4．質問書及び回答

I. ORGANIZATIONS CONCERNING THE IMPLEMENTATION OF THE STUDY

ITEM	DESCRIPTION	AVAILABILITY		NAME OF MATERIALS
		AVAILA-BILITY	PLACE OF DATA AVAILABLE	
1. Agencies responsible for the followings:				
(1) City & Regional Planning	Hanoi Metropolitan Area and Surrounding Regions	O	MOC, HPC	Planning Institute
(2) Transportation Planning		O	HPC, MOT	Transport Master Plan in 2010
(3) Road Planning, Construction & Maintenance	(1) Roads in Hanoi City	O	TUPWS	
	(2) National Roads	O	MOT	
	(3) Provincial Roads	O	MOT	
	(4) Other Roads	O	MOT	
(4) Operation of Toll Road		O	MOF, VN Road Institute	
(5) Railway Operation		O	Vietnam Railway	
(6) Bus Operation		O	TUPWS	
(7) Taxi Operation		O	TUPWS	
(8) Vehicle Registration		O	City Police	
(9) Traffic Control		O	City Police	
(10) Traffic Accident Investigation		O	City Police	
(11) Environmental Issue		O	HPC, MOSTE	
(12) National Census		O	Population Commitee	
(13) Mapping		O	Survery Dept.	
(14) Geological Investigation		O		
(15) Hydrographical Investigation		O	Hydrographical Dept	
(16) Meteorological Data Collection		O	Meteorogical Dept.	
2. Organization Chart				
(1) Hanoi People's Committee		O	HPC	
(2) Ministry of Transport	Present Chart	O	MOT	

II. LAWS AND REGULATIONS

ITEM	DESCRIPTION	AVAILABILITY		NAME OF MATERIALS
		AVAILA-BILITY	PLACE OF DATA AVAILABLE	
1. Laws and Regulation Related to the followings:				
(1) City & Regional Planning	Name of Law and/or Regulation	O	HPC	
(2) Road Planning, Construction & Maintenance	- do -	O	MOT, HPC	
(3) Operation of Toll Road	- do -	O	MOT, VN Road Institute	
(5) Railway Operation	- do -	O	Vietnam Railway	
(6) Bus Operation	- do -	O	TUPWS	
(7) Taxi Operation	- do -	O	TUPWS	
(8) Vehicle Registration	- do -	O	City Police	
(9) Traffic Control	- do -	O	City Police	
(10) Traffic Accident Investigation	- do -	O	City Police	
(11) Environmental Impact Assessment	Other than "Law on Environmental Protection"	O	MOSTE	
2. Outline of Regulations for the followings				
(1) Land Ownership		O	Min. of Law	
(2) Regulation for Land Acquisition & Registration		O	Min. of Law	
3. Urban and Regional Planning		O		
(1) Outline of Urban & Regional Planning System		O	MOC, HPC	
(2) Outline of Urban Development System		O	MOC, HPC	
(3) Restriction for Urban & Regional Development		O	MOC, HPC	
(4) Trend of Land Prices		O	MOC, HPC	
4. Public Investment				
(1) Outline of Public Investment System		O	HPC, TUPWS	
(2) Financial Source for the Urban Development	Availability of Special Fund, etc.	O	HPC, VN Government	
(3) Financial Source for the Transport Development		O	MOT, MOF	
(4) Trend of Public Investment		O	HPC, TUPWS	

III. TAX SYSTEM

ITEM	DESCRIPTION	AVAILABILITY		NAME OF MATERIALS
		AVAILA-BILITY	PLACE OF DATA AVAILABLE	
1. Outline of General Tax system	Income Tax, Sales Tax, etc.	O	MOF, Tax Dept.	
2. Outline of Tax System for the Land Ownership		O	MOF, MOC, HPC	

IV. SOCIO-ECONOMIC DATA/INFORMATION

ITEM	DESCRIPTION	AVAILABILITY		NAME OF MATERIALS
		AVAILA-BILITY	PLACE OF DATA AVAILABLE	
1. Progress of Economic Restructuring				
(1) Economic Restructuring Plan		O	SPC	Central Economic Management Institute
(2) Major Achievement in Economic Restructuring		O	SPC	
(3) Progress of Privatization of State Enterprises		O	SPC	
(4) Progress of Deregulation		O	SPC	
2. Socio-Economic Information for the last 10 to 20 years		O		
(1) Gross National Product (GNP)		O	Statistic Dept.,	Hanoi Statistic Dept.
(2) Gross Regional Domestic Product (GRDP)		O	- do -	
(3) Major Products in Agriculture, Industry and Mining by Region		O	HPC, Hanoi Statistic Dept	
(4) Foreign Trade in Quantity and Value		O	Min. of Trading	Foreign Economic Relation Dept. of HPC
(5) Population Trend	(1) By Region in National Level	O		
	(2) By District in Hanoi Metropolitan Area	O	HPC, Hanoi Statistic Dept	
(6) Income Distribution by Region		O	HPC, SPC	
3. Development Plans (Nation & Hanoi City)		O	SPC, HPC	
(1) Long Term National Development Plan		O	SPC	
(2) Five Year Economic Development Plan		O	SPC	
(3) Transport Development Plan		O	MOT, SPC	
(4) Forecast of Socio-Economic Indicators		O	SPC	
(5) Land Management Plan		O	MOC	
4. Financial Performance in the Last 5 years				
(1) National Budget with Breakdown		O	MOF,	
(2) Foreign Trade Balance		O	Min. of Trading	
(3) Foreign Economic Assistance		O	Min. of Foreign Trading	

V. URBAN DEVELOPMENT IN HANOI METROPOLITAN AREA

ITEM	DESCRIPTION	AVAILABILITY		NAME OF MATERIALS
		AVAILA-BILITY	PLACE OF DATA AVAILABLE	
1. Land Use in Hanoi Metropolitan Area				
(1) History of Urbanization in Hanoi		O	Planning Institute, HPC	
(2) Present Land Use Map		O	Ppanning Institute	Land Use Dept.
(3) Major Development Plan	(1) Industrial Development Plan	O	Planning Institue	
	(2) Agricultural Development Plan	O	- do -	
	(3) Housing Estate Development Plan	O	- do -	
	(4) Other Development Plan	O	HPC	
(4) Future Land Use Plan		O		
2. National Census Results (1991)				
(1) Population by District		O	Statistic Dept.	
(2) Number of Household		O	- do -	
(3) Number of Employment by Sector		O	- do -	
(4) Other Information		O	-do -	

VI. TRANSPORT SYSTEM IN HANOI METROPOLITAN AREA

ITEM	DESCRIPTION	AVAILABILITY		NAME OF MATERIALS
		AVAILA-BILITY	PLACE OF DATA AVAILABLE	
1. Road Network				
(1) Present Road Network Map		O	TUWPS, Design Comp.	
(2) Classified Length of Road Network for the last	(1) By Road Category	O	- do -	
10-20 years	(2) By Road Surface Condition	O	- do -	
(3) Type and Condition of Major Structures		O	- do -	
(4) Traffic Volume on Major Roads		O	TUPWS	
(5) Road Network Development Plan		O	TUPWS, Design Domp.	
2. Motor Vehicle Registration				
(1) Number of Registered Motor Vehicles by Type, including Motorcycle, for the last 10-20 Years.		O	City Police, TUPWS, MOT	
(2) Procedure of Motor Vehicle Registration		O	City Police	
3. Bus System				
(1) Route Map of Bus System	(1) Intra-Urban Bus System	O	Bus Company	Design Company, Trolley Bus Company
(Including location of bus stops)	(2) Inter-Urban Bus System	O		South-North Transportation Company
(2) Number of Bus Passengers for the last 10 years		O	Bus Company	
(3) Name of Bus Operators		O	TUPWS	
(4) Bus Operation Timetable		O	Bus Company, TUPWS	
(5) Outline of Bus Fleet Maintenance Facilities		O	-do-	
(6) Number of Bus Fleets		O	-do-	
(7) Outline of Bus Terminal		O	-do-	
(8) Fare Structure		O	-do-	
(9) Salary Level of Bus Drivers and Conductors		O	- do -	
4. Railway				
(2) Number of Passengers for the Last 10 Years		O	Vietnam Railway	
(3) Volume of Cargoes for the Last 10 Years		O	- do -	

VII. OTHER NECESSARY INFORMATION

ITEM	DESCRIPTION	AVAILABILITY		NAME OF MATERIALS
		AVAILA-BILITY	PLACE OF DATA AVAILABLE	
1. Air Traffic at Noibai International Airport				
(1) Number of Passengers	After 1991	O	Vietnam Airways	
(2) Volume of Cargoes and Posts	After 1991	O	- do -	
2. Traffic Control System				
(1) Location of Signalized Intersections		O	TUPWS, City Police	
(2) One-way Traffic System		O	TUPWS	
(3) Other Traffic Control System		O	TUPWS	
3. Traffic Accident				
(1) Number of Traffic Accidents and Casualties		O	City Police	
(2) Major Type of Traffic Accidents		O	- do -	
4. Design Standard				
(1) Road Design Standard	Other than TCVN4054-85	O	MOT	
(2) Bridge Design Standard		O	MOT,	Transort Design Institute
(3) Manual/Guideline for Other Road Facilities		?		
(4) Railway Design Standard	Other than TCVN411785		Railway Design Institute	
5. Local Consultants				
(1) Name and Address of Consultants Capable for	(1) Traffic Survey	O	Design Company	
	(2) Topographic Survey	O		
	(3) Geological Survey	O		
	(4) Environment Survey	O		
	(5) Hydrological Investigation	O		

Ⅶ. ENVIRONMENTAL ISSUES

ITEM	DESCRIPTION	AVAILABILITY		NAME OF MATERIALS
		AVAILA-BILITY	PLACE OF DATA AVAILABLE	
1. Legisration related to environmental policies and standards		○	・Ministry of Science, Technology and Environment ・Hanoi Department of Science, technology and Environment	・Law on regulations
(1)Environmental quality standards including emission/effluent standards - Standard values and penalties - Monitoring system and its responsible agency	1)Air pollution			
	2)Water pollution			
	3)Soil pollution			
	4)Noise			
	5)Vibration			
	6)Offensive odor			
(2)Laws/guidelines related to environmental impact assessment(EIA)	1)Type/size of activities for EIA			
	2)Procedure			
2. Present situation of the proposed project sites			・Ministry of Science, Technology and Environment ・Hanoi Department of Science, Technology and Environment	
(1) Socio-economic environment	1)Plan of resettlement, if any (number of people to be resettled) (compensation)	○		・Law on regulations
	2)Distribution of schools, hospitals, etc. (public facilities)	○		
	3)Cultural property or archaeological sites	○	・Hanoi Department of Culture and Information	
(2) Natural environment	1)Location of environmentally vulnerable areas such as mangrove forest and wetland	○	・Transportation and Urban Public Works Service	
	2)Distribution of important historical spots, landscape and scenery	○	・Hanoi Department of Culture and Information	
(3) Quality of life	1)Present conditions of air quality, noise and vibration	○	・Ministry of Science, Technology and Environment ・Hanoi Department of Science, Technology and Env.	
3. Present organization executing environmental impact assessment (EIA)				
(1) Organization executing EIA	1)Governmental organization/university	○	ditto	
	2)Private sector	NO		
(2) Experience of execution of environmental study and EIA		○	・Ministry of Science, Technology and Environment ・Hanoi Department of Science, Technology and Env.	
4. Environmental impact assessment (EIA) of the proposed project				
(1)Environmental factors/items to be expected affecting environments by the proposed project	(Please refer to the attached forms of Screening and Scoping)			
(2)Necessity of EIA in the proposed project				

IX. TECHNICAL DATA/INFORMATION

ITEM	DESCRIPTION	AVAILABILITY		NAME OF MATERIALS
		AVAILA-BILITY	PLACE OF DATA AVAILABLE	
(1)Topographic data	1)Topographic maps - of larger scale on site, if any	○	・Department of Survey and Map (belonging to the Government)	・Topographical and geographical maps and some reports
	2)Availability of aerial photos - Aerial photos (1/5,000)	○		
(2)Geodetic data	1)Triangulation point network	○		・High level(degree) triangulation network and some description
	2)Points description (Control points)	○		
	3)Triangulation point data list	○		
(3)Meteorological data	1)Wind	○	・Department of Meteorology and Hydrology	・Some statistics
(4)Natural disaster	1) History of natural disaster - Strong wind - land slide	○		

The Socialist Republic of Vietnam
Hanoi People's Committee
Transportation and Public Works Service
Survey and Public Company

Intoduction in brief basic data of study on urban transportation of Hanoi-Vietnam

Hanoi Foreign Economic Relation Department

Hanoi, 15 March, 1995
Director
Dr. Chief Eng.

Nguyen Van Buc

TABLE OF CONTENTS

CHAPTER 1

1. COUNTRY BACKGROUND
- BASIC FACTS

1.1 PHYSICAL CHARACTERISTICS

Hanoi, founded in 1010, lies in the middle of the plain on both banks of the Red River (Song Hong). The capital is teemed with numerous lakes and ponds as the area used to be the flood plain of the Red River - and hence the name of the city Hanoi (Ha = river, Noi = inside) "the city inside a bend of the Red River".

The Red River flows through Hanoi for over 93 km and populated areas on both sides of the river are crossed by three bridges: Long Bien, Thang Long and Chuong Duong. There are also a number of minor river systems running through the city such as: the Da, Duong, Day, Nhue, and Kim Nguu.

To the west of Hanoi stretches a number of hills more or less high. Mount Ba Vi (1,237 m) is about 65 km from the centre of the city. To the north undulates the ever-rising ranges of hills and mountains, leading to the mountainous region of Viet Bac.

The climate in the months of May, June and July is humid with the maximum temperature of 42.8° C and minimum of 20° C. In the months of January, February, March, April as well as in September, October and November, it is colder. The temperature in January is 33.1° C maximum and 2.7° C minimum. In February, March and April vegetation is abundant and trees are laden with juicy fruit.

1.2 POPULATION

Administratively, Hanoi is made up of the central area (or the city proper) of four (4) districts:

- Hoan Kiem
- Hai Ba Trung
- Dong Da
- Ba Dinh, etc.

Eleven (11) suburban districts, comprising:

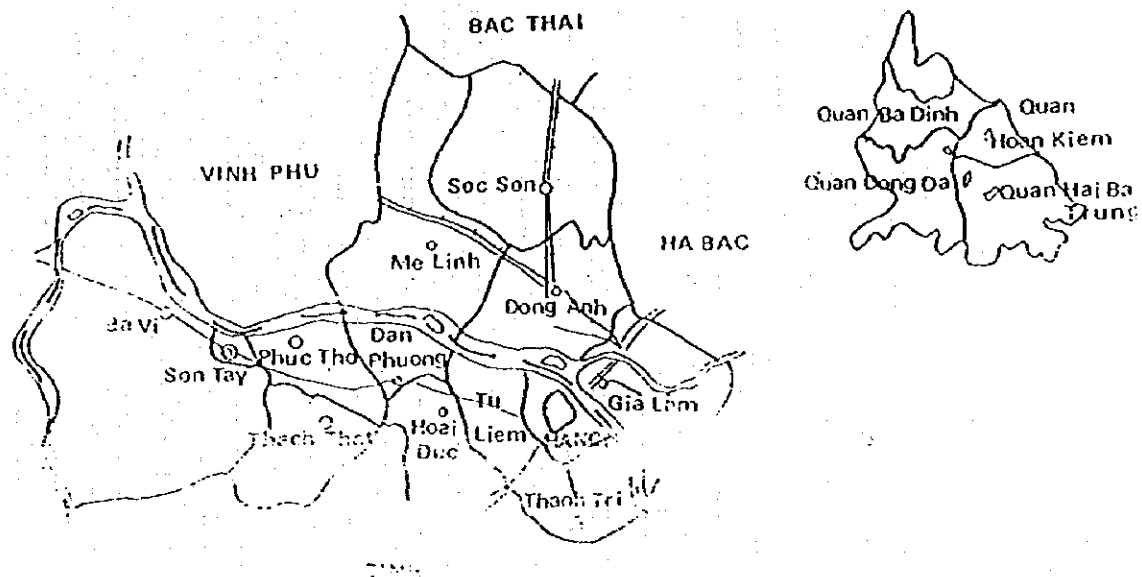
Thanh Tri, Tu Liem, Dong Anh, Gia Lam, Ba Vi, Thach Taht, Phuc Tho, Hoai Duc, Dan Phuong, Me Linh, and Soc Son (where the Noi Bai International Airport is situated).

The direct influence area of the project is entirely within the province of Hanoi and the project alignment itself starts at a point south of the Thang Long Bridge and ends at the Ba Dinh Square in the central area of Hanoi in the Ba Dinh district.

According to the 1989 census, the total population of Hanoi Province was about 3.1 million inhabitants. The area of the province is about 2,140 km² which leads to an average density of 1,450 inh./km². Hanoi city proper occupies an area of 43 km² with an urban population of about 1.1 million. The urban density is about 25,600 inh./km² which is in line with densities of other metropolitan areas of the world.

The remaining part of the Hanoi Province consists of rural area with an estimated population of 2.0 million inhabitants living in 2,100 km². The average density is about 950 inh./km². The population census gives an equivalent number of males and females and a total number of households in the Province amounting to 980,000 of which 28 % are in the urban area. The inter-census comparison indicates a natural growth rate of 1.53 % for the population living in the region and 2 % per annum taking into account of migration effects.

Figure 2.1 Hanoi and Its Province



1.3 URBAN ACTIVITIES

The 1989 population census shows that in the Hanoi Province 56 % of the total population and 79 % of the total work force is involved in economic activities. It can be assumed that a large part of the jobs of service industries are located in the districts of Hoan Kiem and Ba Dinh. Hoan Kiem district consists mostly of shops and commercial businesses whereas Ba Dinh district consists of offices (Ministries, administrations, etc.). The largest industrial settlements are located in Dong Da district.

Little data is available on employment location, as a whole. The following Table gives a breakdown by size and location for a sample of registered companies.

Industrial Settlements by Size and District

	Corporations		Interm. Size		Small Size		Priv. Enterp.		Total	
	Numb.	Empl.	Numb.	Empl.	Numb.	Empl.	Numb.	Empl.	Numb.	Empl.
Ba Dinh	43	2,286	8	116	112	965	613	1,840	776	5,207
Hoan Kiem	76	2,358	14	430	202	2,005	343	1,224	635	6,017
Hai Ba Trung	63	2,627	25	307	327	2,326	937	1,970	1,352	7,230
Dong Da	59	2,970	4	123	252	2,401	678	1,352	993	6,846
Total	241	10,241	51	976	893	7,697	2,571	6,386	3,456	25,300

Main technical universities and medical schools as well as the largest hospital are located in the southern part of the districts of Dong Da and Hai Ba Trung near the southern section of National Highway No. 1. All current social and educational services (health and social care, schools and high schools, etc.) are provided in each living quarter.

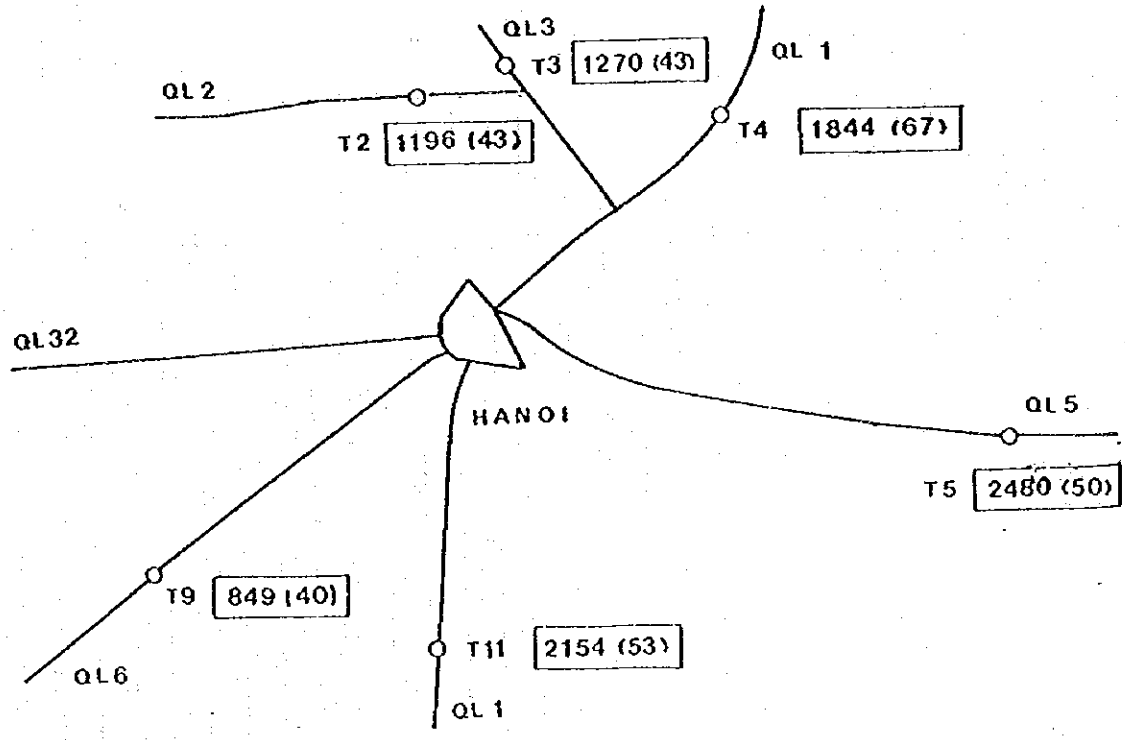
1.4 PROVINCIAL TRANSPORT INFRASTRUCTURES

The city of Hanoi is potentially well-served by the transport network which could supply all facilities needed by urban activities.

Highways.

Seven national highways radially connect Hanoi with surrounding provinces as shown in the schematic diagram below. They are all-weather asphalted or concrete surfaced roads.

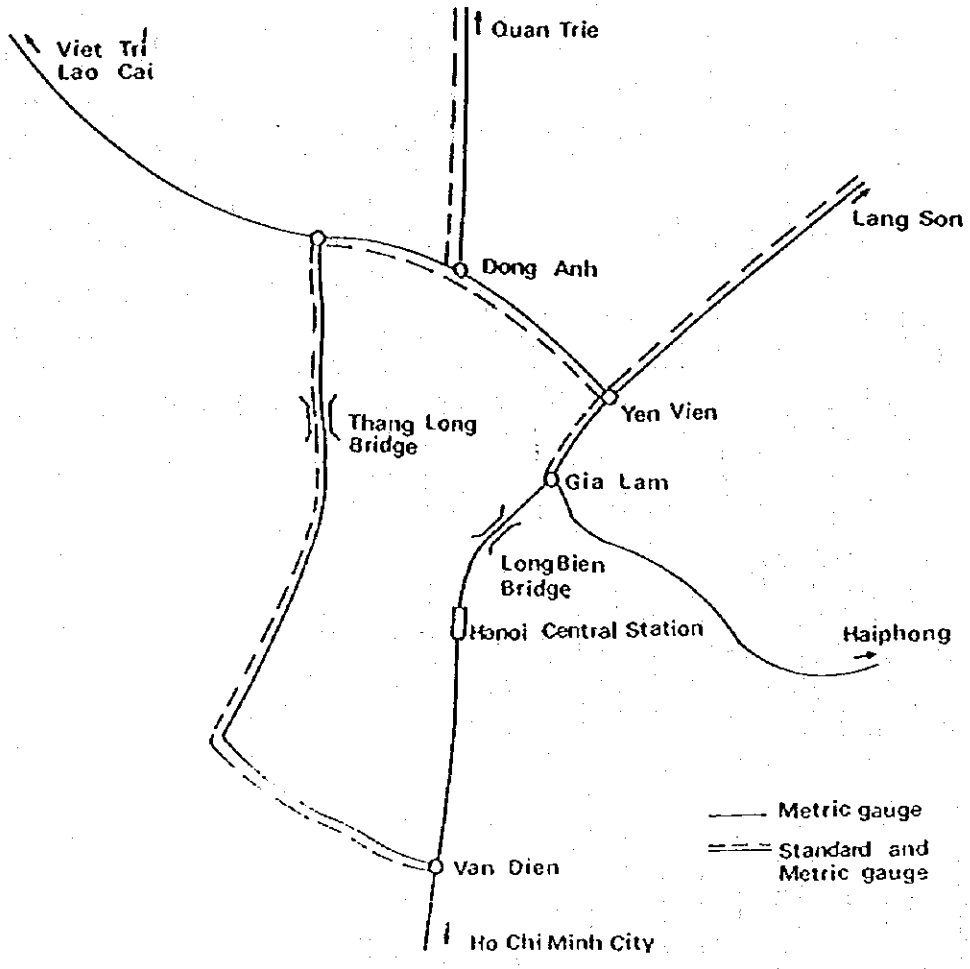
Figure 2.2 National Highways Serving Hanoi and Their Average Daily Traffic (ADT)*



The Railway Network

Hanoi is a major railway junction serving the northern provinces of Lao Cai, Bac Thai and Lang Son as well as Haiphong port. On the other hand, the Hanoi railway network connects the northern provinces to the southern part of the country. Figure 2.3 shows the different railway junctions and especially the new "west-belt railway" which has been operated since 1986 after the Thang Long bridge was opened to traffic.

Figure 2.3 Main Railway Network Around Hanoi



Waterway Transport

Two main river ports located on the right bank of the Red river serve Hanoi. The most important is located downstream near the Long Bien bridge and is operated under the supervision of the Ministry of Transport, Communication and Post (MOTC). It was created in early 1954 but started to undergo major expansion after 1970. Access to the port is affected by heavy siltation requiring some 250,000 m^3 of yearly dredging. The second one, Khuyen-Luong port, is used as a relief port during the dry season. It is located 10 km downstream and is operated under supervision of provincial institutions, serving mainly for local traffic and for river-cum-sea transport.

Air Transport

Hanoi is served by Noi Bai Airport for domestic and international relations. In 1990, domestic traffic totalled about 231,000 passengers for 3,900 aircraft movements. The main routes are operated to Ho Chi Minh city with eight weekly scheduled flights, and to Da Nang. Domestic air traffic has been growing at a 6.2 % annual rate since 1986. Relevant data for international traffic was not available for recent years but the traffic is expected drastically in the coming years keeping pace with the rapid economic development. It should be underlined that Noi Bai Airport is located 45 km from the city center and the existing highway link is narrow and is in dilapidated condition. The travel time needed to reach the airport is about one hour which is quite a long time when the average travel time on domestic routes is about one hour and a half.

Recognizing this problem, a new highway section between the airport and north of the Thang Long Bridge is under construction to provide a faster, convenient link with Hanoi city and the airport. The proposed highway between south of the Thang Long Bridge and Ba Dinh Square is the government's endeavour to complete this high speed road transport system between the airport and the city center.

1.5 LAND USE AND ECONOMIC ACTIVITIES IN THE DIRECT INFLUENCE ZONE (DIZ)

The Hanoi Urban Transportation Master Plan (HUTMP) for the year 2010 provided in Figure 2.4 shows the present and intended land use plan of the Hanoi city. This plan, worked out by the Transport Engineering Design Institute (TEDI), is in draft stage and is not yet approved by the Government.

Agricultural Area

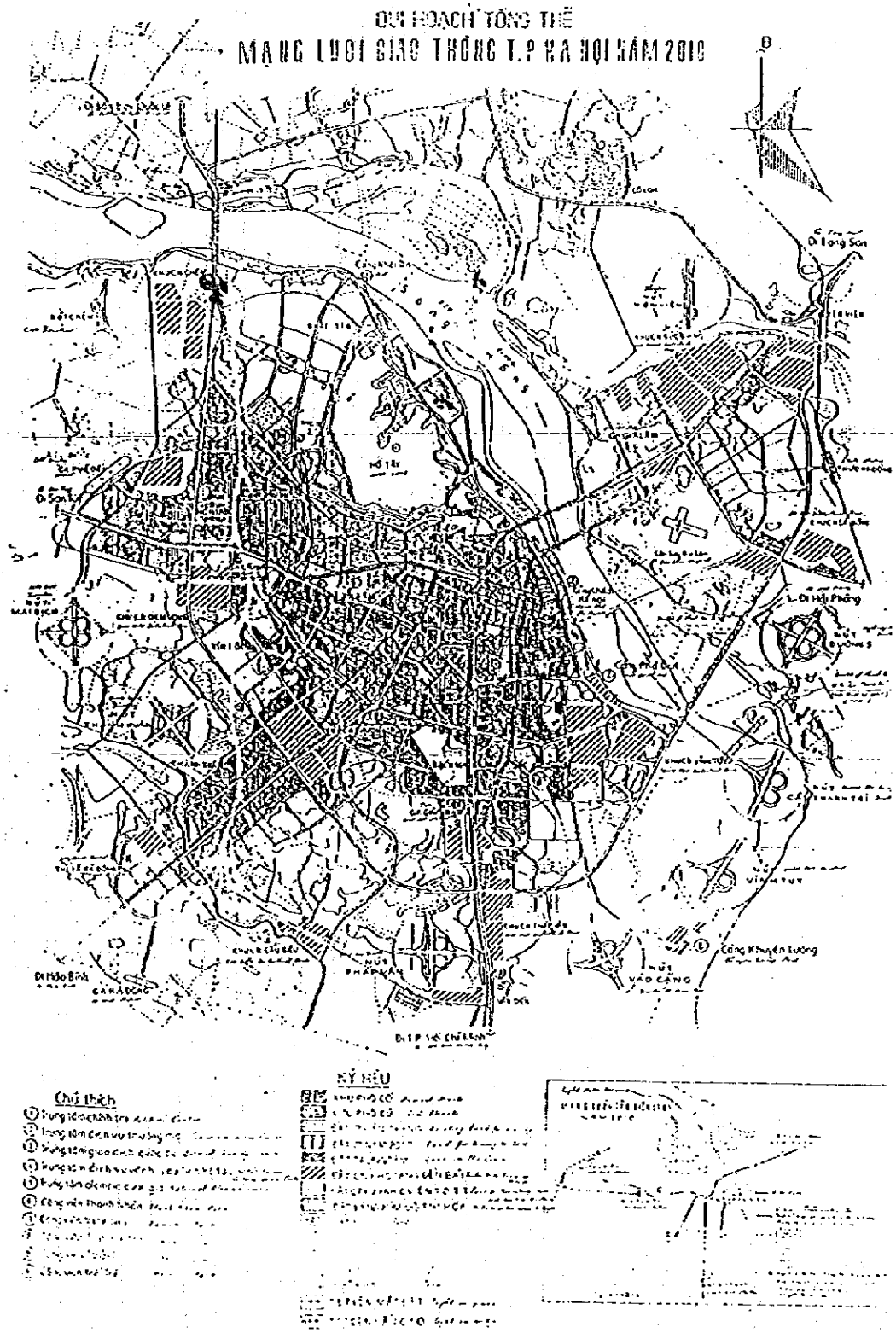
The proposed alignment for the section beginning from south of the Thang Long Bridge to Ngia Do which constitutes about half of the alignment is presently used as farm land with a belt of rural community engaged in agriculture. This part of the land along the corridor of the new road is planned to be developed into a new town in the future, which will eventually accommodate about 300,000 inhabitants in 17 km². Along with the modern residential housing, government offices and large scale sport complex are to be built in this area to complement the existing functions in the city center.

Industrial and Commercial Areas

The area immediately west of the beginning point of the project along the existing Thang Long Bridge Road and railway is the industrial area, which includes the municipal government's asphalt concrete mixing plant, construction materials production and steel structure fabrication yard and several other factories.

From Ngia Do to the ending point of the road and the area along the corridor of the Hoang Hoa Tham and Thuy Khue roads is already urbanized but some what disorderly developed area where a variety of economic activities co-exists with the residential function. These includes: Boui Market serving the local community; a brick and tile factory, a beer brewery, sanatorium, and various educational institutions; a flower growing community in south of the Hoang Hoa Tham road which still remains as a considerable open space; many local shops and vendors which encroach into the narrow and winding roads; a number of light industries using local crafts; and a municipal park and water pumping stations. This area might need a major face-lift for the existing settlement as well as the widening and improvement of the road system.

Figure 2.4 Hanoi Urban Transportation Master Plan For Year 2010



Tourism Area

The area around this part has rich heritage of both natural and man-made tourist attractions scattered around the West Lake, which is the largest among the numerous lakes in Hanoi city. There already exists a considerable tourist facilities around this area. The government has a further plan to make the most of these treasured resources and a number of tourist hotels and recreational facilities are to be added in the area. In order to provide necessary tourism infrastructure, the metropolitan government also envisages to construct a circular road system along the shore of the West Lake.

Government Administration Area

The area between the Ba Dinh Square, where the proposed road terminates, and Lake Hoan Kiem is the hub of the political and government activities in the country. It is conceived that some of the governmental functions might be relocated to the new town to be built in the future along the corridor of the proposed road as elaborated earlier.

CHAPTER 2 TRAFFIC STUDY

2.1 PRESENT ROAD NETWORK

2.1.1 TRANSPORT INFRASTRUCTURE

The present transport infrastructures covering highways, railway network, waterway transport and air transport has been briefly presented in section 1.4, Chapter 1. This section will review more specific information about these components.

1) Road Network

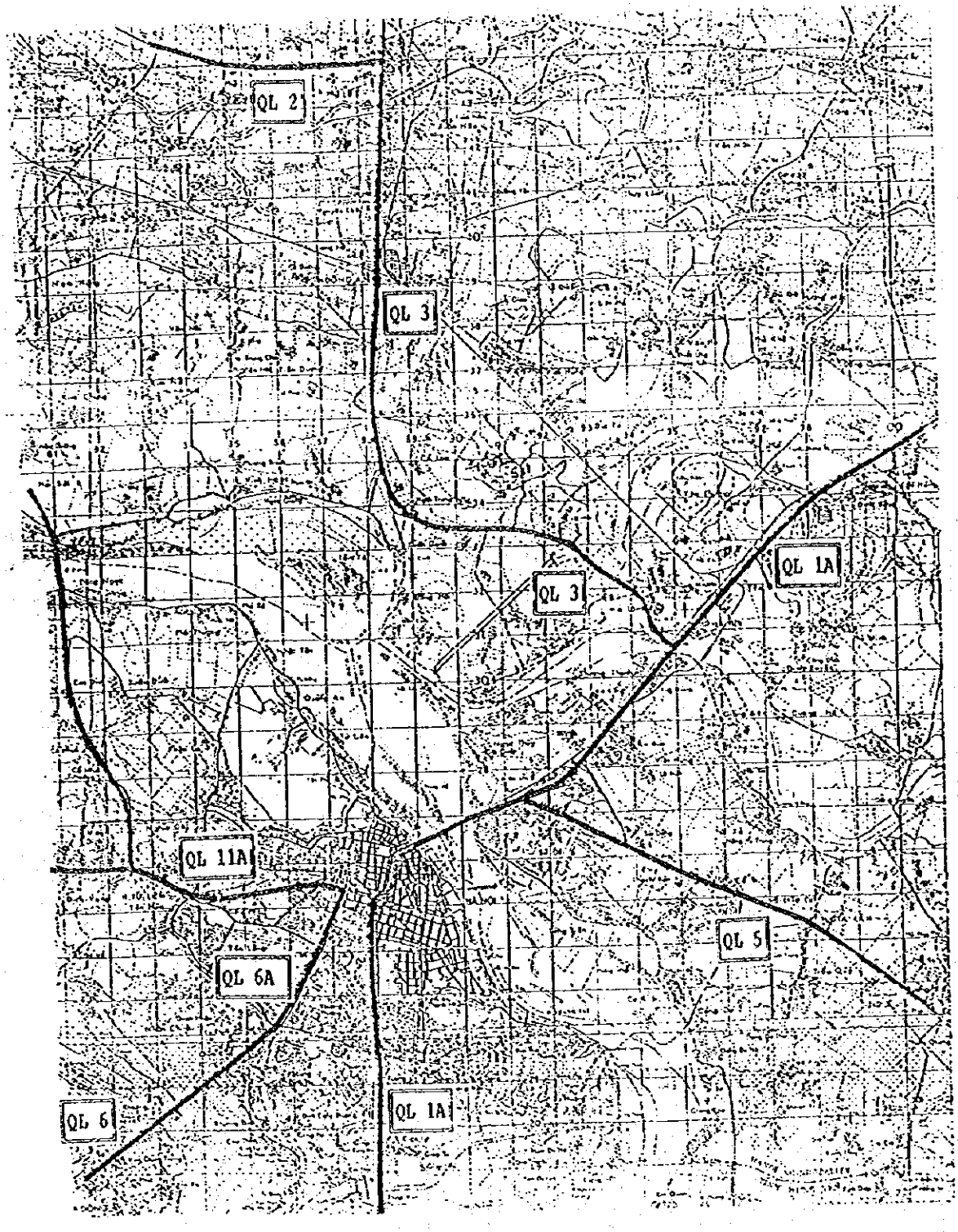
As shown in Figure 2.2 in Chapter 1, the Hanoi Metropolitan Area is served by seven national highways (QLs), which are considered adequate in terms of the network development albeit the condition of these QLs need significant level of improvement. The salient features of these national arteries are as shown in the table below:

Table 3.1 National Highway Characteristics in Hanoi

National Highway (QL) No.	Segment From Hanoi To	Length (km)	ADT	Width		Poor Condition of Surface (km)
				Carriageway (m)	Shoulder (m)	
3	Thai Nguyen	66	1,290	5.5 - 7.5	1.0 - 2.0	16 (24.2%)
1A	Bac Giang	50	1,850	5.0 - 7.0	0.5 - 1.5	4 (0.8%)
5	Hai Duong	50	2,480	2*7.5 - 7.5	1.0 - 1.5	-
1	Phu Ly	50	2,150	5.0 - 7.0	0.5 - 1.5	-
6	Hoa Binh	72	370	5.5 - 6.0	1.0 - 1.5	31 (44.3%)
2	Viet Tri	76	1,200	5.5 - 6.0	0.5	23 (30.3%)

Source: UNDP-NTSR Report - Vol II Pt 1 (1992)

Main Radial Highway in Hanoi



2) Railway Network

The railway system of Vietnam is made up of two distinct parts. The first one serves the mountainous and industrial area, and it consists of a branched network converging in Hanoi. The other one, the "Reunification line (DSTN)", serves the central and southern areas.

The network comprises six lines under operation and two branch lines, representing a total length of 2,560 km:

Hanoi - Ho Chi Minh City	1,730 km
Hanoi - Hai Phong	102 km
Hanoi - Lao Cai	283 km
Hanoi - Lang Son	148 km
Hanoi - Thai Nguyen	75 km
Thai Nguyen - Bai Chay	166 km

3) Air Transport

Of the 16 airports in Vietnam, only three (Hanoi/Noi Bai, Ho Chi Minh City/Than Son Nhut, Danang) can handle international passenger and freight traffic.

The Noi Bai International Airport in Hanoi is the second busiest airport in Vietnam. The following statistics will provide a dimension of the domestic traffic of the airport during 1990.

-	Air-craft handled	:	3,880
-	Passengers handled	:	230,812
-	Average passengers per aircraft	:	59.5

Although there exists a general lack of statistical information on operation of Noi Bai Airport, the following will give a picture on passenger traffic trend in the period between 1986-1990.

Table 3.2 Total Domestic Passengers Carried by Air Vietnam

	1986	1987	1988	1989	1990
Passenger	258,000	250,000	220,000	236,000	273,000
% Increase/Decrease		- 3.1	- 11.2	+ 6.3	+ 15.6

Source: UNDP-NTSR Report Vol X (Air Transport) P7 (1992)

Notwithstanding imposed restrictions on domestic capacity, the 6.3 % increase in 1989 and the even more substantial increase of 15.6 % in 1990 can be construed as a healthy trend in domestic air travel.

On the other hand, the domestic and international passenger traffic in the three major airports were as follows:

Table 3.3 Domestic & International Passenger Traffic

Airports	Domestic	International	Total
HCMC AIRPORT			
Aircraft Movements			
- Scheduled	3,952	5,146	9,098
- Non-scheduled	-	246	246
TOTALS	3,952	5,392	9,344
Passengers Handled	251,301	358,397	609,698
- Aver. Pax per a/c	63.6	66.4	65.2
HANOI/NOI BAI AIRPORT			
Aircraft Movements			
- Scheduled	3,880	4,558	8,438
- Non-scheduled	-	-	-
TOTALS	3,880	4,558	8,438
Passengers Handled	230,812	221,007	451,819
- Aver. Pax per a/c	59.5	48.4	53.5
DANANG/DANANG AIRPORT			
Aircraft Movements			
- Scheduled	834	-	834
- Non-scheduled	-	60	60
TOTALS	834	60	894
Passengers Handled	51,514	1,333	52,847
- Aver. Pax per a/c	61.8	22.2	59.1
TOTAL PASSENGERS HANDLED	533,627	580,737	1,114,364

2.1.2 ROAD NETWORK AND TRANSPORT CONDITION IN PROJECT INFLUENCE AREA

Urban arterial system in Hanoi is consisted of two arteries generally running north to south at Ba Dinh and Hoan Kiem Districts and of the other three which spread out east to west near the presidential palace and Ba Dinh Square, thereby forming a radial network system from this core area.

Table 3.4 shows the primary road network by districts in the Hanoi City proper and the Table 3.5 is the urban road inventory statistics of the city. The road and street infrastructure in this city is in poor condition and this situation is expected to create a serious urban transport problem when the motorized traffic becomes dominant mode of transport.

The roads cover a mere 3.5 % of land area as compared to 23.3 % in developed countries.

The following issues are cited as the major traffic problems faced in Hanoi City.

- Road network
- Road condition
- Slow vehicles mixed with motorized vehicles impeding the traffic flow
- Pedestrian problem
- Grossly insufficient public transportation service

Table 3.4 Primary Road Network Breakdown Into Districts

District	Road Length (km)	Total Lane Length (km)	Lane Density (km/km²)
Ba Dinh	52.4	144.4	13.0
Hoan Kiem	58.0	160.9	29.3
Hai Ba Trung	40.6	150.6	12.9
Dong Da	28.0	95.6	6.5
Total	179.0	551.5	31.7

Table 3.5 Road Inventory in Hanoi

Road Inventory (Urban Road)

ROAD NAME	LENGTH(m)	CARRIAGEWAY	SIDEWALK			
			LEFT		RIGHT	
			LENGTH	WIDTH	LENGTH	WIDTH
o HOAN KIEM DISTRICT						
BA TRIEU	1100	10	1000	9	1000	5
HAI BA TRUNG	1676	15	1562	7.5	2562	7.5
H KHAN	160	14	169	3	145	3
LE DUAN	550	10	--	--	--	--
LE DUAN	1644	14	--	--	--	--
LE THAI TO	250	2*8	250	2	--	
LE THENH TONG	592	12	590	6.5	590	6.5
LY THAD TO	685	12	650	6.3	550	6.5
LY THUONG KIET	1736	15	1635	6.5	1636	6.3
NEO QUYEN	370	13	340	6.5	340	6.5
NGUYEN HU HUAN	448	12	255	5	255	5
TRAN HUNG DAO	2144	15	2004	7.5	2004	7.5
TRAN QUANG KHAI	1095	18	1590	3	460	4.5
o DONG DA DISTRICT						
KHAM THIEN	2270	12	1150	4	1150	3
NG LUONG BANG	1615	18	740	4	740	4
NGUYEN TRAI	250	32	--	--	--	--
TAY SON	450	18	625	4	625	3
o HAI BA TRUNG DISTRICT						
BACH MAI	1442	11	2240	3	1440	3
DAI CO VIET	1100	30	1000	8	1000	8
HUE	1166	14	1106	5.5	1106	5.5
THAI PHIEN	260	10	240	5	240	5
THI SACH	212	20	272	5	272	5
THINH YEN	325	20	300	5	300	5
THU TINH	463	10	410	5	410	5
o BA DINH DISTRICT						
BAC SON	288	5*2	278	8	278	8
CHU VAN AN	489	12	468	6.5	468	6.5
HUNG VUONG	40	12	550	10	550	10
NG CANH CHAN	296	12	237	6.5	237	6.5

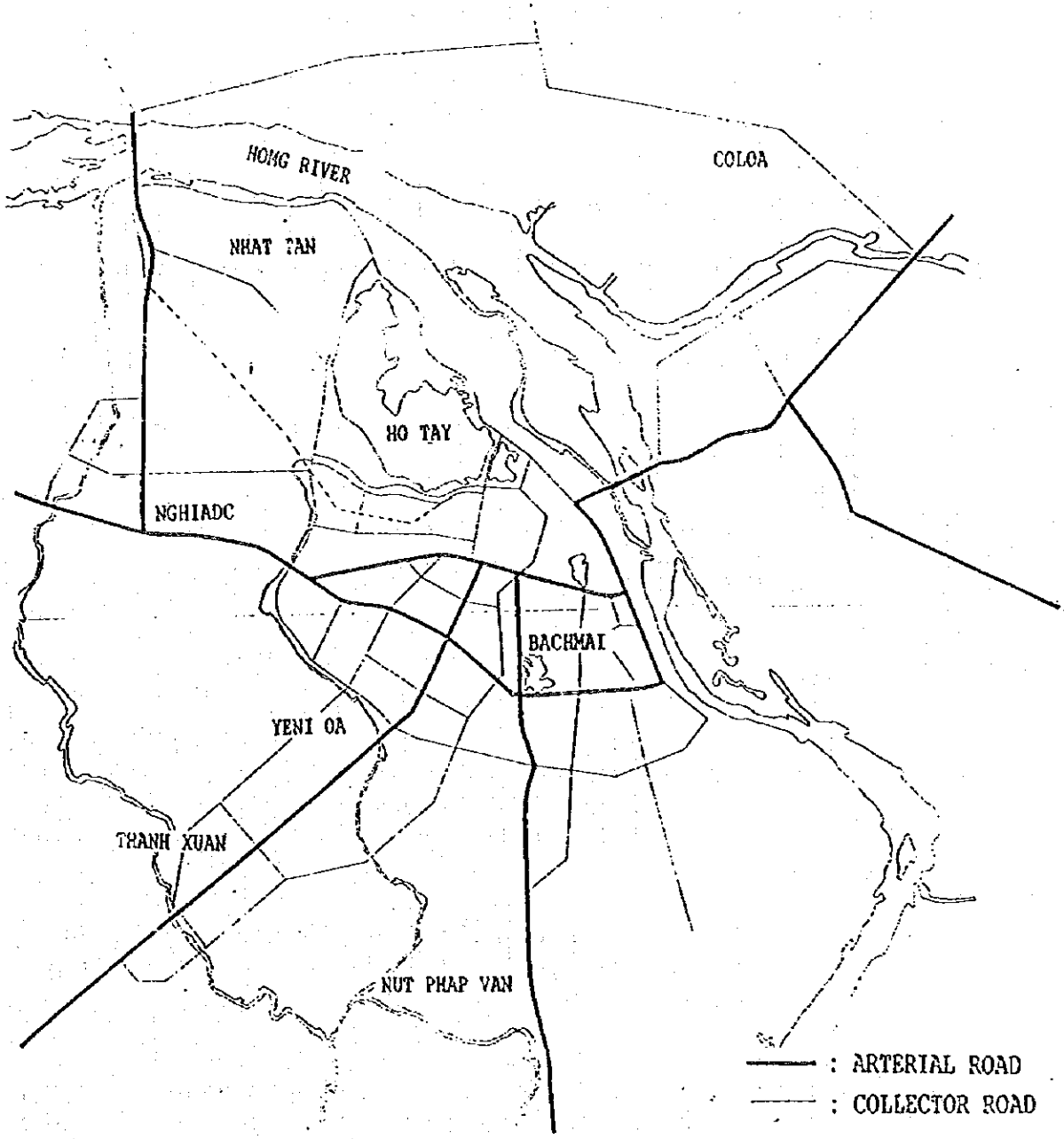
Table 3.5 Road Inventory in Hanoi (Continued)

Road Inventory (External Road)

Road Name	Length (m)	No. of Lanes	Carriageway	Median (m)	Sidewalk (m)		Pavement
					Right	Left	
NR 1A	2000	4	27	18.5	0	0	Good
NR 1B	7000	2	8 To 12	18.5	0	0	Fair
NR 2	550	2	10	20	3 - 4	4 - 5	Fair
NR 3	1644	4	14	20	0	0	Good
NR 5	8700	8	31 To 37	20	0	0	Good
NR 6	7000	2	9 To 10	0	0	0	Fair
32 Road	27000	2	9 To 12	0	0	0	Fair & Poor
	11000	4	23	0	0	0	Good
	3935	4	18	0	2 - 6	2 - 6	Fair
	2500	8	32	0	2 - 6	2 - 6	Good
	2000	2	9 To 12	0	2 - 6	2 - 6	Fair
	5000	4	14	0	0	0	Fair

Source: HPWCDC

Functional Classification of the Road



2.2 GENERAL TRAFFIC SURVEY METHODOLOGY

2.2.1 FUNCTIONAL CLASSIFICATION AND TRAFFIC

The following parameters have been established for proper planning and organization of collection and analysis of data, distribution and assignment of traffic, and for evaluation of alternatives etc. for the traffic study.

- Zoning of project area for classifying traffic origin/destinations (O/D).
- Selection of networks for traffic assignment and estimation of benefits.
- Identification of nodes and links.
- Decision on number of lanes, node to node distance and travel speed.
- Selection of the minimum time path.
- Identification of PCU, DHV and design classification.

2.2.2 ZONING

Generally, it is necessary to decide beforehand the area and number of zones required or needed for zoning. The topography, existing road network and land use pattern of project area, etc., must be also taken into consideration when deciding on the zone boundaries because of the data limitation.

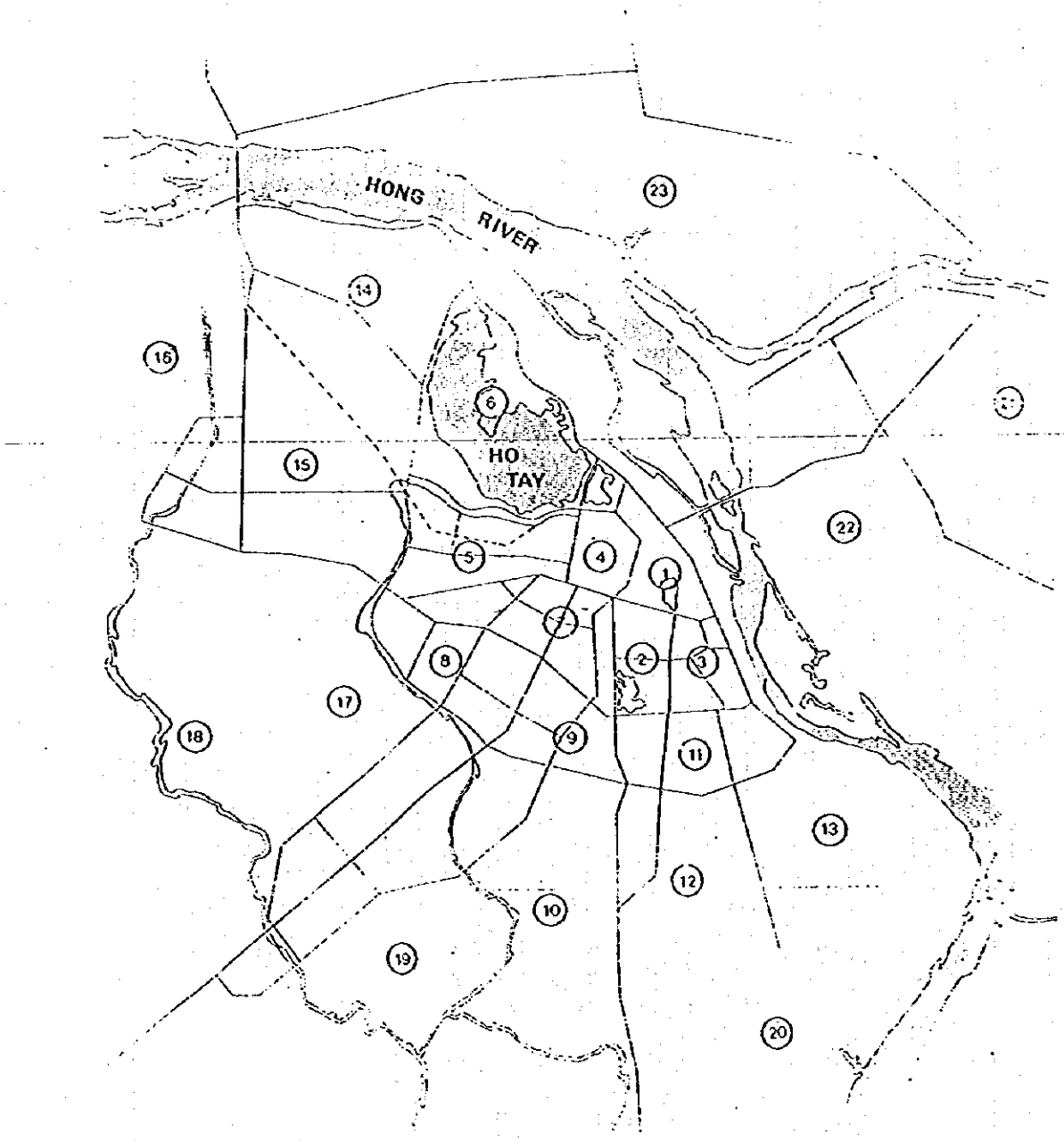
For this purpose, the study area was divided by the consultant into 23 internal zones within the city and 6 external zones. Their composition is shown in Table 3.6 and Figure 3.3.

In this process, due consideration has been made as the growth of the city toward north to south direction and restructuring of transport facilities according to the Hanoi Master Plan (2010) will greatly change the balance of the zonal origin/destinations.

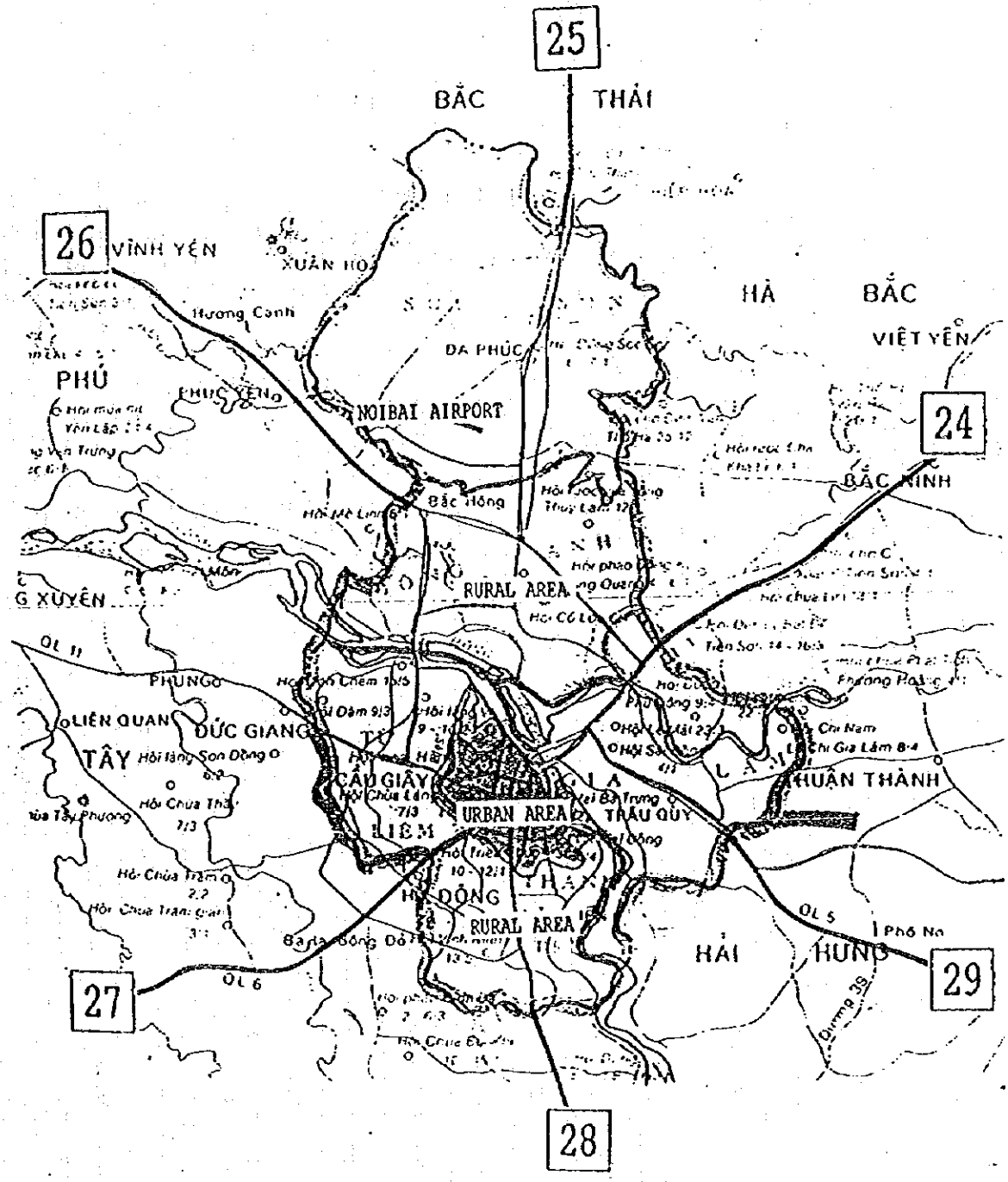
Zonal Composition

ZONE NO	NAME	COMPOSITION
1	HOAN KIEM	HOAN KIEM, DEN BACH MA, BA DA, HPC
2	HANOI STATION	UNDP, GERMAN EMBASSY, QUAN SU, CUNG VAN HOA
3	BAO TANG LICH SU	HOA BINH, DI DUOC, FRANCH EMBASSY
4	MAJOR OFFICE	CBD, HO TRUC BACH, CUA BAC, QUAN DOI
5	HO VAN PHUC	VINH PHUC, NGOC HA, HO VAN PHUC
6	HA TAY	HO TAY, YEN PHU
7	VAN CHUONG	VAN CHUONG, SVD HANOI, VAN MIEU, THO QUAN
8	HO DONG DA	HO DONG DA, HANG BOT, QUANG TRUNG, THINH QUANG, LANG HA
9	TRUNG TU	TRUNG TU, KHUONG TRUNG, CHUA BOC
10	NUT PHAP VAN	VAN DIEN, NUT PHAP VAN
11	HO BAY MAU	BACH KHOA, THANH NHAN, QUYNH LOI, BACH KHOA, BACH MAI
12	MAI DONG	MAI DONG, TRUONG DINH, TUONY MAI, GIAP BAT
13	VINH TU	KHUCN VINH TUY, KHUCN PHAP VAN
14	KHUC, N CHEM	GA PHU DIEN, NUT CHEM
15	NHAT TAN	NHAT TAN, CAY NHAT TAN
16	NGHIADC	NGHIADC, PROPOSED NEW TOWN
17	YEN HOA	TRUNG HOA, QUAN NHAN, YEN HOA
18	TAY MO	MU DINH, PHU DO, NGOC TRUC
19	HA DONG	YEN XO, XA LA, YEN PHUC
20	PHAP VAN	YEN DUYEN, THUY LINH, GIUONG FE
21	VIET HUNG	GIANY BIEN, HOI XA
22	THACH BAN	LONG BIEN, BA DE, THACH BAN, DONG DU, CU KHOI, NGOC THUY
23	NGOC GIANG	NGOC GIANG, CO LOA, TAM XA, NAM HANG, THUY LAM
24	NORTH EAST AREA	CAO BANG, LANG SON, BAC THAI, NORTH EAST AREA IN VIETNAM
25	NORTH AREA	HA TUYEN, HOANY LIEN SON, NORTH AREA IN VIETNAM
26	NORTH WEST AREA	LAI CHAU, SON LA, NORTH WEST AREA IN VIETNAM
27	SOUTH WEST AREA	HA SON BINH, THANH HOA, SOUTH WEST AREA IN VIETNAM
28	SOUTH AREA	SOUTH AREA IN VIETNAM
29	EAST AREA	HAI PHONG, HONG GAI, EAST AREA IN VIETNAM

Figure 3.3 Internal Zone Map



Extemal Zone Map



2.2.3 NETWORK

A functional classification of the links was determined and is shown in Figure 3.2. It has been schematically drawn and approximates to the main roads of the city including Thang Long Bridge, Chuong Duong Bridge, Hoang Hoa Tham Road. Buoi Road, Nghia Do Road, Doi Can street, Yen Phu Road, Ton Duc Thang street and Hanoi external Ring Road.

In this project, the network of Hanoi has been studied not only for the existing network but also for the proposed network as established in the Hanoi Urban Transportation Master Plan, with the target year of the study set at 2010. For these two networks, the cases "with" and "without" the proposed project have been analyzed.

The classification is simple and dichotomizes roads as either arterial or collectors. Figure 3.5 and Table 3.7 show the travel speed on each road under Project Area Network. In addition to main roads highlighted, there are other minor roads connecting zone centres to main roads. These have been hypothetically drawn to show the distribution of traffic to and from the main road and the locations within the zone.

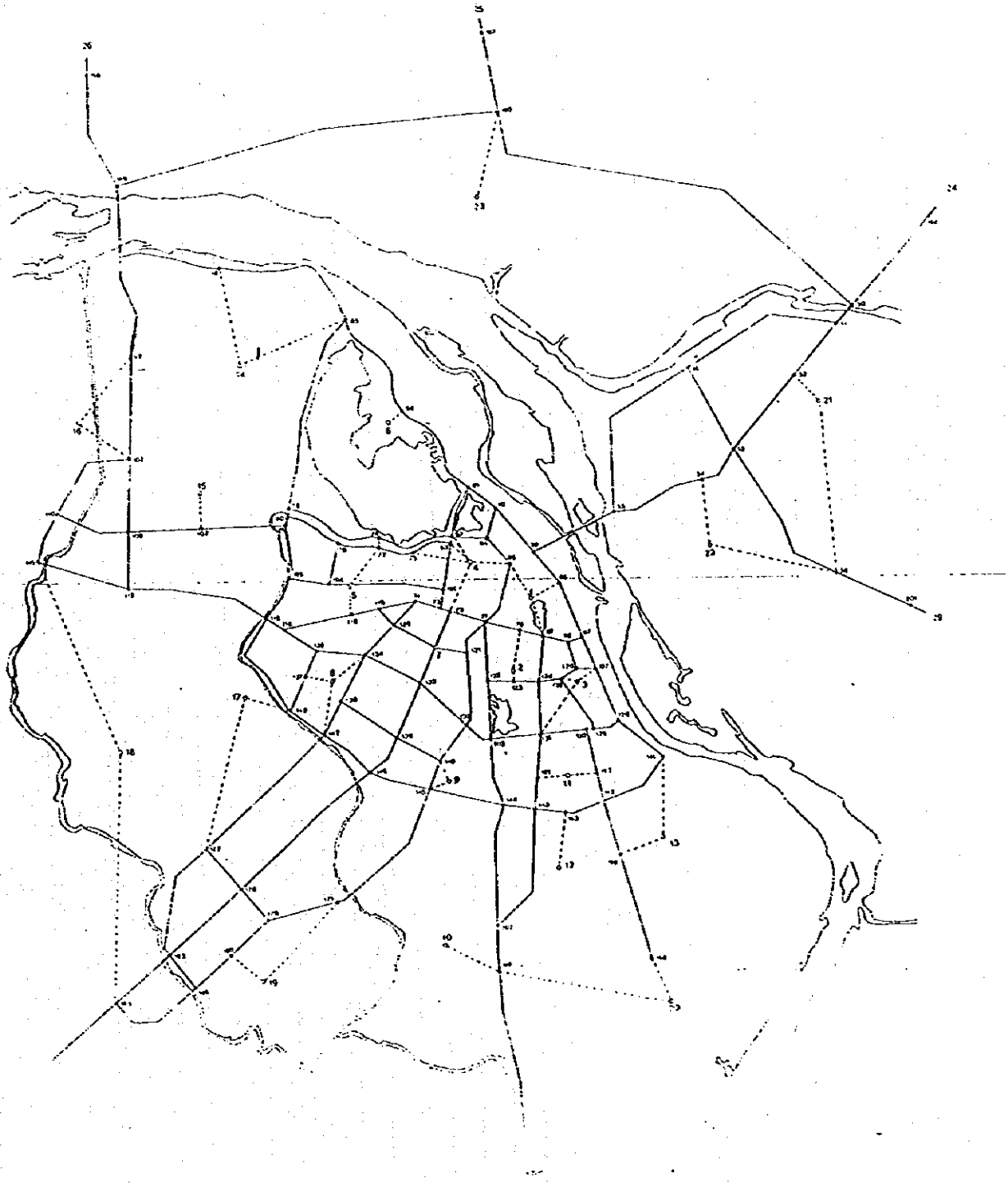
2.2.4 NODES AND LINKS

The network has been devided into links which connect nodes. The links are numbered serially from 50 to 206. In addition there are links within each zone which are numbered after the zone number for each zone separately. The location of links and nodes are shown in the Figures 3.5 and 3.6. The proposed alignment is included and the proposed improvements to existing roads are distinguished by dotted lines.

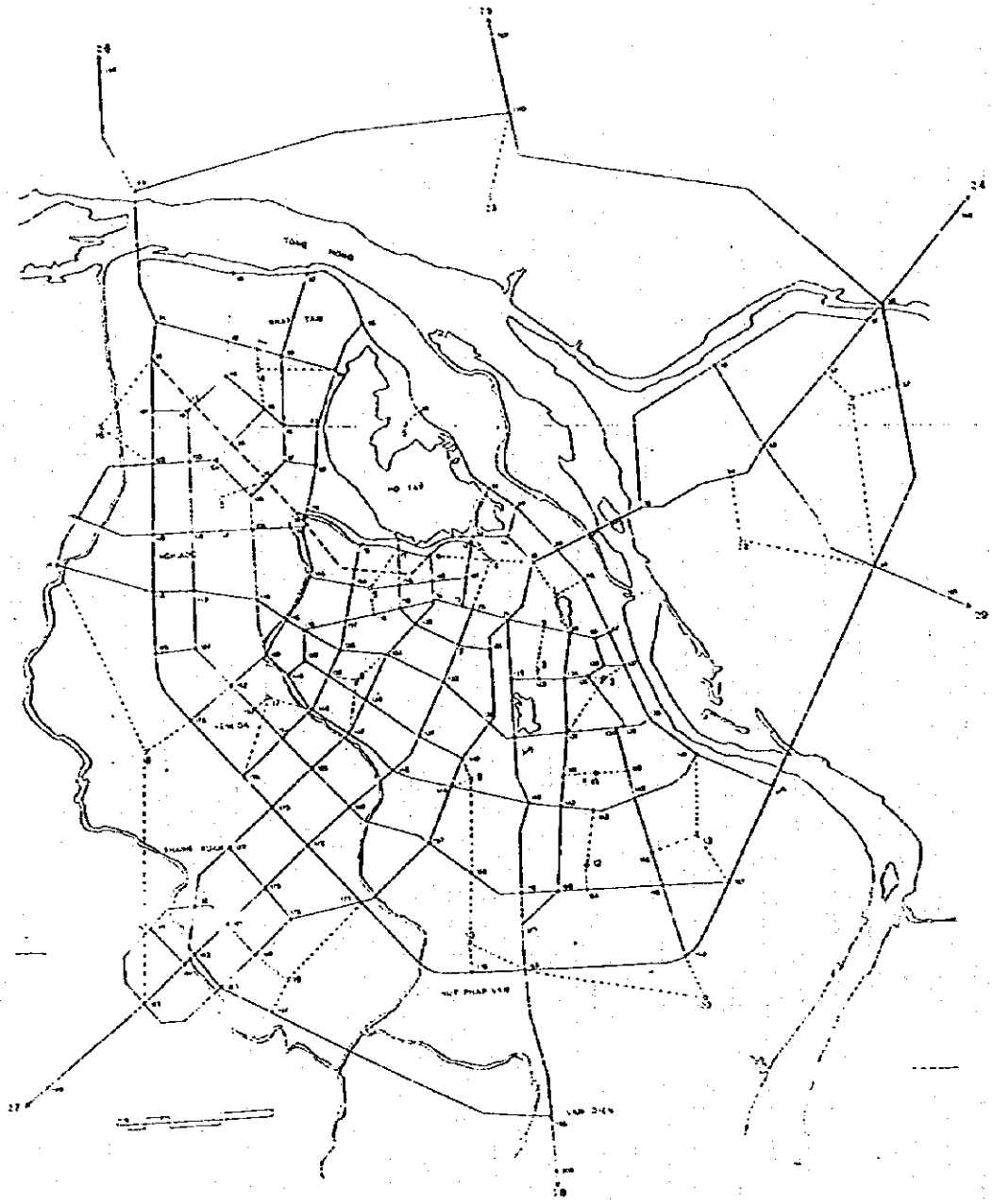
2.2.5 TRAVEL SPEED

Travel time is an important element in urban transport studies. It is inversely related to travel speed which is adversely affected by congestion which is rather acute in city centres. The travel speeds on city roads would be the most significant factor in determining the volume of traffic likely to use the proposed bypass.

Node Map (Existing Network)



Node Map (Full Network)



A detailed study of speeds on various city roads is not within the scope of this study. Therefore, speeds on various roads have been assumed intuitively. It is assumed that roads in the congested parts of the city have an average speed of 30 kilometers an hour; roads in the intermediate band have a speed of 40 kilometers an hour and in the outer band, 50 kilometers an hour.

The travel speed of the project road section between south of Thang Long Bridge and Ba Dinh Square has been set at 100 km/hour as established by the design criteria to be discussed in section 5-3, chapter 5,while 120 km/h has been used for the ring road contemplated in the HUTMP-2010.

Table 3.7 List of Links by Travel Speed

Speed (km/h)	Nodes
30	88-87-85-86-61, 74-120-134-138-147, 69-124-131-161-143
40	100-103-108-113-151-152-153-154-155-156-157-158, 116-117-118-119-74-72
50	71-122-203-144-159, 60-59-66-67-127-128, 72-7-133-139-146-156-172-178-182
70	92-93-99-98-81-75-63
120	92-19-102-109-112-176-175-174-173-172-171, 170-169-168-167-206-58-57-50-190-189

2.2.6 MINIMUM TIME PATH

On the basis of selected network and travel time on various links, all possible routes from every outer zone to all internal and external zones were identified for "with" or "without" project and travel time was calculated. The minimum time path was selected for present network.

The minimum time path can be used as useful data in distribution of tra to relevant road networks. The following Table 3.8 shows an example zone 1 which represents the minimum time path.

Table 3.3 Minimum Time Path for Zone 1

*3)**BUILD HIGHWAY MINPATH**

TITLE : HANOI EXPRESSWAY PROJECT(EXISTING NETWORK)

DESTRUCTIVE VINE TRACE - VINE NO. 1

TO	THRU	TIME 1	THRU	TIME 1	THRU	TIME 1	THRU	TIME 1	THRU	TIME 1	THRU	TIME 1	THRU	TIME 1
1	HOME NODE													
2		3.75	70	2.23	69	1.52	-1-							
3		3.13	67	2.68	68	2.27	69	1.52	-1-					
4		3.06	65	1.52	-1-									
5	70	9.75 2.23	118	3.04 -2-	119	7.26	74	6.86	73	6.11	72	5.82	71	3.25
6		10.52	76	9.80	62	5.45	64	3.47	65	1.52	-1-			
7		6.70	121	5.44	71	3.25	-5-							
8		10.76	134	9.20	120	8.04	74	6.86	-5-					
9		7.08	203	5.48	122	4.90	71	3.25	-5-					
10		14.17	169	11.87	202	10.85	144	7.40	203	5.18	-9-			
11		7.92	161	6.76	131	5.14	124	3.20	69	1.52	-1-			
12		10.04	163	8.79	143	7.92	161	6.76	-11-					
13		9.92	141	6.92	128	5.28	127	3.67	67	2.68	-3-			
14		18.66	85	14.26	86	10.16	61	6.16	60	5.18	64	3.47	-6-	
15	-5-	16.98	107	15.68	81	12.08	195	11.33	115	10.61	116	10.07	118	8.04
16		19.57	102	17.15	109	15.79	112	14.71	115	10.61	-15-			
17		15.58	148	13.80	147	12.54	138	11.16	134	9.20	-8-			
18		25.34	111	17.44	112	14.71	-16-							
19		17.95	171	13.75	145	9.53	144	7.40	-10-					
20		18.67	169	11.87	-10-									
21	-1-	10.25	52	8.91	53	6.76	54	5.69	55	3.53	59	2.35	66	1.24
22		8.15	51	5.69	-21-									
23		25.28	190	21.98	50	11.96	51	11.43	52	8.91	-21-			
24		31.46	136	17.96	50	11.96	-23-							
25		41.48	197	27.98	190	21.98	-23-							
26		42.67	198	29.17	189	23.17	204	19.67	92	19.07	102	17.15	-16-	
27	-13-	39.29	199	25.79	185	19.79	183	17.70	178	16.27	146	11.29	145	9.53
28		30.37	200	16.87	169	11.87	-10-							
29		31.05	201	17.55	58	11.55	53	6.76	-21-					

2.2.7 IDENTIFICATION OF PASSENGER CAR UNIT AND DESIGN HOURLY VOLUME

Passenger Car Unit (PCU)

Traffic volumes are expressed in passenger car unit (PCU). To value vehicles in PCU in flat areas, the coefficients below are used:

-	Bicycle	:	0.3
-	Motor Cycle	:	0.5
-	Passenger Car	:	1.0
-	Bus Mini Bus (Van)	:	1.5
	Bus (Trolly Bus)	:	2.0
-	Truck	:	3.0
-	Tractor	:	4.0
-	Xe-Clo	:	0.3
-	Xe-Lam	:	0.8

In rolling and mountainous terrains the above coefficients can be raised. Unmotorized vehicles such as bicycles, xe-clo, xe-lam can not be given the PCU in normal cases, because their running manner is quite different from that of vehicles and their effects on vehicle traffic vary depending on vehicle traffic volume itself of the occasion.

Where the traffic volume of bicycle is high enough to give significant effect on motorized car traffic flow, they should be separated by being provided with exclusive traffic space.

Particular to Hanoi City, however is that the ratio of low speed mode of transport such as bicycles and motor-cycles in the traffic mix is extremely high. Therefore, although these components are excluded the PCU conversion in general practice, these low speed vehicle traffic has been considered in conversion of the PCU in this particular study.

Design Volume

The design classification of urban roads is determined based on the volume of traffic on the road in addition to their function in roads networks.

The design of certain elements of roads should be based on Average Annual Daily Traffic (AADT) which is referred to as "Design Hourly Volume (DTV)" and "Directional Design Hourly Volume".

The AADT is as shown in Table 3.19 and Figure 3.13, 3.14.

For 2 lane roads;
DHV = AADT × (K/100)

For multi-lane roads;
DDHV = AADT × (K/100) × (D/100)

Where,

DDHV: Design Hourly Volume (veh/hr/heavy directions)

DTV: Directional Design Hourly Volume (veh/hr/both directions)

K : Peak Coefficient (%)
As for K, the ratio of the thirtieth-hour volume per AADT shall be used. In case the data for thirtieth-hour volume and AADT from field observation are not available, K = 10 (%) can be used.

D : Direction Coefficient (%)
As for D, the direction coefficient from field observations shall be used. In case the field observation data are not available, D = 60 (%) can be used.

2.3 TRAFFIC SURVEY

2.3.1 GENERAL

Supplementary traffic surveys were conducted to update previous traffic data in the study area and also to estimate the possible traffic movement.

Surveys conducted are as follows:

i) Classified Volume Surveys

- Major Arterial Road in Hanoi
- Cordon Line and Screen Line Survey

ii) Vehicle Origin-Destination Survey

iii) Zonal Passenger Origin-Destination Survey

iv) Other Survey - i.e., Travel Speed, Link Distance, Road Inventory, etc.

2.3.2 SURVEY METHOD, TIME AND LOCATIONS

Classified Volume Surveys were carried out for 12 hours (07:00-19:00) at each place on separated dates and Sample Vehicle Origin-Destination Surveys were conducted on the basis of passenger car, jeep and truck, etc. for 8 hours at Thang Long Bridge and Chuong Duong Bridge.

Also, the Sample Surveys on zonal passenger Origin-Destination (O/D) were performed for 2 days regarding O/D, trip purpose, trip mode and travel time through the interviews in 23 internal zones of Hanoi Urban Area by surveyors.

In parallel to this, Travel Speed Survey using cars, Road Inventory Survey and Link Distance Study using maps were also carried out.

Table 3.9 and Figure 3.7 show locations and time of these traffic surveys. The forms provided in Figure 3.8 are the ones the Consultant used in the traffic survey.

Table 3.9 Survey Time & Locaiton

NO	ROAD NAME	SURVEY LOCATION	TIME	DIRECTION	SURVEY TYPE
1	THANG LONG BRIDGE	NEAR TOLL BOOTH	1993.6(12HR)	BOTH DIRECTION	TVC.VOC.
2	LONG BIEN BRIDGE	SOUTH SIDE	1993.6(12HR)	BOTH DIRECTION	TVC.
3	CHUONG DUONG BRIDGE	SOUTH SIDE	1993.6(12HR)	BOTH DIRECTION	TVC.VOC.
4	THUY KHUE ROAD	MIDDLE POINT	1993.6(12HR)	ONE DIRECTION	TVC.VOC.
5	HOANY HOA THAN ROAD	MIDDLE POINT	1993.6(12HR)	ONE DIRECTION	TVC.VOC.
6	BUOI ROAD	NEAR VINH PHUC	1993.6(12HR)	BOTH DIRECTION	TVC.VOC.
7	NGHIA DO ROAD	NEAR VIEN KHOA HOC VIETNAM	1993.6(12HR)	BOTH DIRECTION	TVC.VOC
8	DOI CAN STREET	NEAR LA THANH	1993.6(12HR)	BOTH DIRECTION	TVC.VOC
9	NGOC KHANH STREET	NEAR UNFPA	1993.7(12HR)	BOTH DIRECTION	TVC.VOC
10	YEN PHU ROAD	NEAR HONG HA	1993.7(12HR)	BOTH DIRECTION	TVC.VOC
11	LE DUAN ROAD	NEAR HO BAY MAU	1993.7(12HR)	BOTH DIRECTION	TVC.VOC
12	TON DUC THANG ROAD	NEAR TEDI	1993.7(12HR)	BOTH DIRECTION	TVC.VOC
13	LANG ROAD	NEAR LANG HA	1993.8(12HR)	BOTH DIRECTION	TVC.VOC
14	GIANG VO STREET	NEAR HY VONG	1993.7(12HR)	BOTH DIRECTION	TVC.VOC
15	LONG QUAN	NEAR BUOI	1993.8(12HR)	BOTH DIRECTION	TVC.VOC
16	NGUYEN THAI HOC RD.	NEAR VAN MIEU	1993.8(12HR)	BOTH DIRECTION	TVC.VOC
17	TRANG THI STREET	HOAN KIEM	1993.8(12HR)	BOTH DIRECTION	TVC.VOC
18	TRAN QUANG KHAI	NEAR GAS STATION	1993.8(12HR)	BOTH DIRECTION	TVC.VOC
19	MINH KHAI STREET	NEAR MAI DONG	1993.8(12HR)	BOTH DIRECTION	TVC.VOC

TVC : TRAFFIC VOLUME COUNT

VOC : VEHICLE & PASSENGER O/D SURVEY(SAMPLE SURVEY)

Survey Location Map

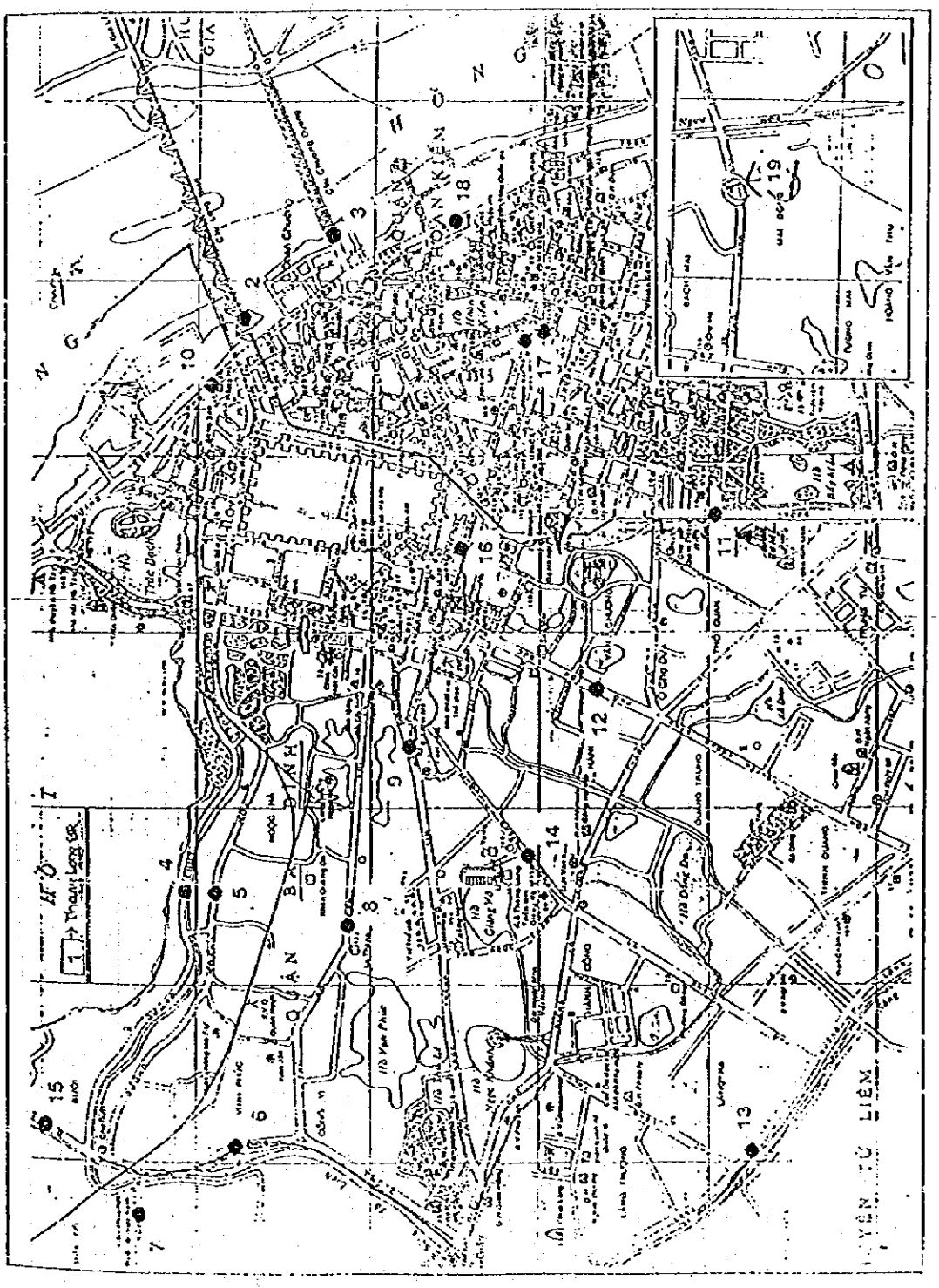


Figure 3.8 Traffic Survey Sheet

PASSENGER O/D SURVEY

SURVEY POINT
DATE TIME
SURVEYOR

mode:

ORIGIN _____ ZONE NUMBER DISTRICT _____ TOWN _____ VILLAGE _____	
DESTINATION _____ ZONE NUMBER DISTRICT _____ TOWN _____ VILLAGE _____	
TRIP PURPOSE ① GO TO HOME ② FOR WORK ③ FOR SHOPPING ④ FOR BUSINESS ⑤ GO TO SCHOOL ⑥ OTHER _____	
TRIP MODE ① BICYCLE ② M-CYCLE ③ CAR & JEEP ④ MINI BUS ⑤ BUS ⑥ TRUCK ⑦ OTHER _____	
AVERAGE TRIP COST DONG/TRIP	
AVERAGE TRAVEL TIME MIN/TRIP	

mode:

ORIGIN _____ ZONE NUMBER DISTRICT _____ TOWN _____ VILLAGE _____	
DESTINATION _____ ZONE NUMBER DISTRICT _____ TOWN _____ VILLAGE _____	
TRIP PURPOSE ① GO TO HOME ② FOR WORK ③ FOR SHOPPING ④ FOR BUSINESS ⑤ GO TO SCHOOL ⑥ OTHER _____	
TRIP MODE ① BICYCLE ② M-CYCLE ③ CAR & JEEP ④ MINI BUS ⑤ BUS ⑥ TRUCK ⑦ OTHER _____	
AVERAGE TRIP COST DONG/TRIP	
AVERAGE TRAVEL TIME MIN/TRIP	

THE FEASIBILITY STUDY FOR HANOI EXPRESSWAY PROJECT

TRAFFIC VOLUME SURVEY

ROAD SECTION : _____
LOCATION : _____ DIRECTION : FROM _____ TO _____ SURVEYOR _____

V.TYPE / TIME	BICYCLE	M/CYCLE	CAR & JEEP	BUS		TRUCK		PRIVATE VEH.		TOT
				MINI	BUS	TRUCK	TRAILOR	XE-LAM	XE-CLO	
- 15:00										
- 30:00										
- 45:00										
- 00:00										
TOTAL										

THE FEASIBILITY STUDY FOR HANOI EXPRESSWAY PROJECT

PLAT SURVEY(VEHICLE O/D SURVEY)

ROAD SECTION : _____
LOCATION : _____ DIRECTION : FROM _____ TO _____ SURVEYOR _____

V.TYPE / TIME	BICYCLE	M/CYCLE	CAR & JEEP	BUS		TRUCK		PRIVATE VEH.		TOT
				MINI	BUS	TRUCK	TRAILOR	XE-LAM	XE-CLO	

THE FEASIBILITY STUDY FOR HANOI EXPRESSWAY PROJECT

2.3.3 TRAFFIC VOLUME

Present Status of Traffic

Traffic Survey were conducted at screen line and cordon line of the Hanoi City including major arterial roads by type of vehicle for 12 hours daily from July 5 through July 9.

As shown in the following table in the case of Thang Long is Bridge, the traffic volume of both direction was surveyed to be 3,497 PCU/12 hr between 07:00 and 19:00 hours; while in the case of Chuong Duong Bridge the traffic volume was surveyed to be 30,383 PCU/12hr.

On the other hand, the share of transport by vehicles in most of the roads in the 19 surveyed zones shows a low figure, as about 70 % to 90 % of the movement of passenger and goods are done by bicycles and motor-cycles. Despite of this, review of past data shows a trend that the share of motorized mode of transport is gradually increasing.

Adjustment to ADT and AADT

To convert to annual average daily traffic (AADT), the traffic volumes surveyed has been adjusted for daily traffic variation factors and monthly variation factors.

Traffic volumes were based on 12 hours survey between 07:00 and 19:00 hours, as explained above. Due to the general lack of base data needed in conversion of these 12 hours to average daily traffic (ADT) Consultant's traffic engineer had to derive the daily traffic conversion rate from the limited data of other available 24 hour survey result, in order to use it as the conversion factor for the adjustment.

The formula for the calculation of ADT and AADT are as follows:

ADT = 12hrs traffic volume * daily traffic conversion rate

AADT = ADT * [1/(daily variation factor * monthly variation factor)]

Summary of Traffic Volume (12 Hour volume)

ROAD SECTION	DIRECTION		BICYCLE	M-CYCLE	CAR-JE	BUS		TRUCK		PRIVATE		TOT
						MINI	BUS	TRUCK	TRAILOR	XE-LAM	XE-CLO	
THANG LONG BRIDGE (1)	SOUTH->NORTH	VECH	0	790	332	42	14	219	5	15	0	1517
		PCU	0	445	332	53	28	657	20	5	0	1550
	NORTH->SOUTH	VECH	0	1450	269	45	24	262	6	25	0	2101
		PCU	0	725	269	56	48	786	24	8	0	1947
LONG BIEN BRIDGE (2)	SOUTH->NORTH	VECH	6400	0	0	0	0	0	0	0	0	6400
		PCU	2520	0	0	0	0	0	0	0	0	2520
	NORTH->SOUTH	VECH	9438	0	0	0	0	0	0	0	0	9436
		PCU	2631	0	0	0	0	0	0	0	0	2631
CHUONG DUONG BRIDGE (3)	SOUTH->NORTH	VECH	0	18300	1703	21	255	763	6	704	0	21542
		PCU	0	9150	1703	32	500	2289	24	211	0	13979
	NORTH->SOUTH	VECH	0	23610	1495	18	252	789	4	632	0	26800
		PCU	0	11805	1495	27	504	2367	16	190	0	16404
(4) - ONE WAY		VECH	1650	1552	360	49	2	80	1	89	253	4036
		PCU	495	776	360	74	4	240	4	27	202	2182
(5) - ONE WAY		VECH	5580	8740	734	15	15	95	0	73	172	16174
		PCU	1674	4370	734	23	30	285	0	22	138	7475
BUOI ROAD (6)	SOUTH->NORTH	VECH	2200	2620	259	27	17	12	107	41	208	6091
		PCU	657	1310	259	41	34	36	426	12	166	3133
	NORTH->SOUTH	VECH	6010	4310	241	27	37	9	186	27	245	11092
		PCU	1803	2155	241	41	74	27	744	8	196	5289
NGHIA DO ROAD (7)	WEST->EAST	VECH	5130	5990	455	17	3	216	4	101	181	12097
		PCU	1539	2995	455	26	6	648	16	30	145	5860
	EAST->WEST	VECH	6260	6613	360	31	0	153	0	95	153	13665
		PCU	1878	3307	360	47	0	458	0	29	122	6201
DOI CAN STREET (8)	WEST->EAST	VECH	5318	3460	472	3	9	6	0	60	117	9439
		PCU	1595	1730	472	5	18	0	0	18	94	3932
	EAST->WEST	VECH	5430	3355	367	0	17	12	0	33	99	9313
		PCU	1629	1678	367	0	34	36	0	10	79	3833
NGOC KHANH STREET (9)	WEST->EAST	VECH	6270	6260	890	9	63	40	0	249	542	14343
		PCU	1881	3140	890	14	126	120	0	75	434	6679
	EAST->WEST	VECH	8976	8940	752	111	101	50	0	208	853	19991
		PCU	2093	4470	752	167	202	150	0	62	682	9178
YEN PHU ROAD (10)	SOUTH->NORTH	VECH	1890	3280	373	89	61	209	0	89	404	6395
		PCU	567	1640	373	134	122	627	0	27	323	3612
	NORTH->SOUTH	VECH	2310	1820	417	139	40	244	1	169	292	5502
		PCU	693	645	417	209	80	732	4	51	234	3364
LE DUAN ROAD (11)	SOUTH->NORTH	VECH	17390	9010	813	66	102	19	0	175	1071	28646
		PCU	5217	4505	813	99	204	57	0	53	857	11804
	NORTH->SOUTH	VECH	15690	14590	1572	150	97	81	6	216	1105	33507
		PCU	4707	7295	1572	225	194	243	24	65	956	15281
TON DUC THANG STREET (12)	SOUTH->NORTH	VECH	13300	9550	699	31	51	31	0	306	352	24320
		PCU	3990	4775	699	47	102	93	0	92	282	10079
	NORTH->SOUTH	VECH	12090	8500	748	89	88	41	0	251	264	22071
		PCU	3627	4250	748	134	176	123	0	75	211	9344
LANG ROAD (13)	WEST->EAST	VECH	5300	4190	409	54	77	21	468	127	223	10858
		PCU	1590	2090	409	81	154	63	1872	38	178	6476
	EAST->WEST	VECH	8966	8330	535	26	0	521	0	133	511	19024
		PCU	2690	4165	535	39	0	1563	0	40	409	9441
GIANG VO STREET (14)	SOUTH->NORTH	VECH	18641	14870	1030	0	0	183	0	104	1987	36815
		PCU	5592	7435	1030	0	0	549	0	31	1590	16227
	NORTH->SOUTH	VECH	10990	10841	929	98	27	222	0	79	1487	24673
		PCU	3297	5421	929	147	54	666	0	24	1190	11727
LONG QUAN (15)	SOUTH->NORTH	VECH	5332	2560	104	0	0	143	2	52	111	8304
		PCU	1600	1280	104	0	0	429	8	16	89	3525
	NORTH->SOUTH	VECH	5730	3023	92	0	7	116	0	53	153	9174
		PCU	1719	1512	92	0	14	348	0	16	122	3823
NGUYEN THAI HOC STREET (16)	EAST->WEST	VECH	2050	4540	499	22	21	12	0	240	1032	8414
		PCU	615	2270	499	33	42	36	0	72	826	4390
	WEST->EAST	VECH	8670	9780	1419	202	130	85	0	256	615	21157
		PCU	2601	4890	1419	303	260	255	0	77	492	10297
TRANG THI STREET (17)	EAST->WEST	VECH	7729	16690	1778	193	79	14	0	0	0	26483
		PCU	2319	8345	1778	290	158	42	0	0	0	12931
	NORTH->SOUTH	VECH	11470	12214	780	116	9	11	0	14	19	[illegible]
		PCU	3441	6107	780	177	18	33	0	4	15	[illegible]
TRAN QUANG KHA (18)	SOUTH->NORTH	VECH	1463	9016	1455	220	158	158	0	335	1999	[illegible]
		PCU	439	4508	1455	330	316	1754	0	33	1599	[illegible]
	NORTH->SOUTH	VECH	1789	4476	1653	235	730	84	747	326	996	12736
		PCU	537	2238	1653	353	[illegible]	252	2988	98	797	[illegible]
[illegible] STREET (19)	EAST->WEST	VECH	[illegible]	1704	202	[illegible]	[illegible]	276	[illegible]	[illegible]	727	[illegible]
		PCU	[illegible]	[illegible]	202	[illegible]	[illegible]	[illegible]	204	[illegible]	[illegible]	[illegible]
	WEST->EAST	VECH	[illegible]	[illegible]	162	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		PCU	[illegible]	[illegible]	162	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Note : Survey Time: 07:00 - 19:00

Summary of Traffic Volume (ADT Adjusted)

ROAD SECTION	DIRECTION		BICYCLE	MOTORCYCLE	CAR	MINI	BUS	TRUCK	TRAILER	[illegible]	[illegible]	TOTAL
THANG LONG BRIDGE (1)	SOUTH->NORTH	VECH	3	134	31	5	15	230				[illegible]
		PCU	3	212	31	112	30	1119	6	1		1278
	NORTH->SOUTH	VECH	3	539	26	79	42	153	11	4		477
		PCU	3	[illegible]	26	119	14	1176	[illegible]	3		[illegible]
LONG BIEN BRIDGE (2)	SOUTH->NORTH	VECH	17952			3	3	[illegible]	[illegible]			[illegible]
		PCU	2856			[illegible]	3	3				[illegible]
	NORTH->SOUTH	VECH	14440	[illegible]	[illegible]	3	0	0	3		[illegible]	[illegible]
		PCU	4332	[illegible]		3	3	[illegible]				[illegible]
CHUONG DUONG BRIDGE (3)	SOUTH->NORTH	VECH	3	[illegible]	[illegible]	30	274	[illegible]	[illegible]	[illegible]		[illegible]
		PCU	0	[illegible]	[illegible]	45	753	[illegible]	24	[illegible]		[illegible]
	NORTH->SOUTH	VECH	3	23752	2138	35	140	1128	4	224	[illegible]	[illegible]
		PCU	0	[illegible]	2138	29	221	3385	23	271	[illegible]	[illegible]
(4) - ONE WAY		VECH	2772	[illegible]	605	42	3	134	2	150	175	[illegible]
		PCU	832	1304	605	123	7	[illegible]	[illegible]	45	[illegible]	[illegible]
(5) - ONE WAY		VECH	10974	[illegible]	[illegible]	13	15	[illegible]	3	[illegible]	[illegible]	[illegible]
		PCU	1292	[illegible]	[illegible]	[illegible]	12	[illegible]		1	1	[illegible]
BUOI ROAD (6)	SOUTH->NORTH	VECH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5	[illegible]	[illegible]
		PCU	1172	1755	[illegible]	[illegible]	46	[illegible]	[illegible]	5	223	[illegible]
	NORTH->SOUTH	VECH	3174	[illegible]	229	27	[illegible]	2	253	27	233	[illegible]
		PCU	2457	2931	328	55	101	37	1012	11	167	[illegible]
NGHIA DO ROAD (7)	WEST->EAST	VECH	6515	7807	479	[illegible]	[illegible]	414	5	128	230	15062
		PCU	1955	7804	578	32	8	873	20	39	154	7442
	EAST->WEST	VECH	7950	4309	457	39	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		PCU	2385	4109	457	59	0	[illegible]	2	26	155	[illegible]
DOI CAN STREET (8)	WEST->EAST	VECH	7711	[illegible]	[illegible]	4	13	3	0	37	173	[illegible]
		PCU	2313	2509	[illegible]	7	38	3	0	28	106	[illegible]
	EAST->WEST	VECH	7765	4798	525	0	24	17	0	47	142	13318
		PCU	2329	2399	525	0	49	51	0	14	113	[illegible]
NGOC KHANH STREET (9)	WEST->EAST	VECH	8715	[illegible]	1237	13	58	8	3	348	253	[illegible]
		PCU	2615	4765	1237	19	175	157	3	104	[illegible]	[illegible]
	EAST->WEST	VECH	12477	12427	1045	154	140	73	3	139	196	27797
		PCU	3743	6213	1045	231	281	220	3	37	349	[illegible]
YEN PHU ROAD (10)	SOUTH->NORTH	VECH	2685	[illegible]	524	125	86	295	0	125	570	[illegible]
		PCU	799	2312	524	158	172	884	0	38	456	[illegible]
	NORTH->SOUTH	VECH	3257	2565	588	198	56	344	1	230	412	[illegible]
		PCU	977	1302	588	294	113	1002	3	71	329	[illegible]
LE DUAN ROAD (11)	SOUTH->NORTH	VECH	23824	17244	1114	70	140	25	0	240	[illegible]	[illegible]
		PCU	7147	5172	1114	138	279	78	0	72	[illegible]	[illegible]
	NORTH->SOUTH	VECH	21495	13268	2154	206	130	111	8	206	[illegible]	[illegible]
		PCU	5449	2934	2154	308	258	333	33	19	1210	[illegible]
TON DUC THANG STREET (12)	SOUTH->NORTH	VECH	19551	14008	1028	46	75	16	0	453	517	[illegible]
		PCU	5865	7019	1028	68	150	137	3	135	414	[illegible]
	NORTH->SOUTH	VECH	17772	12495	1100	131	129	60	0	369	388	[illegible]
		PCU	5332	5248	1100	196	259	181	0	111	310	13736
LANG ROAD (13)	WEST->EAST	VECH	7367	5810	509	75	107	29	551	177	310	[illegible]
		PCU	2210	2905	569	113	214	88	2502	53	248	[illegible]
	EAST->WEST	VECH	17408	11579	744	36	0	724	0	185	210	[illegible]
		PCU	3740	5789	744	54	0	2173	0	55	168	[illegible]
GIANG VO STREET (14)	SOUTH->NORTH	VECH	26284	[illegible]	1452	3	0	259	0	147	[illegible]	[illegible]
		PCU	7885	[illegible]	1452	0	0	774	0	14	[illegible]	[illegible]
	NORTH->SOUTH	VECH	15435	[illegible]	1310	138	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
		PCU	[illegible]	[illegible]	1310	207	75	339	0	33	1577	15535
LONG QUAN (15)	SOUTH->NORTH	VECH	7027	3405	139	0	0	[illegible]	0	[illegible]	[illegible]	[illegible]
		PCU	2127	1702	178	0	0	171	11	[illegible]	[illegible]	[illegible]
	NORTH->SOUTH	VECH	7621	4021	122	3	9	154	0	70	[illegible]	[illegible]
		PCU	2286	[illegible]	122	0	19	[illegible]	0	21	[illegible]	[illegible]
NGUYEN THAI HOC STREET (16)	EAST->WEST	VECH	2219	[illegible]	133	31	33	19	0	377	1520	[illegible]
		PCU	258	3564	183	47	68	57	0	113	[illegible]	[illegible]
	WEST->EAST	VECH	13612	15355	2229	317	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]
		PCU	4084	7677	2229	476	408	400	0	121	[illegible]	[illegible]
TRANG THI STREET (17)	EAST->WEST	VECH	17259	25537	2527	307	128	23	0	[illegible]	[illegible]	[illegible]
		PCU	[illegible]	13229	2527	150	251	47	[illegible]	[illegible]	[illegible]	[illegible]
	NORTH->SOUTH	VECH	18237	[illegible]	1240	[illegible]	14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		PCU	5471	[illegible]	1240	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TRAN QUANG KHAI (18)	SOUTH->NORTH	VECH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		PCU	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	NORTH->SOUTH	VECH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		PCU	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MINH KHAI STREET (19)	EAST->WEST	VECH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		PCU	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	WEST->EAST	VECH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		PCU	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Summary of Traffic Volume (AADT Adjust)

ROAD SECTION	DIRECTION		BICYCLE	M/CYCLE	CAR&JE	BUS MINI	BUS	TRUCK	TRAILOR	PRIVATE XE LAM	PRIVATE XE CLO	TOT
THANG LONG BRIDGE (1)	SOUTH->NORTH	VECH	0	2170	526	26	25	289	8	33	2	3176
		PCU	0	1085	528	113	50	866	33	10	0	2685
	NORTH->SOUTH	VECH	0	3476	457	60	42	340	10	54	6	4453
		PCU	0	1738	452	113	85	1019	23	16	2	3467
LONG BIEN BRIDGE (2)	SOUTH->NORTH	VECH	18101	0	0	0	0	0	0	0	0	18101
		PCU	5430	0	0	0	0	0	0	0	0	5430
	NORTH->SOUTH	VECH	20338	0	0	0	0	0	0	0	0	20338
		PCU	6101	0	0	0	0	0	0	0	0	6101
CHUONG DUONG BRIDGE (3)	SOUTH->NORTH	VECH	0	35753	2159	30	390	803	6	1234	0	40367
		PCU	0	17876	2159	45	760	2408	31	370	0	23650
	NORTH->SOUTH	VECH	0	46250	1909	26	364	838	5	1116	0	50505
		PCU	0	23125	1909	39	728	2507	21	335	0	28664
(4) - ONE WAY		VECH	2924	3572	549	63	3	100	2	185	552	8940
		PCU	1171	1786	540	125	7	229	5	55	442	4430
(5) - ONE WAY		VECH	15456	20593	1127	26	25	121	0	15	273	37777
		PCU	4637	10296	1127	39	52	363	0	47	218	16779
BUOI ROAD (6)	SOUTH->NORTH	VECH	5266	4609	322	37	23	12	132	58	262	11030
		PCU	1560	2405	322	55	46	36	326	70	293	5279
	NORTH->SOUTH	VECH	11512	8030	293	37	51	9	232	45	430	20641
		PCU	3454	4015	293	56	102	27	928	14	346	9234
NGHIA DO ROAD (7)	WEST->EAST	VECH	9176	10421	516	22	4	203	5	156	299	20804
		PCU	2753	5210	516	33	8	610	19	49	239	9434
	EAST->WEST	VECH	11197	11505	408	40	0	144	0	149	252	23695
		PCU	3359	5758	408	60	0	432	0	45	202	10256
DOI CAN STREET (8)	WEST->EAST	VECH	10861	6873	611	4	13	0	0	107	220	18690
		PCU	3258	3436	611	7	26	0	0	32	176	7547
	EAST->WEST	VECH	10936	6572	459	0	25	13	0	58	184	18257
		PCU	3281	3286	459	0	49	38	0	17	147	7287
NGOC KHANH STREET (9)	WEST->EAST	VECH	12275	11956	1105	13	88	41	0	477	978	26885
		PCU	3683	5979	1105	19	172	124	0	178	783	11998
	EAST->WEST	VECH	17573	17023	933	156	142	51	0	357	1540	37775
		PCU	5272	8511	933	234	284	154	0	107	1232	16727
YEN PHU ROAD (10)	SOUTH->NORTH	VECH	3753	6335	470	127	87	218	0	155	740	11885
		PCU	1126	3168	470	190	174	655	0	46	592	6420
	NORTH->SOUTH	VECH	4587	3651	525	158	57	255	1	294	535	10103
		PCU	1376	1825	525	297	114	765	5	88	428	5423
LE DUAN ROAD (11)	SOUTH->NORTH	VECH	33555	16809	994	91	141	19	0	298	1906	53812
		PCU	10067	8455	994	137	282	58	0	89	1524	21606
	NORTH->SOUTH	VECH	30275	27381	1973	208	134	82	8	365	2126	62502
		PCU	9083	13691	1973	311	268	247	30	110	1701	27363
TON DUC THANG STREET (12)	SOUTH->NORTH	VECH	27537	19231	917	48	76	34	0	555	572	49068
		PCU	8261	9615	917	69	151	101	0	167	538	19820
	NORTH->SOUTH	VECH	25031	17116	982	132	131	45	0	456	564	44397
		PCU	7509	8558	982	198	261	134	0	137	403	18183
LANG ROAD (13)	WEST->EAST	VECH	10376	7959	506	76	108	22	597	218	403	20266
		PCU	3113	3980	506	114	216	65	2387	65	322	10709
	EAST->WEST	VECH	17557	15661	664	37	0	506	0	228	922	35806
		PCU	5267	7931	664	55	0	1509	0	68	738	16332
GIANG VO STREET (14)	SOUTH->NORTH	VECH	37019	28772	1797	0	0	191	0	181	2639	71048
		PCU	11106	14361	1797	0	0	573	0	54	2911	30802
	NORTH->SOUTH	VECH	21825	20939	1170	140	38	232	0	136	2723	47205
		PCU	6548	10470	1170	209	77	696	0	41	2178	21368
LONG QUAN (15)	SOUTH->NORTH	VECH	9968	4664	123	0	0	141	2	65	192	15196
		PCU	2926	2332	123	0	0	423	10	25	153	6063
	NORTH->SOUTH	VECH	10734	5508	109	0	9	114	0	87	254	16825
		PCU	3220	2754	109	0	19	343	0	25	211	6682
NGUYEN THAI HOC STREET (16)	EAST->WEST	VECH	4533	9754	699	32	33	14	0	465	2154	17645
		PCU	1360	4867	699	48	67	42	0	142	1563	8920
	WEST->EAST	VECH	19172	21034	1989	323	206	92	0	496	1254	44570
		PCU	5752	10517	1989	481	412	297	0	149	1003	20599
TRANG THI STREET (17)	EAST->WEST	VECH	17309	36352	2524	310	127	16	0	[illegible]	0	56838
		PCU	5193	18176	2524	465	254	48	0	[illegible]	[illegible]	26681
	NORTH->SOUTH	VECH	25665	26003	1107	190	14	[illegible]	0	[illegible]	22	53680
		PCU	7700	13002	1107	254	72	[illegible]	[illegible]	[illegible]	31	22406
TRAN QUANG KHAI (18)	SOUTH->NORTH	VECH	[illegible]	[illegible]	[illegible]	309	278	[illegible]	[illegible]	[illegible]	[illegible]	27156
		PCU	[illegible]	[illegible]	[illegible]	463	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17146
	NORTH->SOUTH	VECH	[illegible]	[illegible]	[illegible]	[illegible]	523	[illegible]	[illegible]	[illegible]	[illegible]	33277
		PCU	[illegible]	[illegible]	[illegible]	463	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MINH KHAI STREET (19)	EAST->WEST	VECH	[illegible]	[illegible]	254	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22567
		PCU	[illegible]	[illegible]	254	13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	14125
	[illegible]	VECH	[illegible]	[illegible]	254	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		PCU	[illegible]	[illegible]	254	47	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

CHAPTER 3

3 FIELD SURVEY AND INVESTIGATIONS

3.1 TOPOGRAPHIC SURVEY

The alignment study and preliminary engineering activities were undertaken based on the topographic maps with a scale of 1:2,000. Since the available maps were prepared in 1984, the maps did not show the changes resulting from the development occurred thereafter. Therefore it was necessary for the Consultant to update about 2.5 km of the proposed road corridor covering an area of approximately 90 ha. The primary reason for this step was to determine the exact location of the Thang Long Bridge Road, which was constructed after the maps were published, in order to fix the beginning point of the proposed road alignment from this road.

As the 1:2,000 scale of the existing maps were detailed enough to satisfy the requirement of the preliminary design, the updating survey as limited only to the extent necessary, and the output of this survey are as follows:

- Triangulation nets in the scale of 1:25,000.
- Traverse net in the scale of 1:2,000.
- Topographic maps for approximately 90 ha, in the scale of 1:2,000.
- Measurement data for triangulation, traverse, and field notebook.
- Calculation data
- Control data list
- Photographic records and location map for future identification of the reference points established in the project locations.

Based on the survey output, the surveyed corridor of the route prepared in identical scale was super-imposed to the base map and changed features were incorporated as appropriate.

3.2 METEOROLOGY

1) General

The ground level of Hanoi area becomes lower beginning from north-west toward south-east. The lowest area is in the city is Thanh Tri district. Sewage of Hanoi area flows into the district through such rivers as the Nhue River, To Lich River and the Kim Nguu River and also through other minor canals. The sewage flows into discharge canals in the flooding season is pumped out into the Red River.

In Hanoi city, due to substantial construction activities, some lakes and low-lying areas are filled up. On the other hand, since the drainage system has not been improved adequately, stormwater cannot be drained timely when it rains heavily , which causes flooding at low areas. Flooding lasts for a few hours at a time.

In the past, Hoang Hoa Tham Road was a part of the old dike system surrounding Hanoi city to prevent high level water from the Red River. Since the Red River dike has been constructed, this dike is not used now for its original purpose. That is the reason why it is not necessary to design a new road in conformity with the elevation of the Hoang Hoa Tham road. The elevations and locations of bridges and drainage facilities are needed to be designed to meet the demand of stormwater drainage in Hanoi City.

2) Climate and Temperature

Hanoi belongs to sub-tropical zone in climate. The hottest months are June, July and August with the maximum temperature of 42.8°C and the minimum of 20°C, while the coldest month is January with the maximum temperature of 33.1°C and the minimum of 2.7°C.

Table 5.2-1 Absolute Maximum Monthly/Yearly Temperature

Month	Temperature(° C)	Year
January	33.1	1911
February	35.1	1950
March	36.8	1919
April	38.5	1919
May	42.8	1926
June	40.4	1949
July	40.0	1910
August	39.0	1901
September	37.1	1911
October	35.7	1911
November	34.5	1930
December	31.9	1929
Yearly Maximum	42.8	1926

Table 5.2-2 Absolute Minimum Monthly/Yearly Temperature

Month	Temperature (°C)	Year
January	2.7	1955
February	5.0	1968
March	8.5	1936
April	9.8	1916
May	15.4	1917
June	20.0	1964
July	21.0	
August	20.9	1928
September	16.1	1970
October	12.4	1942
November	6.8	1922
December	5.1	1975
Yearly Minimum	2.7	1955

3) Rainfall

The rainy season is from May to October with the average monthly maximum rainfall of 318 mm, while the driest season is November through April with the average monthly maximum rainfall of 90.1 mm and the minimum of 18.6mm. The average annual rainfall is 1,676.2mm.

4) Typhoons

Annually there are 6 to 7 typhoons in Hanoi area and most them are concentrated in June through September.

The dates of the most severe typhoons recorded in the last few decades were:

- On 24 November 1963. The wind velocity was 22m/s in the direction of north-east.
- On 14 October 1972. The wind velocity was 19 m/s in the direction of north-east.
- On 14 June 1974. The wind velocity was 20 m/s in the direction of north-north-east
- On 21 July 1977. The wind velocity was 28 m/s in the direction of north-west
- On 9 September 1968. The wind velocity was 28 m/s in the direction of east-north-east
- On 15 May 1969. The wind velocity was 30 m/s in the direction of South-west.

Table 5.2-3 Average Monthly/Yearly Rainfall

Month	Rainfall (mm)
January	18.6
February	26.2
March	43.8
April	90.1
May	188.5
June	239.9
July	288.2
August	318.0
September	265.4
October	130.7
November	43.4
December	23.4
Yearly Average	1,676.2

Table 5.3-4 Maximum Daily Rainfall

Month	Rainfall (mm)	Year
January	45.5	1908
February	48.0	1932
March	63.1	1911
April	150.7	1944
May	155.0	1923
June	243.6	1929
July	568.6	1902
August	260.0	1941
September	250.5	1916
October	240.3	1940
November	394.9	1984
December	42.3	1963
Yearly Maximum	560.6	1902

?

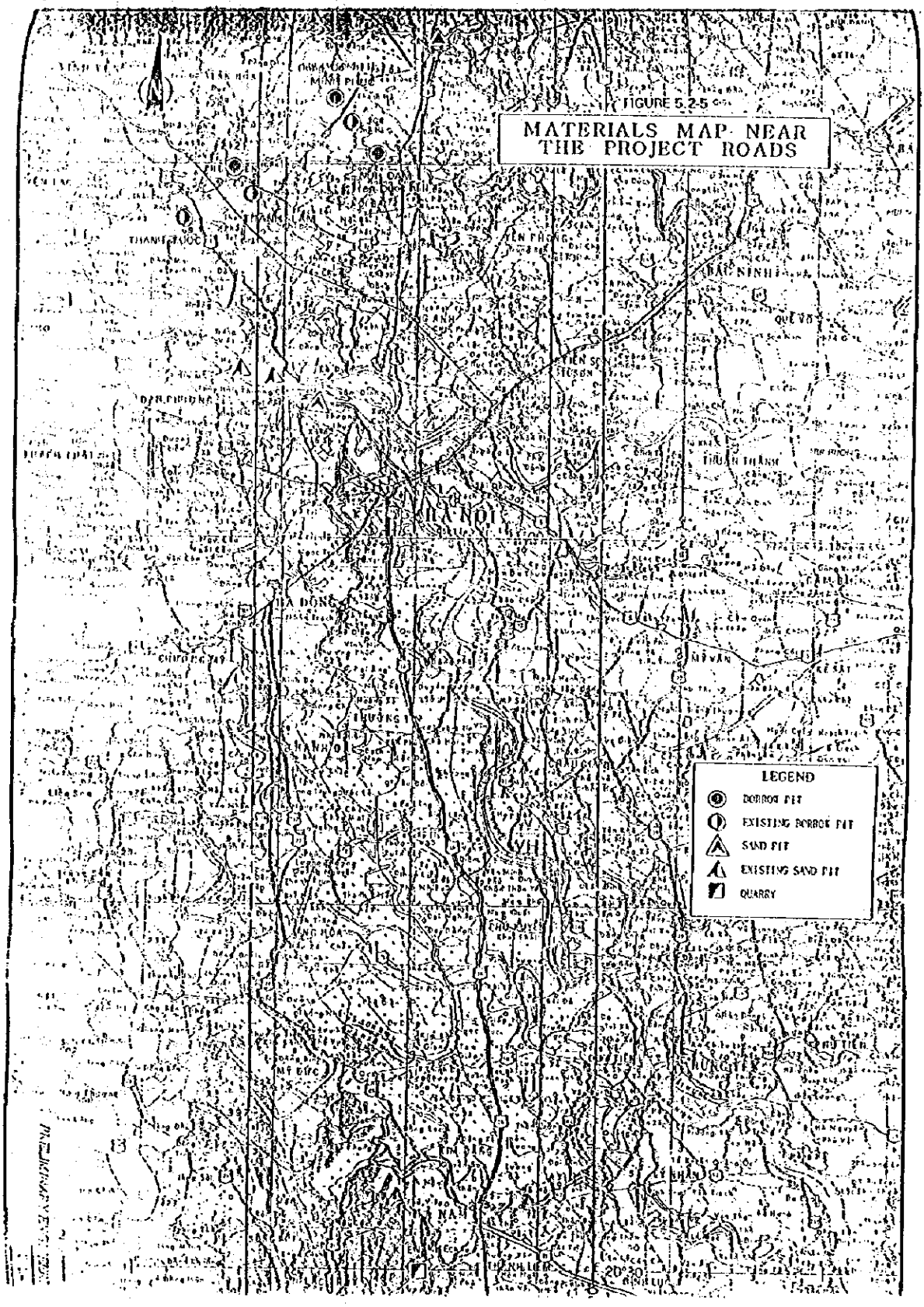


FIGURE 5.2.5
MATERIALS MAP NEAR THE PROJECT ROADS
HA NOI
LEGEND
BORROW PIT
EXISTING BORROW PIT
SAND PIT
EXISTING SAND PIT
QUARRY

Table 5.2-5 Number of Average Monthly/Yearly Rainy Days

Month	No. of / Rainy Days
January	8.4
February	11.3
March	15.0
April	13.3
May	14.2
June	14.7
July	15.7
August	16.7
September	13.7
October	9.0
November	6.5
December	6.0
Yearly Average	144.5

3.3 GEOLOGICAL CHARACTERISTICS

1) Geological Features of the Project Area

Figure 5.2-1 shows a 1:250,000 geological map covering the proposed alignment, published by the Cartographic Department of General Staff of Vietnam People's Army in 1970 and subsequently revised in 1977.

The sea level on the grobal scale are known to be controlled by a number of different factors. In Vietnam, the changes might have been effected by the process of the change of climate throughout the world during the Quaternary and local neotectonic movements.

The stratigraphical divisions distributing in depressed plains and on terraces of uplifting shorelines and islands could be correlated according to origin or age.

[illegible] marine regressions and four [illegible] in the Quaternary [illegible] Vietnam territory.

it involved in a large scale throughout the plains during a long time process from the Middle Pleistocene to Early-Late Pleistocene (0.7 to 0.035 million years ago). The Hanoi formation as well as alluvial sediments consisting coarse grained pebble, gravel and sand were created during this regression. This is of continental origin with a thickness of 50-70 m lying at 50-100 m deep in the plains.

Metro Hanoi is developed on a wide Pleistocene Division of Quaternary System. The basic rock, which is either of Permian System, upper division - Vietnam Formation or lower division of Triassic System consisted of carbonaceous clayish shale, sandstone, limestone, basaltic prophyrite and rhyolitic tuff. Also Dong Geao suite, lower sub-suite composed of beded gray limestone, upon which marl is overlaid, consitues the geologic features.

The other Hanoi formation of middle - upper part of Quaternary Pleistocene is overlaid with a flood plain deposits in consolidated conditions. Consecutively, Holocene Divisions lower to middle part of Quaternary System is overlaid on them by Hai Hung Formation with fluviatile, marine, lucustrine and swamp deposits with blue clay and yellowish gray loam and soft laleritoid in the medium consistency.

2) Seismicity

Vietnam is situated at the cross point of the two earthquake belts of the Circum-Pacific and the Mediterraneam/Himalayan earthquake zones.

The seismicity in the territory is not well known and the seismic activity could be considerably higher than it is known

In this region with a rather complex tectonic structure, the crust the earth is known to have passed through severe deformation periods in recent geologic times. One of the evidences for the tectonic changes may be seen as the possibility of seismicity in a part of the earth. The results of seismological studies carried out

the last 65 years has confirmed this fact. According to the first phase report of UNDP/VIE/84/011 performed during the period of 1987 - 1989, the occurrence of local earthquakes monitored in Hanoi was 3.0 and this figure is the smallest one among the monitoring results in Vietnam. (Figure 5.2-2).

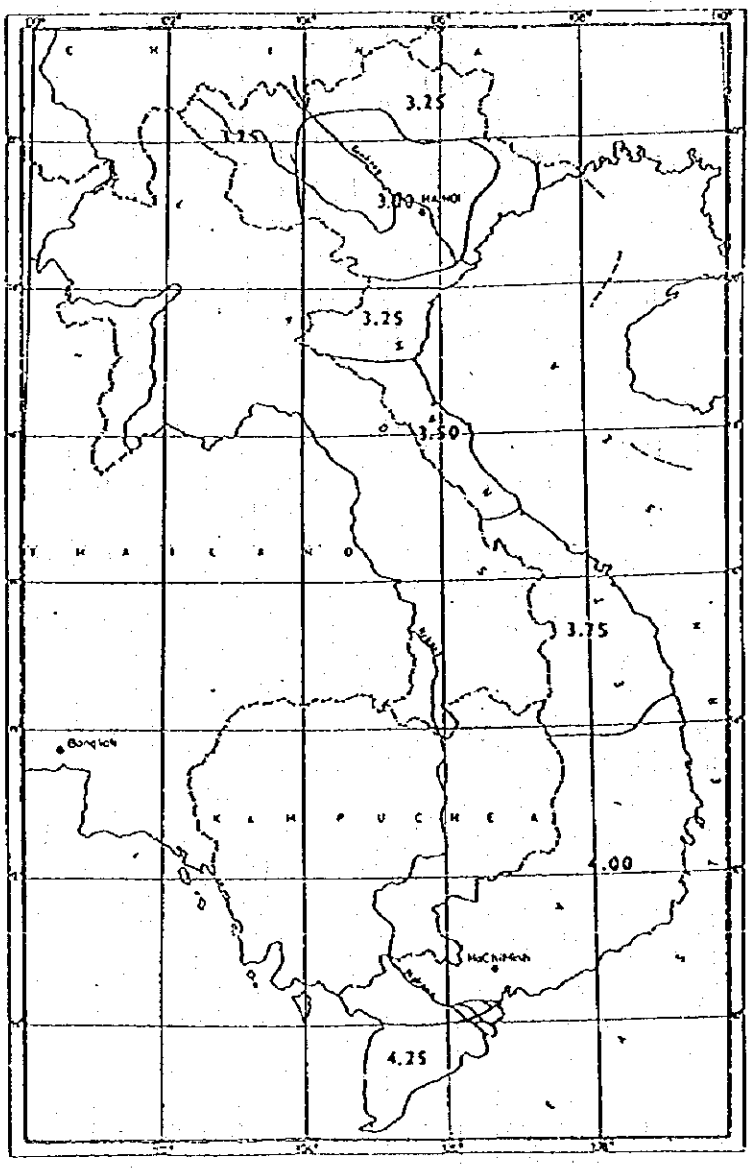


Figure 5.2-2 Detectability of seismological network, consisting of stations, built up during the first phase of fulfilment of project VIE/84/011 for monitoring of local earthquakes in Viet Nam

3.4 SOIL INVESTIGATION

These activities were undertaken in order to find out the inherent properties and characteristics of the materials and sub-soil conditions to:

- Determine suitability of the alignment both vertically and horizontally for the proposed project.
- Select and locate suitable materials for construction.
- Ascertain stability of roadbed under embankment.
- Identify locations and foundation conditions for new bridges, interchanges and over-pass bridges.
- Determine subgrade condition and all relevant characteristics such as layer thickness and each material properties for design of pavement structure.

The content in this section has been prepared and made available for information purpose only and is intended to be used as a supplementary guide for the preparation of the preliminary design and development of materials sources.

Therefore, the relatively limited scope of the investigations may require further detailed investigation and laboratory testing during the detail design stage.

1) Field Investigation

The Consultant carried out soil investigation activities with assistance of Railway Survey, Design and Construction Enterprise (RSDCE) (a member enterprise of TEDI), aiming at providing information related to soils and materials for prefeasibility study of the proposed project.

The investigation works were executed in the manner as described below:

Locations	Type of Investigation
Road bed	Test Pit, hand auger boring
Major structures	Machine boring
Areas where weak sub-soil is suspected	Machine boring

Boreholes

Five boreholes number-coded BH1, BH2, BH3, BH4, HAB1 were executed with total depth of 160 m. Standard penetration tests (ASTM-D1586) were carried out simulaneously during boring for use in finding N-value. The location plan where the borehole investigations have been carried out is provided as Figure 5.2-3.

Test Pittings

At 4 locaitons along the proposed alignment namely TP1, TP2, TP3, TP4, was excavated to a depth of 1.5 m. The general location of test pits are indicated in the attached sketches. Samples were obtained at each test pit for use to determine C.B.R.

As to the borrow pits in Nui Dam and Minh Phuc, two pits were dug to a depth of 1.5 m, and samples were obtained for tests.

2) Laboratory Tests

The laboratory tests required to determine soil engineering properties were conducted in the laboratory on the representative samples obtained from boreholes and test pits. All soil samples from the site were transported on a day-to-day basis to the laboratory to accelerate the testing. Index property tests to identify the soil samples and soil layers according to the United Soil Classification for the augur samples and AASHTO Classificaiton for the test pit samples.

Type of Tests	AASHTO Designations
Sieve analysis	AASHTO T27
Moisture content	AASHTO D2216
Plastic limit	AASHTO T90
Liquid limit	AASHTO T89
Specific gravity	AASHTO T100
Compaction	AASHTO T99
C.B.R.	AASHTO T193
Consolidation coefficient	AASHTO T216
Triaxial compression test	method of fast shearing without measuring pore pressure was used.

3) Preliminary Findings

The following findings have been drawn from the data of soils and materials investigaiton and tests. The general test result indicates that

i) The geological foundation of this alignment consists of very different soil strata with very different soil properties.

ii) The cohesive soils have relative moisture content exceeding liquid limit. Clayey soils are characterized by high degree of swell. The cohesiveless soils lie in deep strata consisting of sand, sand mixed with gravel, saturated, dense.

iii) As far as borrow pits are concerned, like subsoils they have low C.B.R. (maximum C.B.R. at 95 % MDD: 3). The major cause is due to high degree of sweil.

iv) Consolidation coefficient was determined by applying several levels of load, from that permeability coefficient is derived. Value of Cv (with pressure 1kg/cm²) = 0.25 × 1/1000 cm²/sec.

v) Undrained triaxal shear test without measuring pore pressure shows shear strength not very high.

The tables below shows further particular characteristics of the sub-soil conditions.

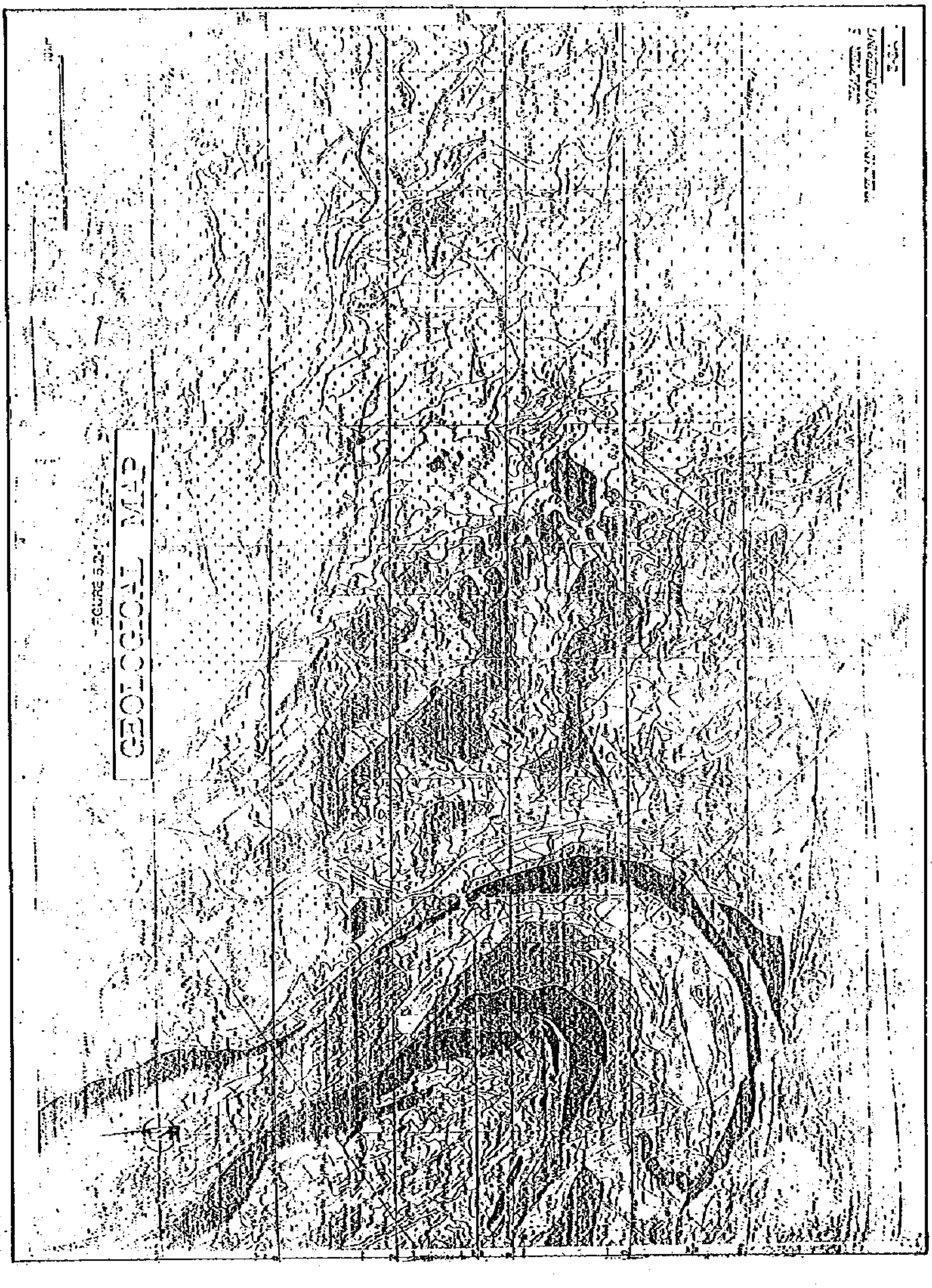
a) Overall Alignment

The either road sections except for the structures are to be built on embankment formed by borrow pit materials. The result of the tests are as shown in the table below:

Table 5.2-6 Alignment Condition in General

Description	Section I			Section II	
	TP-1	TP-2	HAB	TP-3	TP-4
U.S.C.S.	CL	CL	CL	CL	CL
AASHTO CLASSIFICATION	A-6(14) A-7-6(16)	A-6(14)	-	A-6(12) A-6(14)	A-6(16)
C.B.R (%)	3.00	2.50	-	1.0	1.16

Tables 5.2-7, 5.2-8 and 5.2-9 in the next pages are provided as a general reference for the soil classification system used in this project.


GEOLOGICAL MAP

CHAPTER 4

4 GEOMETRIC DESIGN STANDARDS

4.1 GENERAL

For a well balanced highway design, all basic criteria and geometri elements should, as far as economically feasible, be established to provid safe, continuous operation of the highway at a speed likely under th general conditions.

These design elements include:

- Horizontal and vertical alignments
  - Maximum curvature
  - Maximum/minimum grades
  - Vertical curves
  - Super-elevation
- Cross-section elements
  - Pavement and cross-slope
  - Lane widths
  - Bicycle lane widths
  - Shoulders and side slopes
  - Medians
- Intersection characteristics
- Drainage features
- Structural standard, loading and clearance
- Utilities, signalling and lighting
- Landscape development

The geometric design standard on this project was determined based on the review of data and information collected in the field survey and investigation, and giving reference to the Vietnamese Urban Highway Design Standard (20 TCN-104-83), Rural Highway Standard (TCVN 4054-85) and the Design Standard for Expressways and Highways in Korea.

Classification of Roads

According to the Vietnam Urban Highway Standard, the hierarchy, speeds and widths of urban highways are designated as follows.

Table 5.3-1 Vietnam Urban Highway Standard

Class	Design Speed (km/hr)	Width (m)
Expressway	120	68.0
Class I	100	60.0
Class II	80	50.5
Zonal Road	60	43.5
Collector Road	40	30.0

4.2 GEOMETRIC DESIGN STANDARDS

In the Hanoi Urban Transportation Master Plan upto 2010, the proposed road has been designated as the Class I category road of 60 m. Therefore, based upon this designation, the Consultant has established its geometric standard as shown in Table 5.3-2.

Table 5.3-2 Geometric Design Standard

	Design Element	Unit	Value
1.	Design Speed	km/hr	100
2.	Horizontal Alignment		
	a) Desirable minimum curve radius	m	600
	b) Absolute minimum curve radius	m	400
	c) Minimum length of horizontal curve	m	110
3.	Vertical Alignment		
	a) Desirable maximum	%	5
	b) K value for vertical curve		
	- Crest	m	6,000
	- Sag	m	1,200
4.	Standard Cross-slope	%	2.0
5.	Stopping Sight Distance		
	a) Minimum stopping sight distance	m	280
	b) Minimum passing sight distance	m	550
6.	Lane Width	m	3.75
7.	Bicycle Lane Width	m	3.0
8.	Clearance		
	a) Roadway	m	4.5
	b) Railway	m	6.1
9.	Right-of-way	m	60

Elements of Geometric Design Standards

Some of the principal design elements are reviewed in this section and, as necessary, are further discussed in other sections that follow.

a) Design Speed

Urban Highway Standard (20 TCN-104-83) of Vietnam sets the maximum design speed of Class I Arterial Highway as 100 km/hr and this is considered reasonable.

b) Lane Widths

In the interest of safety, efficiency, ease of operation and rider comfort, the lane width is considered to be the most influencing element, the larger values providing the additional freedom and ease of operation consistent with the traffic volume and speed.

As the desirable lane width should be wide enough to allow large vehicles to pass without either vehicles having to move sideways, the width of each lane was determined to be 3.75 m for the proposed project.

c) Bicycle Lane Widths

In locations where high volume of bicycle traffic is expected, it is desirable to provide bicycle lanes for smooth flow of the high speed, motorized vehicles. It is especially important matter for concern as bicycles are the most popular mode of transport in Vietnam, with the number of bicycle ownership in Hanoi alone is approximately 2 million units. And hence, it was decided to provide separate bicycle lanes of 3.0 m on either sides of the proposed highway except for the part of the roadway on top of the viaduct.

d) Right of Way (ROW) Widths

The ROW should be wide enough to provide space for all the cross-section elements with good balance throughout.

The HUTMP-2010 designates that the proposed road is class I arterial road of 60 m. It is planned that the ROW width to accommodate the eventual 60 m highway is to be acquired all together in the first stage of the construction to be discussed later.

This width pertains to the Section I. However, for the Section II, where the elevated structures are to be built, the ROW width is planned at 45 m to 60 m depending on construction options.

e) Horizonal Alignment

Minimum horizontal curve radius is determined by the maximum super elevation, allowable maximum friction coefficient and design speed. In order to ensure smooth turning with comfort and safety, minimum curve radius of 600 m is proposed.

f) Vertical Alignment

The gradient and vertical curve radius are also planned to ensure safety at the allowable design speed.

g) Standard Cross-slope

In consideration of the pavement type and surface drainage, the standard cross-slope has been decided to be 2.0 %.

5.3.3 TYPICAL CROSS SECTIONS

Based on the fore-going discussions and with reference to the HUTMP-2010, typical cross-sections of the project road have been established as shown in the Table 5.3-3 and Figures 5.3-1/A and 5.3.1/B

Particulars of Typical Cross Sections

Description	Unit	At Grade (Section I)	Elevated(*) (Section II)
Number of Lane	Lane	8 (eventual)	8 (eventual)
· 1st stage	Lane	4	4 (elevated)
· Final stage	Lane	4	4 (at grade)
Total Width	m	60.0	45.0(**)
· Vehicle Lane	m	30.0	15.0 (at grade) 19.1 (elevated)
· Median	m	3.0	5.0
· Bicycle Lane	m	3.0	3.0
· Pedestrian Side Walk	m	7.5	7.5

NOTE: (*) The typical cross section of the Section II has a couple of other variants depending on the construction options contemplated. These variants are illustrated in the Figures 5.3-1/A and 5.3-1/B as the Options II-A, II-B and II-C. The tabulated data in Table 5.3-3 above are for the Option II-B. Further topics in this regard will be discussed in relevant sections of 5.4 Alignment Design and 5.7 Structural Design in this Chapter.

(**) The widths for the Options II-A and II-C are 60.0 m.

5. APPENDIX - A1

TOPOGRAPHIC SURVEY DATE

5.1 TECHNICAL EXPLANATORY NOTES
5.2 TRIANGULATION NET AND TRAVERSE OUTPOUR

APPENDIX A1

BASIC GEODETIC CENTER

TECHNICAL EXPLANATORY NOTES
for
ESTABLISHING TRIANGULATION POINTS, IV CLASS
and
CONTROL POINTS, II ORDER

5.1 TECHNICAL EXPLANATORY NOTES

1. Coordinate Points

a) 6 triangulation points of IV class which constitute 2 triangles located in Co Nhue village (1Km south of Thang Long bridge) and Nghia Do village (300m from Buoi three-way intersection). Distance between two triangulation nets is about 2.7Km.

The longest side of two of these triangles is 310m, the shortest one is 162m.

These points are number-coded as TL I, TL II, TL III and ND 1, ND 2, ND 3 which were identified by the Client.

To determine coordinates of these points in pertinent authorized datum they were selected and tied to two points of State authorized triangle with number-code of 10451 and 10472.

For sides of triangles are very short, to be accurate, combined method of GPS and TOTAL STATION were used.

All internal angles and sides of triangles were measured by TOTAL STATION. GPS instrument was fixed at points of TL I, TL II, TL III, ND 1, ND 2, ND 3. Layout of survey is shown in Appendix 1.

b) Balancing errors:

Survey output of GPS and TOTAL STATION is balanced according to the State coordinate system of zone 3 with central latitude of 105 45' (Hanoi local coordinate system used to be basis for mapping of large scale)

2. Establish control points of II order

Control points of II order constitute the single traverse starting at TL I and ending at ND 1. To determine this traverse, beginning azimuth of TL II - TL I and ending azimuth of ND 1 - ND 2 were used.

Angles and sides of traverse were measured by TOTAL - SET2B system.

Survey output was balanced by precise method.

Sketch is shown in Appendix 2.

3. Determining elevations

For the purpose of determining elevations of traverse chain, these points were referred to the State datum system from vertical control points of II class with number-code of CT-TL2 and CT-TL3. Elevations were determined by using Ni025 and 3m wood staff.

Elevations of II order were determined by TOTAL STATION system using reciprocating measurement method.

All survey output were balanced together with corresponding coordinate net.

Sketch is shown in Appendix 3.

III. APPRAISAL OF SURVEY OUTPUT

		Coordinate Net of IV Class	Traverse Net of II Order
Location error of points:			
+ Minimum	mx =	0.0001m (TL1)	0.0004m (S16)
	my =	0.0001m (TL3)	0.0005m (S16)
+ Maximum	mx =	0.0016m (TL2)	0.0008m (S8)
	my =	0.0020m (TL2)	0.0010m (S8)

Side relative error:

+ Minimum 1/34607549 (51-ND1 side) 1/625807 (S11-S12 side)
+ Maximum 1/89492 (TL1 - TL2 side) 1/240281 (S1-S2 side)

Azimuth error:

+ Minimum	0.01" (51-TL1)	0.3" (S11-S12)
+ Maximum	0.28" (TL1-TL2)	0.97" (S1-TL1)

Survey outputs are fully satisfactory with requirements set out.

MATERIALS TO BE SUBMITTED

1. GPS measurement Notebook : 1
2. TOTAL STATION Notebook : 4
3. Elevation Notebook : 1
4. Outputs:

   - Output of coordinate, elevation of IV class and errors: 1
   - Output of azimuths, side length and errors of control points of IV class: 1
   - Output of coordinate, elevation of traverse of II order: 1
   - Output of azimuths, side length and errors of control points of II order : 1

CONCLUSIONS

Determination of coordinate points, elevation of IV class and traverse of II order in Thang Long - Nghia Do area is completed in time and with high quality.

Survey outputs satisfies requirements set out. Particularly, accuracy of coordinate net of IV class is very high which can be satisfactory for the further survey purpose in this area.

In the course of survey, the latest technology being available in Vietnam are used which ensure fast tempo with high accuracy.

5.2 Triangulation Net and Traverse Outpur

OUTPUT SUMMARY OF COORDINATE AND ELEVATION ADJUSTMENT OF TRIANGULATION NET OF IV CLASS THANG LONG - NGHIA DO AREA

Coordinate Adjustment Summary
Network = Hanoi
Time = Thu Jul 08 07:05:50 1993

Datum = HN-72
Coordinate System = Gaus - 105.45
Zone = Hanoi

Network Adjustment Constraints:
2 fixed coordinates in y
2 fixed coordinates in x
2 fixed coordinates in h

Point Number	Preliminary Values	Adjustment Values	Balanced Values	Errors
1	x= 2332195.9090	+0.0000	2332195.9090	0.000000m
10451	y= 502938.5390	+0.0000	502938.5390	0.000000m
	h= 9.1259	+0.0000	9.1259	0.000000m
2	x= 2328354.9770	+0.0000	2328354.9770	0.000000m
10472	y= 505197.1530	+0.0000	505197.1530	0.000000m
	h= 24.9744	+0.0000	24.9744	0.000000m
3	x= 2328690.3505	+0.0493	2328690.3998	0.000119m
ND 1	y= 505379.4539	-0.0359	505379.4180	0.000113m
	h= 6.0260	+0.0000	6.0260	0.000000m
4	x= 2328880.2589	+0.0449	2328880.3038	0.000239m
ND 2	y= 505399.6923	-0.0368	505399.6555	0.000276m
	h= 6.1120	+0.0000	6.1120	0.000000m
5	x= 2328649.2737	+0.0502	2328649.3239	0.000243m
ND 3	y= 505192.3578	-0.0320	505192.3258	0.000277m
	h= 6.5110	+0.0000	6.5110	0.000000m
6	x= 2330785.0870	-0.0020	2330785.0850	0.000098m
ND 4	y= 503645.7136	+0.0015	503645.7151	0.000016m
	h= 8.3880	+0.0000	8.3880	0.000000m
7	x= 2330689.7364	+0.0011	2330689.7375	0.001612m
TL 2	y= 503514.4789	+0.0039	503514.4828	0.002045m
	h= 10.3060	+0.0000	10.3060	0.000000m
8	x= 2330953.1511	-0.0041	2330953.1470	0.000114m
TL 3	y= 503533.4415	+0.0025	503533.4440	0.000108m
	h= 11.8100	+0.0000	11.8100	0.000000m

OUTPUT SUMMARY OF AZIMUTH AND SIDE LENGTH
AFTER BALANCING TRIANGULATION NET OF IV CLASSE
THANG LONG - NGHIA DO AREA

Summary of Covariances
Network = Hanoi
Time = Thu Jul 08 07:06:13 1993

Datum = HN-72
Coordinate System = Gaus - 105.45
Zone = Hanoi

Network Adjustment Constraints:
2 fixed coordinates in y
2 fixed coordinates in x
2 fixed coordinates in h

From Point	To Point	Azimuth Angle	Error	Side	Diffence of Error	Eleva-tions	Error	Ratio of Closure
10451	10472	149°32'34"	0.00	4455.79	0.0000	+15.85	0.0000	1: 0
10451	ND1	145°09'02"	0.01	4271.59	0.0001	-3.04	0.0000	1: 34607549
10451	ND2	143°24'51"	0.01	4129.20	0.0003	-2.76	0.0000	1: 15694303
10451	ND3	147°33'53"	0.01	4282.12	0.0003	-2.41	0.0000	1: 15954703
10451	TL1	153°22'40"	0.01	1578.14	0.0001	-0.61	0.0000	1: 15030968
10451	TL2	159°04'25"	0.25	1612.53	0.0017	+1.30	0.0000	1: 923841
10451	TL3	154°25'11"	0.02	1377.81	0.0001	+2.81	0.0000	1: 11608060
10472	ND1	28°31'09"	0.07	381.74	0.0001	-18.89	0.0000	1: 3416618
10472	ND2	21°04'50"	0.10	563.31	0.0002	-18.61	0.0000	1: 2384569
10472	ND3	359°03'38"	0.19	294.39	0.0002	-18.26	0.0000	1: 1211570
ND 1	TL	320°23'12"	0.01	2719.09	0.0001	+2.43	0.0000	1: 21718194
ND2	ND3	221°54'41"	0.08	310.38	0,0001	+0.35	0.0000	1: 2795129
TL1	TL2	233°59'58"	0.28	162.21	0.0018	+1.92	0.0000	1: 89497
TL1	TL3	326°15'21"	0.15	202.11	0.0001	+3.42	0.0000	1: 1363273
TL2	TL3	4°07'02"	0.06	264.09	0.0016	+1.50	0.0000	1: 165341

OUTPUT SUMMARY OF COORDINATE AND ELEVATION
TRAVERSE OF II ORDER
THANG LONG - NGHIA DO AREA

Coordinate Adjustment Summary
Network = Hanoi
Time = Thu Jul 08 07:05:50 1993

Datum = HN-72
Coordinate System = Gaus - 105.45
Zone = Hanoi

Network Adjustment Constraints:
2 fixed coordinates in y
2 fixed coordinates in x
2 fixed coordinates in h

Point Number	Preliminary Values	Adjustment Values	Balanced Values	Errors
1	x= 2328690.4000	+0.0000	2328690.4000	0.000000m
ND 1	y= 505379.4180	+0.0000	505379.4180	0.000000m
	h= 6.0260	+0.0000	6.0260	0.000000m
2	x= 2330687.7606	+0.0030	2330687.7637	0.000362m
S1	y= 503647.2132	+0.0124	503647.2257	0.000460m
	h= 7.6259	-0.0003	7.6256	0.000929m
3	x= 2330609.6695	+0.0137	2330609.6832	0.000497m
S2	y= 503712.6454	+0.0206	503712.6660	0.000631m
	h= 6.9734	-0.0004	6.9730	0.001272m
4	x= 2330480.9170	+0.0331	2330481.9501	0.000584m
S3	y= 503834.8952	+0.0337	503834.9288	0.000742m
	h= 6.7639	-0.0006	6.7633	0.001505m
5	x= 2330391.1055	+0.0454	2330391.1509	0.000652m
S4	y= 503910.5650	+0.0430	503910.6080	0.000828m
	h= 6.6002	-0.0009	6.5995	0.001675m
6	x= 2330270.7556	+0.0620	2330270.8176	0.000700m
S5	y= 504013.1882	+0.0556	504013.2438	0.000888m
	h= 5.9303	-0.0009	5.9293	0.001799m
7	x= 2330172.4055	+0.0759	2330172.4814	0.000739m
S6	y= 504098.6500	+0.0658	504098.7158	0.000933m
	h= 6.3285	-0.0011	6.3274	0.001887m
8	x= 2330053.4297	+0.0965	2330053.5202	0.000758m
S7	y= 504185.5790	+0.0785	504185.6576	0.000962m
	h= 5.5878	-0.0312	5.5566	0.001943m

[illegible] AZIMUTH AND SIDE LENGTH
[illegible]ER BALANCING TRAVERSE NET OF II ORDER
[illegible]G LONG - NGHIA DO AREA

Summary of Covariances
Network = Hanoi
Time = Thu Jul 08 07:06:13 1993

Datum = HN-72
Coordinate System = Gaus - 105.45
Zone = Hanoi

Network Adjustment Constraints:
2 fixed coordinates in y
2 fixed coordinates in x
2 fixed coordinates in h

From Point	To Point	Azimuth Angle	Error	Side	Diffence of Error	Eleva-tions	Error	Ratio of Closure
ND1	S16	298° 15'59"	0.63	119.61	0.0005	+0.71	0.0009	1: 263545
S1	S2	140° 01'59"	0.80	101.88	0.0004	-0.65	0.0009	1: 240281
S1	TL1	359° 06'38"	0.97	97.33	0.0004	+0.76	0.0009	1: 267938
S10	S11	141° 12'25"	0.45	181.46	0.0004	+0.18	0.0009	1: 431513
S10	S9	321° 15'52"	0.47	174.52	0.0004	-0.29	0.0009	1: 415227
S11	S12	137° 12'45"	0.30	271.01	0.0004	-0.16	0.0009	1: 625807
S12	S13	138° 10'20"	0.43	187.74	0.0004	+0.20	0.0009	1: 440829
S13	S14	147° 49'08"	0.44	192.21	0.0004	-0.21	0.0009	1: 469670
S14	S15	138° 54'15"	0.79	103.34	0.0004	+0.12	0.0009	1: 252614
S15	S16	143° 35'50"	0.53	156.68	0.0004	+0.87	0.0009	1: 376565
S2	S3	136° 28'36"	0.45	177.54	0.0004	-0.21	0.0009	1: 414385
S3	S4	139° 52'36	0.70	117.44	0.0004	-0.16	0.0009	1: 277309
S4	S5	139° 32'17"	0.51	158.16	0.0004	-0.67	0.0009	1: 373760
S5	S6	139° 00'12"	0.62	130.29	0.0004	+0.40	0.0009	1: 306901
S6	S7	143° 50'21"	0.56	147.35	0.0004	-0.74	0.0009	1: 354470
[illegible]	S8	136° 26'40"	0.32	252.12	0.0004	+0.57	0.0009	1: 583041
S8	S9	139° 43'48"	0.44	184.45	0.0004	-0.73	0.0009	1: 435927

Point Number	Preliminary Values	Adjustment Values	Balanced Values	Errors
9	x= 2329870.6822	+0.1180	2329870.8002	0.000762m
S8	y= 504359.2771	+0.0970	504359.3742	0.000968m
	h= 6.1628	-0.0014	6.1614	0.001971m
10	x= 2329729.9226	+0.1374	2329730.0600	0.000761m
S9	y= 504478.4925	+0.1117	504478.6042	0.000967m
	h= 5.4326	-0.0016	5.4310	0.001971m
11	x= 2329593.7740	+0.1553	2329593.9293	0.000750m
S10	y= 504597.6785	+0.1261	504587.8045	0.000953m
	h= 5.7220	-0.0017	5.7203	0.001943m
12	x= 2329452.3207	+0.1740	2329452.4947	0.000728m
S11	y= 504701.3513	+0.1410	504701.4923	0.000924m
	h= 5.9065	-0.0019	5.9046	0.001887m
13	x= 2329253.4013	+0.2033	2329253.6046	0.000694m
S12	y= 504885.4249	+0.1613	504885.5862	0.000881m
	h= 5.7495	-0.0021	5.7474	0.001799m
14	x= 2329113.4867	+0.2234	2329113.7102	0.000647m
S13	y= 505010.6124	+0.1756	505010.7880	0.000821m
	h= 5.9476	-0.0022	5.9453	0.001675m
15	x= 2328950.7886	+0.2413	2328951.0299	0.000584m
S14	y= 505112.9645	+0.1936	505113.1581	0.000740m
	h= 5.7359	-0.0024	5.7335	0.001505m
16	x= 2328872.9026	+0.2522	2328873.1548	0.000492m
S15	y= 505180.8814	+0.2017	505181.0830	0.000624m
	h= 5.8606	-0.0026	5.8580	0.001272m
17	x= 2328746.7774	+0.2678	2328747.0452	0.000361m
S16	y= 505273.8535	+0.2152	505274.0687	0.000456m
	h= 6.7339	-0.0027	6.7312	0.000929m
18	x= 2330785.0850	+0.0000	2330785.0850	0.000000m
TL1	y= 503645.7150	+0.0000	503645.7150	0.000000m
	h= 8.3880	+0.0000	8.3880	0.000000m

5．収集資料リスト

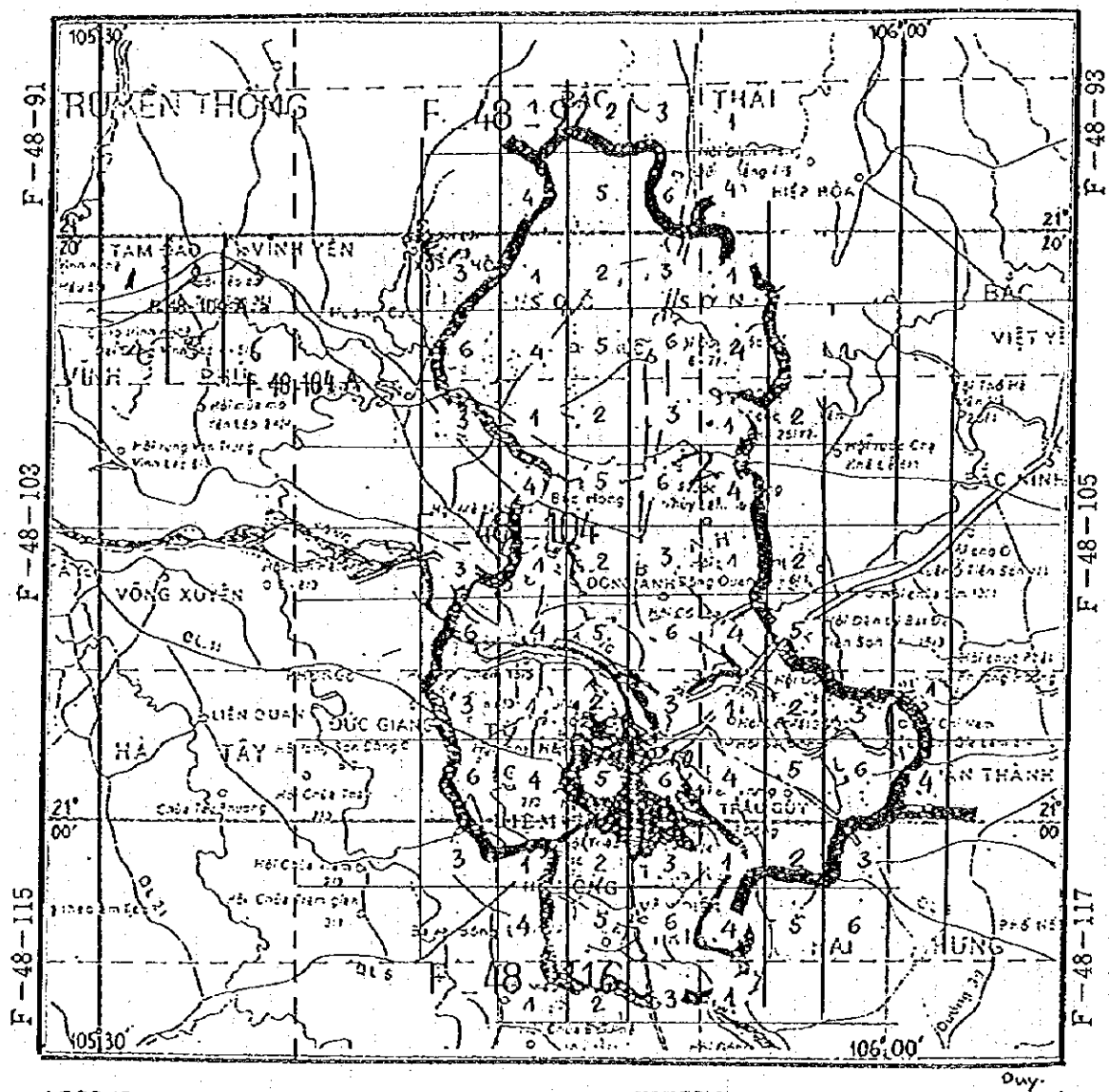
資料リスト（収集資料）

地域	東南アジア	調査団名	ハノイ市都市交通計画	調査の種類	事前調査
国名	ヴィエトナム	配属機関名		現地調査期間	平成7年3月3日～ 7年3月17日

番号	資料の名称	形態	版型	ページ数	オリジナルコピーの別	部数	収集先名称又は発行機関	寄贈・購入（価格）の別
1	Port System. The Report	報告書	A4	71	コピー	1	Ministry of Transport, Communication and Post	購入
2	Implementation Process and Experiences for Investment and Technical Assistance in Transport	〃	〃	20	〃	1	State Planning Committee	〃
3	National Transportation Sector Review. Final Report, Excutive Summary	〃	〃	30	〃	1	MOTCP, UNDP	〃
4	Feasibility Study on Vietnam Land Managemant System. Report 1	〃	〃	300	〃	1	UNDP	〃
5	Feasibility Study on Vietnam Land Managemant System. Report 3. Implementation Plan	〃	〃	143	〃	1	UNDP	〃
6	Vietnam Land Administration System (Land Use Planning. Regulations and Decree of the Land Law)	〃	〃	100	〃	1	The General Dept. of Land Administration, UNDP	〃
7	Brief Report on Master Plan of Hanoi's Transpotation to 2000 （英訳） （付属資料6）	報告書訳	〃	22	〃	1	MOTC作成のオリジナルから事前調査団により英訳	
8	Introduction in Brief Basic Data of Study on Urban Transport of Hanoi, Vietnam	資料	〃	66	コピー	1	ハノイ人民委員会 TUPWS	寄贈
9	Vietnam a Legal Brief	本	B6	319	オリジナル	1	The State Political Publishing House	購入
10	Hanoi Survey and Urban Public Works Design Co.	パンフレット	A4	12	〃	1	Hanoi Survey and Urban Public Works Design Co.	寄贈
11	Science-Technology Institute for Land Administration	パンフレット	〃	4	〃	1	Science-Technology Institute for Land Administration	〃
12	一覧図集（地形図、航空写真等）	本	B5	32	〃	1	〃	〃
13	ベトナム地形図等各種主題図リスト （付属資料7）	リスト	A4	8	コピー	1	〃	〃
14	1/250,000地形図（ハノイ市カバー）	地図	A2	4面	オリジナル	1	ハノイ市内書店	購入
15	1/50,000地形図（ハノイ市カバー）	〃	〃	2面	〃	6	Science-Technology Institute for Land Administration	〃
16	1/10,000地形図（ハノイ市カバー）	〃	〃	73面	〃	1	〃	〃
17	Vietnam Railways Network	本	A4	61	〃	1	Ministry of Transport, Communication and Post	〃
18	New Vietnam No.19 - 1995. Vol 1	本	A4	48	〃	1	The Gioi Publishers	寄贈

地形図の範囲

PROJECT LOCATION MAP



LEGEND :

PROVINCE / CITY BOUNDARY (STUDY AREA)- 921 sq. km

PRESENT DENSELY INHABITED DISTRICT (DID) OF HANOI CITY - approx. 45 sq. km

RIVER

MAJOR ROAD

RAILWAY

1 / 400000

LEGEND

F-48-104	:scale 1/100,000
F-48-104-A	:scale 1/50,000
F-48-104-A-a	:scale 1/25,000
F-48-104-A-a-1	:scale 1/10,000

SHEET NO.		AREA
NF-48-11	1/250,000	HA NOI
NF-48-12		LANG SON
NF-48-15		NAM DINH
NF-48-16		HAI PHONG
6150 I	1/50,000	HA DONG
6151 II		HA NOI
F-48-92-D-c-1 以下		XOM CHUA
F-48-92-D-c-2	1/10,000	THUONG VU
F-48-92-D-c-3		PHO YEN
F-48-92-D-c-4		DONG MAI
F-48-92-D-c-5		PHUC XU AN
F-48-92-D-c-6		PHU DOAI
F-48-92-D-d-1		XOM NUI
F-48-92-D-d-4		HUONG THINH
F-48-104-A-b-3		AN DONG
F-48-104-A-b-6		XUAN HOA
F-48-104-A-d-3		XUAN PHUONG
F-48-104-B-a-1		LAP DINH
F-48-104-B-a-2		HOA SON
F-48-104-B-a-3		PHO NI
F-48-104-B-a-4		THANH TRI
F-48-104-B-a-5		QUANG HOI
F-48-104-B-a-6		SOC SON
F-48-104-B-b-1		NINH TAO
F-48-104-B-b-4		YEN TANG
F-48-104-B-c-1		THACH LOI
F-48-104-B-c-2		XUAN BACH
F-48-104-B-c-3		DA PHUC
F-48-104-B-c-4		THUY HUONG
F-48-104-B-c-5		THANG LOI
F-48-104-B-c-6		PHU LO
F-48-104-B-d-1		DAI TAO
F-48-104-B-d-2		NHU NGUYET
F-48-104-B-d-4		THUY LOI
F-48-104-C-b-3		HA LOI
F-48-104-C-b-6		THU ONG CAT
F-48-104-C-d-3		THON NHON
F-48-104-C-d-6		AN TRAI
F-48-104-D-a-1		YEN NHAN
F-48-104-D-a-2		VAN TRI

SHEET NO.	AREA
F-48-104-D-a-3	DONG ANH
F-48-104-D-a-4	CAU THANG LONG
F-48-104-D-a-5	PHU GIA
F-48-104-D-a-6	TIEN HOI
F-48-104-D-b-1	CHAU PHONG
F-48-104-D-b-2	DONG KY
F-48-104-D-b-4	YEN VIEN
F-48-104-D-b-5	DINH BANG
F-48-104-D-c-1	CO NHUE
F-48-104-D-c-2	QUANG BA
F-48-104-D-c-3	GIA LAM
F-48-104-D-c-4	MAI DICH
F-48-104-D-c-5	CO DONG DA
F-48-104-D-c-6	HO HOAN KIEM
F-48-104-D-d-1	TRUONG LAM
F-48-104-D-d-2	CONG DINH
F-48-104-D-d-3	TRUNG MAU
F-48-104-D-d-4	THONG NHAT
F-48-104-D-d-5	TRAU QUY
F-48-104-D-d-6	PHU THUY
F-48-105-C-c-1	THON DEN
F-48-105-C-c-4	CONG HA
F-48-116-A-b-3	QUANG TRUNG
F-48-116-B-a-1	HA DONG
F-48-116-B-a-2	DINH CONG THUONG
F-48-116-B-a-3	GIAP BAT
F-48-116-B-a-4	BAC LAM
F-48-116-B-a-5	TA THANH OAI
F-48-116-B-a-6	VAN DIEN
F-48-116-B-b-1	NAM DU THUONG
F-48-116-B-b-2	NGOC DONG
F-48-116-B-b-3	NHU QUYNH
F-48-116-B-b-4	TRUNG QUAN
F-48-116-B-b-5	THON BEN
F-48-116-B-b-6	THO VUC
F-48-116-B-c-1	BINH DA
F-48-116-B-c-2	DAI ANG
F-48-116-B-c-3	THUONG DINH
F-48-116-B-d-1	XAM DUONG