Japan International Cooperation Agency (JICA)
Ministry Of Transport, Socialist Republic of Vietnam (MOT)
Ho Chi Minh City People's Committee (HCMC-PC)

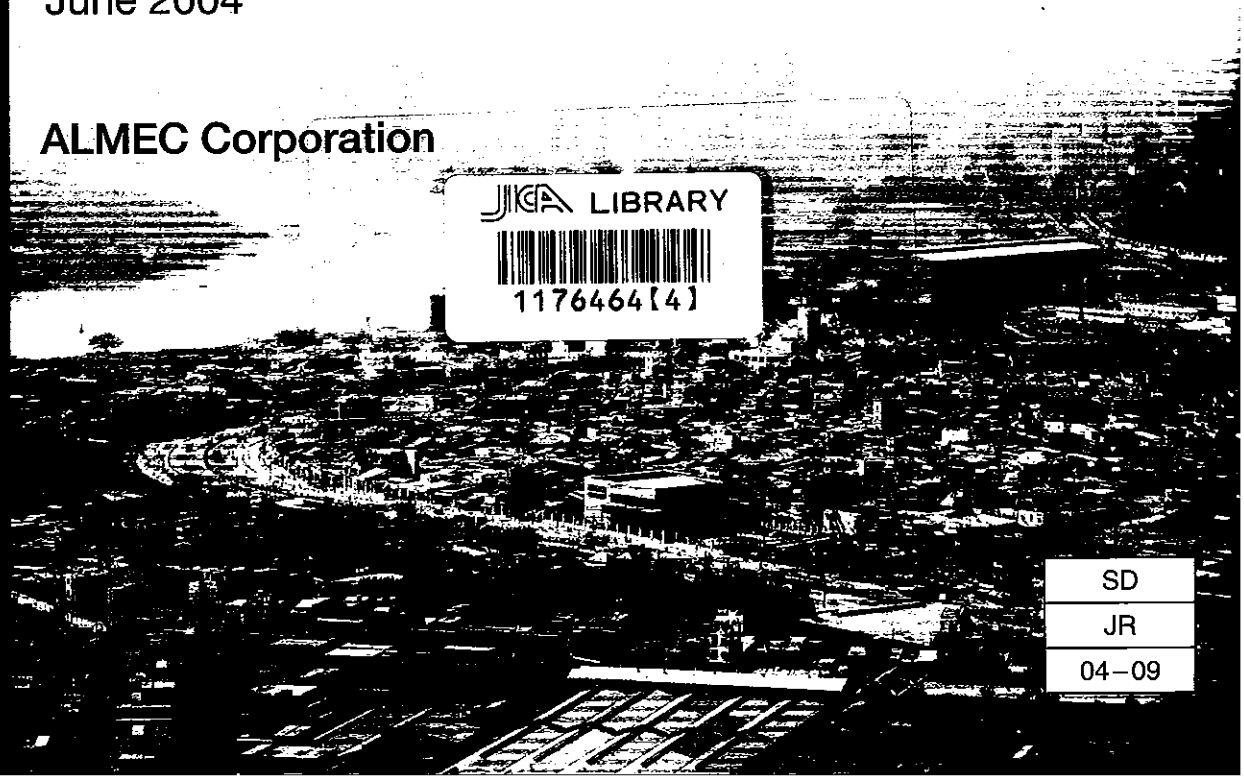
The Study on Urban Transport Master Plan and Feasibility Study in Ho Chi Minh Metropolitan Area (HOUTRANS)

FINAL REPORT

Vol.3 Feasibility Studies

June 2004

ALMEC Corporation



JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF TRANSPORT, SOCIALIST REPUBLIC OF VIETNAM (MOT)
HO CHI MINH CITY PEOPLE'S COMMITTEE (HCMC-PC)

THE STUDY ON URBAN TRANSPORT MASTER PLAN AND FEASIBILITY STUDY IN HO CHI MINH METROPOLITAN AREA (HOUTRANS)

FINAL REPORT

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(average in 2003)

PREFACE

In response to the request from the Government of the Socialist Republic of Vietnam, the Government of Japan decided to conduct the Study on Urban Transport Master Plan and Feasibility Study in Ho Chi Minh Metropolitan Area and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a team to Vietnam between August 2002 and June 2004, which was headed by Mr. IWATA Shizuo of ALMEC Corporation.

The team conducted the study in collaboration with the Vietnamese counterpart team including field surveys, traffic demand forecast, formulation of a master plan and feasibility studies on the selected priority projects, and then held a series of discussions with the officials concerned of the Government of Vietnam. Upon returning to Japan, the team duly finalized the study and delivered this report.

I hope that this report will contribute to the development of urban transport in Ho Chi Minh Metropolitan Area and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Vietnam for their close cooperation extended to the team.

June 2004

MATSUOKA Kazuhisa
Vice President
Japan International Cooperation Agency

June 2004

MATSUOKA Kazuhisa
Vice President
Japan International Cooperation Agency
Tokyo

LETTER OF TRANSMITTAL

Dear Sir,

We are pleased to formally submit herewith the final report of the Study on Urban Transport Master Plan and Feasibility Study in Ho Chi Minh Metropolitan Area in the Socialist Republic of Vietnam.

This report compiles the result of the study which was undertaken both in Vietnam and Japan form August 2002 to June 2004 by the Team, organized by ALMEC Corporation.

We owe a lot to many people for the accomplishment of this report. First, we would like to express our sincere appreciation and deep gratitude to all those who extended their extensive assistance and cooperation to the Team, in particular the Ministry of Transport as well as the Ho Chi Minh City People's Committee both in Vietnam.

We also acknowledge the officials of your agency, the JICA Advisory Committee and the Embassy of Japan in Vietnam for their support and valuable advice in the course of the Study.

We wish the report would contribute to the promotion and sustainable development of urban transport in Ho Chi Minh Metropolitan Area.

Very truly yours,

IWATA Shizuo
Team Leader
The Team for the Study on Urban Transport Master Plan and Feasibility Study in Ho Chi Minh Metropolitan Area

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B: UMRT LINE 1 (EAST)

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ACRONYM

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Concrete
ADB	Asian Development Bank
APD	Architecture and Planning Department
ASEAN	Association of Southeast Asian Nations
ATC	Area Traffic Control
BOT	Build-Operate-Transfer
BR-VT	Ba Ria-Vung Tau
CAO	Chief Architect Office
CBD	Central Business District
CP	Counterpart
CPRGS	Comprehensive Poverty Reduction and Growth Strategy
DBST	Double Surface Treatment
DCI	Department of Culture and Information
DFID	Department for International Development
DLH	Department of Land and Housing
DOC	Department of Construction
DONRE	Department of Natural Resource and Environment
DOSTE	Department of Science and Technology
DOT	Department of Transport
DPI	Department of Planning and Investment
EIA	Environment Impact Assessment
E&M	Electronics and Mechanics
EIRR	Economic Internal Rate of Return
EPZ	Export Processing Zone
FIRR	Financial Internal Rate of Return
F/S	Feasibility Study
GDP	Gross Domestic Product
GIS	Geographical Information System
GOJ	Government of Japan
GOV	Government of Vietnam
GPS	Global Positioning System
GRDP	Gross Regional Domestic Product
HCM	Ho Chi Minh
HCMC	Ho Chi Minh City
HDI	Human Development Index
HEPZA	HCMC Export Processing and Industrial Zones Authority
HIS	Household Interview Survey
HOUTRANS	The Study on the Urban Transport Master Plan and Feasibility Study in HCM Metropolitan Area
HPI	Human Poverty Index
ICD	Inland Clearance/Container Depot
IRR	Internal Rate of Return
IT	Information Technology

ITS	Intelligent Transportation Systems
IWT	Inland Waterway Transport
IZ	Industrial Zone
JICA	Japan International Corporation Agency
JBIC	Japan Bank of International Cooperation
J/V	Joint-venture
HCMC-PC	Ho Chi Minh City People's Committee
IER	Institute of Economic Research
LED	Light Emitting Diode
LS	Learning Session
MOC	Ministry of Construction
MOCPT	Management and Operation Center of Public Passenger Transport
MOF	Ministry of Finance
MOT	Ministry of Transport
MPI	Ministry of Planning and Investment
M/C	Motorcycle
M/P	Master Plan
MRDR	Mekong River Delta Region
NESR	Northeastern South Region
NGO	Non Governmental Organization
NH	National Highway
NMV	Non-motorized vehicle
NPO	Non Profit Organization
NTSP	National Traffic Safety Program
OD	Origin-Destination
ODA	Official Development Assistance
O&M	Operation and Management
PC	People's Committee
PCU	Passenger Car Unit
PBSC	Public Benefit Service Companies
PLC	Public Lighting Company
PMU	Project Management Unit
PMU-IUT	Project Management Unit of Investment in Urban Transport
PPC	Provincial People's Committee
PPP	Public Private Partnership
PR	Provincial Road
PTP	Policy Test Project
RAO	Road Area Occupancy
RFID	Radio Frequency Identification
RND	Road Network Density
ROW	Right of Way
RR	Ring Road
SC	Steering Committee
SFEZ	Southern Focal Economic Zone
SOE	State-owned Enterprise
STRADA	System for Traffic Demand Analysis

S/W	Scope of Work
SWM	Solid Waste Management
TDSI	Transport Development Strategy Institute
TDM	Traffic Demand Management
TMU	Transport Management Unit
TSSV	Transport Science Society of Vietnam
TUPWS	Transportation and Urban Public Works Services
TWG	Technical Working Group
UMRT	Urban Mass Rapid Transit
UNESCO	United Nation Educational, Scientific and Cultural Organization
UNDP	United Nations Development Program
UPI	Urban Planning Institute
VC	Volume-Capacity
VCR	Volume-Capacity Ratio
VITRANSS	The Study on the National Transport Development Strategy in the Socialist Republic of Vietnam
VMS	Variable Message Signboard
VND	Vietnam Dong
VOC	Vehicle Operating Cost
VUTIP	Vietnam Urban Transport Improvement Project
VR	Vietnam Railway

VOLUME 3: FEASIBILITY STUDIES

A: Ring Road No.2

1 INTRODUCTION

1.1 Background and Objective

1) Background

On the basis of the Master Plan formulated for the metropolitan area, priority projects have been selected for further studies.

In selecting candidate projects for which a feasibility study was conducted, the criteria were defined, as follows:

(1) The project has to have strategic impact on the envisioned urban growth, i.e. it is a critical link in the proposed transport network master plan;

(2) The project can contribute to the strengthening of institutional capacity in the urban transport sector; and,

(3) The project can tap effective support from the experience and development cooperation schemes of Japan in urban transport sector development and management.

While many of the projects comprising the Master Plan fall in the criteria set forth, the following candidate projects were proposed at the second Steering Committee meeting held in July 2003:

(1) Ring Road No.2 (RR2)

(2) Development of at-grade primary and secondary roads in emerging areas

(3) Urban expressways

(4) Urban mass rapid transit (especially busway sections)

(5) Modernized bus transport system

(6) Institutional development and capacity building

The above six projects were further studied and modified as integral components of the proposed Master Plan. Three proposed projects were approved as priority projects and these are: (1) Ring Road No.2, (2) urban mass rapid transit and (3) modernized bus transport system. However, due to time and budget constraints, the first two projects were selected further studies.

This report embodies the results of the study on Ring Road No.2

2) Objectives

Development of efficient and effective road network is the most important policy agenda for sustainable urban area development and growth in the study area. Urban area has been quickly expanding towards the outer areas along major roads. Dramatic population increase expected in the future requires a huge amount of urban areas for housing and other socio-economic activities. In order to support and guide these development demands properly, well articulated road network is the must. Without provision of adequate roads, it is difficult to achieve planned land-use, ensure accessibility to necessary urban services, realize good environment and avoid disasters such as fire and flood.

While there are many roads which have to be developed in the study area, the importance of Ring Road No. 2 is highly significant in the following points:

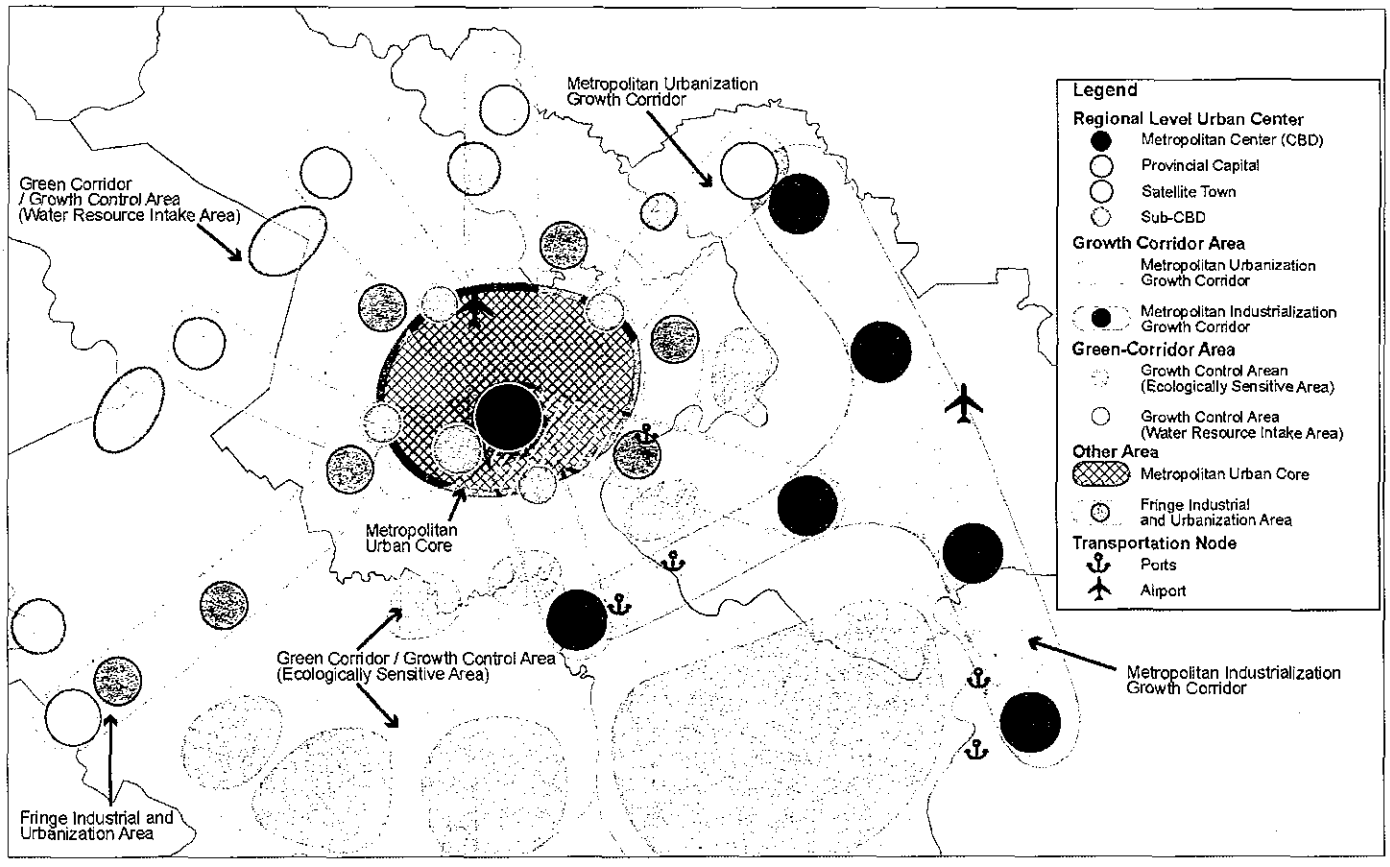
(1) Ring road No.2 which is presently functioning as a intercity/regional trunk road will become a critical major urban road in the future because of expansion of urban area. More commercial and residential developments will take place along the roads rather than industrial developments.

(2) Ring road No.2 is expected to integrate all important radial roads along which developments area making rapid progress and congestions area getting worse. The Ring road No.2 can contribute to disperse the traffic and use the roads more efficiently.

(3) Ring road No.2 with high design standards can provide excellent opportunities for development of new urban growth centers along the roads, especially in the areas where the Ring road No.2 and major radial roads intersect. For this, strategic integrated development between urban development and transport must be duly taken into account as illustrated in the following examples.

- Cat Lai Port access (Provincial Road No.25) promoting industrialization and urbanization in fringe areas
- Nam Saigon new town development and its extension
- Suburban center developments

Figure 1.1.1 Future Urban Development Scenario and Role of Ring Road No.2



Source: Study Team

1.2 Project Scope and Components

The scope and component of the project have been defined as follows:

(1) Formulate integrated urban/ landuse plan for the areas along the Ring road No.2: this will be further elaborated and incorporated in urban Master Plan, while in this study basic concepts and orientation are identified and developed.

(2) Conduct traffic demand forecast: this has been done in the Master Plan and the result area further examined in some detail.

(3) Determine the role and function of the Ring Road No.2: based on the discussion held in the Master Plan as well as (a) and (b) above. The role and function of the Ring Road No.2 will be discussed to provide a solid basis in determining the design standards to be adopted for Ring road No.2

(4) Conduct preliminary engineering study of the following sections:

- Eastern section (24km including, Phu My Bridge); new construction.
- Southwestern section (6km, including Phu My Bridge; new construction)
- Major intersections on An Suong-An Lac section
- Flyovers along the Ring road No.2

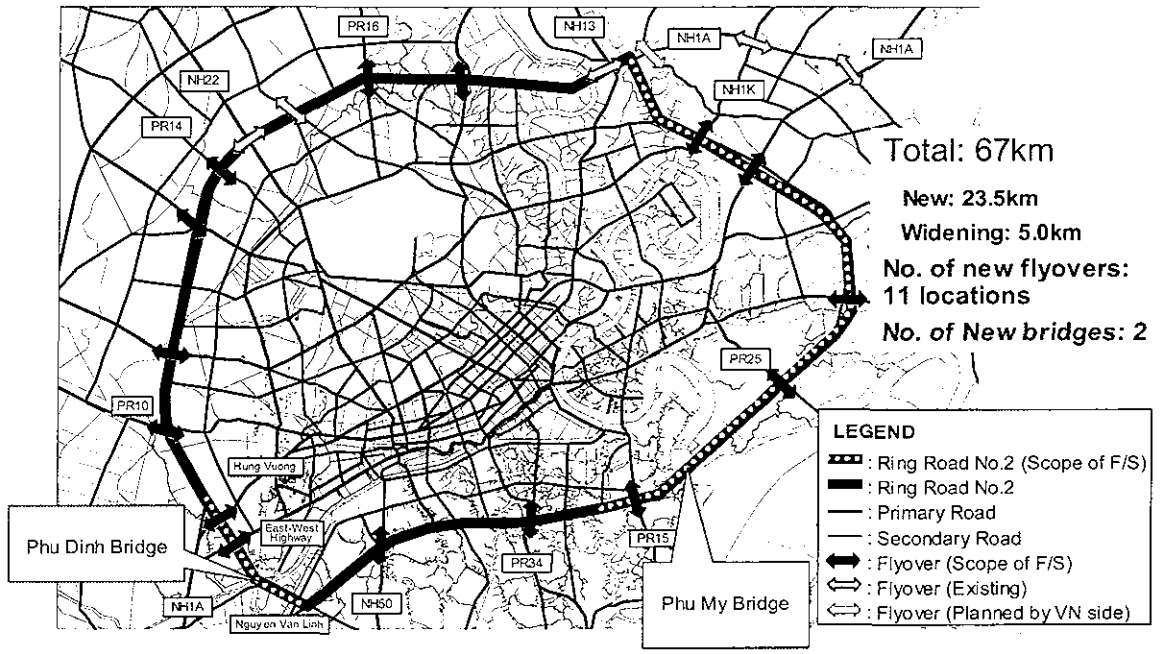
(5) Prepare an effective method for land acquisition and resettlement applicable for at-grade road development

(6) Develop a solid mechanism for bothe build-operate-transfer (BOT) and public-private partnership (PPP) schemes

(7) Evaluate the project from economic, financial, environmental and social perspective.

(8) Develop a project implementation plan

Figure 1.2.1 Components of Ring Road No.2 Project



Source: Study Team

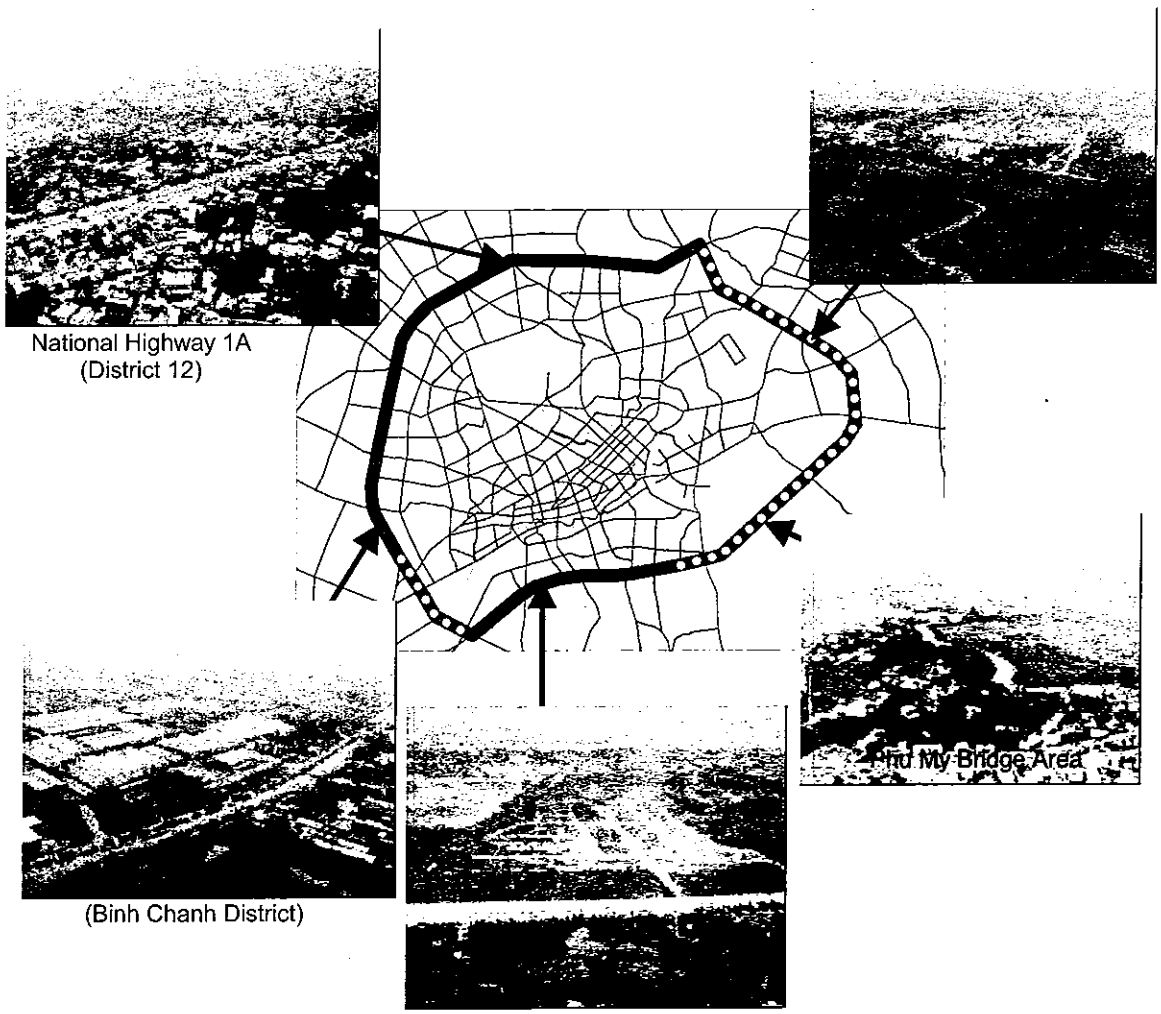
2 CURRENT CONDITION OF PROJECT AREA

2.1 Overview

RR2 was planned to pass through the suburban area of HCM City. An aerial view of the present situation in the project area is shown in Figure 2.1.1.

In the suburban area, majority of land is being used for agriculture. Compared with the inner city, suburban residential areas are mostly scattered residential dwellings, except in the vicinity of the district centers. Along major arterial roads and some canals, ribbon settlements have also developed. There are three major industrial areas in the suburban districts. One is located along Provincial Road No.15 connecting to the southern area of the city through District 7 and Nha Be district. The second is located along National Road No.1, 9 and Thu Duc districts. The third is located along the outer ring road (National Road No.1) from Binh Chanh district to District 2 and Thu Duc district.

Figure 2.1.1 Current Situation in Project Area



Source: aerial photos taken by the Study Team

2.2 Natural Condition of the Project Area

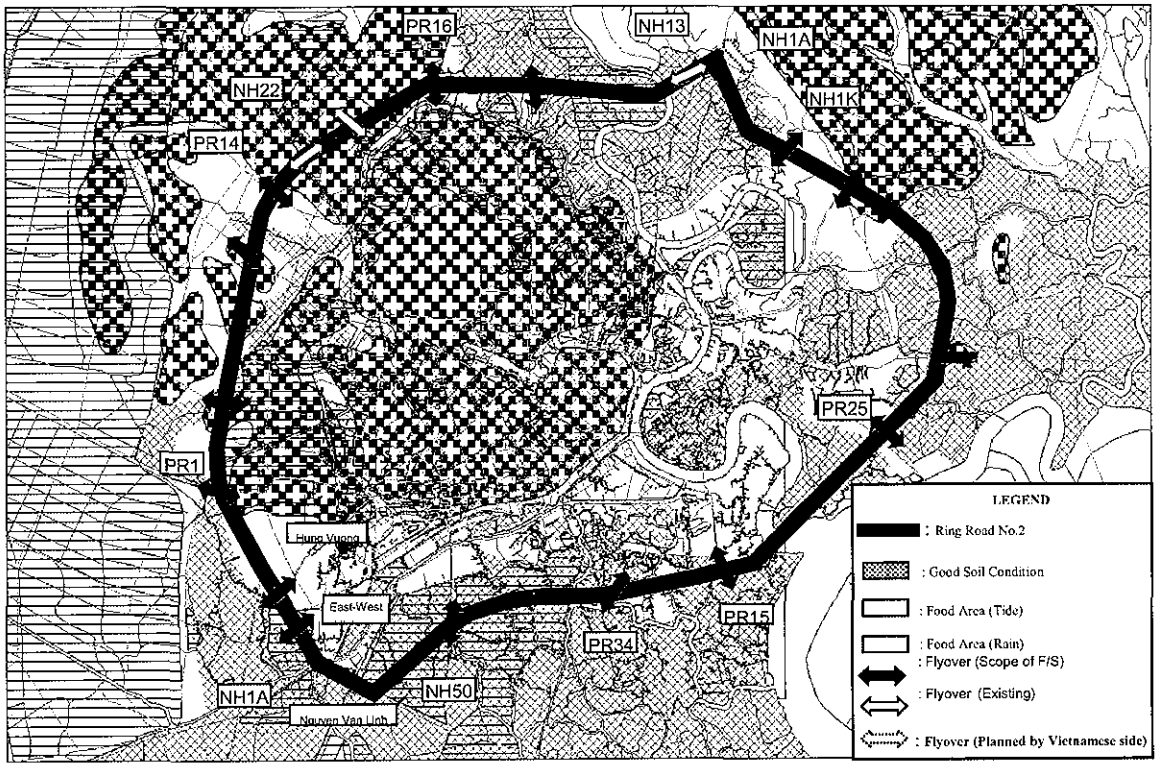
1) Topography

The majority of HCMC is located in the sedimentary plains of the Mekong delta, and is a generally flat an elevation less than 5m above the sea level. On the other hand, the some tips of plateau which extend from the Cambodia border at are partially located at the northern part of Ho Chi Minh City, and The ends of these plateau reach to the vicinity of Tau Hu Ben Nghe canals and Tang Nhon Phu of District 9. The central Ho Chi Minh City is located in the end of this plateau, and surrounded by the sedimentary plains, and it likes to present the aspect of the island that floats on the sea.

Because the Ring Road No.2 is a circular road, the project area is located on the sedimentary plains and the elevation is less than 1m above sea level, excluding slightly the plateau of which the elevation is approximately 7m above sea level around Hanoi Highway. Moreover, the small and medium rivers innumerably run through the sedimentary plains. Therefore, it will require substantial filling and draining to be suitable for developing of the roads and the area. Figure 2.2.1 shows the ground condition around the Project Area.

Topographical Survey was carried out to update existing topographic map with 1:2,000 scale.

Figure 2.2.1 Ground Condition along Ring Road No.2



Source: Study Team

2) Geology

Ho Chi Minh City is located within the extensive flood plain formed by the Mekong, Saigon and Dong Nai Rivers. Deposition has taken place due to the progressive growth of continental deltas from the original river network interspersed by marine inundations arising from the fluctuation of sea level during the glacial period of the Pleistocene. The Holocene saw the final and major marine inundation with steadily rising sea level over the last 10,000 years or so.

As a result of this last inundation soft marine clays now cover a large part of the flood plain and may attain 30 metres in thickness. Formations of peat, accumulations of brackish water swamp deposits and assimilated sandy beach or sand bar deposits can also be contained in this clay and locally they can be quite homogeneous.

The base strata are a cyclic sequence of dense sands and clays of stiff to hard consistency. They have been the subject of sub-aerial section erosion and lateralization giving rise to their over-consolidation and improved soil characteristics.

Older deposits are expected to be present at shallow depth beneath central Ho Chi Minh City, extending northwest from the city center. Everywhere else, adjoining the Saigon River northwards, in Thu Thiem District and in District 4, the soft clays predominate at the surface. Deep channels of soft clays may also be occasionally found in central Ho Chi Minh City.

Groundwater levels are expected to be near to the natural ground surface, at or close to National Datum. A slight seasonal variation may arise between wet and dry seasons.

Exploitable groundwater resources are potentially available in the deeper sands of the older deposits.

However, exploitation has not been undertaken and associated difficulties arising from the resulting regional land subsidence, as has occurred in Bangkok and in Ha Noi, are not anticipated.

Field investigation showed alluvial deposits of the Holocene of soft clay from the flood plain formed by Mekong, Saigon and Dong Nai Rivers. These overlying diluvial deposits of the Pleistocene, which consist of stiff clay and silty sand strata.

The alluvium deposit is of primary importance for this project since this comprises deep soft clay layers and requires high construction cost due to a large scale of foundation and soft ground treatment.

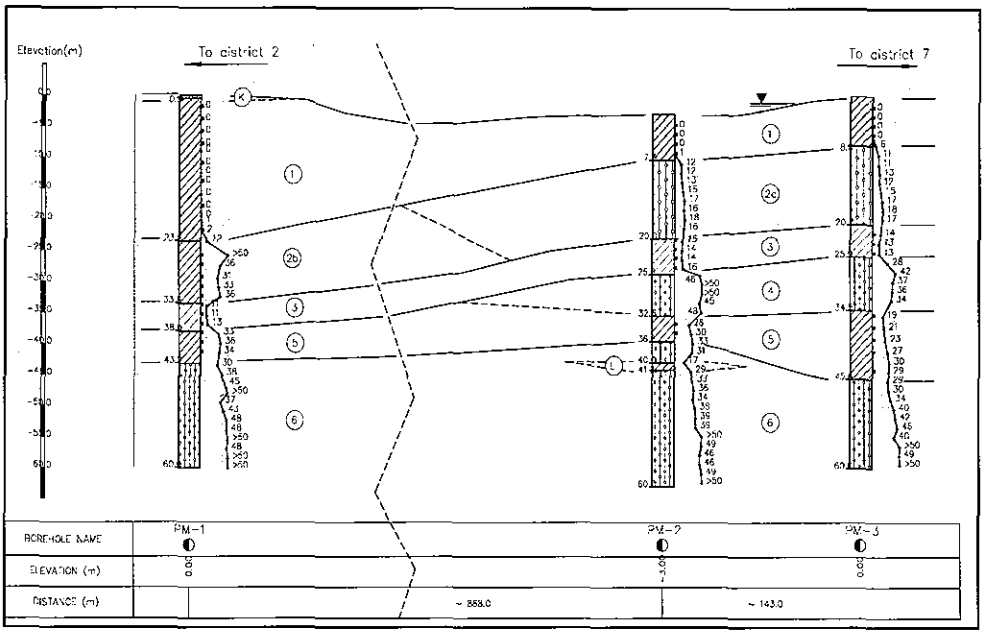
The soft clay is 8 to 23 m deep from the boring log survey results in Phu My and Phu Dinh Bridge locations and to a maximum of 40 m deep from the existing data for East West Highway Construction Project. The soft clay contains fines fraction silt (45.9%) and clay (54.1%) by weight. SPT blow count is 0 and its representative physical and mechanical properties from the surveys in this study are:

In this study, 3 boring log tests with laboratory tests for each Phu My and Phu Dinh Bridges, totaling 6 boring logs, have been carried out to recognize the ground conditions to plan and design these two bridges. The results are shown as geological profile in. Figure 2.2.2 For other roads and structures, the following documents were referred:

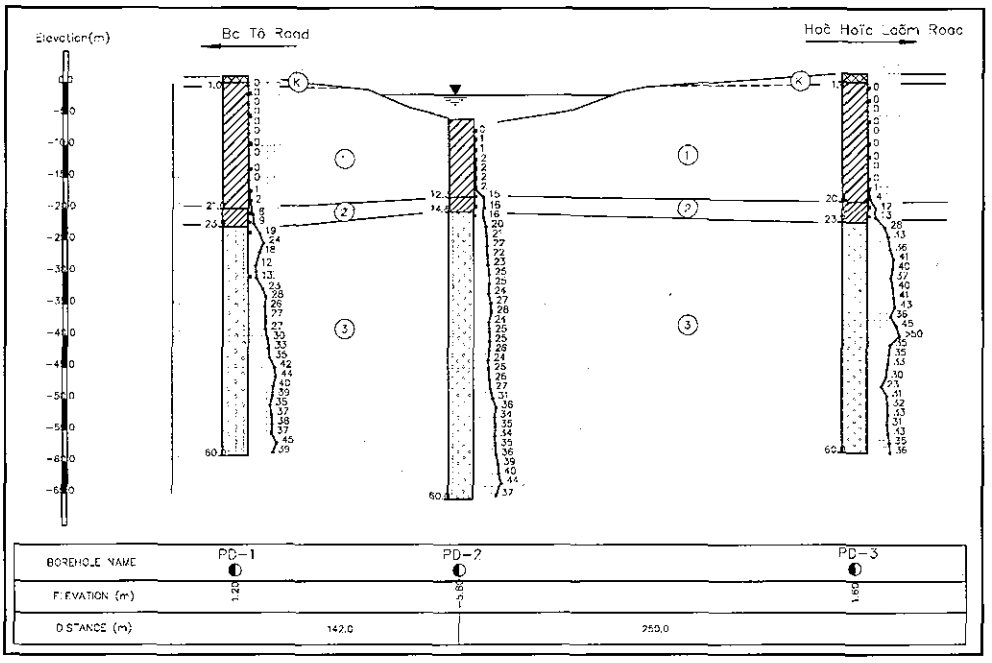
- Detailed Design Report on East West Highway Construction Project
- Geological Map

Figure 2.2.2 Result of Soil Survey

Phu My Bridge



Phu Dinh Bridge



Source: Study Team

Table 2.2.1 Summary of Laboratory Tests

Item		Average	Range
Natural Water Content	Wn	85.9 %	73.1 – 110.5 %
Liquid Limit	LL	87.3 %	63.0 – 106.9 %
Plasticity Index	Ip	54.0	36.7 – 67.2
Unified Classification	-	CH	–
Specific Gravity	Gs	2.677	2.640 – 2.700
Wet Density	t	14.92 kN/m^3	14.00 – 15.60 kN/m^3
Void Ratio	e	2.340	1.996 – 2.941
Unconfined Compression Strength	qu	23.4 kN/mm^2	7.00 – 44.00 kN/mm^2
Pre-consolidation Yield Stress	Py	66.3 kN/mm^2	32.0 – 117.0 kN/mm^2
Compression Index	Cc	1.106	0.668 – 1.598

Source: Study Team

Diluvial deposits are bands of cohesive soil, which consist of light gray clay, and sandy soil, which consist of yellowish brown fine to medium sand.

The light gray clay is intercalated in the silty sand. It contains fine fraction 83.6 % and fine to medium sand 16.4 % by weight. Unified classification is CH and CL.

Yellowish blown fine to medium sand contains fine fraction 17.4 % and fine to medium sand 82.6 % by weight. Unified classification is SC.

The top of strata in the flood plain is located at a depth from 8 to 23m from ground surface. SPT blow count is 12 to 57 and an increase with depth was observed.

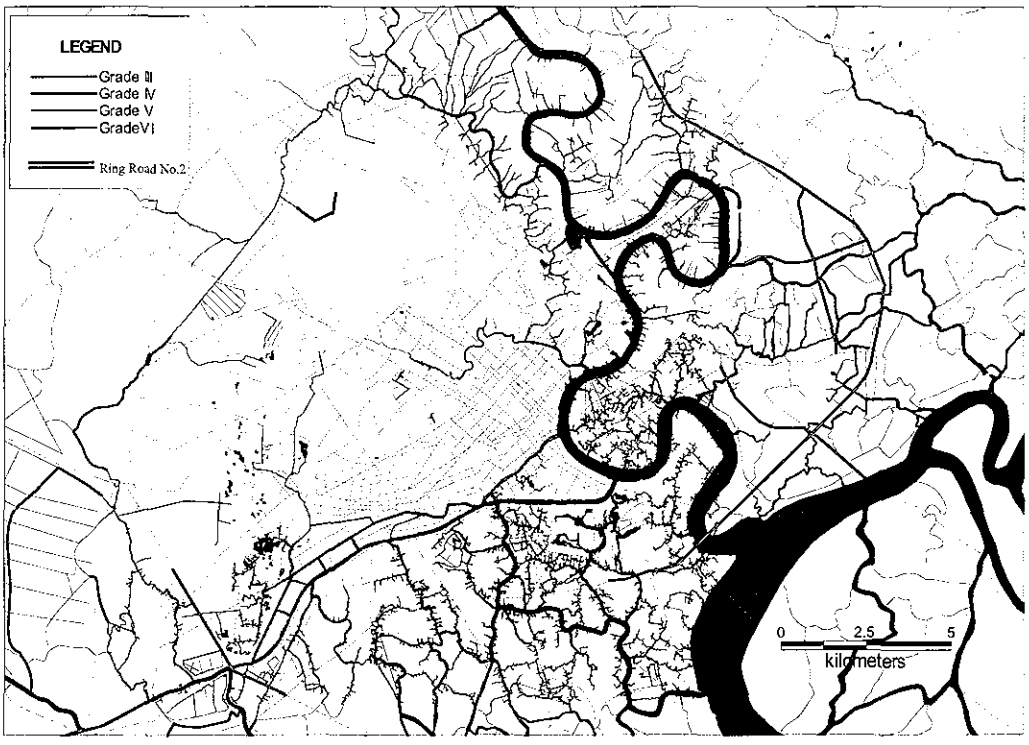
Bearing strata (Sandy soil: N>30, cohesive Soil: N>20) are located 25~50m from ground surface.

3) Navigation

The navigation clearance is stipulated in the Vietnamese Standard (TCVN 5664-1992, Technical classification of inland waterway), which is published by the MOSTE, and the Study conforms to this standard.

Rivers and canals are classified into six grades. Figure 2.2.3 shows these locations from Grade III to VI in the project area. And, the applied navigation clearance is shown in table Navigable Rivers and Canals in Project Area

Figure 2.2.3 Rivers and Canals in the Study Area



Source: MOSTE, TCVN 5664-1992

Table 2.2.2 Classification of Inland Waterway in TCVN 5664-1992

Grade	Dimension of structure (m)			
	Bridge			Power line clearance without electronic field
	Aperture		Clearance	
	River	Canal		
I	80	50	10	12
II	60	40	9	11
III	50	30	7	9
IV	40	25	6(5)	8
V	25	20	3,5	8
VI	15	10	2,5	8

Source: MOSTE, TCVN 5664-1992

2.3 Socio-economic Conditions

1) Population

From 1997 to 2001, HCMC's population increased from more than 4.8 million to almost 5.3 million at an annual rate of 2.2% (an increase of about 100 thousand annually). Table 2.3.1 shows the population growth and density along the existing and proposed sections of RR2. The present population in the existing section is approximately 0.6 million with a density of 33 persons/ha, while that in the proposed section (eastern section) the population is 0.5 million with a density of 33 persons/ha.

Except for District 8, the population in the corridor is expected to increase rapidly. At present, District 2 has the highest growth rate at more than 10% annually, followed by

Binh Chanh district. The development impact of the eastern section of the ring road will be not be limited to the newly constructed sections, but will extend to the whole stretch of the ring road.

Table 2.3.1 Population Growth and Density in Ring Road No.2 Corridor

	District Name	Zone No.	SOCIO-ECONOMY						
			Population (000)			Growth Rate (%/year)		Popultaion Density (ps/ha)	
			1996[2]	2002	2020[1]	1996[2]-2002	2002-2020[1]	2002 Total[3]	2020[1] Total[3]
EAST-Section	Thu Duc District	201	17	20	55	2.7	6.8	52	145
		202	18	21	48	2.7	5.6	47	107
		203	39	46	75	2.7	3.7	113	185
		204	19	23	72	2.7	7.6	31	99
		205	22	22	35	-0.4	2.5	81	130
		206	15	16	32	1.1	4.3	63	125
		207	26	34	79	5.1	6.5	44	101
		208	15	19	43	3.3	5.9	27	62
		209	20	28	84	5.8	8.3	44	133
		Total	**191**	**228**	**523**	**3.0**	**5.7**	**50**	**114**
	District 9	148	19	49	79	16.9	8.2	95	153
		149	19	20	34	0.9	3.2	90	151
		154	16	12	38	-4.5	4.9	10	31
		155	22	13	29	-7.8	1.6	29	62
		156	18	26	91	6.1	9.3	27	94
		150	6	5	32	-1.8	9.9	4	27
		151	13	12	49	-1.0	7.8	6	26
		Total	**113**	**138**	**352**	**3.4**	**6.5**	**21**	**54**
	District 2	137	13	16	102	3.0	11.9	13	85
		139	26	22	130	-2.5	9.3	18	104
		Total	**39**	**38**	**232**	**-0.5**	**10.3**	**16**	**95**
	District 7	142	12	16	36	5.6	6.5	25	57
		143	24	26	58	1.4	5.1	96	216
		144	28	31	50	1.4	3.1	163	261
		145	19	21	61	1.4	6.7	31	91
		146	16	18	55	1.4	7.0	29	91
		147	8	9	19	1.4	5.1	37	82
		Total	**107**	**120**	**279**	**1.9**	**5.5**	**46**	**107**
WEST-Section	District 12	157	20	25	76	4.2	7.8	66	201
		158	34	44	126	4.6	7.6	105	300
		159	30	22	68	-4.6	4.7	84	256
		160	16	18	54	2.2	7.1	41	126
		161	27	46	139	9.2	9.5	35	105
		162	24	29	88	3.2	7.5	20	61
		163	11	13	40	2.5	7.2	17	53
		Total	**162**	**198**	**592**	**3.4**	**7.5**	**39**	**118**
	Go Vap District	102	33	54	122	8.6	7.5	254	572
		103	47	48	108	0.3	4.7	355	800
		104	23	19	43	-2.9	3.6	72	162
		Total	**103**	**121**	**273**	**2.7**	**5.6**	**197**	**445**
	Hoc Mon District	200	28	29	62	0.9	4.5	43	91
		Total	**28**	**29**	**62**	**0.9**	**4.5**	**43**	**91**
	Binh Chanh District	171	14	16	59	1.7	8.2	9	33
		181	17	26	135	7.4	12.3	14	76
		182	25	45	167	10.4	11.2	37	140
		183	23	53	198	15.1	12.7	32	121
		175	15	22	73	6.6	9.1	18	59
		176	13	14	45	0.9	7.1	7	24
		177	7	8	25	0.3	6.9	12	41
		179	12	15	56	4.7	9.2	13	49
		180	35	44	144	4.1	8.3	71	232
		Total	**160**	**242**	**902**	**7.1**	**10.1**	**20**	**76**
	District 8	64	11	14	30	3.1	5.6	46	103
		65	2	3	24	3.1	14.4	11	101
		71	8	9	9	2.1	0.5	173	166
		72	6	9	33	6.9	10.1	27	104
		Total	**27**	**34**	**96**	**3.7**	**7.2**	**38**	**106**

Source: Study Team
[1] Estimated by HOUTRANS study team
[2] HCM Transport Study (DfID-MVA)
[3] Area excluding river area

2) Road Availability

Table 2.3.2 shows the daytime and night-time population of the ring road corridor. Dominant daytime population in the future is expected in the corridor of the proposed new sections. Currently, the night-time population of the existing ring road corridor is larger than the daytime population. This means that the existing western section has been serving industries and educational facilities in the area.

This table also shows the road network in the ring road corridor. In order to ensure the mobility of the future population and economic activities, expansion of the road network will be indispensable.

Table 2.3.2 Day Time and Night Time Population and Road Availability

	District Name	Zone No.	SOCIO-ECONOMY													
			Day/Night Population Ratio						Road Length (km)[4]		Road Availability[3]					
			2002			2020[1]					% to Area		Length/pop. (km/mil.)			
											2002	2020[4]	2002		2020[4]	
			Employ-ment	Student	Total	Employ-ment	Student	Total	2002	2020[4]	Total[2]	Total[2]	Day Time	Night Time	Day Time	Night Time
EAST-Section	Thu Duc District	201	1.1	0.8	1.0	0.6	0.5	0.7	4	3	2.0	3.1	181	184	85	60
		202	1.2	0.8	1.0	0.4	0.6	0.6	0	3	0.0	2.5	0	0	107	63
		203	1.3	2.6	1.5	0.6	5.0	1.5	5	10	2.7	6.7	70	106	94	140
		204	4.0	1.5	2.4	1.4	6.0	2.1	0	6	0.0	1.5	0	0	37	78
		205	0.7	0.9	0.8	0.3	1.1	0.7	0	2	0.0	4.0	0	0	103	68
		206	0.7	1.1	0.9	0.3	1.4	0.7	0	5	0.0	4.8	0	0	212	145
		207	0.9	0.7	0.9	0.8	0.8	0.9	1	6	0.4	2.7	29	26	91	79
		208	1.1	0.7	1.0	0.4	0.7	0.6	3	9	1.1	3.5	169	168	327	207
		209	1.1	1.0	1.1	0.5	0.5	0.6	4	10	1.2	4.7	146	155	185	118
		Total	**1.3**	**1.3**	**1.2**	**0.6**	**2.1**	**1.0**	**17**	**54**	**0.8**	**3.5**	**61**	**74**	**104**	**104**
	District 9	148	0.7	0.7	0.8	0.8	2.0	1.1	5	21	2.3	13.8	117	93	254	271
		149	0.8	0.8	0.9	3.8	2.9	2.8	0	3	0.0	5.6	0	0	30	85
		154	0.5	1.4	0.9	0.8	1.1	0.9	0	9	0.0	2.0	0	0	267	241
		155	0.6	0.9	0.8	0.5	1.0	0.7	2	5	1.1	3.9	185	146	210	155
		156	0.5	0.8	0.7	0.6	2.3	1.0	0	10	0.0	2.9	0	0	115	115
		150	0.5	0.5	0.7	2.2	3.0	2.0	0	4	0.0	1.5	0	0	66	133
		151	0.8	0.7	0.8	1.0	0.9	1.0	0	11	0.0	1.6	0	0	238	228
		Total	**0.6**	**0.8**	**0.8**	**1.2**	**1.9**	**1.2**	**6**	**64**	**0.3**	**3.1**	**59**	**47**	**146**	**182**
	District 2	137	1.1	0.8	1.0	2.5	0.7	1.7	0	9	0.0	3.0	0	0	51	88
		139	*0.7*	*1.2*	*0.9*	*0.5*	*0.8*	*0.7*	*5*	*10*	*0.4*	*2.5*	*247*	*230*	*111*	*80*
		Total	**0.9**	**1.0**	**1.0**	**1.4**	**0.8**	**1.2**	**5**	**19**	**0.2**	**2.7**	**140**	**135**	**71**	**83**
	District 7	142	5.1	0.6	2.7	5.6	0.4	3.4	3	3	0.9	0.9	63	169	22	76
		143	1.1	0.8	1.0	0.3	0.6	0.5	3	3	2.7	2.8	106	106	94	50
		144	0.6	1.0	0.8	0.2	1.0	0.5	1	3	0.9	2.1	47	39	99	54
		145	0.9	0.8	0.9	0.7	0.4	0.7	7	14	1.3	4.3	390	350	325	236
		146	0.7	0.3	0.7	2.9	0.2	1.9	6	10	2.3	4.9	468	346	101	190
		147	1.1	2.0	1.3	0.4	1.4	0.7	0	2	0.1	0.9	24	30	118	87
		Total	**1.4**	**0.8**	**1.1**	**1.6**	**0.6**	**1.2**	**20**	**35**	**1.5**	**3.0**	**148**	**170**	**102**	**125**
WEST-Section	District 12	157	0.8	0.6	0.8	0.2	0.5	0.5	1	4	1.0	2.2	61	51	96	47
		158	0.9	0.8	0.9	0.3	0.6	0.6	3	6	1.8	5.2	84	76	85	47
		159	0.9	1.0	0.9	0.3	0.7	0.5	6	7	4.9	7.0	283	262	191	104
		160	1.0	0.8	1.0	1.5	0.5	1.2	3	4	0.7	2.3	156	150	70	82
		161	1.1	0.7	1.0	0.9	0.5	0.9	7	17	1.1	3.2	143	143	141	122
		162	0.7	0.8	0.9	0.3	0.6	0.5	11	15	1.9	2.9	463	394	334	175
		163	1.2	0.6	1.0	0.5	0.4	0.6	2	8	0.8	2.7	149	150	300	189
		Total	**0.9**	**0.8**	**0.9**	**0.6**	**0.5**	**0.7**	**33**	**61**	**1.5**	**3.3**	**182**	**168**	**153**	**103**
	Go Vap District	102	0.6	0.7	0.8	0.2	0.8	0.6	0	5	0.5	5.7	11	8	74	41
		103	0.7	1.1	0.9	0.1	0.3	0.4	3	8	2.7	14.6	77	69	198	78
		104	0.7	0.9	0.9	0.7	1.0	0.8	0	0	0.0	0.0	0	0	0	0
		Total	**0.7**	**0.9**	**0.8**	**0.3**	**0.6**	**0.5**	**4**	**13**	**0.8**	**5.2**	**37**	**31**	**91**	**49**
	Hoc Mon District	200	0.8	1.3	1.0	0.6	0.5	0.7	0	3	0.0	0.9	0	0	81	55
		Total	**0.8**	**1.3**	**1.0**	**0.6**	**0.5**	**0.7**	**0**	**3**	**0.0**	**0.9**	**0**	**0**	**81**	**55**
	Binh Chanh District	171	0.9	0.3	0.8	0.3	0.3	0.5	6	20	0.5	2.5	443	356	696	333
		181	3.1	0.7	2.0	0.1	0.2	0.4	9	17	0.8	2.8	172	348	338	124
		182	0.9	0.4	0.8	0.0	0.1	0.3	1	11	0.2	2.3	31	26	204	64
		183	0.6	0.5	0.7	0.0	0.1	0.3	7	19	1.0	3.1	187	135	292	96
		175	0.5	0.4	0.7	3.6	0.5	2.3	11	16	0.9	2.9	777	512	94	215
		176	0.7	0.3	0.7	2.1	1.3	1.7	1	7	0.0	0.9	*76*	*56*	99	*165*
		177	1.0	0.5	0.9	0.5	1.7	0.8	3	4	1.3	1.4	496	446	203	169
		179	1.3	0.7	1.1	0.1	0.2	0.3	1	6	0.3	1.5	74	83	291	100
		180	1.2	1.1	1.1	0.2	0.1	0.4	6	10	2.4	5.3	129	140	174	70
		Total	**1.1**	**0.6**	**1.0**	**0.5**	**0.3**	**0.6**	**46**	**109**	**0.7**	**2.4**	**194**	**189**	**204**	**121**
	District 8	64	0.4	0.3	0.6	1.7	2.0	1.6	4	12	1.4	9.9	461	270	263	411
		65	0.9	0.4	0.8	0.6	0.4	0.7	0	3	0.0	2.1	0	0	173	115
		71	0.5	0.3	0.6	0.6	0.4	0.7	0	0	0.0	0.0	0	0	0	0
		72	0.7	0.2	0.7	0.2	0.1	0.4	2	2	0.9	2.1	373	271	124	52
		Total	**0.5**	**0.3**	**0.7**	**0.8**	**0.8**	**0.9**	**6**	**17**	**0.8**	**4.5**	**268**	**176**	**203**	**176**

Source: Study Team
[1] Estimated by HOUTRANS study team
[2] Area excluding river area
[3] Primary/secondary roads only, from HOUTRANS GIS
[4] HOUTRANS Master Plan

2.4 Land Use and Environment

1) Land Use

The existing land use features in the RR2 corridor are listed in Table 2.4.1 and illustrated in Figure 2.4.1. These features are as follows:

(1) 80% of the corridor is agricultural land. Urbanized areas are limited to the area where the ring road crosses major radial roads, such as National Highway No.1, 22 and 13.

(2) Urbanized area of the proposed eastern section is bigger than that of the existing ring road corridor (western section). A comparatively higher development pressure can be observed in the eastern section because of the rapid economic growth in this area including the HCM ~ Bien Hoa growth corridor.

(3) Once completed, the proposed RR2 (east) will improve the accessibility in the whole corridor so that urbanization in this area will rapidly spread. Table 2.4.1 also shows the land use pattern in 2020. Urbanized areas will cover 65% of the corridor, while less than 30% will be devoted to agriculture.

(4) Dominant land use in the future urbanized areas in the corridor will be residential, sharing 50% of the corridor.

(5) Figure 2.4.2 shows the future land use for the proposed new ring road corridor. Industrialization in the corridor will be further enhanced.

(6) In order to avoid expansion of urban sprawl, a planned development based on RR2 and its supplementary road network (secondary road) will be indispensable. Existing and proposed ring road sections will cover an area of approximately 19,000ha and 16,000ha in size, respectively. The corridor boundary is referred to in the planning zone system (Figure 2.4.3).

2) Environment

The southwestern section of RR2 is located in the suburbs where there are still many trees and plants especially in the residential areas as shown in Figure 2.4.4

The eastern section of the RR2 is characterized by two distinct features. The northern part, mostly in Thu Duc and District 9, has a suburban setting with a stable natural environment. The southern part, which is in District 2, is located in the lowland where there are agricultural fields and uncultivated land. And although it has many waterways and a rich natural environment, no unique fauna and flora can be found here. Nonetheless, the environment in the southern part is more sensitive than that in other areas of the project.

Table 2.4.1 Existing and Future Land Use

Existing Land Use Composition

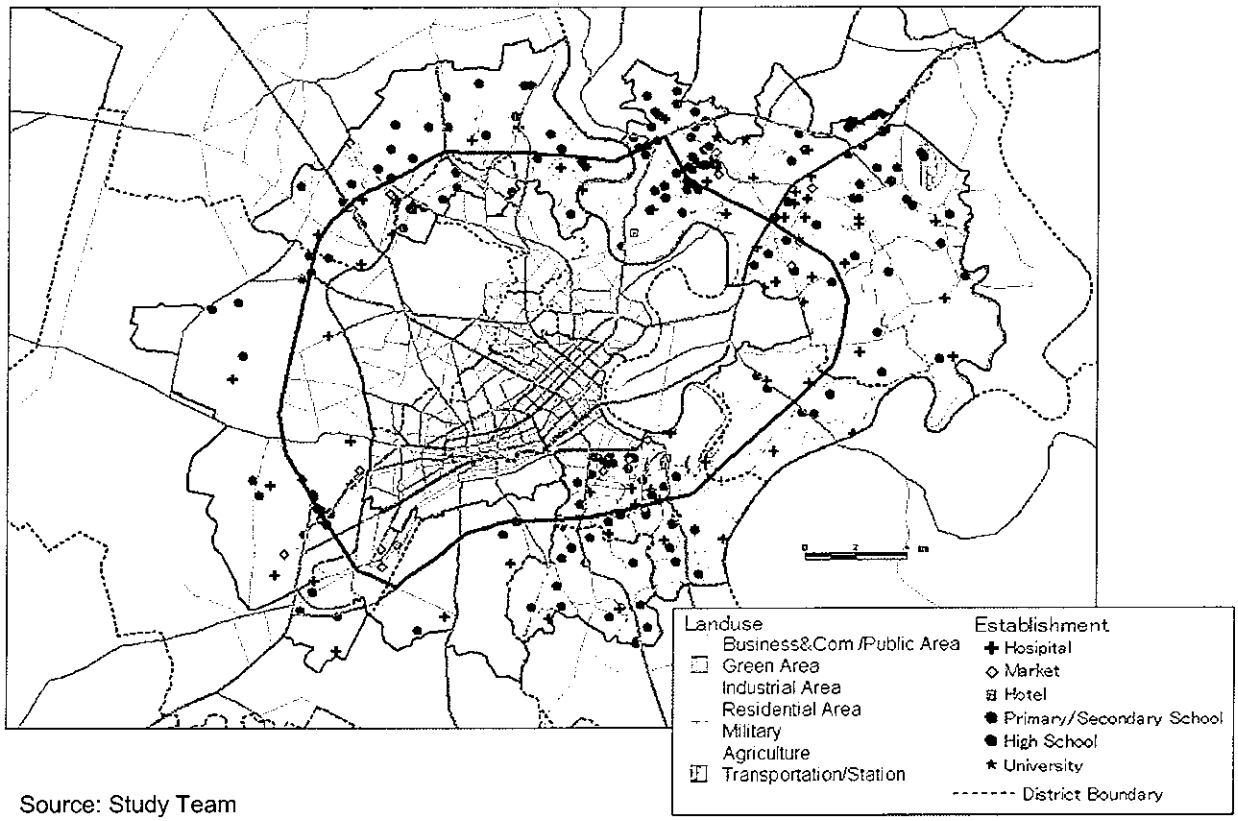
District Name	Planning Zone No.	Residential Area		Business & Commercial / Public Area		Industrial Area		Developed Area		Agriculture		Green Area		Others (incl. Military)		Total	
		2002		2002		2002		2002		2002		2002		2002			
		(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Thu Duc District	412	266	25.8	11	1.1	8	0.8	**285**	**27.6**	642	62.2	0	0.0	105	10.1	1,032	100.0
Thu Duc District	411	305	23.2	13	1.0	28	2.1	**346**	**26.3**	970	73.7	0	0.0	0	0.0	1,316	100.0
Thu Duc District	401	195	27.2	18	2.5	151	21.0	**364**	**50.7**	345	48.0	0	0.0	9	1.3	718	100.0
Thu Duc District	402	373	24.6	90	5.9	222	14.6	**685**	**45.2**	671	44.3	0	0.0	160	10.5	1,516	100.0
District 9	161	169	32.6	21	4.1	68	13.1	**258**	**49.8**	245	47.3	0	0.0	15	2.9	518	100.0
District 9	162	665	23.2	128	4.5	78	2.7	**871**	**30.3**	1,755	61.1	133	4.6	113	3.9	2,872	100.0
District 9	171	208	6.8	8	0.3	1	0.0	**217**	**7.1**	2,647	86.1	0	0.0	211	6.8	3,075	100.0
District 2	3	153	6.2	7	0.3	51	2.1	**212**	**8.7**	1,678	68.6	0	0.0	557	22.8	2,446	100.0
District 7	12	260	23.9	7	0.6	426	39.1	**694**	**63.6**	149	13.7	21	1.9	226	20.8	1,090	100.0
District 7	13	221	14.6	18	1.2	76	5.0	**314**	**20.8**	1,196	79.2	0	0.0	0	0.0	1,510	100.0
Sub-total		2,816	17.5	321	2.0	1,109	6.9	**4,246**	**26.4**	10,298	64.0	154	1.0	1,395	8.7	16,093	100.0
District 12	221	123	16.2	2	0.3	2	0.3	**127**	**16.7**	631	83.2	0	0.0	0	0.1	758	100.0
District 12	222	219	15.1	6	0.4	9	0.6	**234**	**16.1**	1,133	78.1	0	0.0	84	5.8	1,451	100.0
District 12	21	739	26.2	98	3.5	71	2.5	**907**	**32.2**	1,732	61.4	0	0.0	180	6.4	2,819	100.0
Go Vap District	242	457	74.4	11	1.8	19	3.1	**486**	**79.2**	128	20.8	0	0.0	0	0.0	614	100.0
Hoc Mon District	zone 200	167	24.5	3	0.4	3	0.4	**173**	**25.4**	508	74.6	0	0.0	0	0.0	681	100.0
Binh Chanh District	362 excl.a	709	11.1	12	0.2	36	0.6	**757**	**11.8**	5,654	88.2	0	0.0	0	0.0	6,411	100.0
Binh Chanh District	371	198	15.8	0	0.0	0	0.0	**198**	**15.8**	1,052	84.2	0	0.0	0	0.0	1,250	100.0
Binh Chanh District	zone 176	195	10.6	2	0.1	0	0.0	**197**	**10.7**	1,645	89.3	0	0.0	0	0.0	1,842	100.0
Binh Chanh District	382	380	16.0	8	0.3	36	1.5	**424**	**17.8**	1,957	82.2	0	0.0	0	0.0	2,381	100.0
District 8	62	73	13.2	2	0.3	211	38.1	**285**	**51.6**	266	48.0	0	0.0	2	0.4	553	100.0
District 8	151	92	26.4	103	29.6	87	25.0	**282**	**81.0**	59	17.0	0	0.0	7	1.9	348	100.0
Sub-total		3,351	17.5	246	1.3	473	2.5	**4,071**	**21.3**	14,765	77.3	0	0.0	273	1.4	19,108	100.0
Total		6,166	17.5	568	1.6	1,583	4.5	**8,317**	**23.6**	25,063	71.2	154	0.4	1,668	4.7	35,201	100.0

Future Land Use Composition

District Name	Planning Zone No.	Residential Area		Business & Commercial / Public Area		Industrial Area		Developed Area		Agriculture		Green Area		Others (incl. Military)		Sub Total	
		2020		2020		2020		2020		2020		2020		2020			
		(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Thu Duc District	412	682	66.1	22	2.1	48	4.7	**752**	**72.9**	270	26.2	10	1.0	0	0.0	1,032	100.0
Thu Duc District	411	566	43.0	33	2.5	72	5.5	**671**	**51.0**	630	47.9	15	1.1	0	0.0	1,316	100.0
Thu Duc District	401	283	39.4	75	10.4	210	29.2	**568**	**79.1**	150	20.9	0	0.0	0	0.0	718	100.0
Thu Duc District	402	582	38.4	95	6.3	320	21.1	**997**	**65.8**	350	23.1	5	0.3	164	10.8	1,516	100.0
District 9	161	364	70.3	87	16.8	30	5.8	**481**	**92.9**	0	0.0	22	4.2	15	2.9	518	100.0
District 9	162	1,562	54.4	185	6.4	470	16.4	**2,217**	**77.2**	550	19.2	105	3.7	0	0.0	2,872	100.0
District 9	171	930	30.2	30	1.0	20	0.7	**980**	**31.9**	2,050	66.7	45	1.5	0	0.0	3,075	100.0
District 2	3	560	22.9	40	1.6	70	2.9	**670**	**27.4**	1,200	49.1	20	0.8	556	22.7	2,446	100.0
District 7	12	274	25.1	30	2.8	500	45.9	**804**	**73.8**	30	2.8	30	2.8	226	20.7	1,090	100.0
District 7	13	611	40.5	170	11.3	200	13.2	**981**	**65.0**	499	33.0	30	2.0	0	0.0	1,510	100.0
Sub-total		6,414	39.9	767	4.8	1,940	12.1	**9,121**	**56.7**	5,729	35.6	282	1.8	961	6.0	16,093	100.0
District 12	221	342	45.1	12	1.6	40	5.3	**394**	**52.0**	283	37.3	10	1.3	71	9.4	758	100.0
District 12	222	734	50.6	18	1.2	60	4.1	**812**	**56.0**	617	42.5	15	1.0	7	0.5	1,451	100.0
District 12	21	1,504	53.4	170	6.0	260	9.2	**1,934**	**68.6**	700	24.8	5	0.2	180	6.4	2,819	100.0
Go Vap District	242	528	86.0	50	8.1	8	1.3	**586**	**95.4**	0	0.0	28	4.6	0	0.0	614	100.0
Hoc Mon District	zone 200	340	49.9	12	1.8	115	16.9	**467**	**68.6**	209	30.7	5	0.7	0	0.0	681	100.0
Binh Chanh District	362 excl.a	3,870	60.4	195	3.0	1,000	15.6	**5,065**	**79.0**	886	13.8	460	7.2	0	0.0	6,411	100.0
Binh Chanh District	371	870	69.6	10	0.8	120	9.6	**1,000**	**80.0**	243	19.4	7	0.6	0	0.0	1,250	100.0
Binh Chanh District	*zone 176*	*630*	*34.2*	*25*	*1.4*	*45*	*2.4*	***700***	***38.0***	*1,093*	*59.3*	*49*	*2.7*	*0*	*0.0*	*1,842*	*100.0*
Binh Chanh District	382	1,729	72.6	65	2.7	340	14.3	**2,134**	**89.6**	221	9.3	26	1.1	0	0.0	2,381	100.0
District 8	62	392	70.9	30	5.4	124	22.4	**546**	**98.7**	0	0.0	5	0.9	2	0.4	553	100.0
District 8	151	180	51.7	112	32.2	52	14.9	**344**	**98.9**	0	0.0	4	1.1	0	0.0	348	100.0
Sub-total		11,119	58.2	699	3.7	2,164	11.3	**13,982**	**73.2**	4,252	22.3	614	3.2	260	1.4	19,108	100.0
Total		17,533	49.8	1,466	4.2	4,104	11.7	**23,103**	**65.6**	9,981	28.4	896	2.6	1,221	3.5	35,201	100.0

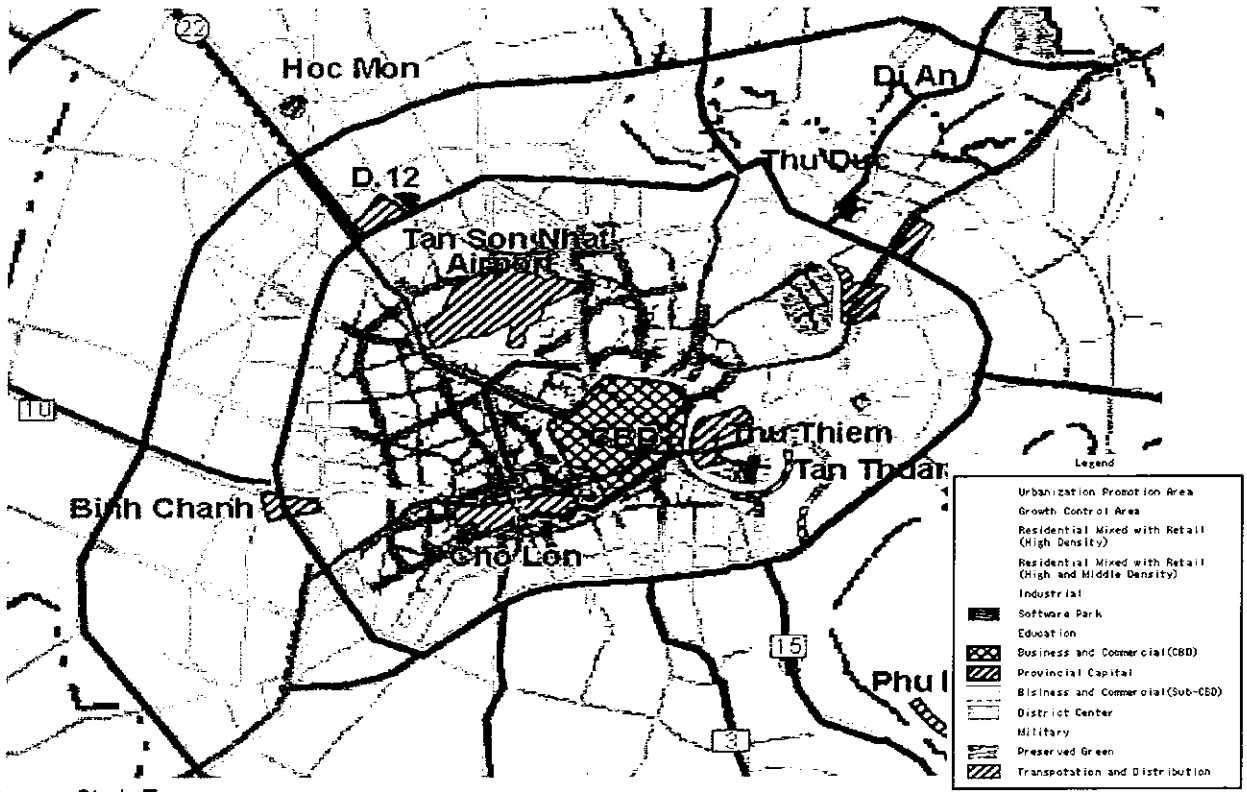
Source: Study Team

Figure 2.4.1 Existing Land Use



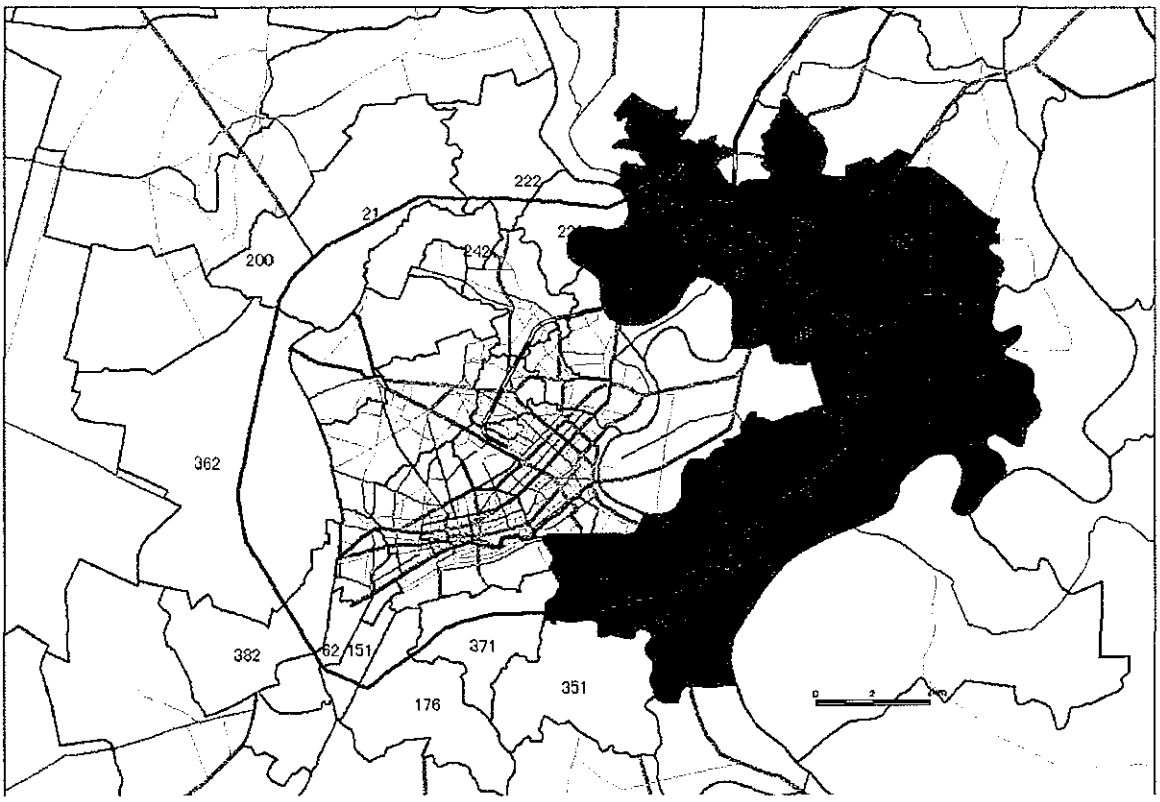
Source: Study Team

Figure 2.4.2 Future Land Use



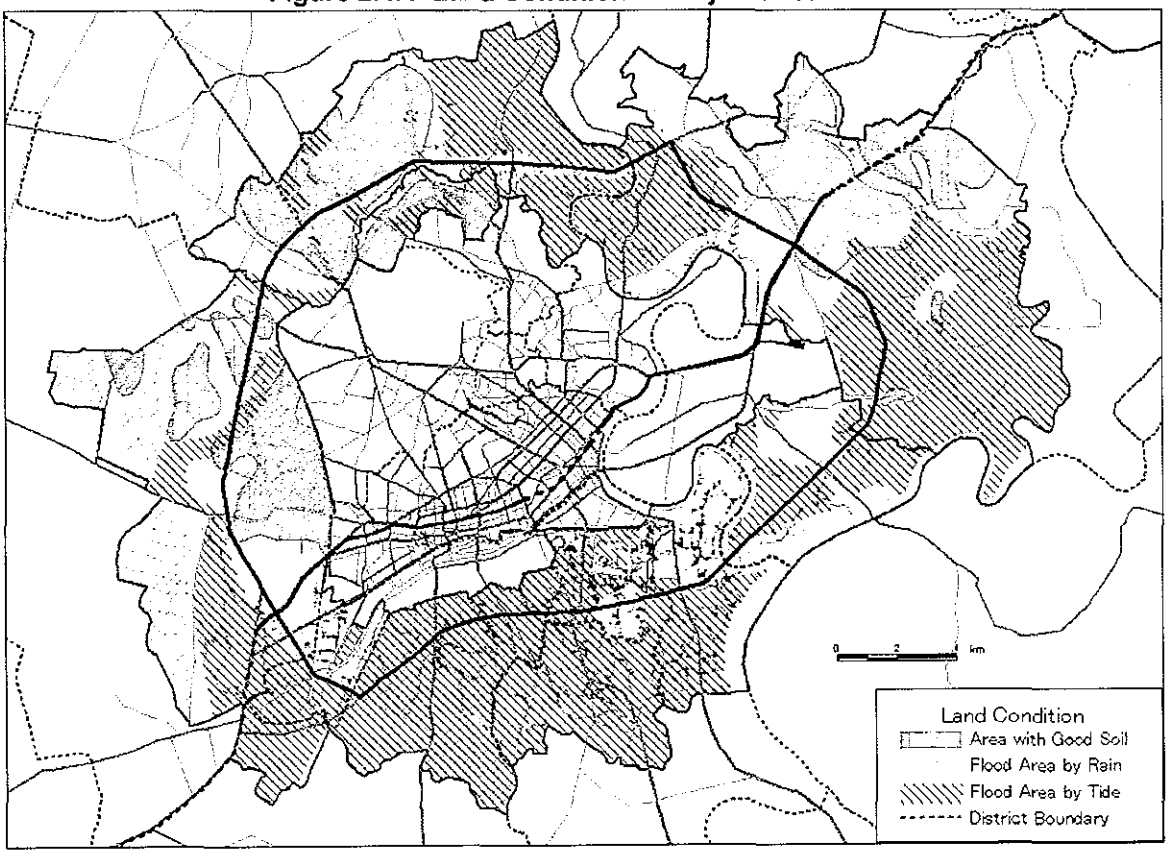
Source: Study Team

Figure 2.4.3 Zones in Project Area



Source: Study Team

Figure 2.4.4 Land Condition in Project Area



Source: Study Team

3 PROJECT ROAD: CURRENT SITUATION AND FUTURE TRAFFIC DEMAND

3.1 Existing Condition of Ring Road No.2

Base on the existing development level, the proposed Ring road No.2 can be divided into 4 sections. Figure 3.1.1 is showing the current situation of the 4 sections including present development such as section length, paved width and road width.

Section A is the missing link, which will be a main project in this feasibility study. Some other sections area newly constructed with 4 lanes dual carriageway, while some sections are just rural road grade with 2 lanes – single carriageway. The existing road conditions area shown in Figure 3.1.2

Table 3.1.1 Current Situation of the Ring Road No.2 Development

	Section	Length (Km)	ROW (m)	Project Period
Asian Highway	An Suong - Tram II	22.5	33	1999-2003
BOT Project	An Suong - An Lac	17.7	33	2001-2008
Saigon South Development	An Lac NguyenTat Thanh	17.6	26-30	1990-n.a.

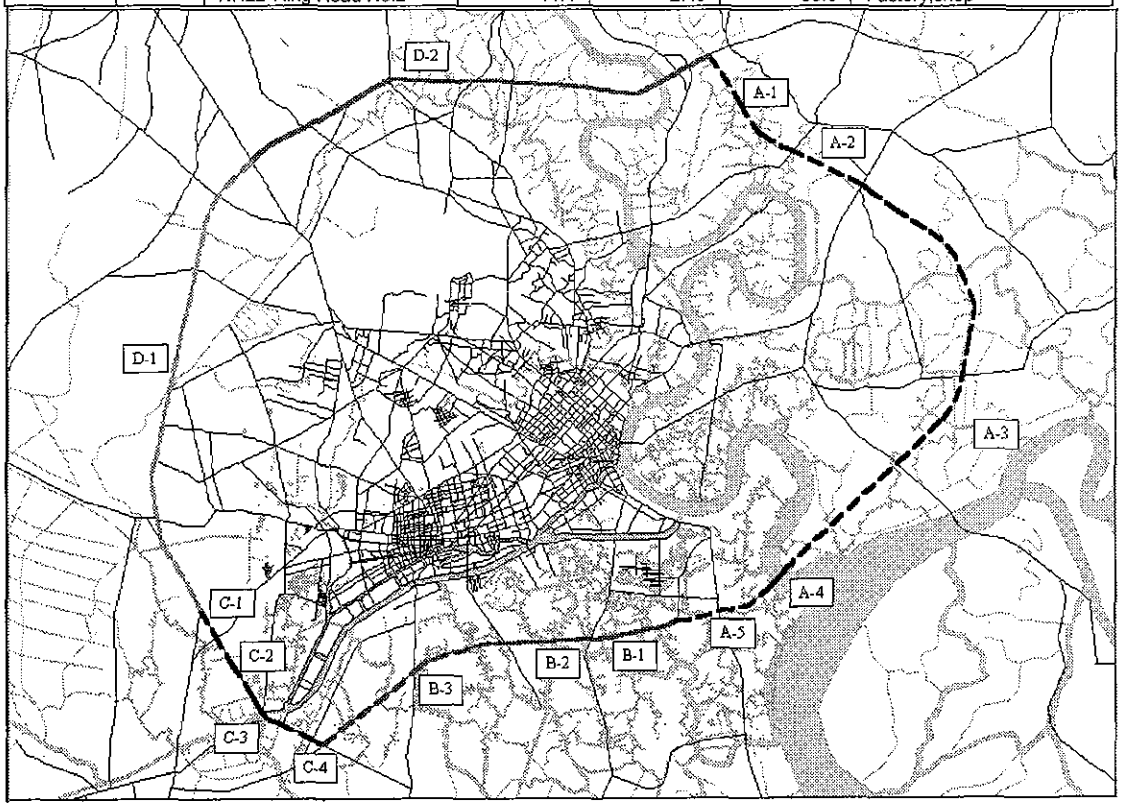
Source: Study Team

Figure 3.1.3 shows the cross section of these roads. As for A section, the divided 4-lane + motorcycle lane is developed by ADB as previously mentioned. The divided 4-lane began to construct though the section B has 2-lane now. The divided 4-lane have already constructed in sections G and H. The section F that is a next of the section G on Nguyen Van Linh Road is still 2-lane. However, It is under construction to the divided 4-lane. The section from C to E is 2-lane road, and its pavement condition is bad.

Figure 3.1.4 shows the situation of the major crossroads. These roads have already developed or are developing or have the development plan. However, the crossings, which have already constructed or have the plan for installation of interchange is slightly three locations including National Highway No.22 and National Highway No.13. It is difficult to realize an efficient and smooth transport.

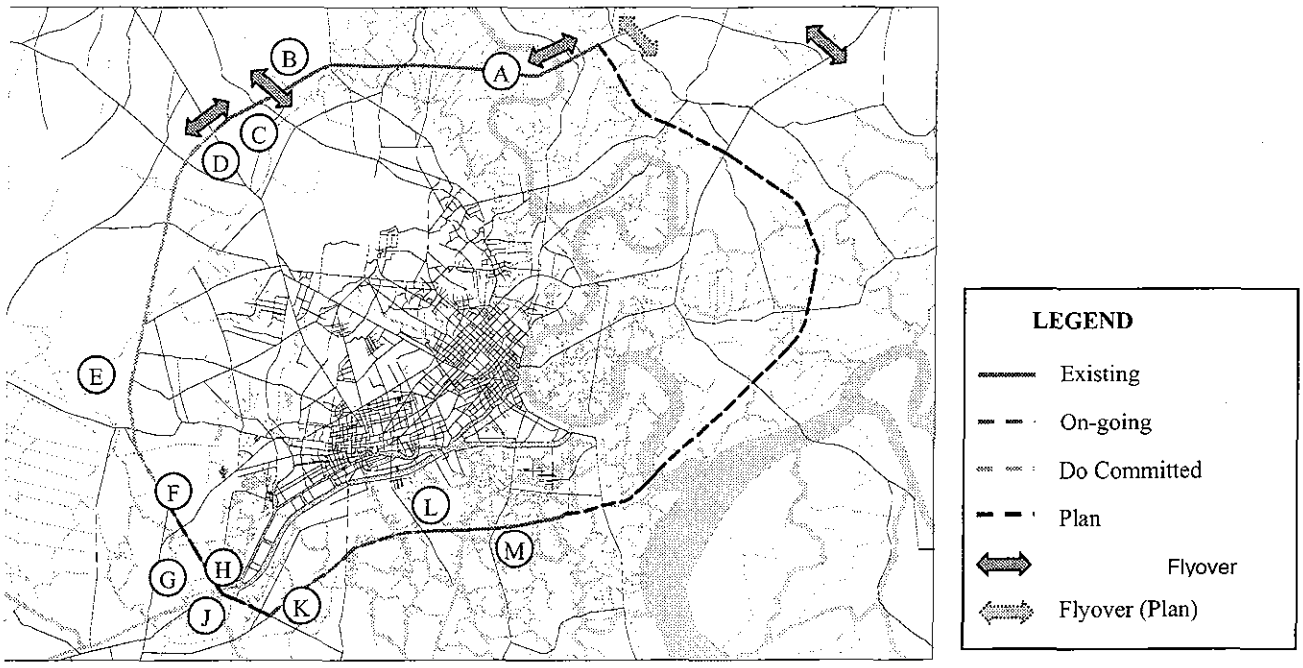
Figure 3.1.1 Current Situation in Each Section of Ring Road No.2

	Code	Section	Length (km)	Paved width (m)	Road width (m)	Main along the road
East Section	A-1	NH1-NH1K	4.4	-	-	Factory, paddy field
	A-2	NH1K - Ha Noi Highway	5.1	-	-	Factory, residence
	A-3	Ha Noi Highway - Phu My Bridge (Partially)	9.5	-	-	Paddy field
	A-4	Phu My Bridge	2.4	-	-	Port(westside), paddy field (eastside)
	A-5	Nam Sai Gon - Phu My Bridge	2.1	-	-	Shop, residence
Nguyen Van Linh	B-1	*Nam Sai Gon*	1.8	16.75	25.25	*Residence developed*
	B-2	Nam Sai Gon- Ong Lon Bridge	1.5	18.75	24.75	Wasteland (residence development plan)
	B-3	*Ong Lon River - Huong Lo 7*	7.2	6.0	-	Wasteland (partially residence development plan)
South-west Section	C-4	Nguyen Van Linh - Phu Dien Bridge	1.7	6.0	9.0	Low-strey residence
	C-3	Phu Dien Bridge	0.2	-	-	Stock-yard (northside), low-strey residence (southside)
	C-2	Huong Lo 2 (Phu Dien Bridge - Hung Vuong)	1.8	8.2	13.0	Factory,shop
	C-1	Huong Lo 2 (Hung Vuong - NH1)	0.9	6.5	13.0	Low-strey residence
NH1	D-1	Huong Lo 2 - NH22	12.8	11.0	17.0	Factory,shop
	D-2	NH22-Ring Road No.2	11.1	27.0	38.6	Factory,shop



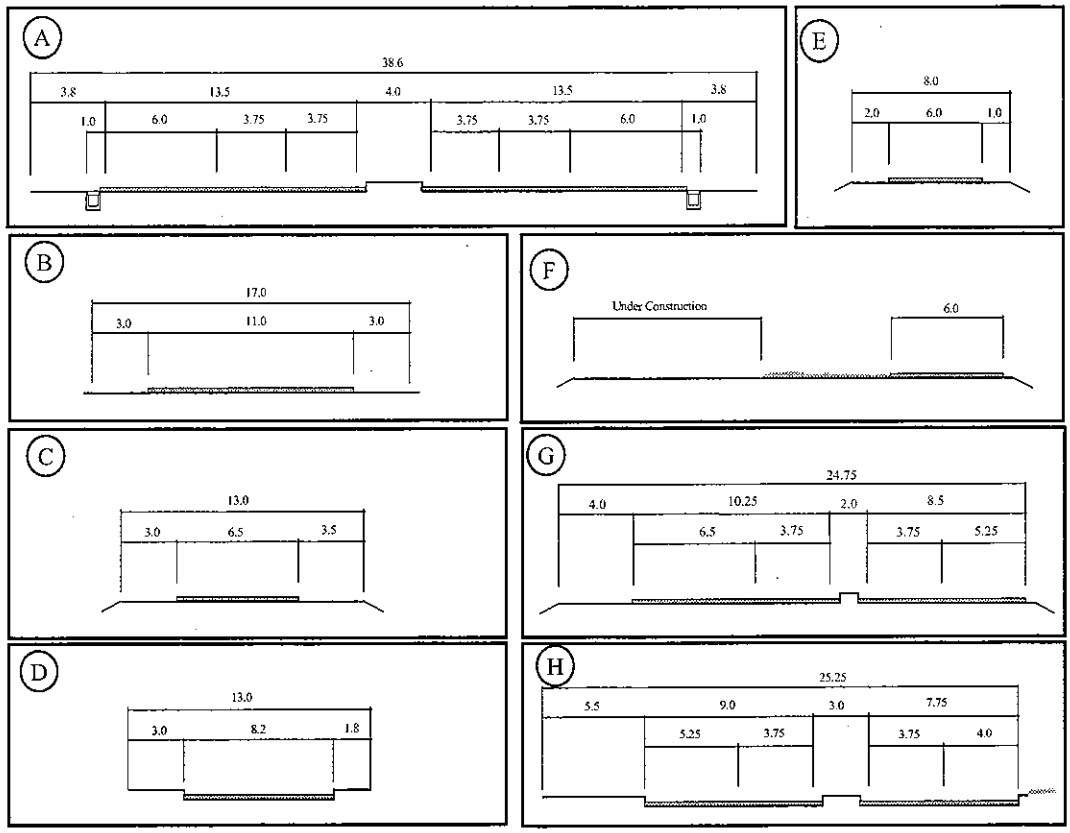
Source: Study Team

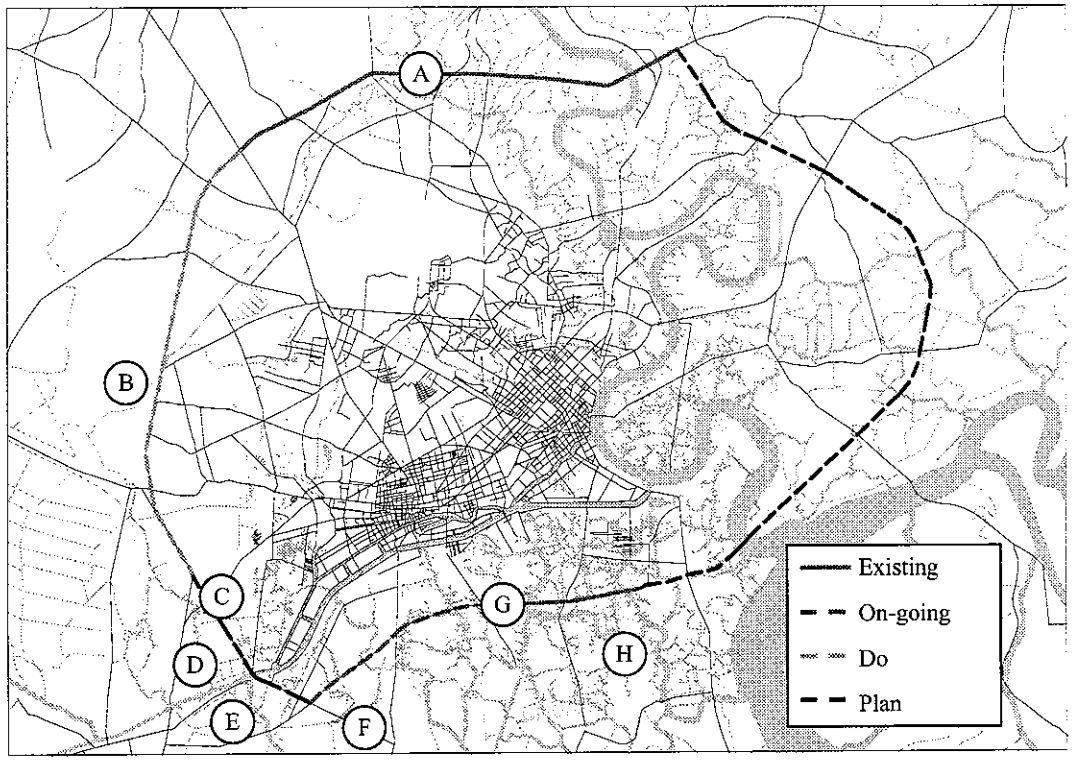
Figure 3.1.2 Current Situation of Road Infrastructure along the Ring Road No.2



Source: Study Team

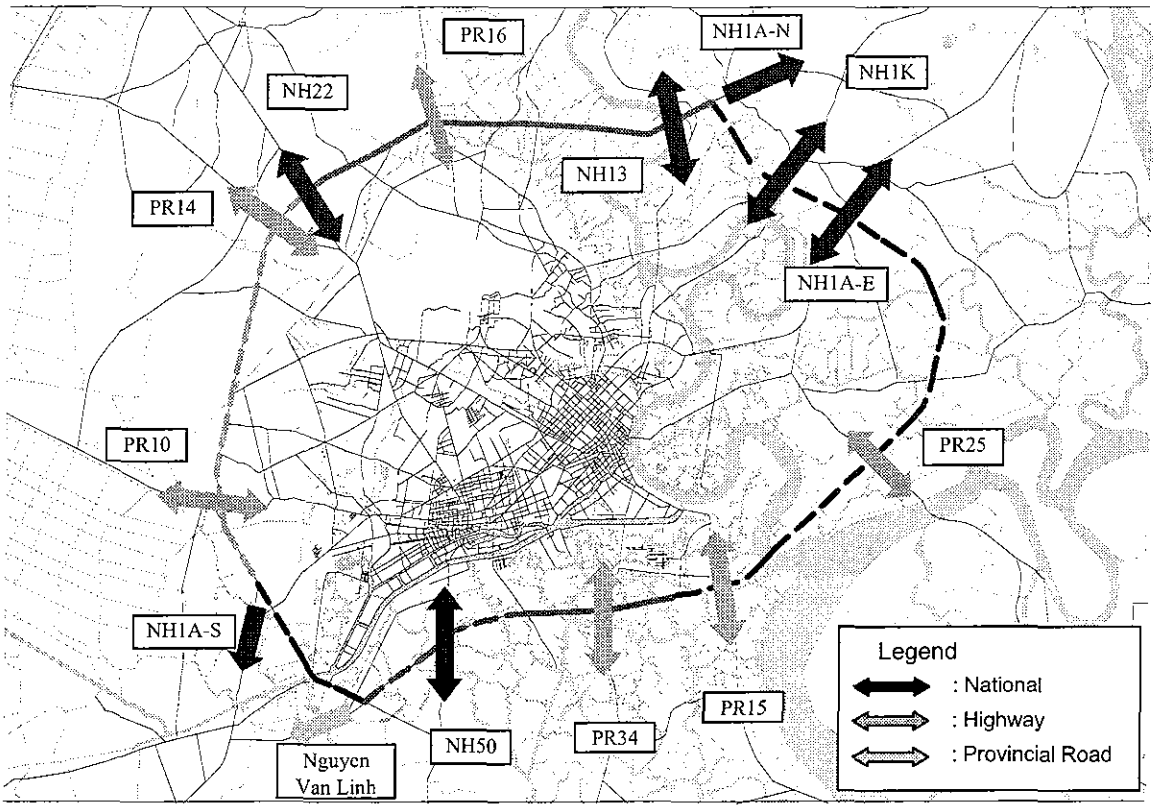
Figure 3.1.3 Existing Cross Section along Ring Road No.2





Source: Study Team

Figure 3.1.4 Current Situation of Major Crossroads



Source: Study Team

3.2 On-going Initiatives for Ring Road No.2 Development

1) Current Status of Ring Road No.2 Development Initiatives

The development concept of the proposed Ring road No.2 is to utilize the existing facilities and to provide any missing linkages, so that the ring road connections will be provided early in the project development stages. On the existing sections, there are different implementing agencies as well as funding. Figure 3.2.1 is showing on-going initiatives for Ring road No.2 development. Section D2 is upgraded as the Asia Highway Project loaned by the Asian Development Bank (ADB).

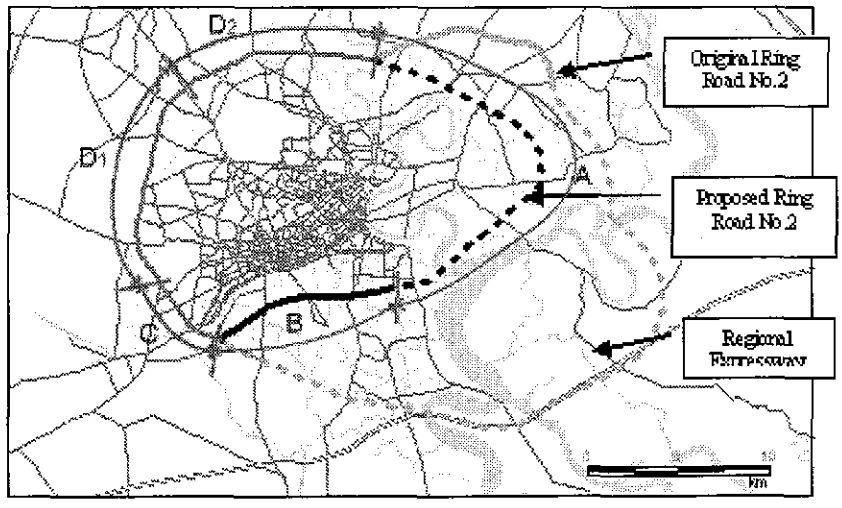
The section D is now under development as the BOT project under MOT, and the section between B is also under development as the private project. There is an existing road in section from C. however, the road width is narrow and the bridge over a river is not provided.

Table 3.2.1 Related Projects along Ring Road No.2

Section	Sub Section	Plan by Vietnamese side				Response of HOUTRANS
		Status	Implementing Agency	Funding	Contents of plan	
East Section (A)		-	-	-		Scope
	A-1*	Conceptual Plan	PC-HCMC	City Budget	New construction	Scope
	A-2	Waiting for approval	PC-HCMC	City Budget	New construction	Scope
	A-3	On-going	PC-HCMC	BOT	New construction	Scope
	A-4	Pre-F/S	PC-HCMC	City Budget	New construction	Scope
Nguyen Van Linh (B)	B-1	Completed (1st stage)	Private Company	BOT		Out of scope
	B-2	Under construction	Private Company	BOT		Out of scope
	B-3	Under construction	Private Company	BOT		Scope (grade separation)
South-west Section (C)	C-4	Pre-F/S	PC-HCMC	City Budget	Planned widening	Scope
	C-3	Pre-F/S	PC-HCMC	City Budget	New construction	Scope
	C-2	Conceptual Plan	PC-HCMC	City Budget	Planned widening	Scope
	C-1	Conceptual Plan	PC-HCMC	City Budget	Planned widening	Scope
NH1 (D)	D-1	Under construction	PMU My Thuan	Local BOT		Scope (grade separation)
	D-2	Almost complete	PMU My Thuan	ADB Loan		Scope(grade separation)

Source: Study Team
* Sub section: referred to Figure 3.1.1

Figure 3.2.1 Original and Proposed Ring Road No.2



Source: Study Team

2) Related Projects

Figure 3.2.2 and Table 3.2.2 show the location and the outline of the projects by HCMC that relates to the Ring Road No.2. Besides this, the An Suong - An Lac section on National Highway No.1A are upgrading by Local BOT under MOT. And, Nguyen Van Linh Road is developing by the private company.

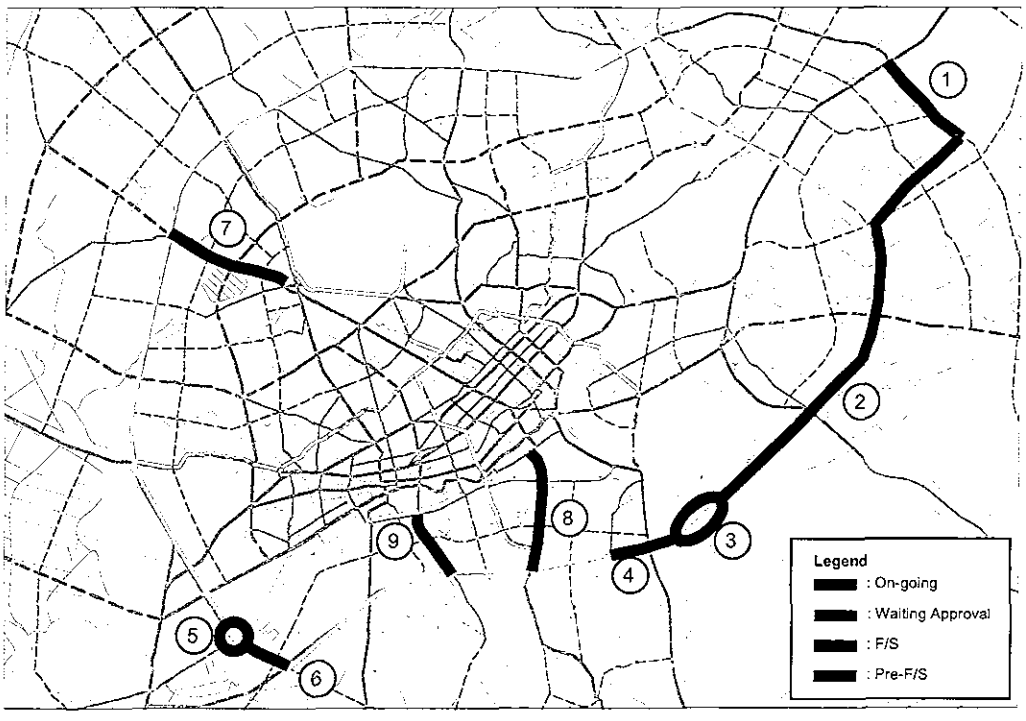
Table 3.2.2 Outline of Related Projects by HCMC

Related Section	Project No. [1]	Project Name	Location			Dimension			Investment Capital	Status
			Dist.	From	To	Length	Cross Section Width	No. of Lane		
Ring Road No.2 East Section	1	Road to High-Tech IP	Dist.9	Ha Noi Highway	Le Van Viet Street	2200m road+cross section:107m	63.0m		83,669 Construction/Installation:14,051 Land clearance:68,001 Other expenses+standby expense:1,527	Revision of F/S
	2	East Ring Road (connecting Phu My Bridge)	Dist. 2,9	The foot of Phu My Bridge	Vo Van Ngan Str. - Road to High-Tech	15,268m (752m bridge + 14,516m road)	67.0m (road), 10.5m (bridge)	4 lane (road), 2 lanes (bridge)	397,177 Construction/Installation : 293,683 Land clearance : 79,953 Other expenses+stanby expenses :23,541	Waiting for approval
	3	Phu My Bridge	Dist. 2,7							F/S by BOT
	4	Intersection Project A Zone	Dist. 7						779,760	Pre-F/S
Ring Road No.2 Southwest Section	5	Rach Cat Bridge (Ben Phu Dinh)	Dist. 8	Provincial Road No.5 - Provincial Road No.7		444,72m bridge	23.5m	6 lanes	477,864	Pre-F/S
	6	Constructing road section connecting Rach Cat Bridge (Phu Dinh to BT St.)	Binh Chanh Dist., Dist. 8			Designing project			Designing project	Pre-F/S
Flyover	7	Upgrading and widening Provincial No. 13 (National Road No.1 - Ba Queo)	Tan Binh Dist., Binh Chanh Dist.	National Road No.1	Tan Ky Tan Quy Street	3,796m road	30.0m	6 lanes	74,940 Construction/Installation : 74,940 Land clearance :2,900 Other expenses+stanby expenses : 6,120	Revision of F/S
	8	Prolonged Chanh Hung	Dist.8	Nguyen Van Linh Ave.	T30 zone of Police Ministry	3000m road + 123.6m bridge	12.5m	2 lanes	27,500 Construction/Installation:17,500 Land clearance:7,400 Basic architecture+standby expense 2,600	On-going
	9	Prolonged Nguyen Tri Phuong road Bridge	Dist.5,8 BC Dist.	Nguyen Tri Phuong Str. - Tran Hung Dao Str. Intersection	Chanh Hung Str. - Binh Thuan Str. Intersection	3072m road+666m bridge	18.5m (road), 13.0m (bridge)	3 lanes	213,000 Construction/Installation:117,000 Land clearance:69,000 Other expenses+standby expense:11,000 Interest:16,000	On-going

Source: Study Team

[1] Location is shown in the map below

Figure 3.2.2 Location of Related Projects by HCMC



Source: Study Team

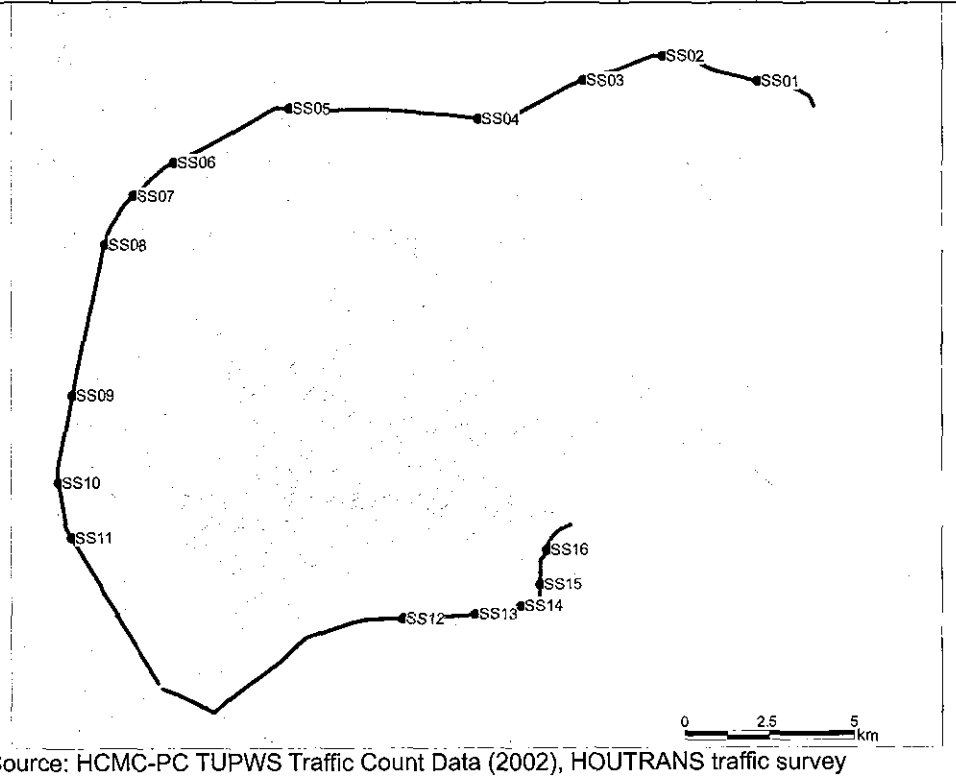
3.3 Existing and Future Traffic Demand of Ring Road No.2

1) Traffic Volume on Existing Sections

Present traffic volumes at related points were studied and are shown in Table 3.3.1 Results show that the traffic volume on the present section of RR2 in 2002 was not that heavy yet because of the present status of several projects. The traffic volumes on the western section showed a comparatively high volume capacity ratio (VCR). This, however, can be improved by the ongoing widening project.

Table 3.3.1 Traffic Volumes on Present Ring Road No.2, 2002

	No of Vehicles (24 hours, both direction)					PCU	V/C Rate
	Bicycle	M/C	Car	Bus	Truck		
SS01	1,847	41,991	1,196	1,690	4,826	25,409	0.30
SS02	2,216	45,404	1,399	1,678	4,874	26,464	0.32
SS03	2,095	33,251	1,667	1,497	5,543	25,588	0.31
SS04	2,290	34,828	1,463	1,202	5,079	23,988	0.29
SS05	2,434	38,357	1,976	1,603	6,041	28,443	0.34
SS06	2,605	40,018	2,246	1,551	5,908	28,643	0.34
SS07	2,751	42,322	2,410	1,636	6,162	30,102	0.36
SS08	3,852	44,317	2,359	1,663	6,188	30,789	0.71
SS09	4,407	43,686	2,220	1,503	6,028	29,915	0.69
SS10	10,231	61,205	1,708	1,661	6,814	36,352	0.84
SS11	9,634	56,546	1,479	1,753	8,182	38,676	0.90
SS12	2,775	7,582	164	94	144	2,783	0.14
SS13	2,751	7,143	186	88	67	2,508	0.13
SS14	3,571	6,374	205	81	86	2,571	0.05
SS15	4,585	8,403	212	117	114	3,329	0.06
SS16	3,998	7,490	233	140	163	3,218	0.05



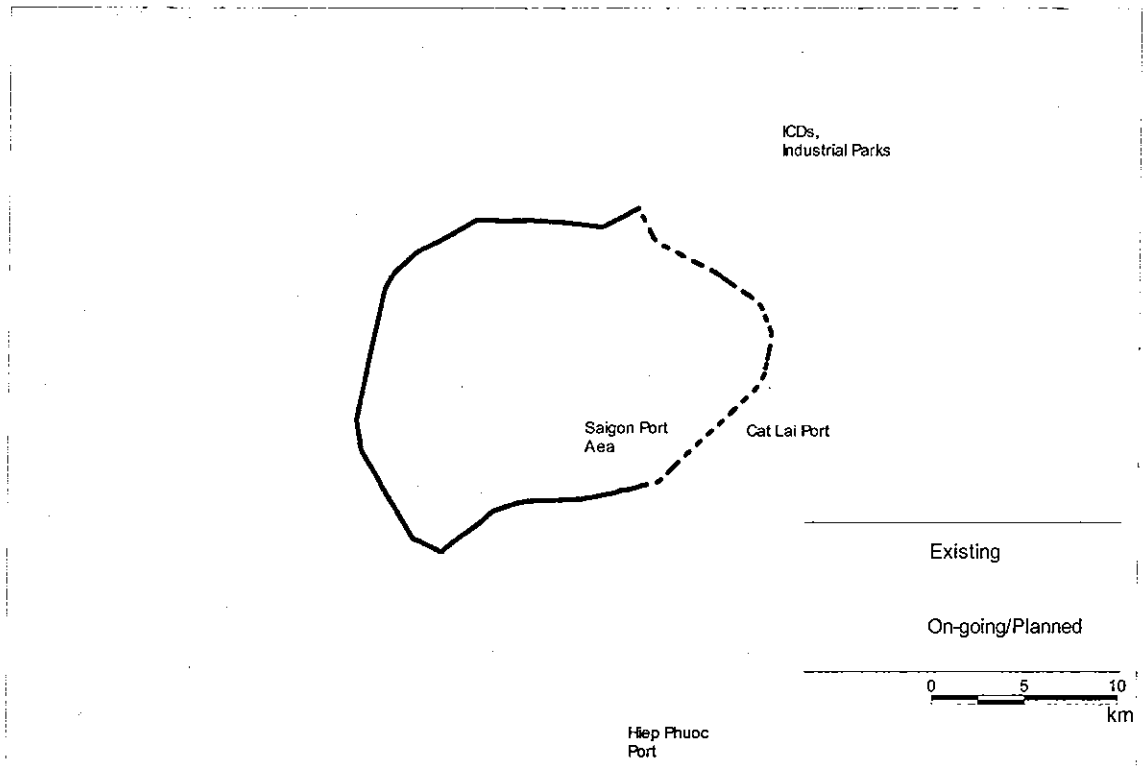
Source: HCMC-PC TUPWS Traffic Count Data (2002), HOUTRANS traffic survey

2) Major Traffic Generation Areas

Major traffic generation areas, especially for freight traffic, are concentrated along RR2 at present and this tendency is likely accelerate in the future. Figure 3.3.1 shows major freight traffic areas related to the Ring road. The Saigon Port, the related ports such as Tan Can Port and ICDs are located at the city center along Saigon River. Since HCMC plays a role as a hub in the southern Vietnam transport network, there is high through freight traffic generated and attracted in this area (see Figure 3.3.2). As it is seen in this figure, the northeast has the largest freight movement from Saigon Port area but there is no direct route from this area at present and they have to pass the city center where such heavy traffic is restricted. Many industrial parks and ICDs are also located northeast of the study area. Sufficient connectivity between ports and such industrial areas will be very beneficial to the economy in this area.

In addition, there are two ongoing port development projects, Cat Lai and Hiep Phuoc (see Figure 3.3.1). Cat Lai Port will be developed in a 400ha land and Hiep Phuoc Port in a 800ha area by 2010[1]. The connectivity between the south and the northeast of the HCM metropolitan area is getting more crucial and the completion of RR2 can serve as the main corridor that will connect the ports and the industrial areas.

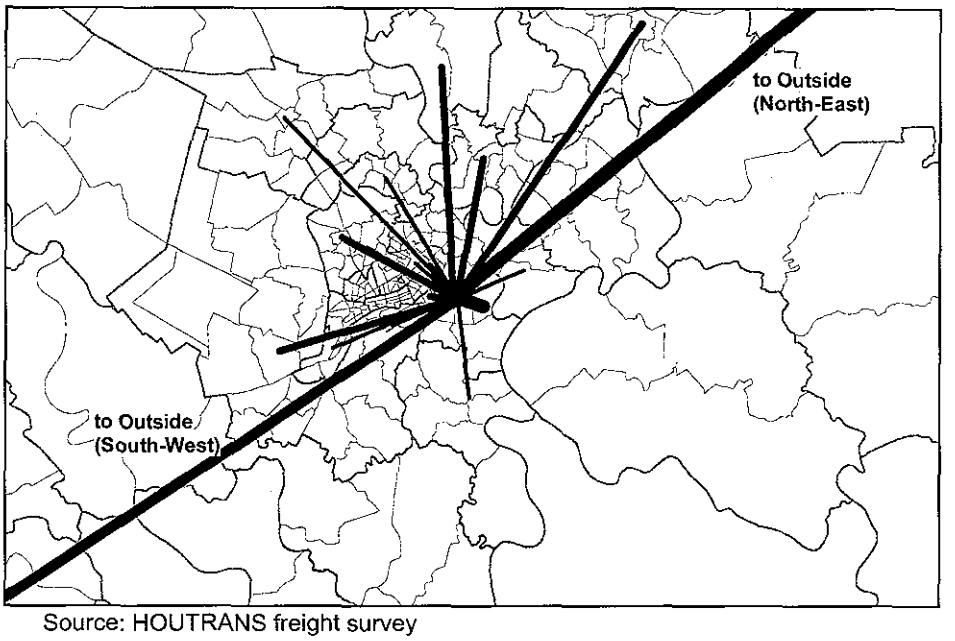
Figure 3.3.1 Major Freight Traffic Generation Areas



Source: Study Team

[1] The planned development of Hiep Phuoc Port will eventually cover 2,000ha.

Figure 3.3.2 Distribution of Freight Traffic from/to Saigon Port Area, 2002

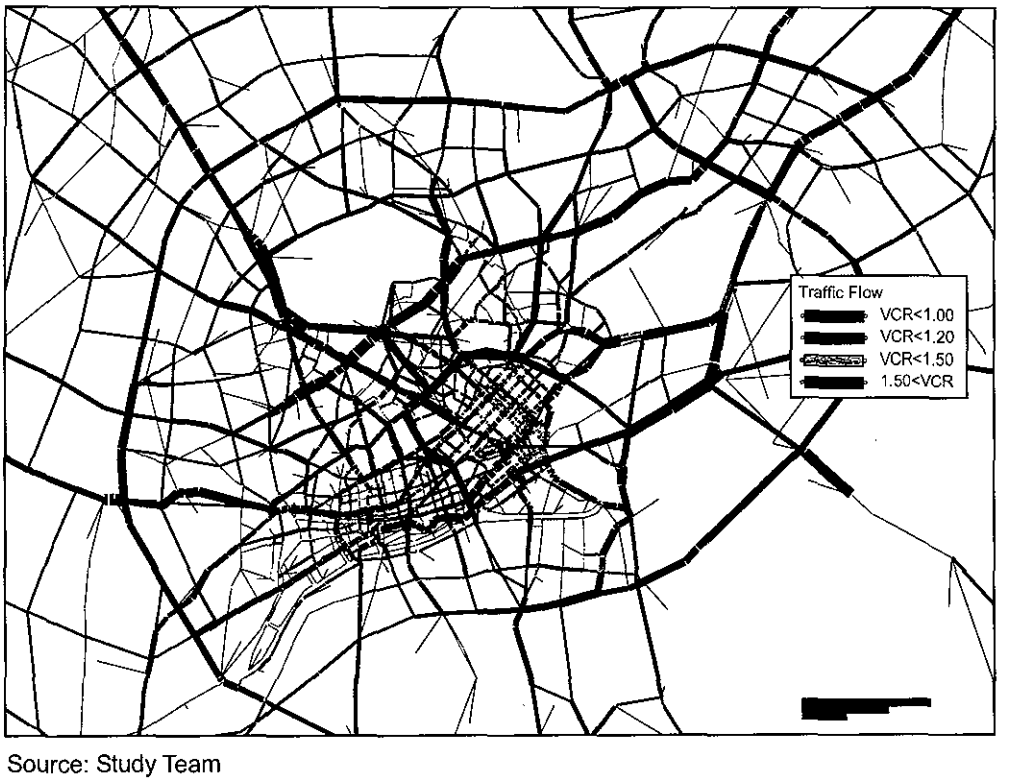


Source: HOUTRANS freight survey

3) *Future Traffic Demand*

Traffic demand forecast was conducted to obtain the estimated traffic volume on the ring road using the master plan network proposed by the Study Team. Figure 3.3.3 and Figure 3.3.4 show the assigned traffic volume and VCR in all the links near RR2 in 2020 and 2010, respectively. According to this, a newly constructed section on RR2 will have a high traffic volume and play a strong role as a circular road transport corridor in this area.

Figure 3.3.3 Result of Traffic Assignment, 2020



Source: Study Team

Note: Assumed modal share (%) of motorcycle, car and bus/rail is 30, 20 and 50, Average occupancy: motorcycle - 1.3, car - 1.9, bus – 50, respectively.

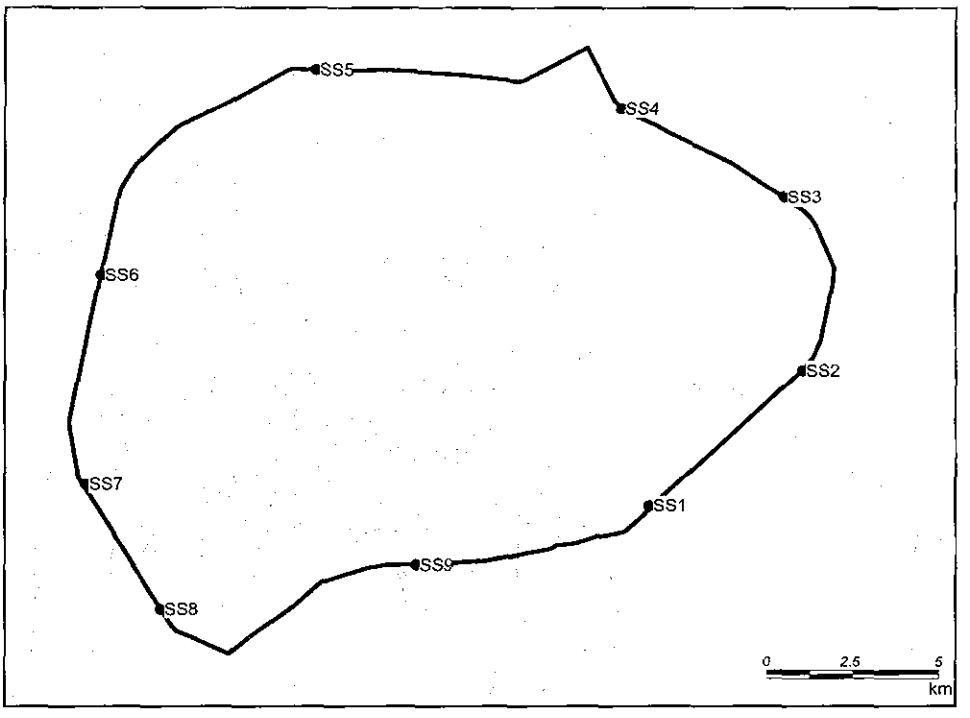
Figure 3.3.4 Result of Traffic Assignment, 2010

Source: Study Team

Note: Assumed modal share (%) of motorcycle, car and bus/rail is 55, 15 and 30, Average occupancy: motorcycle - 1.3, car - 1.9, bus – 36, respectively.

Specific traffic volumes are shown in Figure 3.3.5. In 2020, the estimated traffic volume on the newly constructed road will be around 60,000PCUs/day by section. Considering the incompleteness of future policies promoting public transport, when public transport accommodates only 30% of travel demand in 2020, the traffic volume on RR2 is estimated to be 80,000-100,000PCUs/day by section.

Figure 3.3.5 Estimated Traffic Volume on Ring Road No.2

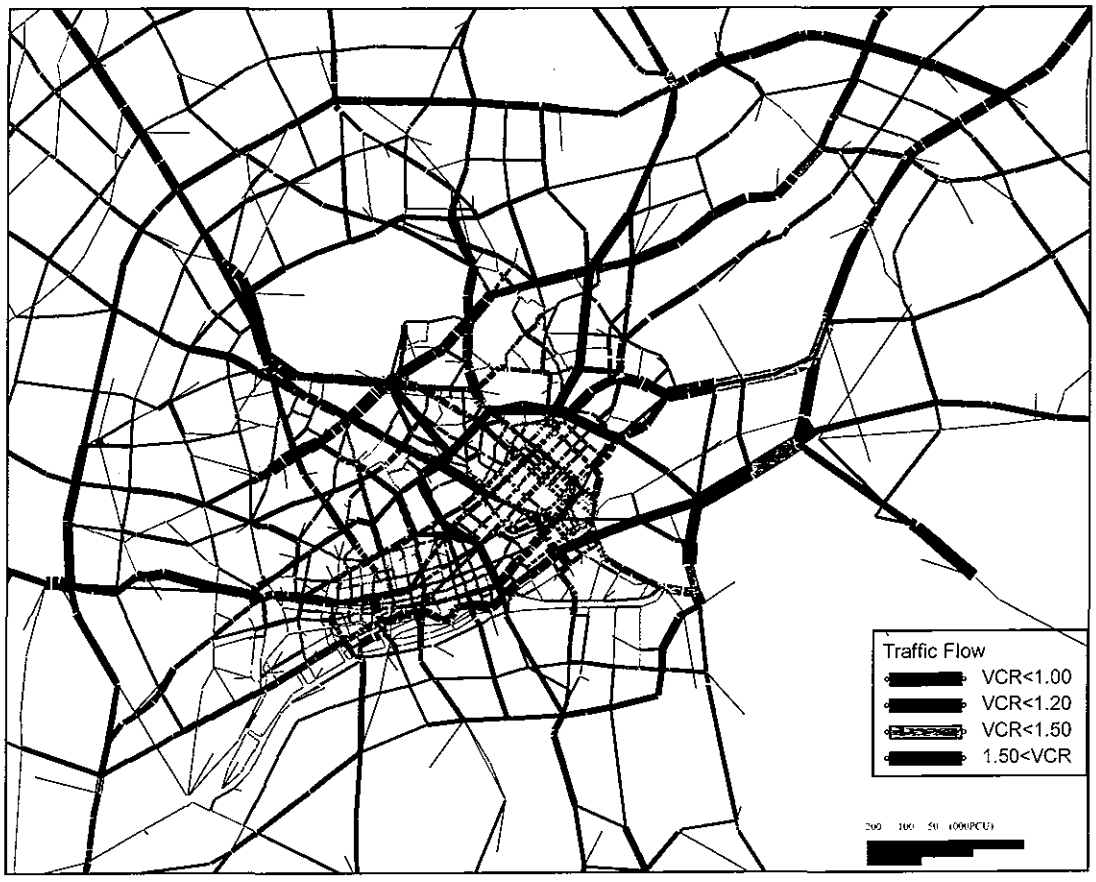


	2002				2010				2020			
	Traffic Volume (000/day)			PCU (000/day)	Traffic Volume (000/day)			PCU (000/day)	Traffic Volume (000/day)			PCU (000/day)
	M/C	Car	Bus		M/C	Car	Bus		M/C	Car	Bus	
SS1	-	-	-	-	49.6	13.4	0.6	30	91.0	30.0	1.3	60
SS2	-	-	-	-	36.6	10.7	0.5	23	79.5	31.9	1.4	59
SS3	-	-	-	-	46.2	12.8	0.6	28	74.3	26.1	1.9	53
SS4	-	-	-	-	71.5	18.7	0.5	41	83.5	34.8	1.0	62
SS5	37.1	6.5	1.2	28	87.9	20.0	1.4	49	78.7	33.0	2.5	63
SS6	48.2	8.5	1.7	31	106.2	18.2	1.3	54	74.4	22.1	1.7	48
SS7	66.2	9.7	1.8	39	163.0	29.0	2.8	85	107.5	27.6	3.9	70
SS8	n.a.	n.a.	n.a.	n.a.	63.4	13.6	1.0	35	87.9	31.7	1.5	61
SS9	10.4	0.3	0.1	3	88.8	20.8	1.4	51	49.8	21.3	2.3	42

Source: Study Team and HCMC-PC TUPWS Traffic Count Data (2002)

Figure 3.3.6 illustrates the result of traffic assignment without RR2's east and southwest sections. The result shows high congestion in District 2 and central areas along Saigon River compared to the condition shown on Figure 3.3.3. Based on the traffic assignment, an economic evaluation was conducted to determine the feasibility (see more detail in Chapter 7).

Figure 3.3.6 Result of Traffic Assignment w/o RR2 East and Southwest Sections, 2020



Source: Study Team

Note: Assumed modal share (%) of motorcycle, car and bus/rail is 30, 20 and 50, Average occupancy: motorcycle - 1.3, car - 1.9, bus – 50, respectively.

4 ENGINEERING STUDY

4.1 General

This section of the study covers key issues including design standards to be applied for roads and bridges, alignment studies in the section between NH No.1A and Hanoi Highway, and in intersection of Saigon River crossing (Phu My bridge). in addition the type of bridges which will be decided through a comparative examination.

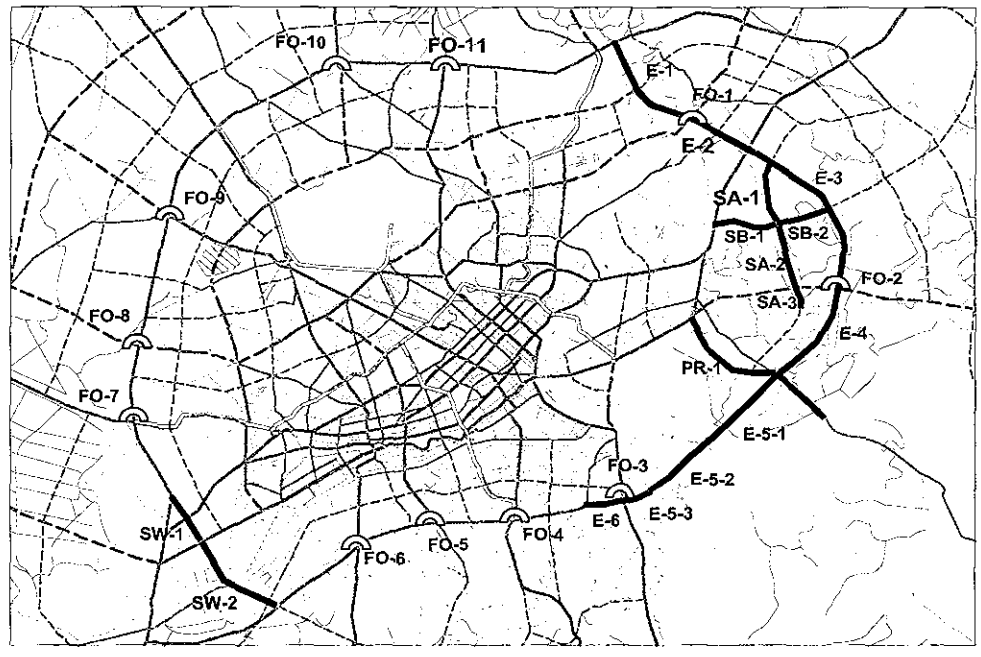
Since the project scope covers the complete length of Ring Road No.2, the project road was divided into the twenty eight (28) sections for the preliminary design excluding the implementation plan. In dividing into these sections, it was considered the ultimate requirements for the future road network. The divided sections and its location were shown as in Figure 4.1.1 and Table 4.1.1.

Table 4.1.1 List of Divided Sections

Road's flyover	Section/subsection	Road		Length
		From	To	(km)
Ring Road No.2 East Section	E-1	STA.0+991.721	STA.4+500.000	3.508
	E-2	STA.4+500.000	STA.7+140.000	2.64
	E-3	STA.7+140.000	STA.12+600.000	5.46
	E-4	STA.12+600.000	STA.15+600.000	3
	E-5	STA.15+600.000	STA.22+550.000	6.95
	E-5-1	STA.15+600.000	STA.19+255.000	3.655
	E-5-2	STA.19+255.000	STA.21+845.000	2.59
	E-5-3	STA.21+845.000	STA.22+550.000	0.705
	E-6	STA.22+550.000	STA.23+730.386	1.18
	Sub-Total			22.739
Ring Road No.2 Southwest Section	SW-1	STA.1+000.000	STA.3+261.000	2.261
	SW-2	STA.3+261.000	STA.6+977.000	3.716
	Sub-Total			5.977
Provincial Road No.25	PR-1	STA.1+000.000	STA.4+785.000	3.785
	PR-2	STA.4+785.000	STA.6+610.156	1.825
	Sub-Total			5.61
Secondary Road "A"	SA-1	STA.0+991.004	STA.3+300.000	2.309
	SA-2	STA.3+300.000	STA.5+250.000	1.95
	SA-3	STA.5+250.000	STA.6+000.983	0.751
	Sub-Total			5.01
Secondary Road "B"	SB-1	STA.0+975.580	STA.3+050.000	2.074
	SB-2	STA.3+050.000	STA.4+851.921	1.802
	Sub-Total			3.876
Flyover	FO-1	STA.1+209.000	STA.1+866.000	0.657
	FO-2	STA.1+034.000	STA.1+866.000	0.832
	FO-3	STA.0+999.000	STA.1+826.000	0.827
	FO-4	STA.1+023.000	STA.1+796.000	0.773
	FO-5	STA.1+268.000	STA.1+878.000	0.61
	FO-6	STA.1+095.000	STA.1+773.000	0.678
	FO-7	STA.1+086.000	STA.1+885.000	0.799
	FO-8	STA.0+957.000	STA.1+831.000	0.874
	FO-9	STA.1+047.000	STA.1+687.000	0.64
	FO-10	STA.1+074.000	STA.1+642.000	0.568
	FO-11	STA.1+342.000	STA.2+080.000	0.738
	Sub-Total			7.996

Source: Study Team

Figure 4.1.1 Location of Sections of Ring Road No.2



Source: Study Team

4.2 Design Standards

1) General

"A Policy on Geometric Design of Highways and Streets" published by AASHTO has been widely referred to in the preparation of the geometric design standards in many other countries. in Vietnam the Highway Design Standards (22TCN-273-01) were prepared in 2001. However, these standards are not universally followed by local engineers and there is no generally accepted definition for outer separators.

In determining the geometric design criteria applicable to the feasibility study on RR2, the Study Team recommended the design criteria based on the geometric design criteria established in the Master Plan.

The road, bridge and other road structures will be planned and designed based on Vietnamese standards together with AASHTO specifications. The major standards and references are:

- Specifications for Bridge Design (22 TCN-272-01) published in 2001
- AASHTO LRFD Bridge Design Specifications, Second Edition 1998 published by the American Association of State Highway and Transportation Officials
- Vietnamese Bridge Design Codes published in 1979
- Highway Design Standards of Vietnam (TCVN 4054-98)

The Specifications for Bridge Design (22 TCN-272-01) were newly established based on AASHTO LRFD and the contents are basically the same as the those of AASHTO except for some items based on local conditions such as earthquake and wind conditions.

2) Design Standards for Ring Road No.2

(1) **Design Type:** RR2 is planned as a primary road in the Master Plan Stage and comprises National Highway No.1A and Nguyen Van Ling Road. It is expected that the road will be located in the urbanized area. The road was designed as a primary urban road that is expected to increase the people's mobility. Moreover, accessibility to frontage road was given careful consideration.

(2) **Design Speed:** Presently National Highway No.1A and Nguyen Van Link Road have a design speed of 60 km/h and MOT study for future improvement will apply 100 km/h design speed. However, a design speed of 80 km/h was applied to RR2 upon consideration of the following:

- RR2 will serve as a primary road
- Future land use along RR2 will be urban.
- No access control is planned; and,
- A toll plaza of barrier-gate type on the through carriageway is planned in the vicinity of Phu My Bridge where all vehicles stop to pay toll.

For the frontage road, the following may warrant a design speed of 40 km/h to:

- Facilitate access to the roadside; and,
- Accommodate slow-moving vehicles such as bicycles, xe om and so forth.

Based on AASHTO, design elements were established, adopting wherever appropriate and applicable Vietnamese highway standards. However, the grade of 4.0% is common in Vietnam on the bridges' approach section, because of traffic characteristics such as high proportion of overloaded trucks, trucks and buses of old vintage and other slow-moving vehicles. If the Phu My Bridge, which is long, has a steep gradient, these vehicles will get stuck. Therefore, 4.0% was applied for RR2 to enhance road safety. Table 4.2.1 summarizes the geometric design criteria for RR2.

Table 4.2.1 Geometric Design Criteria for Ring Road No.2

Item		Unit	Design Criteria	
A. General				
A1	Section	-	East	Southwest
A2	Design Speed	km/h	80	
B. Cross-sectional Elements				
B1	Number of Lanes	-	8 + Frontage Road *in Both Sides*	6 + Frontage Road *in Both Sides*
B2	Traveled Lane Width	m	3.5 [1]	
B3	Shoulder Width	m	1.0	
B4	Median	m	3.0	
B5	Outer Separator	m	2.0	
B6	Frontage Road [2]	m	6.0	
B7	Sidewalk	m	5.0	
B8	Cross fall	%	2.0	
B9	Type of Pavement	-	*Flexible Type Pavement*[3]	
C. Design Elements				
C1	Stopping Sight Distance	m	110	
C2	Maximum Super elevation	%	6.0	
C3	Minimum Horizontal Curve Radius	m	280 (400) [4]	
C4	Sharpest Curve without Transition Curve	m	900 (2,000) [4]	
C5	Maximum Grade	%	4.0	
C6	Minimum Vertical Curve Length	m	70	
C7	*Minimum Vertical Curve Radius (Crest)*	m	3,000 (4,500) [4]	
C8	Minimum Vertical Curve Radius (Sag)	m	2,000 (3,000) [4]	
C9	Vertical Clearance	m	4.9	

Source: Study Team
[1] To be lain between traveled lanes
[2] Design speed of frontage road is assumed as 40 km/h.
[3] Cement concrete pavement will be applied at Toll Plaza.
[4] Figures ( ) indicates desirable value.

3) Design Standards for Related Roads

Design Criteria for Related Roads: Based on AASHTO, the design elements were established, adopting wherever appropriate and applicable Vietnamese highway standards.

Table 4.2.2 Geometric Design Criteria for Related Roads

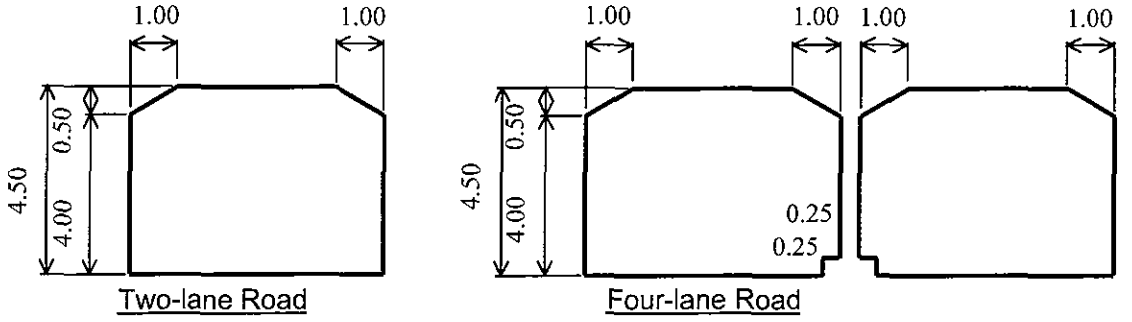
Item		Unit	Design Criteria	
A. General				
A1	Classification	-	*Primary Road* (Provincial Road No.25)	Secondary Road
A2	Design Speed	km/h	60	50
B. Cross-sectional Elements				
B1	Number of Lanes	-	Depend on Traffic Volume	
B2	Traveled Lane Width	m	3.5	3.5
B3	Shoulder Width	m	2.0	2.5
B4	Median	m	3.0	2.0
B5	Sidewalk	m	5.0	3.0
B6	Cross fall	%	6.0	
B7	Type of Pavement	-	Flexible Type Pavement	
C. Design Elements				
C1	Stopping Sight Distance	m	75	50
C2	Maximum Super elevation	%	6.0	
C3	Minimum Horizontal Curve Radius	m	150 (200)	100 (150)
C4	Sharpest Curve without Transition Curve	m	500 (1,000)	350 (700)
C5	Maximum Grade	%	5.0	6.0
C6	Minimum Vertical Curve Length	m	50	40
C7	Minimum Vertical Curve Radius (Crest)	m	1,400 (2,000)	800 (1,200)
C8	Minimum Vertical Curve Radius (Sag)	m	1,000 (1,500)	700 (1,000)
C9	Vertical Clearance	m	4.9	

Source: Study Team
Notes: ( ) shows desirable value.

4) Bridge Design Criteria

In this section, highway and navigation clearances are discussed. Detail design loadings for the road bridge and structures are indicated in Appendix. The clearance of bridges crossing over any classes of roads was determined in accordance with the "Design Specifications for Highway TCVN 4054: 1998".

Figure 4.2.1 Road Clearance



Source: Study Team

The project bridges cross over roads classified as Class II, which requires the clearances as shown below.

For navigation clearances over Saigon River (Phu My Bridge) and Cho Dem River (Phu Dinh Bridge), the following values, adopted from the existing feasibility studies conducted by the Vietnamese side for Phu My Bridge in 2001 and for Phu Dinh Bridge in 2003, were used for this study.

Table 4.2.3 Navigation Clearance

	Sai Gon River	Cho Dem River
Bridge Name	Phu My Bridge	Phu Ding Bridge
Water Level[1)]	1.44 [2)]	1.48
Navigation Clearance	Width = 220m[3)] Height = 45m	Width = 40m Height = 7m

Source: Study Team

Design water level for navigation clearance is 5% frequency high water level based on *National Datum Level.*

This value is from the East-West Highway Construction Project (Thu Thiem Tunnel Section) as no appropriate data close to the project site exists and no hydrological analysis was made.

Minimum navigation clearance for Phu My Bridge is 120m wide and 40m high. These values were used in the existing feasibility study report with MOT approval.

Flood clearances must be provided for structures in waterways or structures prone to flooding. According to Article 1.27 of the Vietnamese Bridge Codes 22 TCN 018-79, the minimum clearances for bridges and culverts are shown in Table 4.2.3, Table 4.2.4 and Table 4.2.5

Table 4.2.4 Flood Clearance for Bridges

No	Bridge Member	Over the Design Water Level		Over the Maximum Water Level
		Railway Bridge	Roadway Bridge	Railway Bridge
1	Soffit of Superstructure			
	a) Water level increase in flood time is not greater than 1.0m	0.50	0.50	0.25
	b) Water level increase in flood time is equal to or greater than 1.0m	0.75	0.50	0.25
	c) Subject to Log Impact	1.50	1.00	1.00
	d) Subject to Stone Collision	-	1.00	1.00
2	Bearing Bedding Plate	0.25	0.25	-
3	Bottom of Arch Impost	0.25	-	-

Source: Study Team

Table 4.2.5 Flood Clearance for Free-pressure Culvert

Shape of Culvert	Circular & Arch	Rectangular
a) Height not greater than 3.0 m	1/4 of the height	1/6 of the height
b) Height equal to or greater than 3.0m	0.75 m	0.50 m

Source: Study Team

5) Aviation Traffic

Since the project's location is far from Tan Son Nhat Airport, it was deemed not necessary to consider aviation traffic. However, the height restrictions shall be discussed and confirmed with the relevant authorities in the next stage.