversing method (relative accuracy, 1/6,000). Traversing was tied at the six national triangulation points (Pérgola, Asilo, Hospital, Fernando, Mojón and M.O.F.C.); (Fig. VI-3). Reinforced concrete was buried in the ground to identify the newly-established control stations (Fig. VI-4). For the purpose of conducting aerial triangulation at a later date, the triangulation and control stations were pricked on two times enlargement photograph.

- a) Quantity of work conducted:
 - Newly-established control stations traversing distance - 14 stations, 117 km
 - National triangulation points tied - 6 points
 - Number of pricking points - 20 points
- b) Main equipments used:
 - Transit theodolite - WILD T-2 (minimum observation, 1") and NIKON NT3A (minimum observation, 10")
 - Electric Distance Meter - AGA 14A (long-distance range, 10 km)
 - Signal - Helio signal and lamp signal
- c) Tolerances:
 - Error of closure in bearing angle, 20" n
 - Error of closure in coordinates, 1/4,000
 - Error of closure in relative height, 12cm x $\sqrt{S(SQR(1))}$

d) Observation Results

Trial computation showed that all satisfied the above tolerances. As a result of reviewing the outcome of the national triangulation stations (1963 observation), the following fractional closing errors were obtained:

Departure Point =====	Closing Point =====	Via ===	Exactitude =====	Route Lenght =====
ASILO	PERGOLA	0	1/318,000	6.3
ASILO	HOSPITAL	3	1/43,000	11.7
ASILO	FERNANDO	1	1/2,000	4.2
ASILO	MOJON	4	1/1,000,000	8.6
ASILO	M.O.P.C.	5	1/50,000	10.8

Since the relative fractional closing errors of Fernando was less than the 1/6,000 limit, it was omitted from the calculations.

3) Levelling

In order to obtain the vertical control necessary for aerial triangulation and compilation, levelling was conducted (tolerance, $\approx 6\text{cm}[\text{SQR}(S)]$, where S = the observed one-way distance in kilometers). The national bench marks (NW 1-1, E 1-11, S 1-1, CNA 2-3 D) were tied as known stations (Fig. VI-4). These bench marks were pricked on two times enlargement photograph, at 400m intervals along the levelling route.

a) Quantity of work conducted:

- Levelling lenght - 130km
- Pricking - one every 400m or so

b) Equipment used: Sokkisa B-2 (autoleveler)

4) Classification (by aerial photograph)

In order to prepare a 1/5,000 map; spots in the aerial photographs that were indistinct (ie., treecovered areas, sidewalks, pylons, railroad trucks, fences, walls, public buildings, etc.) were clarified by confirming and comparing with the actual site. The results were entered on two times enlargements photograph using color classification, and confusing areas were further classified by overlay. The area covered is 120 km².

Reference data necessary for compiling the maps were obtained from the Asuncion and nearby city offices and related organizations, as follows:

- ### 6-3 Map Compilation in Japan

Using the outcome of the five national triangulation stations (Fernando is excluded), adjustment were calculated by using the least square method. As a result, the mean square error of unit weight came to 2.83", which is sufficiently within the 7.0" limit established for the present survey.

- b) Computer used: ACOS-350 (NEC)

Aerial triangulation necessary for map compilation was conducted. At least 10 points within a model were observed. Measuring was conducted by block adjustment based on the analytical method.

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3) Map Compilation

Currently involved in this work, as scheduled. Planned completion date: mid-January 1985.

4) Quality Check

Scheduled for mid-to late January 1985.

6-4 Areas to be Mapped (Fig. VI-2)

About 140 km², covering nearly all Asuncion City and parts of nearby towns and cities, is to be mapped:

Asunción	-->	total
Lambaré	-->	partial
Fernando de la Mora	-->	partial
San Lorenzo	-->	partial
Luque	-->	partial

ESTUDIO DEL TRANSITO URBANO DE ASUNCION Y SU AREA METROPOLITANA

FORMATO Y FOTO INDICE

ESCALA 1:100,000

LEYENDA

	FORMATO 15 HOJAS
	FOTO INDICE
	FOTO ESCALA 1/10,000
	FOTO ESCALA 1/40,000
	AREA DE RESTITUCION

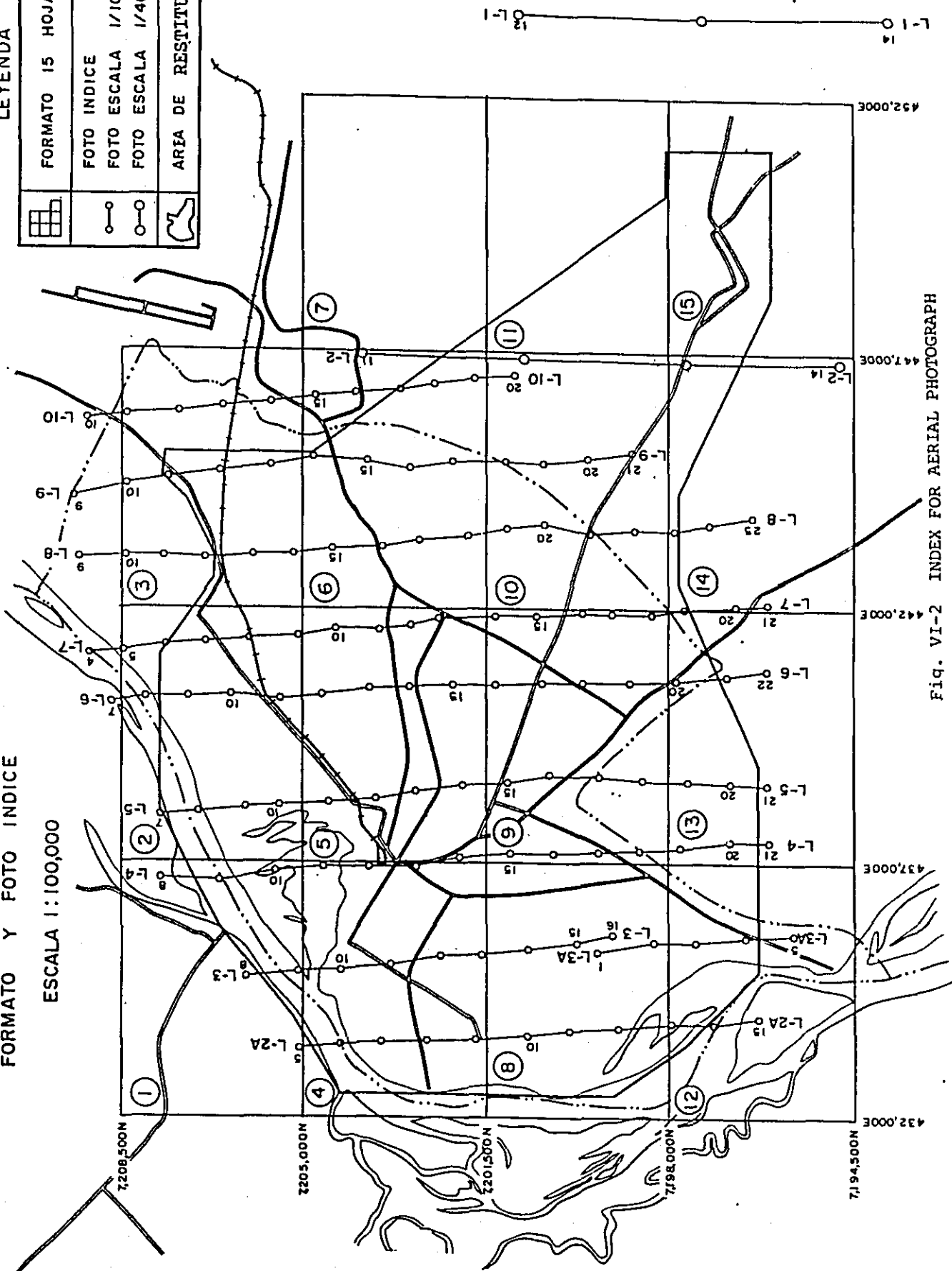


Fig. VI-2 INDEX FOR AERIAL PHOTOGRAPH

ESTUDIO D TRANSITO URBAND DE ASUNCION Y SU AREA METROITANA

RED POLIGONOMETRICA

ESCALA 1:100,000

LEYENDA

△	6 PUNTOS DE TRIANGULACION NACIONAL
○	14 PUNTOS DE POLIGONALES
●	11 PUNTOS DE SUB-POLIGONALES
—	TOTAL EN 117 KM. DISTANCIA
	140 Km² AREA DE RESTITUCION

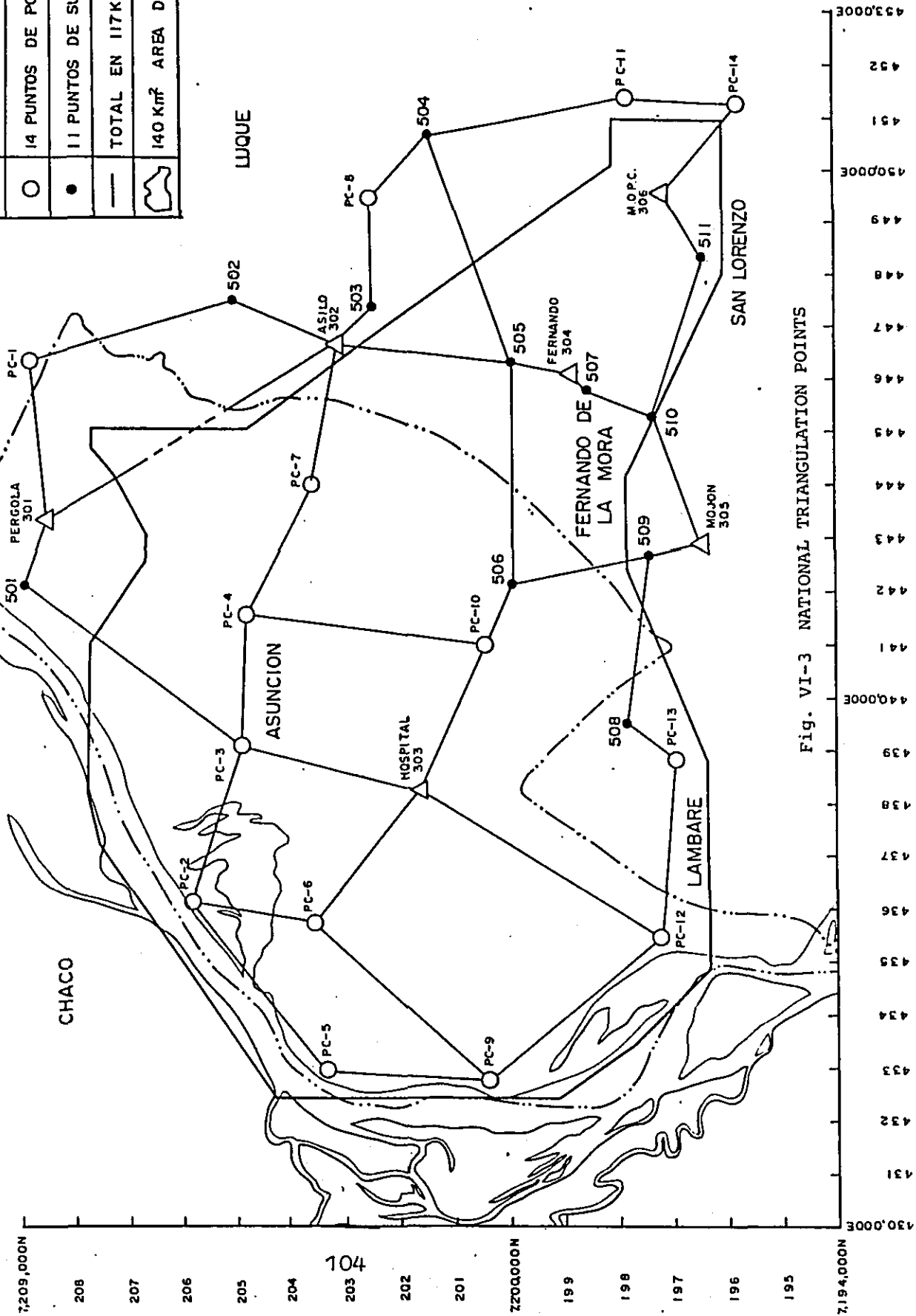
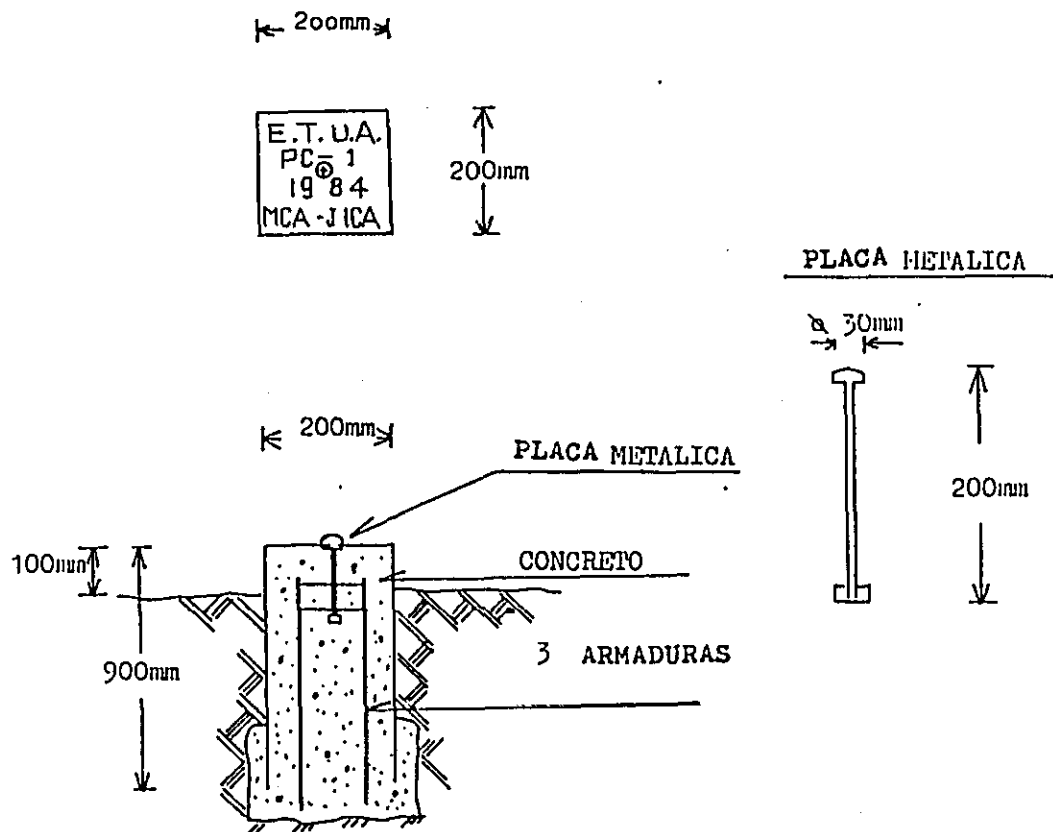


Fig. VI-3 NATIONAL TRIANGULATION POINTS

DETALLES DE LA MATERIALIZACION DE LOS VERTICES DE LA POLIGONAL

EN TIERRA-MOJONES



EN TANQUES, TERRAZAS DE EDIFICIOS - PLACAS METALICAS

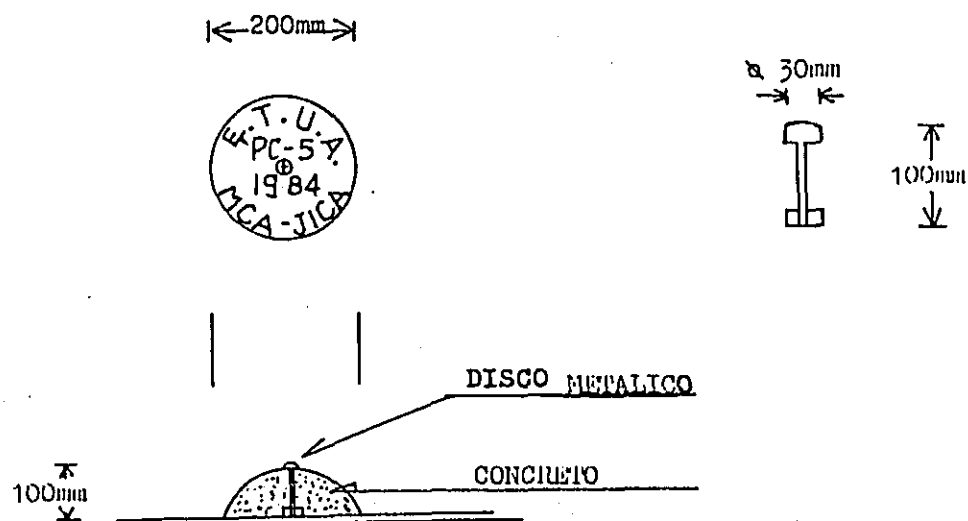


Fig. VI-4 MONUMENTS FOR TOPOGRAPHIC SURVEY

ESTUDIO DEL TRANSITO URBANO DE ASUNCION Y SU AREA METROPOLITANA

LINEAS DE NIVELACION

Y

FOTO UTILIZADA PERFORACION

ESCALA 1:100,000

LEYENDA

	NIVELACION NACIONAL 4 PUNTOS
	PUNTO DE INTERSECCION 9 PUNTOS
	PUNTO DE TRIANGULACION NACIONAL
	PUNTO DE POLIGONAL
	PUNTO DE SUB-POLIGONAL
	NUMERO DE LINEAS DE NIVELACION
	TOTAL EN 130KM. DISTANCIA
	FOTO UTILIZADA PARA PERFORACION
	FOTO ESCALA 1/10,000
	FOTO ESCALA 1/40,000

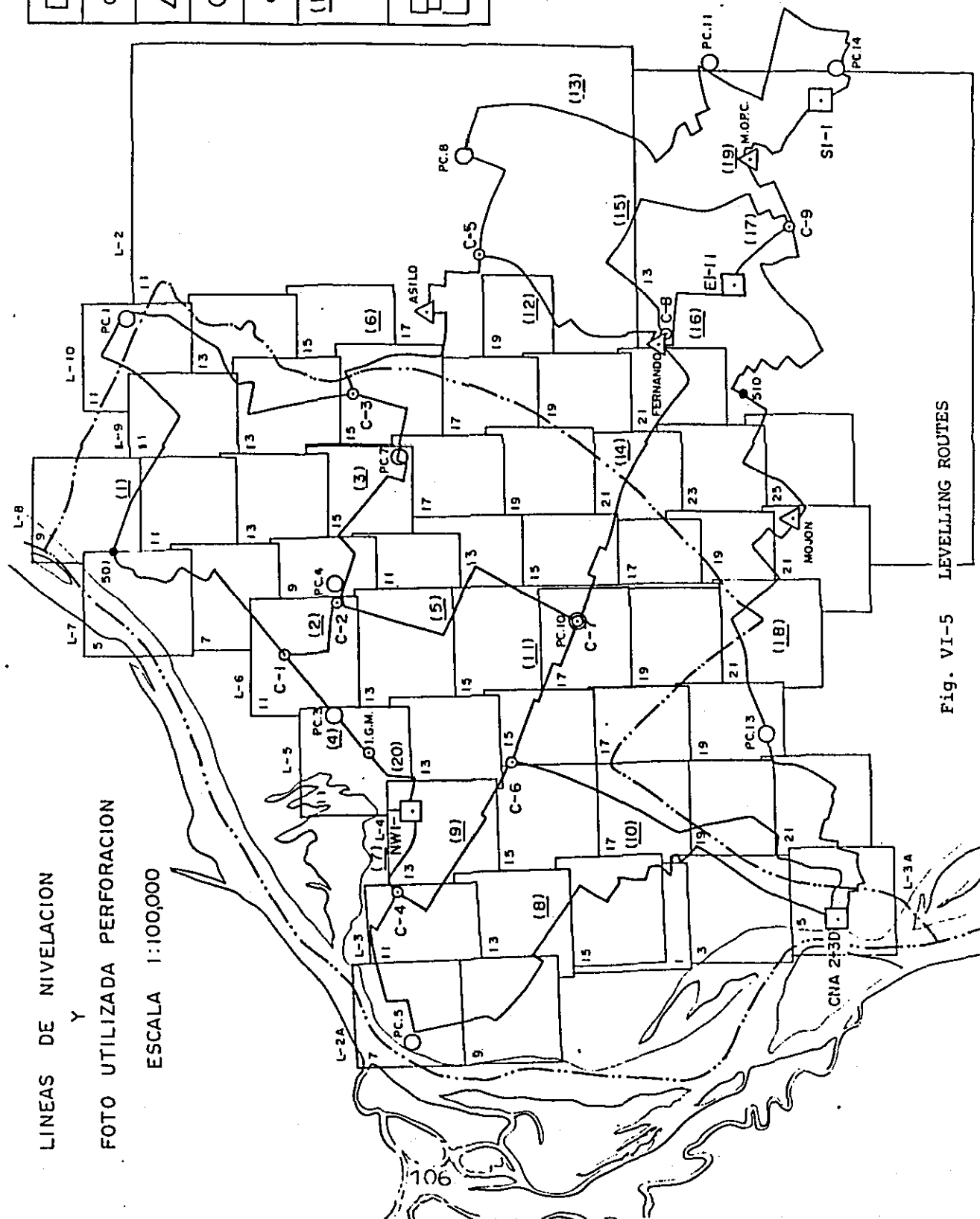


Fig. VI-5 LEVELLING ROUTES

Chapter 7: Schedule after Progress Report I

Our work schedule before submitting Progress report II by the end of March 1985 is shown in Fig. VII-1, and our survey team member dispatching schedule in Fig. VII-2.

NAME	FIELD	1984		1985		
		11	12	1	2	3
Jyuro Kodaera	Team Leader	26 19 24	23		17 8 15	16
Iwane Mizuno	Land Use Planning	20 3	4		28	
Ryuzo Hasegawa	City Planning					
Shigeru Okutsu	Transportation Planning	17		7		16
Kimio Kaneko	Traffic Management		6			16
Mamoru Shibata	Traffic Analysis					16
Shigeru Yoshijima	Traffic Survey			2		
Takeshi Yoshida	Transportation Demand Forecast			7		6
Tetsuo Kawamura	Road Planning			7		16
Kazuhiro Fujita	Road Planning					
Hajime Tanaka	Public Transport (Duputy Team Leader)					
Toshiaki Horii	Public Transport					
Tetsuo Wakui	Project Evaluation					
Yoshio Yoshida	System Analysis	26 12 25				16

 Work in Asuncion
 Work In Japan

Fig. VII-2 DISPATCHING SCHEDULE