

**MINISTRY OF TRANSPORT, VIETNAM**

**SPECIAL ASSISTANCE FOR  
PROJECT IMPLEMENTATION (SAPI)  
FOR ITS INTEGRATION PROJECT  
ON NEW NATIONAL HIGHWAY NO.3  
& NORTHERN AREA OF VIETNAM**

**APPENDIX 3**

**FEASIBILITY STUDY DRAWINGS  
ENVIRONMENTAL & SOCIAL STUDY REPORT**

**AUGUST 2012**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

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**ORIENTAL CONSULTANTS CO., LTD.  
NEXCO EAST ENGINEERING CO., LTD.  
NIPPON KOEI CO., LTD  
TRANSPORTATION RESEARCH INSTITUTE CO., LTD  
LANDTEC JAPAN INC.**

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
MINISTRY OF TRANSPORT, VIETNAM**

**SPECIAL ASSISTANCE FOR PROJECT IMPLEMENTATION (SAPI)  
FOR ITS INTEGRATION PROJECT ON  
NEW NATIONAL HIGHWAY NO.3 & NORTHERN AREA OF VIETNAM**

# **FEASIBILITY STUDY DRAWINGS**

**FINAL REPORT IN AUGUST 2012**

**ORIENTAL CONSULTANTS CO., LTD  
NEXCO EAST ENGINEERING CO., LTD  
NIPPON KOEI CO., LTD  
TRANSPORTATION RESEARCH INSTITUTE CO., LTD  
LANDTEC JAPAN INC.**

THE SOCIALIST REPUBLIC OF VIETNAM  
MINISTRY OF TRANSPORT

SPECIAL ASSISTANCE FOR PROJECT IMPLEMENTATION (SAPI)  
FOR ITS INTEGRATION PROJECT ON  
NEW NATIONAL HIGHWAY NO.3 & NORTHERN AREA OF VIETNAM

# FEASIBILITY STUDY DRAWINGS

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FINAL REPORT IN AUGUST 2012

ORIENTAL CONSULTANS CO., LTD  
NEXCO EAST ENGINEERING CO., LTD  
NIPPON KOEI CO., LTD  
TRANSPORTATION RESEARCH INSTITUTE CO., LTD  
LANDTEC JAPAN CO., LTD

## LIST OF DRAWINGS (1/2)

NO.	DRAWING NAME	SCALE	DRAWING No.	REMARK
<b>I.</b>	<b>PROJECT SCOPE AREA</b>			
I.1	TARGETED EXPRESSWAY	—	TE-01	
<b>II.</b>	<b>BILL OF QUANTITY</b>			
II.1	BILL OF QUANTITIES	—	BQ-01	
<b>III.1</b>	<b>BASIC LAYOUT PLAN</b>			
III.1	BASIC LAYOUT PLAN FOR CCTV AND VEHICLE DETECTION AT THROUGHWAY	—	BLP-01	
<b>III.2</b>	<b>INTERCHANGES</b>			
III.2.1	DRAFT LOCATION PLAN FOR CCTV AND VMS - IC-01 (NOI BAI)	1 : 4000	ICC - 01	
III.2.2	DRAFT LOCATION PLAN FOR CCTV AND VMS - IC-04 (PHAP VAN)	1 : 4000	ICC - 02	
III.2.3	DRAFT LOCATION PLAN FOR CCTV AND VMS - IC-12 (NH3-OLD)	1 : 4000	ICC - 03	
III.2.4	DRAFT LOCATION PLAN FOR CCTV AND VMS - IC-05 (LINH NAM)	1 : 4000	ICC - 04	
III.2.5	DRAFT LOCATION PLAN FOR CCTV AND VMS - IC-06 (GIA LAM)	1 : 4000	ICC - 05	
III.2.6	DRAFT LOCATION PLAN FOR CCTV AND VMS - IC-07 (NH5)	1 : 4000	ICC - 06	
III.2.7	DRAFT LOCATION PLAN FOR CCTV AND VMS - IC-09 (BAC NINH)	1 : 4000	ICC - 07	
III.2.8	DRAFT LOCATION PLAN FOR CCTV AND VMS - IC-10 (PR.295)	1 : 4000	ICC - 08	
III.2.9	DRAFT LOCATION PLAN FOR CCTV AND VMS - NOI BAI - VIET TRI (BINH XUYEN IC)	1 : 4000	ICC - 09	
III.2.10	DRAFT LOCATION PLAN FOR CCTV AND VMS - NOI BAI - VIET TRI (IC TO NH 2B)	1 : 4000	ICC - 10	
III.2.11	DRAFT LOCATION PLAN FOR CCTV AND VMS - NOI BAI - VIET TRI (IC TO PR.305C)	1 : 4000	ICC - 11	
III.2.12	DRAFT LOCATION PLAN FOR CCTV AND VMS - NOI BAI - VIET TRI (IC TO NH 2)	1 : 4000	ICC - 12	
III.2.13	DRAFT LOCATION PLAN FOR CCTV AND VMS - NOI BAI - VIET TRI (IC TO NH 32C)	1 : 4000	ICC - 13	
III.2.14	DRAFT LOCATION PLAN FOR CCTV AND VMS - PHAP VAN - NINH BINH (KHE HOI)	1 : 1000	ICC - 14	
III.2.15	DRAFT LOCATION PLAN FOR CCTV AND VMS - PHAP VAN - NINH BINH (VAN DIEM)	1 : 1000	ICC - 15	

CONSULTANT		SOCIALIST REPUBLIC OF VIETNAM		ITS INTEGRATION PROJECT IMPLEMENTATION OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA	
ORIENTAL CONSULTANTS CO., LTD	TITLE	NAME	SIGNATURE	DATE	DRAWING TITLE:
NEXCO EAST ENGINEERING CO., LTD	PREPARED BY				LIST OF DRAWING (1/2)
NIPPON KOEI CO., LTD	CHECKED BY				
TRANSPORTATION RESEARCH INSTITUTE CO., LTD	APPROVED BY				
LANDTEC JAPAN INC.					SCALE: Sheet of

## LIST OF DRAWINGS (2/2)

NO.	DRAWING NAME	SCALE	DRAWING No.	REMARK
III.2.16	DRAFT LOCATION PLAN FOR CCTV AND VMS - PHAP VAN - NINH BINH (VUC VONG)	1 : 1000	ICC - 16	
III.2.17	DRAFT LOCATION PLAN FOR CCTV AND VMS - PHAP VAN - NINH BINH (LIEM TUYEN)	1 : 1000	ICC - 17	
<b>III.3</b>	<b>TYPICAL CROSS-SECTION</b>			
III.3.1	DRAFT TYPICAL CROSS SECTION FOR CCTV LANG - HOA LAC	N.T.S	TYP.CS.CCTV - 1	
III.3.2	DRAFT TYPICAL CROSS SECTION FOR CCTV HANOI - BAC NINH	N.T.S	TYP.CS.CCTV - 2	
III.3.3	DRAFT TYPICAL CROSS SECTION FOR CCTV NOIBAI - BAC NINH	1 : 100	TYP.CS.CCTV - 3	
III.3.4	DRAFT TYPICAL CROSS SECTION FOR CCTV RING ROAD NO.3	1 : 50	TYP.CS.CCTV - 4	
III.3.5	DRAFT TYPICAL CROSS SECTION FOR CCTV THANH TRI BRIDGE(1)	1 : 200	TYP.CS.CCTV - 5	
III.3.6	DRAFT TYPICAL CROSS SECTION FOR CCTV THANH TRI BRIDGE(2)	1 : 350	TYP.CS.CCTV - 6	
III.3.7	DRAFT TYPICAL CROSS SECTION FOR CCTV THANH TRI BRIDGE(3)	1 : 350	TYP.CS.CCTV - 7	
III.3.8	DRAFT TYPICAL CROSS SECTION FOR CCTV PHAP VAN - NINH BINH	1 : 200	TYP.CS.CCTV - 8	
III.3.9	DRAFT TYPICAL CROSS SECTION FOR CCTV NOI BAI - VIET TRI (1)	1 : 200	TYP.CS.CCTV - 9	
III.3.10	DRAFT TYPICAL CROSS SECTION FOR CCTV NOI BAI - VIET TRI (2)	1 : 200	TYP.CS.CCTV - 10	
III.3.11	DRAFT TYPICAL CROSS SECTION FOR VMS LANG - HOA LAC	N.T.S	TYP.CS.VMS - 1	
III.3.12	DRAFT TYPICAL CROSS SECTION FOR VMS HANOI - BAC NINH	N.T.S	TYP.CS.VMS - 2	
III.3.13	DRAFT TYPICAL CROSS SECTION FOR VMS NOI BAI - BAC NINH	1 : 100	TYP.CS.VMS - 3	
III.3.14	DRAFT TYPICAL CROSS SECTION FOR VMS RING ROAD NO.3	1 : 50	TYP.CS.VMS - 4	
III.3.15	DRAFT TYPICAL CROSS SECTION FOR VMS THANH TRI BRIDGE(1)	1 : 350	TYP.CS.VMS - 5	
III.3.16	DRAFT TYPICAL CROSS SECTION FOR VMS THANH TRI BRIDGE(2)	1 : 200	TYP.CS.VMS - 6	
III.3.17	DRAFT TYPICAL CROSS SECTION FOR VMS PHAP VAN - NINH BINH	1 : 200	TYP.CS.VMS - 7	
III.3.18	DRAFT TYPICAL CROSS SECTION FOR VMS NOI BAI - VIET TRI	1 : 200	TYP.CS.VMS - 8	
<b>IV.</b>	<b>NORTHERN REGIONAL MAIN CENTER</b>			
IV.1	ROOM LAYOUT PLAN FOR NORTHERN REGIONAL MAIN CENTER	1 : 200	NRMCC - 1	

CONSULTANT		SOCIALIST REPUBLIC OF VIETNAM		ITS INTEGRATION PROJECT IMPLEMENTATION OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA	
ORIENTAL CONSULTANTS CO., LTD	TITLE	NAME	SIGNATURE	DATE	DRAWING TITLE: LIST OF DRAWING (2/2)
NEXCO EAST ENGINEERING CO., LTD	PREPARED BY				
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			SCALE: _____ of _____		Sheet _____ of _____

MINISTRY OF TRANSPORT

## I. PROJECT SCOPE AREA



## II. BILL OF QUANTITY



4. Communication System

Item No.	Equipment Component	Unit	Qty (a)	Qty (b)
4.1	Telephone	set	1	1
	Regional Main Center	set	1	1
	Directive Communication Console	set	1	1
	Administrative Telephone	set	1	1
	Road Management Office	set	6	6
	Directive Communication Console	set	6	6
	Administrative Telephone	set	6	6
	Receiving Telephone of Emergency Call	set	6	6
	Toll Office	set	21	21
	Directive Communication Console	set	21	21
	Administrative Telephone	set	21	21
	Roadside	set	211	211
4.2	Center/Roadside Communication			
	Regional Main Center	set	1	1
	Transmission Equipment Component	set	1	1
	Road Management Office	set	6	6
	Transmission Equipment Component	set	6	6
	Node	set	134	134
	Transmission Equipment Component	set	134	134
4.3	Mobile Radio Communication			
	Regd. Management Office	set	10	10
	Base Station for Radio Communication	set	10	10
	Repeater	set	10	10
	Trunking Controller	set	1	1
	Toll Management Office	set	1	1
	Base Station for Radio Communication	set	1	1
	Radio Communication Console at Road Management Office	set	1	1
	In-Vehicle	set	20	20
	Mobile	set	20	20
	Radio Communication Terminal	set	20	20

5. Optical fiber / Ducts

Item No.	Equipment Component	Unit	Qty (a)	Qty (b)
5.1	Optical Fiber Cables	km	861	861
	Optical Fiber Cable (Cable - 12cores)	km	861	861
5.2	Ducts	km	697	697
	Excavation & Foundation	km	697	697
	Installation of Sign's optical cable	km	697	697
	Installation of duct	km	697	697
	MTHH	each	697	697

6. Building Construction

Item No.	Equipment Component	Unit	Qty (a)	Qty (b)
6.1	Building Construction	set	1	1
	Arten Regional Main Center (1400 m <sup>2</sup> )	set	1	1
6.2	Building Construction (Out of Project Scope)	set	1	1
	Road Management Office for Lang - Ho Tur	set	1	1

2. Automated Toll Collection

Item No.	Equipment Component	Unit	Qty (a)	Qty (b)
2.1	Lane Monitoring	set	122	122
	Roadside	set	122	122
	CCTV Camera (Network Camera (Fix Type))	set	122	122
	Toll Booth/Roadside	set	21	21
	CCTV Monitoring in Booth	set	21	21
	Toll Management Office	set	21	21
	CCTV Monitoring Console	set	21	21
2.2	Vehicle Identification	set	21	21
	Roadside	set	21	21
	License Plate Scanner	set	21	21
	Image Recognition Processor	set	21	21
	Toll Office	set	21	21
	Image Recognition Processor	set	21	21
	Lane Server	set	21	21
2.3	Lane Control	set	21	21
	Roadside	set	21	21
	Vehicle Detector	set	21	21
	Entry-Card Issuer	set	21	21
	Toll Display Pad Sign	set	21	21
	Supp-Go Sign	set	21	21
	Barrier	set	21	21
2.4	Road to Vehicle Communication	set	42	42
	In-Vehicle	set	42	42
	IC-Card Reader/Writer	set	42	42
	IC-Card Reader/Writer	set	42	42
2.5	Toll Management	set	21	21
	Toll Office	set	21	21
	Toll Management Server	set	21	21
	Toll Management Center	set	21	21
	Toll Management Server	set	21	21
2.6	OBU Management	set	1	1
	OBU Issue Office	set	1	1
	OBU Registration Terminal	set	1	1
	OBU Management Center	set	1	1
	OBU Management Server	set	1	1

3. Heavy Truck Control

Item No.	Equipment Component	Unit	Qty (a)	Qty (b)
3.1	Axle Load Management	set	21	21
	Roadside	set	21	21
	Axle Load Scale	set	21	21
	Vehicle Detector	set	21	21
	Lane Server	set	21	21
3.2	Overloading Management	set	21	21
	Toll Office	set	21	21
	Heavy Truck Control Data Server	set	21	21

1. Traffic Information/Control

Item No.	Equipment Component	Unit	Qty (a)	Qty (b)
1.1	CCTV Monitoring	set	177	177
	CCTV Camera (Network Camera PTZ type (for Outside))	set	177	177
	Road Management Office	set	20	20
	CCTV Center Controller	set	6	6
	Regional Main Center	set	1	1
	CCTV Center Controller	set	1	1
	CCTV Monitoring Console	set	1	1
1.2	Event Detection (by Image)	set	249	249
	Roadside	set	249	249
	CCTV Camera (Network Camera (Fix Type) for Image Recognition)	set	249	249
	Image Recognition Processor	set	249	249
1.3	Vehicle Detection	set	40	40
	Roadside	set	40	40
	Loop Coil Vehicle Detector	set	40	40
	CCTV Camera (Network Camera (Fix Type) for Vehicle Detection)	set	89	89
	Image Recognition Processor	set	89	89
1.4	Traffic Analysis	set	45	45
	Regional Main Center	set	1	1
	Traffic Analysis Processor	set	1	1
	Traffic Data Server	set	1	1
1.5	Weather Monitoring	set	45	45
	Roadside	set	45	45
	Rain Gauge	each	45	45
	Wind Sensor	each	45	45
	Visibility Sensor	each	45	45
	Thermometer	each	45	45
1.6	Traffic Event Data Management	set	6	6
	Road Management Office	set	6	6
	Traffic Event Data Monitor	set	6	6
	Traffic Event Data Server	set	6	6
1.7	Traffic Supervision	set	6	6
	Regional Main Center	set	1	1
	Traffic Event Data Monitor	set	1	1
	Traffic Event Data Server	set	1	1
	Traffic Supervision	set	6	6
	Road Management Office	set	6	6
	Monitor Screen	set	6	6
	Data Input Terminal	set	6	6
1.8	VMS Indication	set	20	20
	Regional Main Center	set	1	1
	Traffic Supervising/Control Console	set	1	1
	Traffic Supervising/Control Server	set	1	1
	Mobile	set	20	20
	Mobile Data Input Terminal (each Road Management Office x 2)	set	20	20
1.9	VMS Information	set	74	74
	Roadside	set	74	74
	VMS Type-A	set	74	74
	VMS Type-B	set	89	89
	CSS	set	89	89
	Main Center	set	1	1
	VMS Center Controller	each	1	1
	Traffic Information	set	1	1
	Regional Main Center	set	1	1
	Traffic Information Server	set	1	1

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**SOCIALIST REPUBLIC OF VIETNAM**

**MINISTRY OF TRANSPORT**

**ITS INTEGRATION PROJECT IMPLEMENTATION  
 OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA**

DRAWING TITLE: **BILL OF QUANTITIES**

SCALE: \_\_\_\_\_

PACKAGE: \_\_\_\_\_

DRAWING NO.: \_\_\_\_\_

SHEET NO. \_\_\_\_\_ of \_\_\_\_\_

REV: \_\_\_\_\_

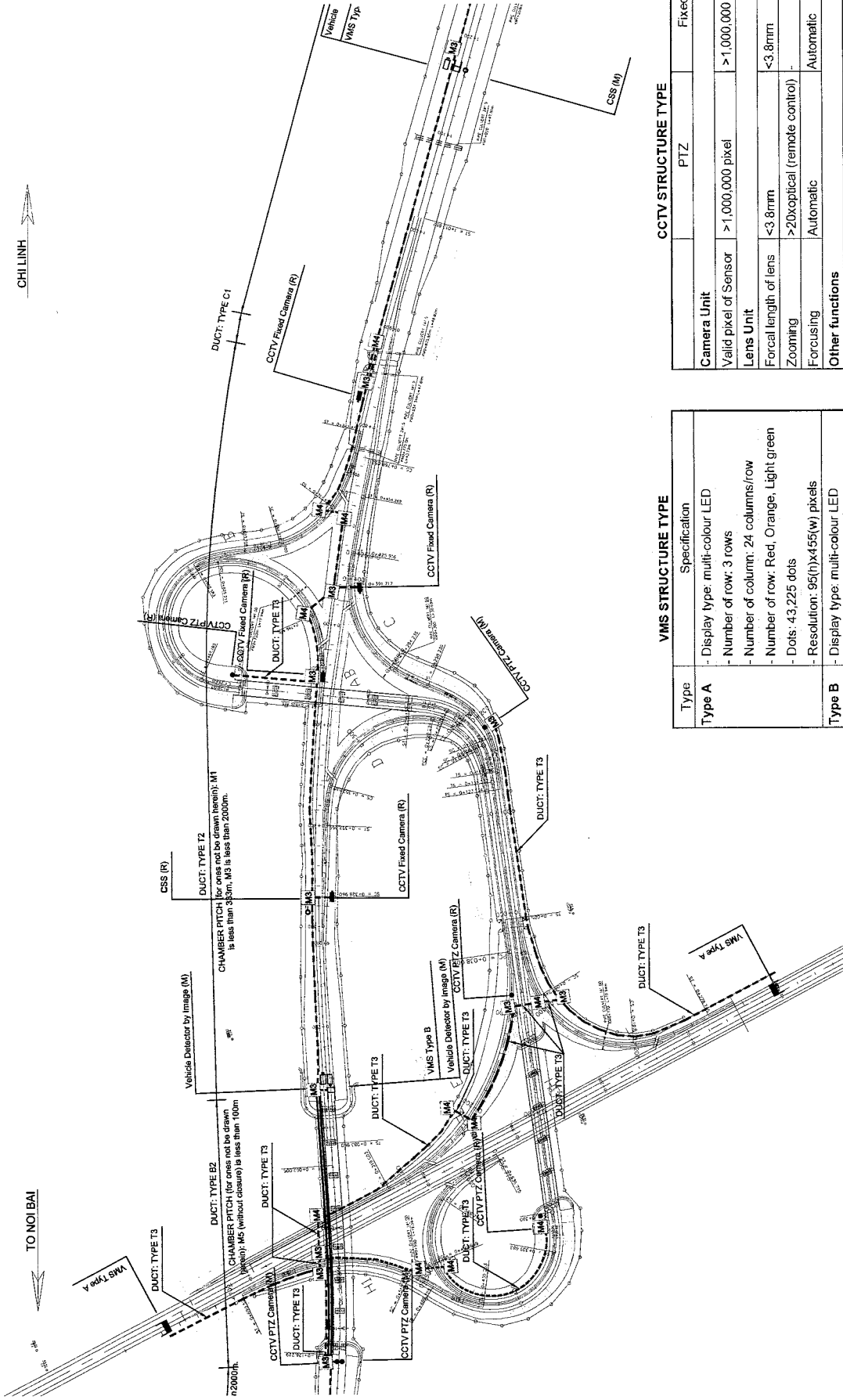
### III.1 BASIC LAYOUT PLAN



### III.2 INTERCHANGES

TO NOI BAI

CHILINH



**VMS STRUCTURE TYPE**

Type	Specification
Type A	<ul style="list-style-type: none"> <li>- Display type: multi-colour LED</li> <li>- Number of row: 3 rows</li> <li>- Number of column: 24 columns/row</li> <li>- Number of row: Red, Orange, Light green</li> <li>- Dots: 43,225 dots</li> <li>- Resolution: 95(n)x455(w) pixels</li> </ul>
Type B	<ul style="list-style-type: none"> <li>- Display type: multi-colour LED</li> <li>- Number of row: 2 rows</li> <li>- Number of column: 24 columns/row</li> <li>- Number of row: Red, Orange, Light green</li> <li>- Dots: 28,665 dots</li> <li>- Resolution: 63(n)x455(w) pixels</li> </ul>

**CCTV STRUCTURE TYPE**

Camera Unit	PTZ	Fixed
Valid pixel of Sensor	> 1,000,000 pixel	> 1,000,000 pixel
Lens Unit	< 3.8mm	< 3.8mm
Forcal length of lens	> 20xoptical (remote control)	-
Zooming	Automatic	Automatic
Forcusing	Automatic	Automatic
Other functions		
Panning	Enable	-
Tilting	Enable	-
Day/night	Enable	Enable
Programmable Preset	Enable	-
Housing Unit		
Ingress Protection	Equivalent IP 66	Equivalent IP 66

**CONSULTANT**

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TITLE	NAME	SIGNATURE	DATE
PREPARED BY			
CHECKED BY			
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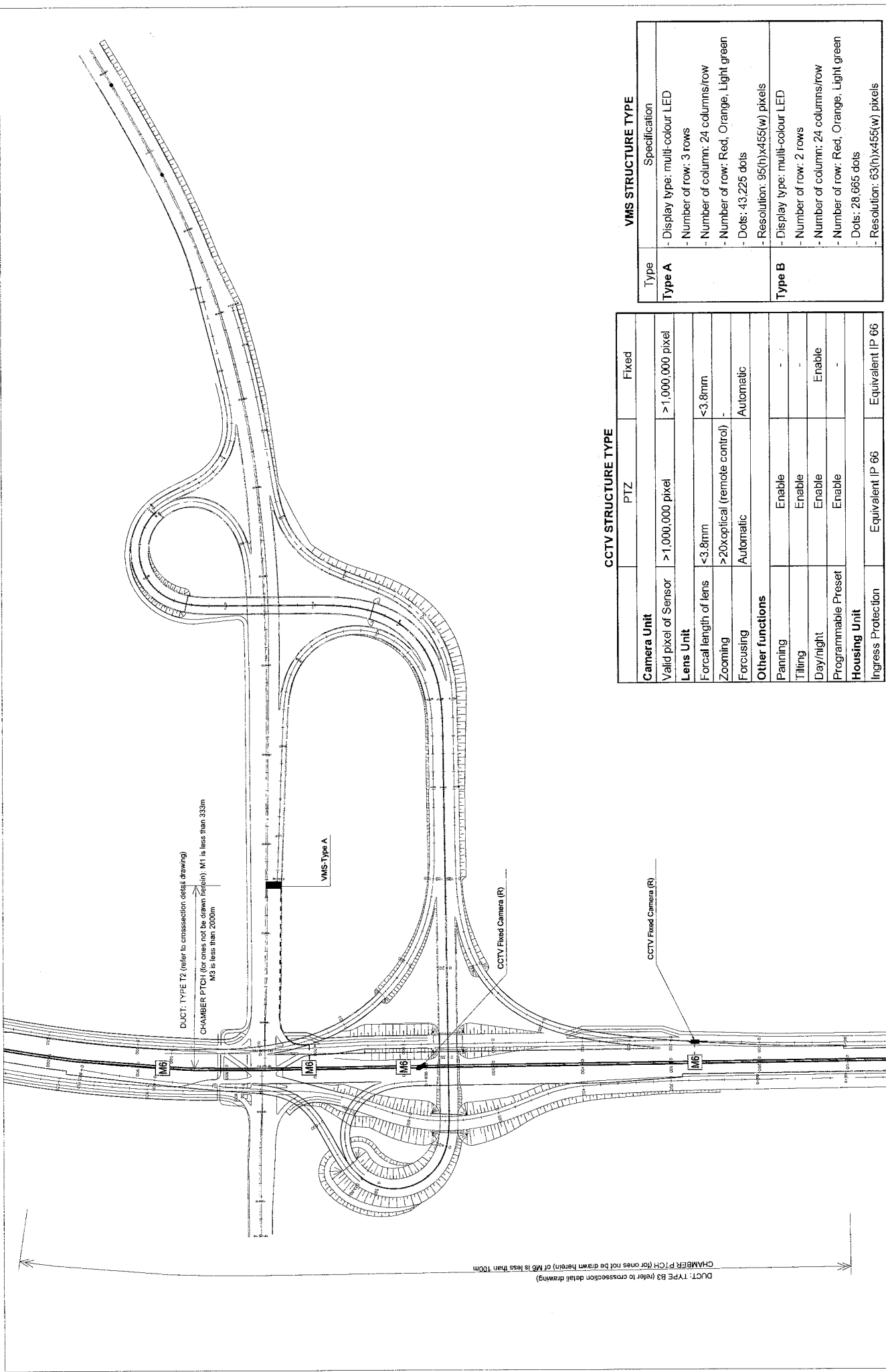
**SOCIALIST REPUBLIC OF VIETNAM**

MINISTRY OF TRANSPORT

ITS INTEGRATION PROJECT IMPLEMENTATION  
 OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA

DRAFT LOCATION PLAN FOR CCTV AND VMS  
 IC-01 (NOI BAI)

PACKAGE: ICC-01  
 DRAWING No.: ICC-01  
 SHEET No.:  
 Scale: 1/400  
 Sheet of



**CCTV STRUCTURE TYPE**

Camera Unit	PTZ	Fixed
Valid pixel of Sensor	>1,000,000 pixel	>1,000,000 pixel
Lens Unit	<3.8mm	<3.8mm
Focal length of lens	>20optical (remote control)	-
Zooming	Automatic	Automatic
Focusing	Automatic	Automatic
Other functions		
Panning	Enable	-
Tilting	Enable	-
Day/night	Enable	Enable
Programmable Preset	Enable	-
Housing Unit	Equivalent IP 66	Equivalent IP 66
Ingress Protection	Equivalent IP 66	Equivalent IP 66

**VMS STRUCTURE TYPE**

Type	Specification
<b>Type A</b>	- Display type: multi-colour LED - Number of row: 3 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 43,225 dots - Resolution: 95(h)x455(w) pixels
<b>Type B</b>	- Display type: multi-colour LED - Number of row: 2 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 28,665 dots - Resolution: 63(h)x455(w) pixels

**SOCIALIST REPUBLIC OF VIETNAM**

**MINISTRY OF TRANSPORT**

DRAFT LOCATION PLAN FOR CCTV AND VMS  
 IC-04 (PHAP VAN)

SCALE: 1:4000

SHEET No. of

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**CONSULTANT**

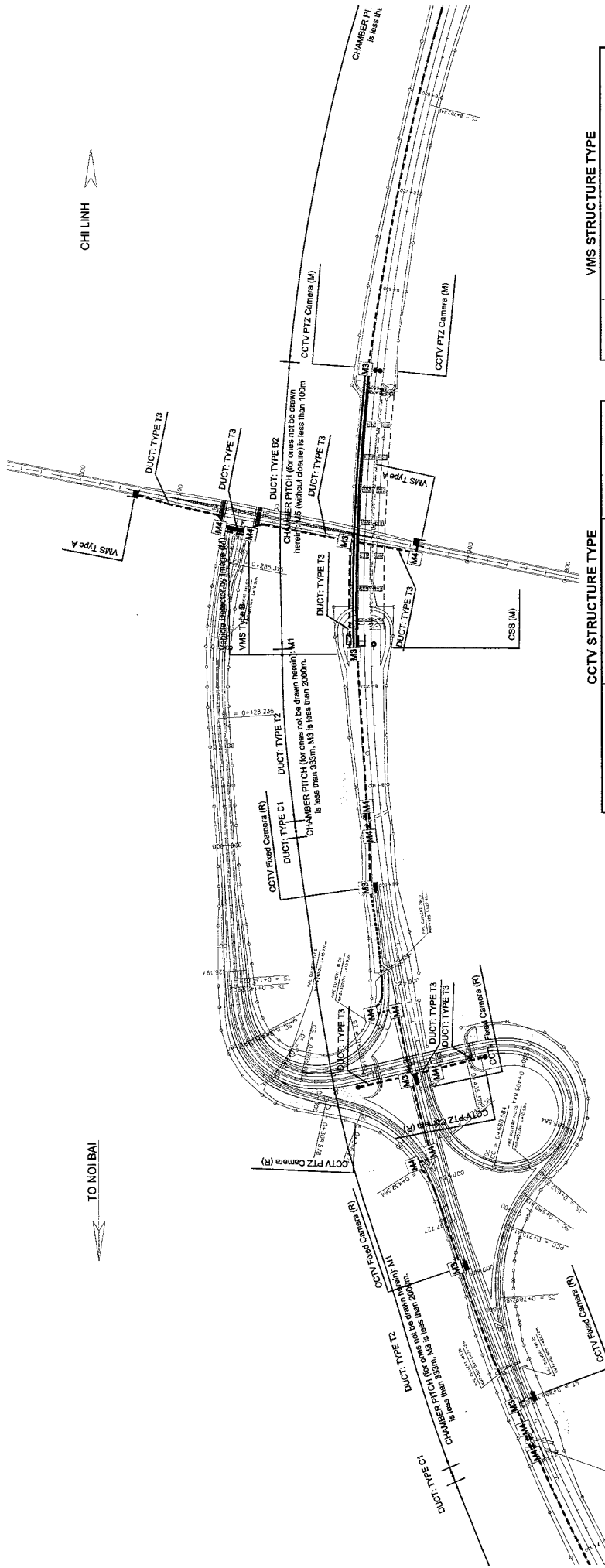
ORIENTAL CONSULTANTS CO., LTD	TITLE	NAME	SIGNATURE	DATE
NEXCO EAST ENGINEERING CO., LTD	PREPARED BY			
NIPPON KOEI CO., LTD	CHECKED BY			
TRANSPORTATION RESEARCH INSTITUTE CO., LTD	APPROVED BY			
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ITS INTEGRATION PROJECT IMPLEMENTATION  
 OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA

DRAWING TITLE

DRAWING NO.: ICC-02

SHEET NO.: ICC-02



CHI LINH

TO NOI BAI

Type	Specification
Type A	<ul style="list-style-type: none"> <li>- Display type: multi-colour LED</li> <li>- Number of row: 3 rows</li> <li>- Number of column: 24 columns/row</li> <li>- Number of row: Red, Orange, Light green</li> <li>- Dots: 43,225 dots</li> <li>- Resolution: 95(h)x455(w) pixels</li> </ul>
Type B	<ul style="list-style-type: none"> <li>- Display type: multi-colour LED</li> <li>- Number of row: 2 rows</li> <li>- Number of column: 24 columns/row</li> <li>- Number of row: Red, Orange, Light green</li> <li>- Dots: 28,865 dots</li> <li>- Resolution: 63(h)x455(w) pixels</li> </ul>

CCTV STRUCTURE TYPE	PTZ	Fixed
Camera Unit		
Valid pixel of Sensor	> 1,000,000 pixel	> 1,000,000 pixel
Lens Unit	< 3.8mm	< 3.8mm
Focal length of lens	> 20optical (remote control)	-
Zooming	Automatic	Automatic
Other functions		
Panning	Enable	-
Tilting	Enable	-
Day/night	Enable	Enable
Programmable Preset	Enable	-
Housing Unit		
Ingress Protection	Equivalent IP 66	Equivalent IP 66

**SOCIALIST REPUBLIC OF VIETNAM**

**MINISTRY OF TRANSPORT**

ITS INTEGRATION PROJECT IMPLEMENTATION  
OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA

DRAWING TITLE: DRAFT LOCATION PLAN FOR CCTV AND VMS  
IC-12 (NH3-OLD)

SCALE: 1:4000

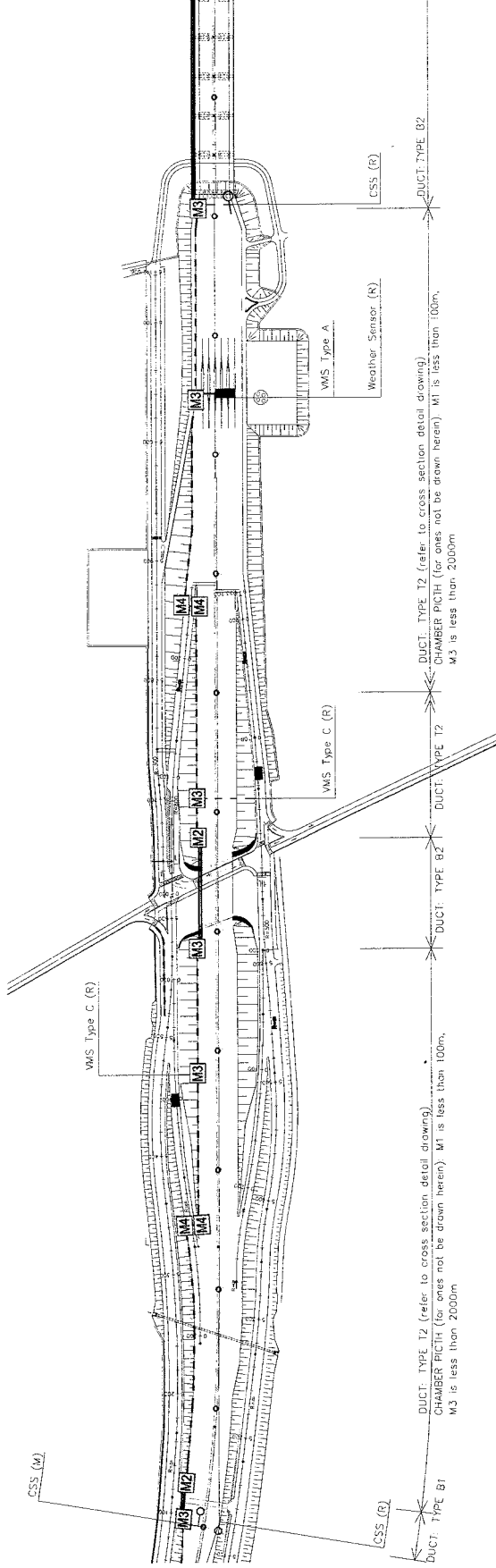
PACKAGE: ITS INTEGRATION PROJECT IMPLEMENTATION OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA

DRAWING NO.: ICC-03

SHEET NO.: \_\_\_\_\_

SHEET \_\_\_\_\_ OF \_\_\_\_\_

CONSULTANT	TITLE	NAME	SIGNATURE	DATE
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	CHECKED BY			
	APPROVED BY			



**CCTV STRUCTURE TYPE**

Camera Unit	PTZ	Fixed
Valid pixel of Sensor	> 1,000,000 pixel	> 1,000,000 pixel
Lens Unit		
Forcal length of lens	<3.8mm	<3.8mm
Zooming	>20xoptical (remote control)	-
Focusing	Automatic	Automatic
<b>Other functions</b>		
Panning	Enable	-
Tilting	Enable	-
Day/night	Enable	Enable
Programmable Preset	Enable	-
<b>Housing Unit</b>		
Ingress Protection	Equivalent IP: 66	Equivalent IP: 66

**VMS STRUCTURE TYPE**

Type	Specification
<b>Type A</b>	<ul style="list-style-type: none"> <li>- Display type: multi-colour LED</li> <li>- Number of row: 3 rows</li> <li>- Number of column: 24 columns/row</li> <li>- Number of row: Red, Orange, Light green</li> <li>- Dots: 43,225 dots</li> <li>- Resolution: 95(h)x455(w) pixels</li> </ul>
<b>Type B</b>	<ul style="list-style-type: none"> <li>- Display type: multi-colour LED</li> <li>- Number of row: 2 rows</li> <li>- Number of column: 24 columns/row</li> <li>- Number of row: Red, Orange, Light green</li> <li>- Dots: 28,665 dots</li> <li>- Resolution: 63(h)x455(w) pixels</li> </ul>

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TITLE	NAME	SIGNATURE	DATE
PREPARED BY			
CHECKED BY			
APPROVED BY			

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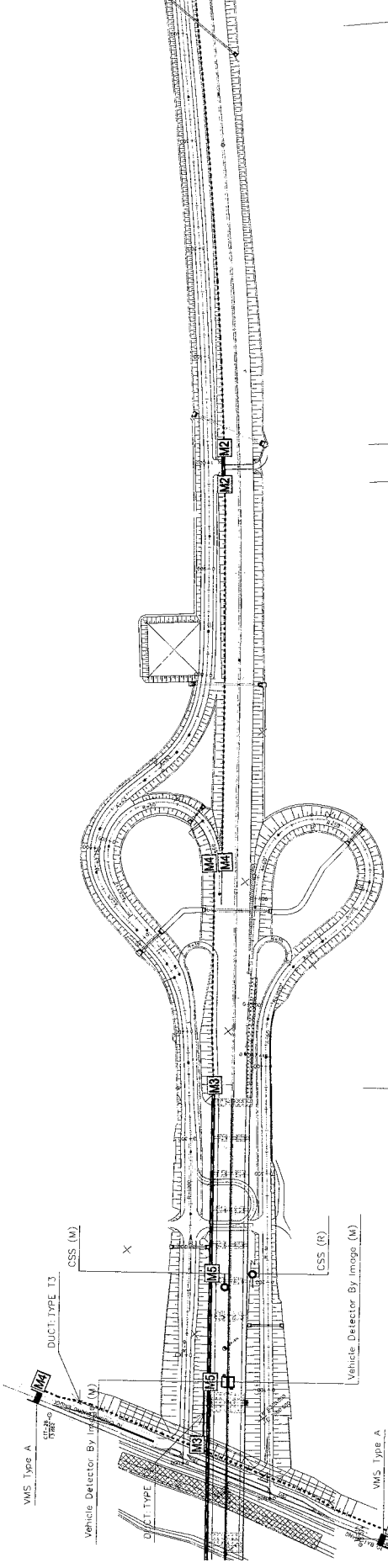
ITS INTEGRATION PROJECT IMPLEMENTATION  
 OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA

DRAWING TITLE: DRAFT LOCATION PLAN FOR CCTV AND VMS  
 IC-05 (LINH NAM)

PACKAGE: DRAWING NO: ICC-04

SCALE: 1:4000  
 Sheet of





DUCT TYPE T2 (refer to cross section detail drawing)  
CHAMBER PITCH (for ones not be drawn herein): M1  
is less than 100m, M3 is less than 2000m

DUCT TYPE T2 (refer to cross section detail drawing)  
CHAMBER PITCH (for ones not be drawn herein): M1  
is less than 100m, M3 is less than 2000m

**CCTV STRUCTURE TYPE**

Camera Unit	PTZ	Fixed
Valid pixel of Sensor	> 1,000,000 pixel	> 1,000,000 pixel
Lens Unit		
Forcal length of lens	<3.8mm	<3.8mm
Zooming	>20xoptical (remote control)	-
Focusing	Automatic	Automatic
Other functions		
Panning	Enable	-
Tilting	Enable	-
Day/night	Enable	Enable
Programmable Preset	Enable	-
Housing Unit		
Ingress Protection	Equivalent IP 66	Equivalent IP 66

**VMS STRUCTURE TYPE**

Type	Specification
Type A	- Display type: multi-colour LED - Number of row: 3 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 43,225 dots - Resolution: 95(n)x455(w) pixels
Type B	- Display type: multi-colour LED - Number of row: 2 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 28,665 dots - Resolution: 63(n)x455(w) pixels

**CONSULTANT**

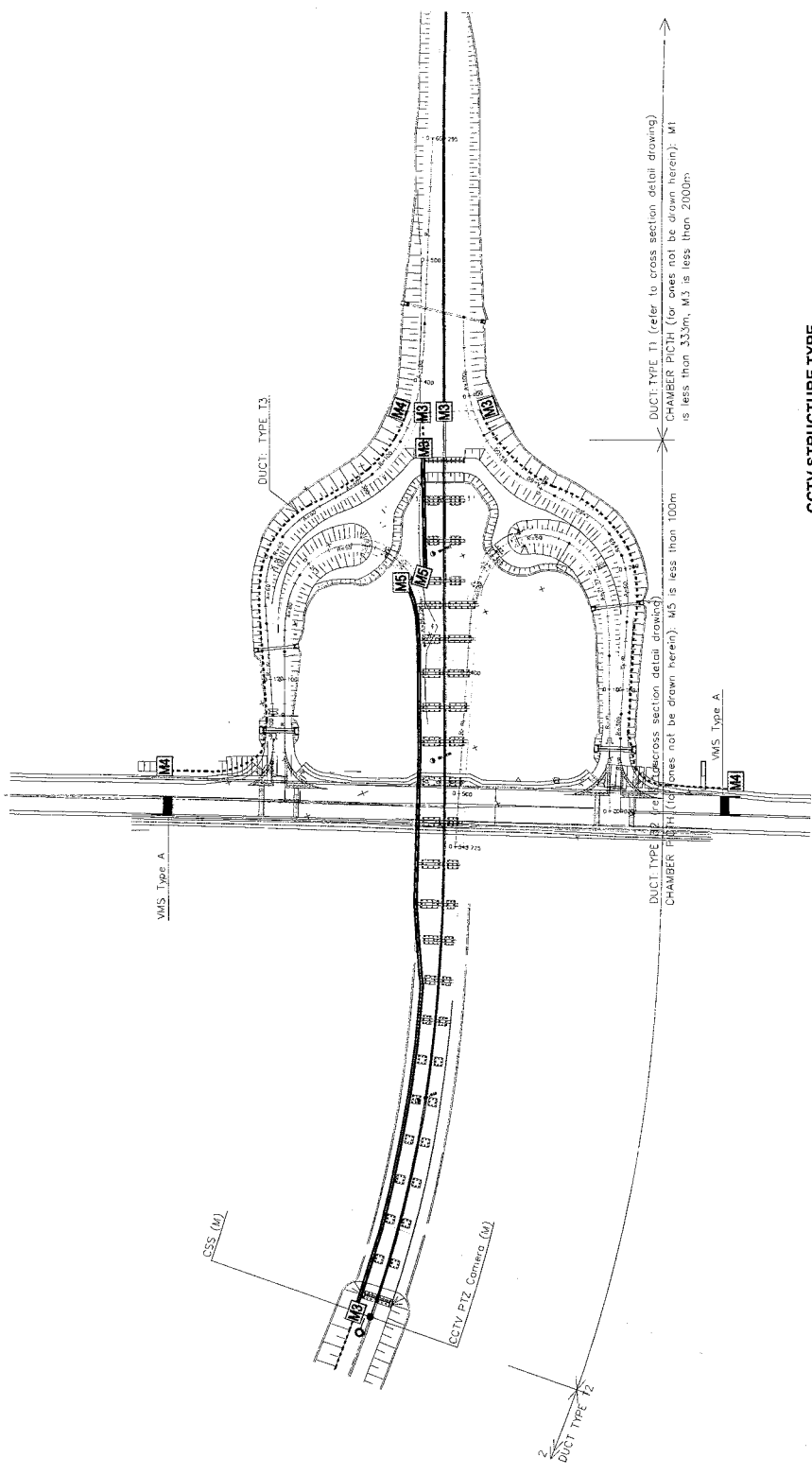
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NEXCO EAST ENGINEERING CO., LTD	PREPARED BY			
NIPPON KOEI CO., LTD	CHECKED BY			
TRANSPORTATION RESEARCH INSTITUTE CO., LTD	APPROVED BY			
LANDTEC JAPAN INC.				

**SOCIALIST REPUBLIC OF VIETNAM**

MINISTRY OF TRANSPORT

**ITS INTEGRATION PROJECT IMPLEMENTATION**

OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA  
DRAWING TITLE  
DRAFT LOCATION PLAN FOR CCTV AND VMS  
IC-06 (GIA, LAM)  
PACKAGE  
DRAWINGS  
SHEET No. of  
KCC-05  
SCALE: 1:4000



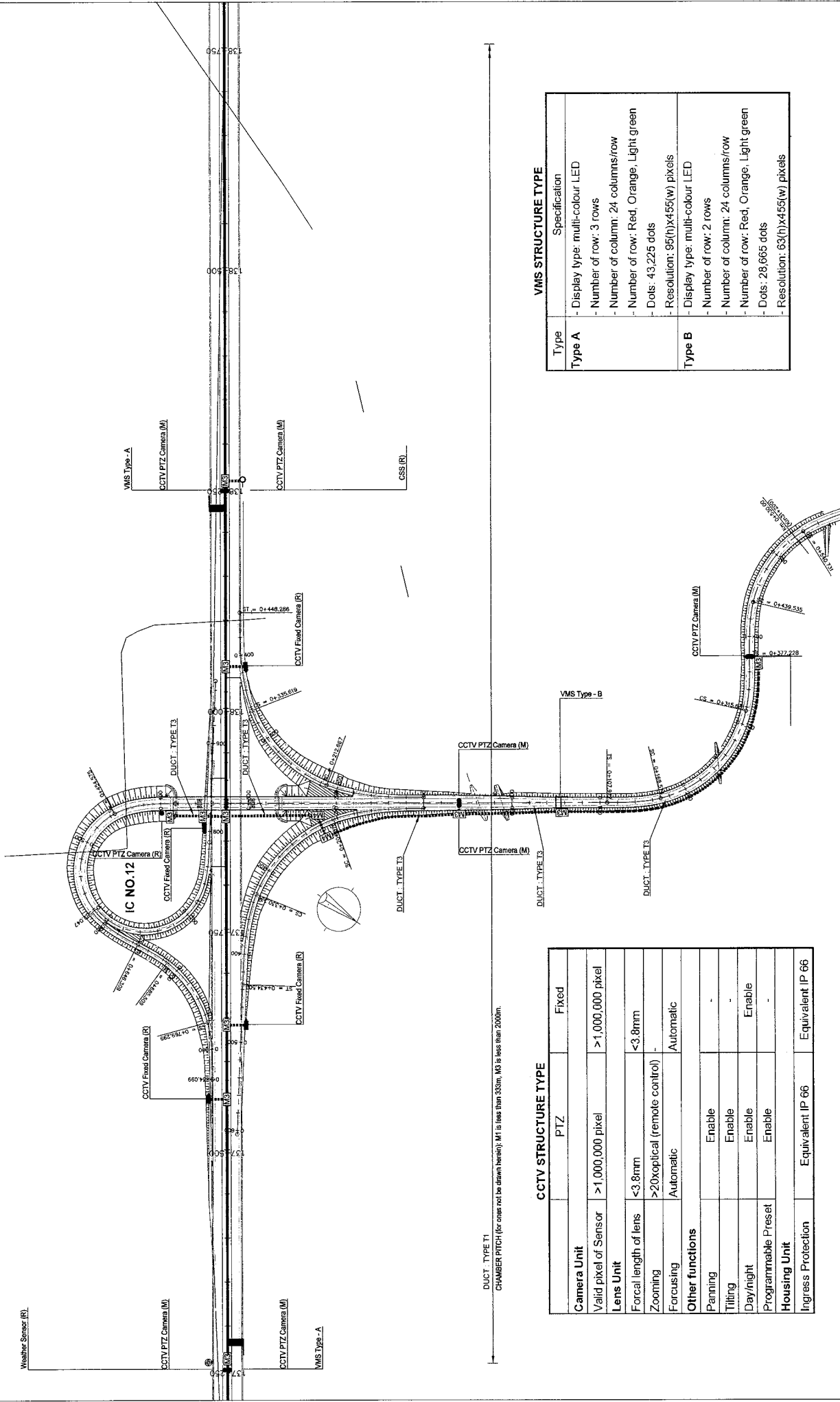
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<b>Type A</b>	- Display type: multi-colour LED - Number of row: 3 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 43,225 dots - Resolution: 95(h)x155(w) pixels
<b>Type B</b>	- Display type: multi-colour LED - Number of row: 2 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 28,665 dots - Resolution: 63(h)x155(w) pixels

CCTV STRUCTURE TYPE	PIZ	Fixed
<b>Camera Unit</b>		
Valid pixel of Sensor	>1,000,000 pixel	>1,000,000 pixel
<b>Lens Unit</b>		
Focal length of lens	<3.8mm	<3.8mm
Zooming	>20xoptical (remote control)	-
Focusing	Automatic	Automatic
<b>Other functions</b>		
Panning	Enable	-
Tilting	Enable	-
Day/night	Enable	Enable
Programmable Preset	Enable	-
<b>Housing Unit</b>		
Ingress Protection	Equivalent IP 66	Equivalent IP 66

<b>CONSULTANT</b>				<b>SOCIALIST REPUBLIC OF VIETNAM</b>			
TITLE	NAME	SIGNATURE	DATE	ITS INTEGRATION PROJECT IMPLEMENTATION OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA			
ORIENTAL CONSULTANTS CO., LTD				DRAWING NO. ICC-06			
NEXCO EAST ENGINEERING CO., LTD				SHEET No. _____ of _____			
NIPPON KOEI CO., LTD				DRAFT LOCATION PLAN FOR CCTV AND VMS (C-07) (NH5)			
TRANSPORTATION RESEARCH INSTITUTE CO., LTD				SCALE 1:4000			
LANDTEC JAPAN INC.							
MINISTRY OF TRANSPORT							

TO LANG SON

TO HA NOI



CCTV STRUCTURE TYPE		PTZ	Fixed
Camera Unit			
Valid pixel of Sensor	>1,000,000 pixel	>1,000,000 pixel	
Lens Unit			
Forcal length of lens	<3.8mm	<3.8mm	
Zooming	>20x(optical (remote control))		
Focusing	Automatic	Automatic	
Other functions			
Panning	Enable	Enable	
Tilting	Enable	Enable	
Day/night	Enable	Enable	
Programmable Preset	Enable	Enable	
Housing Unit			
Ingress Protection	Equivalent IP 66	Equivalent IP 66	Equivalent IP 66

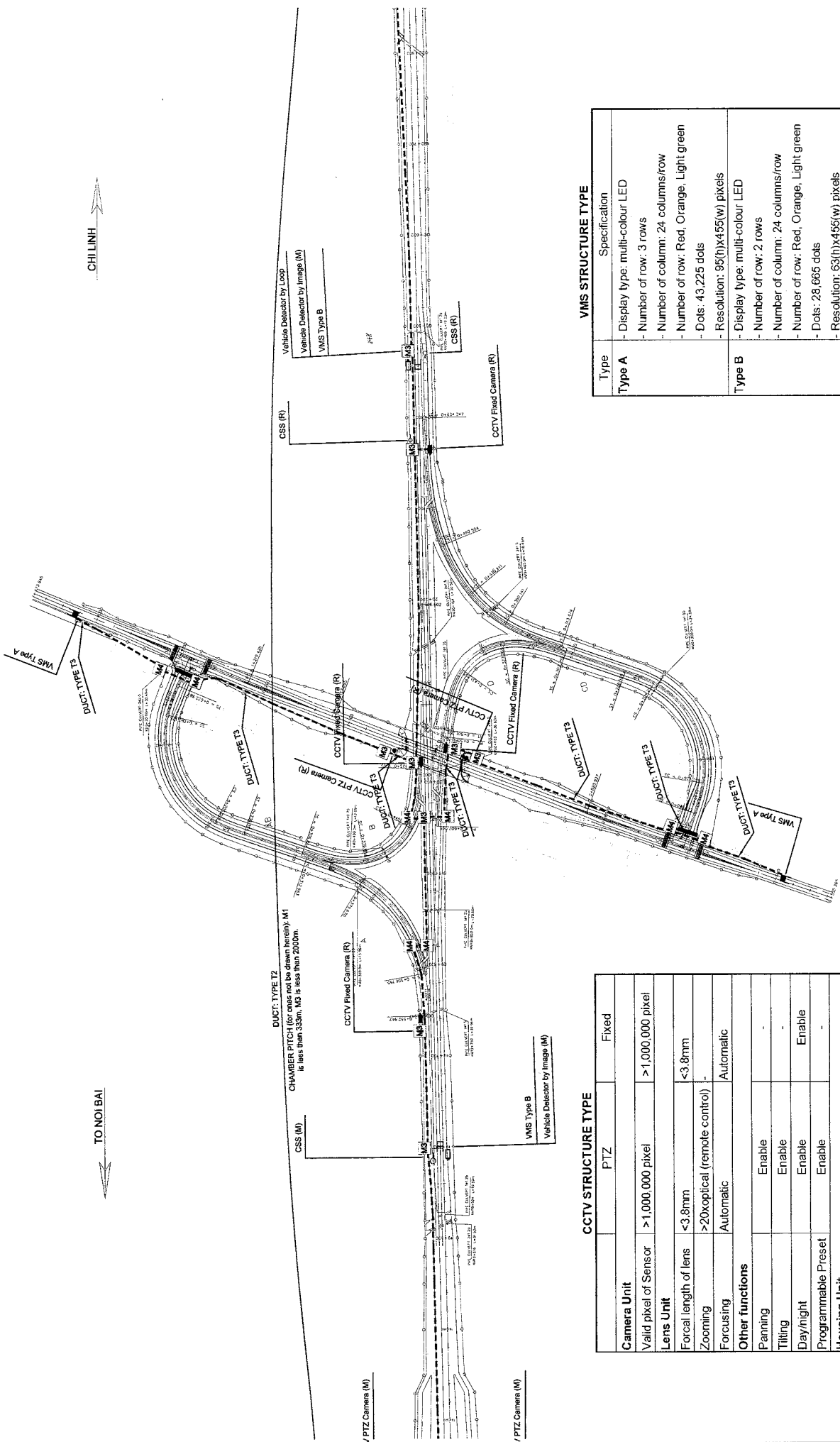
Type	Specification
Type A	- Display type: multi-colour LED - Number of row: 3 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 43,225 dots - Resolution: 95(h)x455(w) pixels
Type B	- Display type: multi-colour LED - Number of row: 2 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 28,665 dots - Resolution: 63(h)x455(w) pixels

DUCT\_TYPE T1  
CHAMBER PITCH (for cases not be drawn herein): M1 is less than 335m, M3 is less than 200m.

<b>CONSULTANT</b>		<b>SOCIALIST REPUBLIC OF VIETNAM</b>	
ORIENTAL CONSULTANTS CO., LTD NEXCO EAST ENGINEERING CO., LTD NIPPON KOEI CO., LTD TRANSPORTATION RESEARCH INSTITUTE CO., LTD LANDTEC JAPAN INC.		<b>MINISTRY OF TRANSPORT</b> DRAFT LOCATION PLAN FOR CCTV AND VMS IC-09 (BAC NINH)	
TITLE PREPARED BY CHECKED BY APPROVED BY		PACKAGE: DRAWING No.: IC-07 SHEET No.: Sheet of	

TO NOI BAI

CHILINH



CCTV STRUCTURE TYPE		PTZ	Fixed
Camera Unit			
Valid pixel of Sensor	>1,000,000 pixel	>1,000,000 pixel	
Lens Unit	<3.8mm	<3.8mm	
Zooming	>20xoptical (remote control)		
Forcusing	Automatic	Automatic	
Other functions			
Panning	Enable	Enable	
Tilting	Enable	Enable	
Day/night	Enable	Enable	
Programmable Preset	Enable	Enable	
Housing Unit			
Ingress Protection	Equivalent IP 66	Equivalent IP 66	Equivalent IP 66

VMS STRUCTURE TYPE		Specification
Type A		<ul style="list-style-type: none"> <li>- Display type: multi-colour LED</li> <li>- Number of row: 3 rows</li> <li>- Number of column: 24 columns/row</li> <li>- Number of row: Red, Orange, Light green</li> <li>- Dots: 43,225 dots</li> <li>- Resolution: 95(h)x455(w) pixels</li> </ul>
Type B		<ul style="list-style-type: none"> <li>- Display type: multi-colour LED</li> <li>- Number of row: 2 rows</li> <li>- Number of column: 24 columns/row</li> <li>- Number of row: Red, Orange, Light green</li> <li>- Dots: 29,685 dots</li> <li>- Resolution: 63(h)x455(w) pixels</li> </ul>

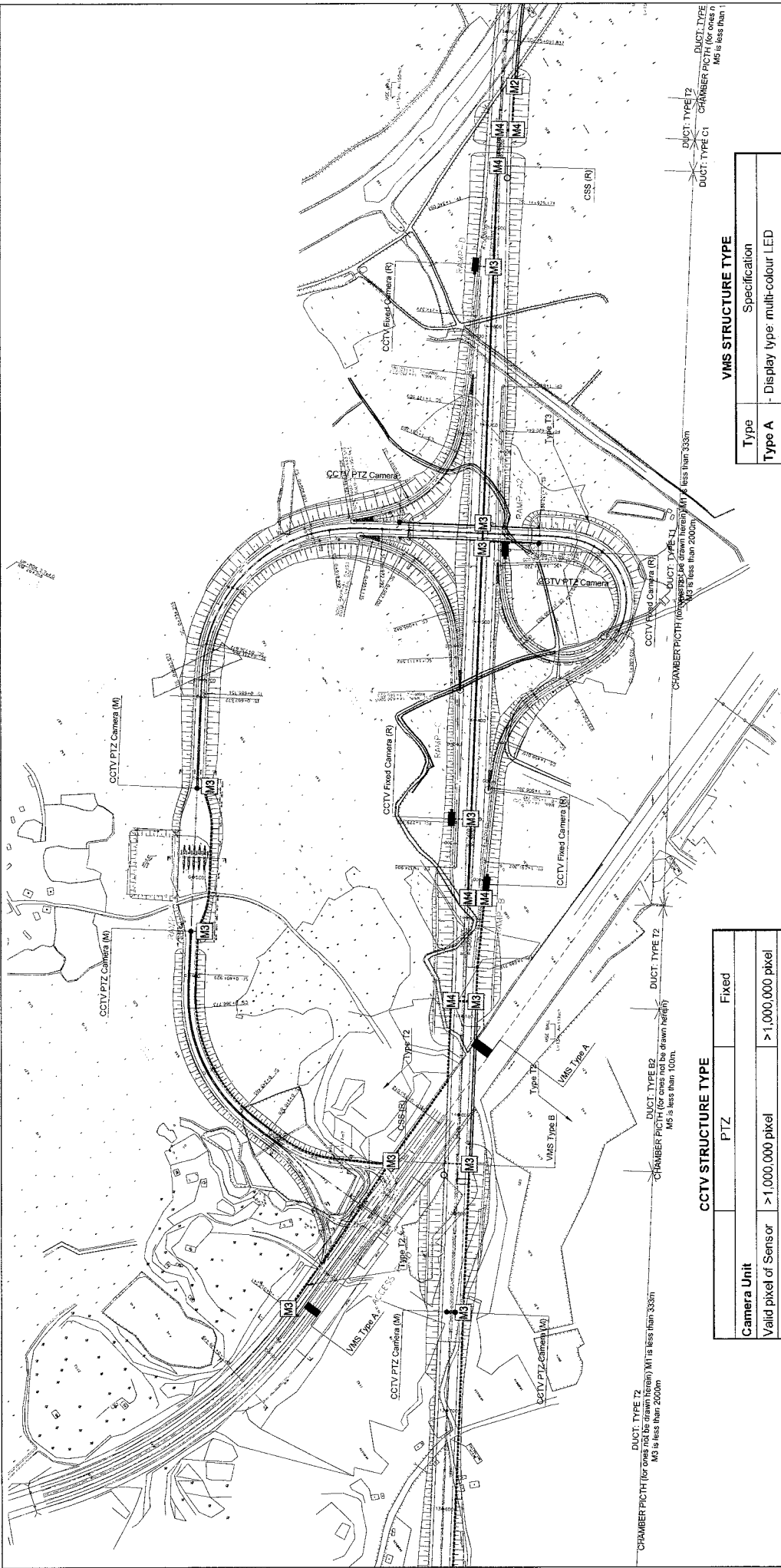
SOCIALIST REPUBLIC OF VIETNAM  
 MINISTRY OF TRANSPORT

ITS INTEGRATION PROJECT IMPLEMENTATION  
 OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA  
 DRAFT LOCATION PLAN FOR CCTV AND VMS  
 IC-10 (PR.295)

PACKAGE  
 DRAWING NO.: ICC-08  
 SHEET NO.:  
 Scale: 1:1000  
 Sheet of

CONSULTANT		TITLE	NAME	SIGNATURE	DATE
ORIENTAL CONSULTANTS CO., LTD					
NEXCO EAST ENGINEERING CO., LTD					
NIPPON KOEI CO., LTD					
TRANSPORTATION RESEARCH INSTITUTE CO., LTD					
LANDTEC JAPAN INC.					

ICC-08



DUCT, TYPE T2  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE B2  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 100m

DUCT, TYPE T1  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T3  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T4  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T5  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T6  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T7  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T8  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T9  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T10  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T11  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T12  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T13  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T14  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T15  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T16  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T17  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T18  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T19  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T20  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T21  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T22  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T23  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T24  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T25  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T26  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T27  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T28  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T29  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T30  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T31  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T32  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T33  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T34  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T35  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T36  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T37  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T38  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T39  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T40  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T41  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T42  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T43  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T44  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T45  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T46  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T47  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T48  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T49  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

DUCT, TYPE T50  
 CHAMBER PITCH (for ones not be drawn here) M1 is less than 333m  
 M5 is less than 200m

CCTV STRUCTURE TYPE		PTZ	Fixed
Camera Unit			
Valid pixel of Sensor	>1,000,000 pixel		>1,000,000 pixel
Lens Unit			
Focal length of lens	<3.8mm		<3.8mm
Zooming	>20xoptical (remote control)		-
Forcusing	Automatic		Automatic
Other functions			
Panning	Enable		-
Tilting	Enable		-
Day/night	Enable		Enable
Programmable Preset	Enable		-
Housing Unit			
Ingress Protection	Equivalent IP 66		Equivalent IP 66

VMS STRUCTURE TYPE		Specification
Type A		- Display type: multi-colour LED - Number of row: 3 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 43,225 dots - Resolution: 95(m)x455(w) pixels
Type B		- Display type: multi-colour LED - Number of row: 2 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 28,665 dots - Resolution: 63(m)x455(w) pixels

CONSULTANT

ORIENTAL CONSULTANTS CO., LTD NEXCO EAST ENGINEERING CO., LTD NIPPON KOEI CO., LTD TRANSPORTATION RESEARCH INSTITUTE CO., LTD LANDTEC JAPAN INC.	TITLE PREPARED BY CHECKED BY APPROVED BY
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SOCIALIST REPUBLIC OF VIETNAM

MINISTRY OF TRANSPORT

ITS INTEGRATION PROJECT IMPLEMENTATION  
OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA

DRAWING TITLE  
DRAFT LOCATION PLAN FOR CCTV AND VMS  
BNH TUYEN INTERCHANGE - KM14+900

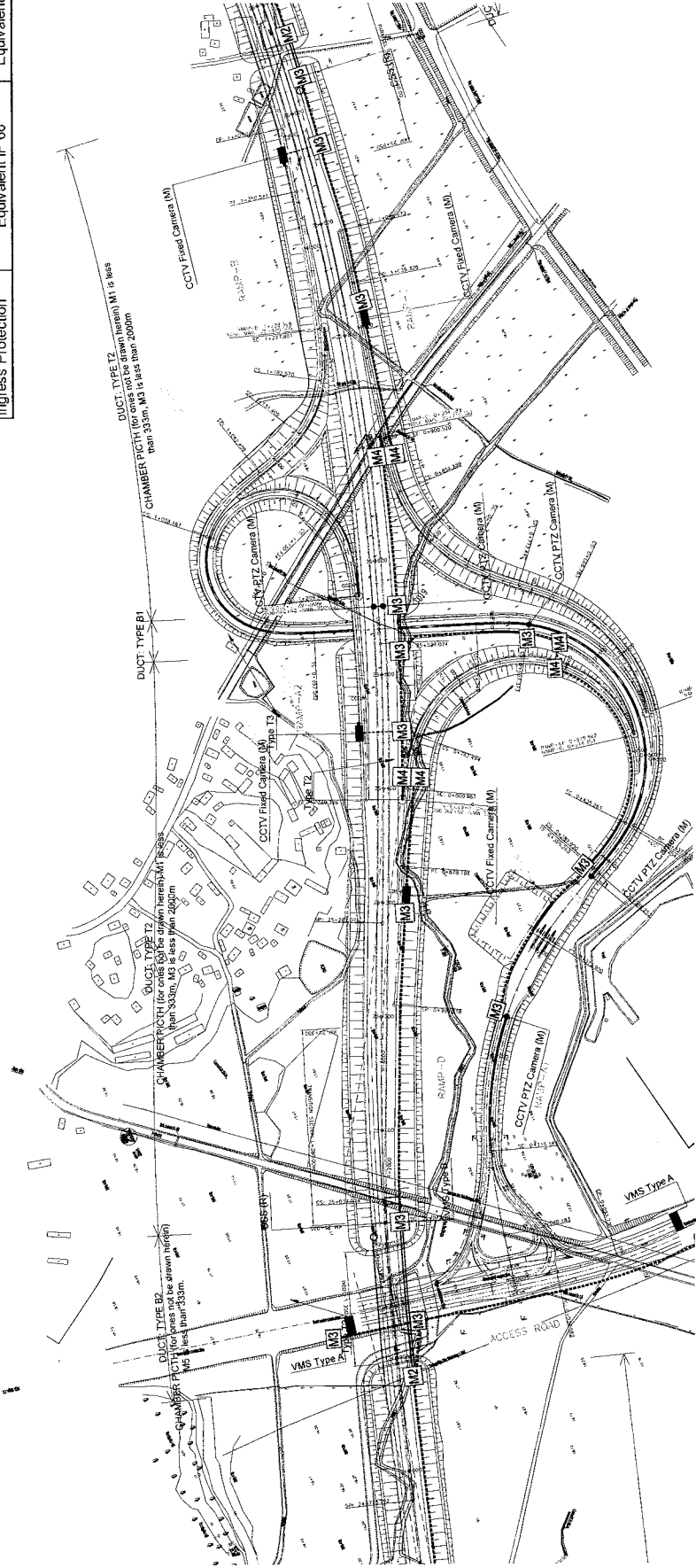
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DRAWING NO: ICC-09  
SHEET No: \_\_\_\_\_ of \_\_\_\_\_  
SCALE: 1/400

**VMS STRUCTURE TYPE**

Type	Specification
<b>Type A</b>	- Display type: multi-colour LED - Number of row: 3 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 43,225 dots - Resolution: 95(h)x455(w) pixels
<b>Type B</b>	- Display type: multi-colour LED - Number of row: 2 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 28,665 dots - Resolution: 63(h)x455(w) pixels

**CCTV STRUCTURE TYPE**

	PTZ	Fixed
<b>Camera Unit</b>		
Valid pixel of Sensor	>1,000,000 pixel	>1,000,000 pixel
<b>Lens Unit</b>		
Focal length of lens	<3.8mm	<3.8mm
Zooming	>20xoptical (remote control)	-
Forcusing	Automatic	Automatic
<b>Other functions</b>		
Panning	Enable	-
Tilting	Enable	-
Day/night	Enable	Enable
Programmable Preset	Enable	-
<b>Housing Unit</b>		
Ingress Protection	Equivalent IP 66	Equivalent IP 66



SOCIALIST REPUBLIC OF VIETNAM

ITS INTEGRATION PROJECT IMPLEMENTATION  
OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA

DRAWING TITLE

DRAFT LOCATION PLAN FOR CCTV AND VMS  
IC TO NH 2B - KM26-54B

SCALE: 1/1000

MINISTRY OF TRANSPORT

CONSULTANT

ORIENTAL CONSULTANTS CO., LTD  
NEXCO EAST ENGINEERING CO., LTD  
NIPPON KOEI CO., LTD  
TRANSPORTATION RESEARCH INSTITUTE CO., LTD  
LANDTEC JAPAN INC.

TITLE	NAME	SIGNATURE	DATE
PREPARED BY			
CHECKED BY			
APPROVED BY			

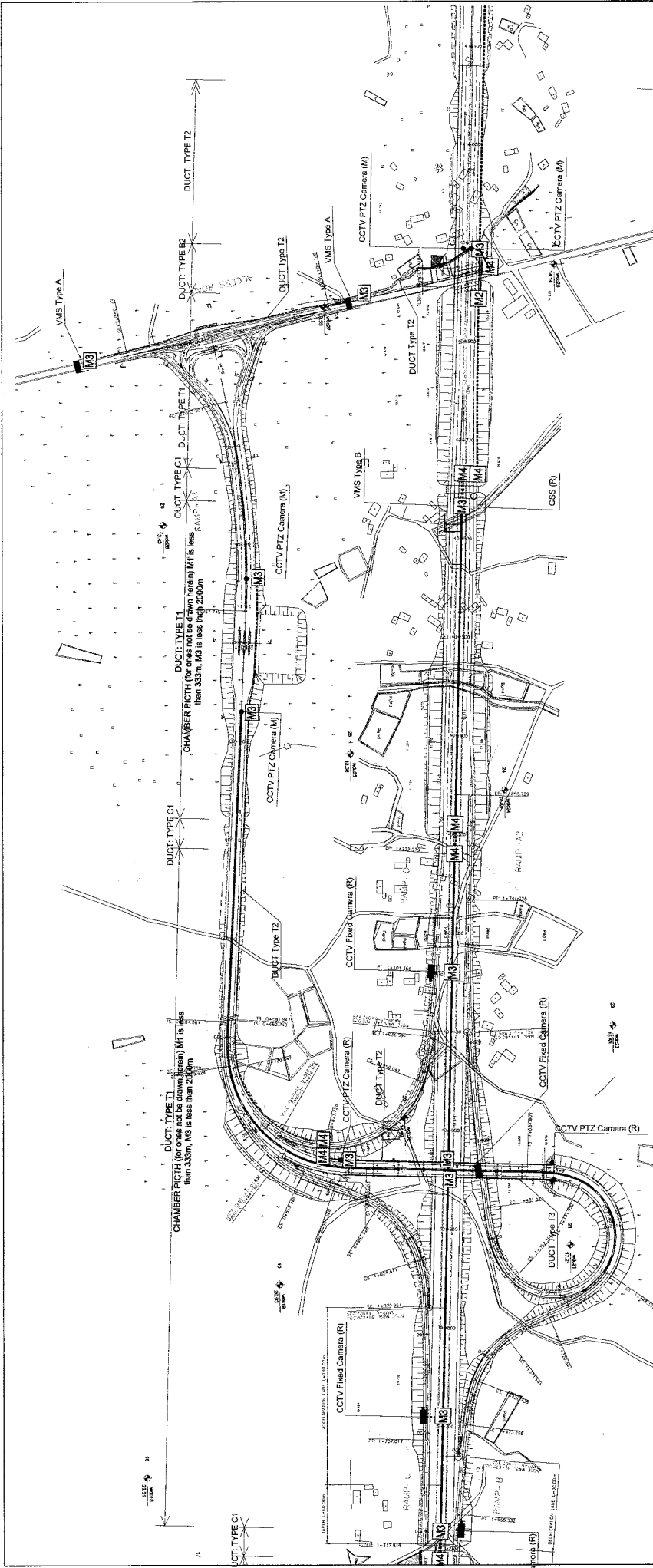
PACKAGE

CONTENTS

SHEET NO.

Sheet of

Rev.



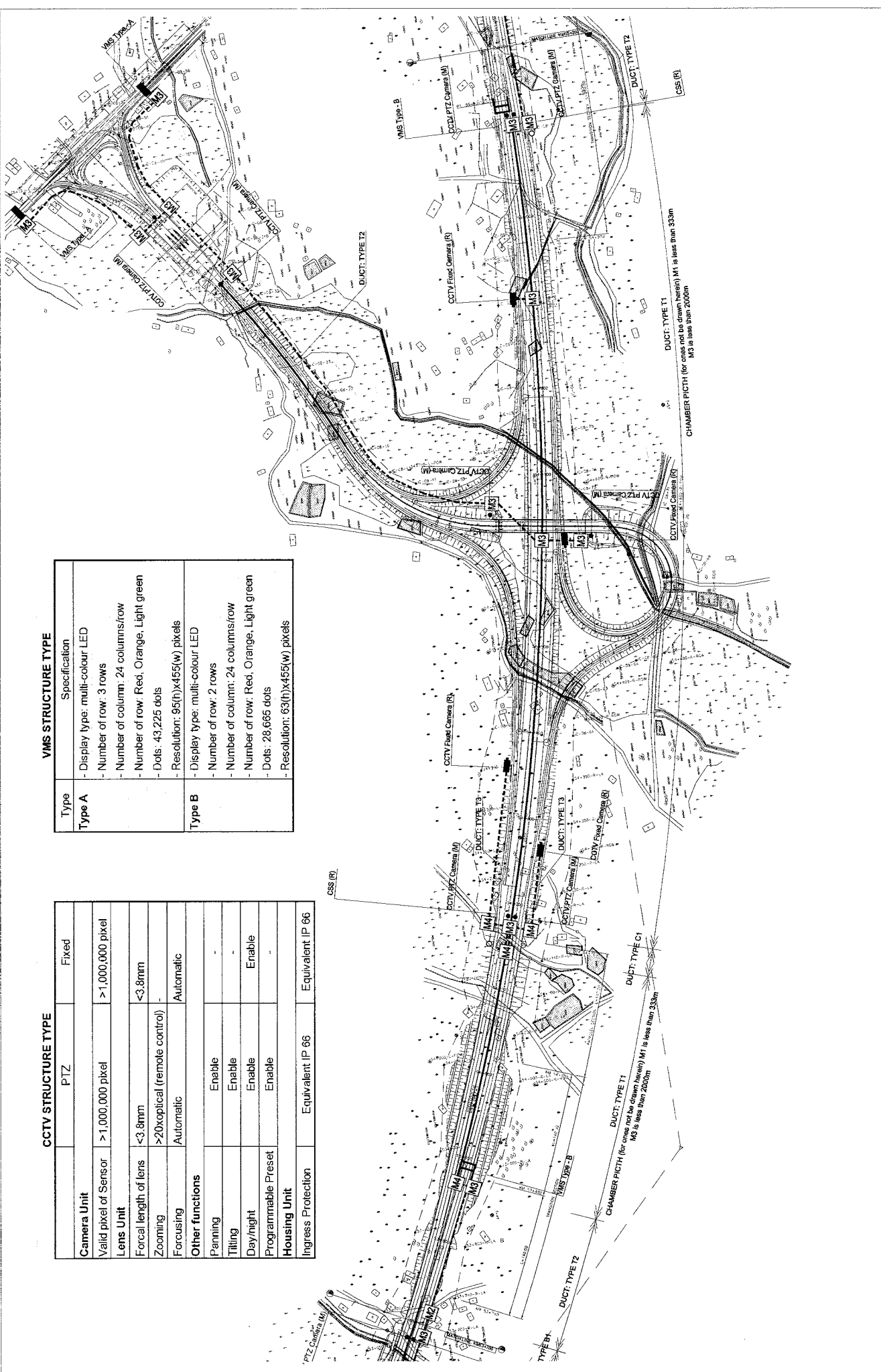
**VMS STRUCTURE TYPE**

Type	Specification
<b>Type A</b>	- Display type: multi-colour LED - Number of row: 3 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 43,225 dots - Resolution: 95(h)x455(w) pixels
<b>Type B</b>	- Display type: multi-colour LED - Number of row: 2 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 28,665 dots - Resolution: 63(h)x455(w) pixels

**CCTV STRUCTURE TYPE**

PTZ	Fixed
<b>Camera Unit</b>	
Valid pixel of Sensor	> 1,000,000 pixel
Valid pixel of Sensor	> 1,000,000 pixel
<b>Lens Unit</b>	
Forcal length of lens	< 3.8mm
Zooming	> 20xoptical (remote control)
Forcusing	Automatic
<b>Other functions</b>	
Panning	Enable
Tilting	Enable
Day/night	Enable
Programmable Preset	Enable
<b>Housing Unit</b>	
Ingress Protection	Equivalent IP 66
Ingress Protection	Equivalent IP 66

<p><b>CONSULTANT</b></p> <p>ORIENTAL CONSULTANTS CO., LTD          NEXCO EAST ENGINEERING CO., LTD          NIPPON KOEI CO., LTD          TRANSPORTATION RESEARCH INSTITUTE CO., LTD          LANDTEC JAPAN INC.</p>		<p>TITLE</p>		<p>DATE</p>	
		<p>PREPARED BY</p>		<p>SIGNATURE</p>	
<p>APPROVED BY</p>		<p>NAME</p>		<p>DATE</p>	
<p>CONSISTENT</p>		<p>SOCIALIST REPUBLIC OF VIETNAM</p>			
<p>MINISTRY OF TRANSPORT</p>		<p>ITS INTEGRATION PROJECT IMPLEMENTATION          OVER NATIONAL HIGHWAY NO.3 &amp; HANOI METROPOLITAN AREA</p>			
<p>DRAFT LOCATION PLAN FOR CCTV AND VMS          IC TO PH 305C - KM69+960</p>		<p>DRAWING TITLE</p>		<p>PACKAGE</p>	
<p>SCALE: 1:1000</p>		<p>PROJECT NO.</p>		<p>DRAWING NO.</p>	
<p>Sheet</p>		<p>of</p>		<p>ICC-11</p>	

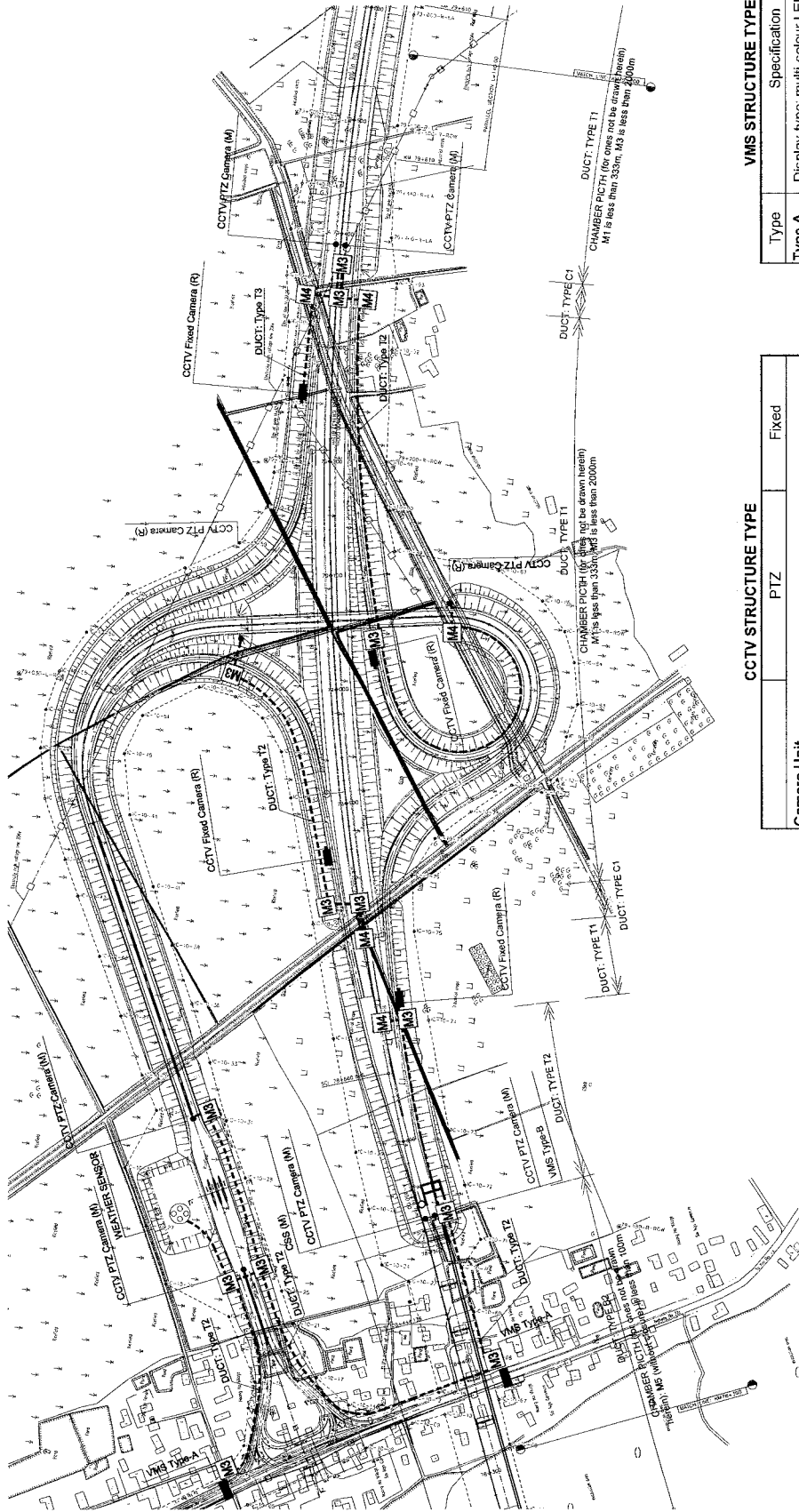


VMS STRUCTURE TYPE	
Type	Specification
Type A	- Display type: multi-colour LED - Number of row: 3 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 43,225 dots - Resolution: 95(h)x455(w) pixels
Type B	- Display type: multi-colour LED - Number of row: 2 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 28,665 dots - Resolution: 63(h)x455(w) pixels

CCTV STRUCTURE TYPE	
Camera Unit	Fixed
Valid pixel of Sensor	>1,000,000 pixel
Lens Unit	<3.8mm
Forcal length of lens	>20xoptical (remote control)
Focusing	Automatic
Other functions	Automatic
Panning	Enable
Tilting	Enable
Day/night	Enable
Programmable Preset	Enable
Housing Unit	Equivalent IP 66
Ingress Protection	Equivalent IP 66

CONSULTANT		SOCIALIST REPUBLIC OF VIETNAM	
TITLE	NAME	SIGNATURE	DATE
ORIENTAL CONSULTANTS CO., LTD			
PREPARED BY			
NEXCO EAST ENGINEERING CO., LTD			
CHECKED BY			
TRANSPORTATION RESEARCH INSTITUTE CO., LTD			
APPROVED BY			
LANDTEC JAPAN INC.			
DRAWING TITLE		PACKAGE	
DRAFT LOCATION PLAN FOR CCTV AND VMS IC TO NH2 - KM54+600		OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA	
DRAWING NO.		DRAWING NO.	
ICC-12		ICC-12	
SHEET No.		SHEET No.	
1		1	
Sheet		Sheet	
of		of	
		SCALE	





**CCTV STRUCTURE TYPE**

Camera Unit	PTZ	Fixed
Valid pixel of Sensor	>1,000,000 pixel	>1,000,000 pixel
Lens Unit	<3.8mm	<3.8mm
Forcal length of lens	>20optical (remode control)	-
Zooming	Automatic	Automatic
Focusing	Automatic	Automatic
Other functions		
Panning	Enable	-
Tilting	Enable	-
Day/night	Enable	Enable
Programmable Preset	Enable	-
Housing Unit	Equivalent IP 66	Equivalent IP 66
Ingress Protection	Equivalent IP 66	Equivalent IP 66

**VMS STRUCTURE TYPE**

Type	Specification
Type A	- Display type: multi-colour LED - Number of row: 3 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 43,225 dots - Resolution: 95(h)x455(w) pixels
Type B	- Display type: multi-colour LED - Number of row: 2 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 28,665 dots - Resolution: 63(h)x455(w) pixels

SOCIALIST REPUBLIC OF VIETNAM

ITS INTEGRATION PROJECT IMPLEMENTATION  
OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA

MINISTRY OF TRANSPORT

DRAFT LOCATION PLAN FOR CCTV AND VMS  
IC TO NH32C - KW79-460

CONSULTANT

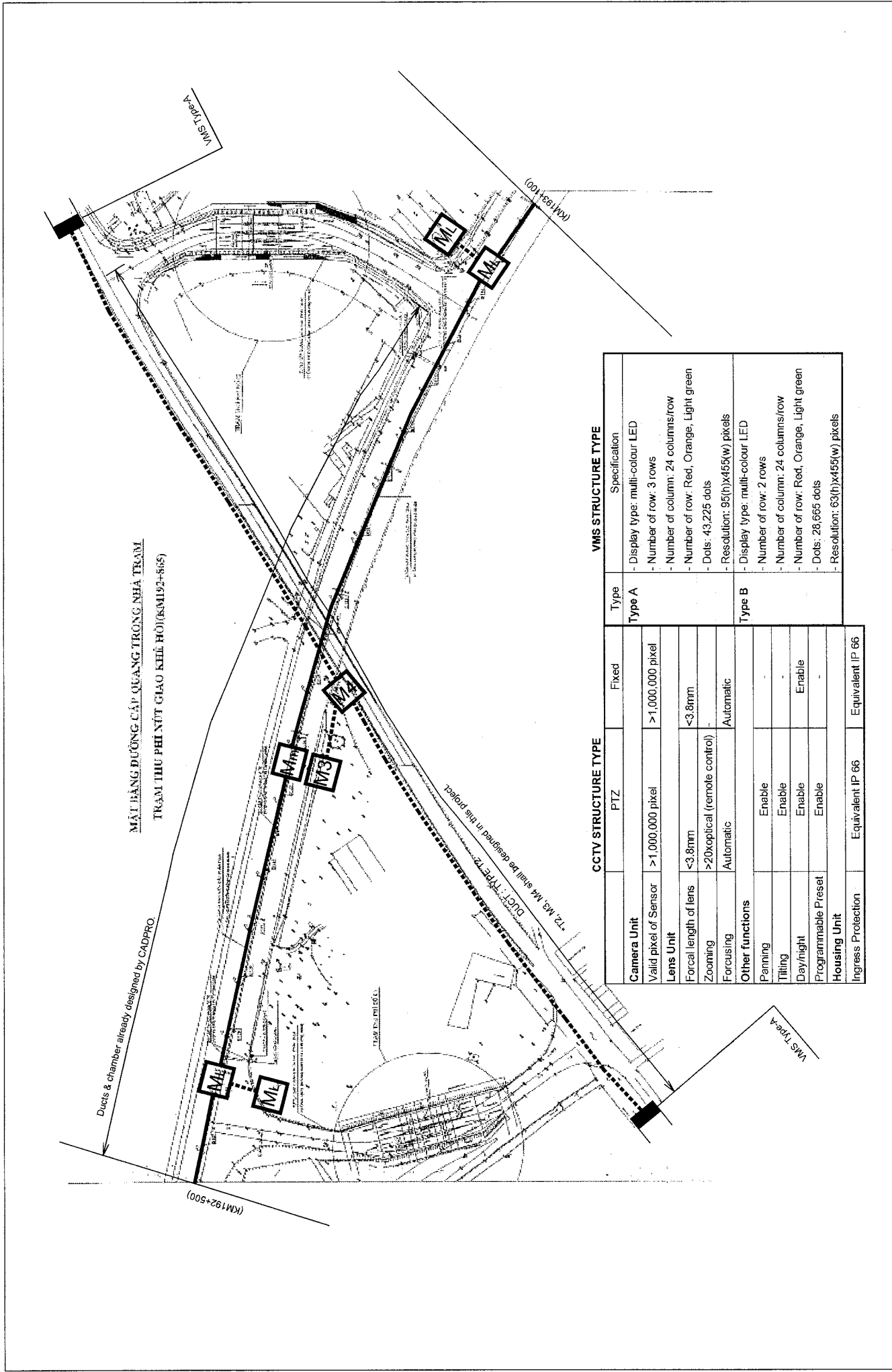
ORIENTAL CONSULTANTS CO., LTD  
NEXCO EAST ENGINEERING CO., LTD  
NIPPON KOEI CO., LTD.  
TRANSPORTATION RESEARCH INSTITUTE CO., LTD  
LANDTEC JAPAN INC.

TITLE	DATE
PREPARED BY	
CHECKED BY	
APPROVED BY	

PACKAGE  
DRAWING NO.  
SHEET No.  
Sheet of

ICC-13

SCALE



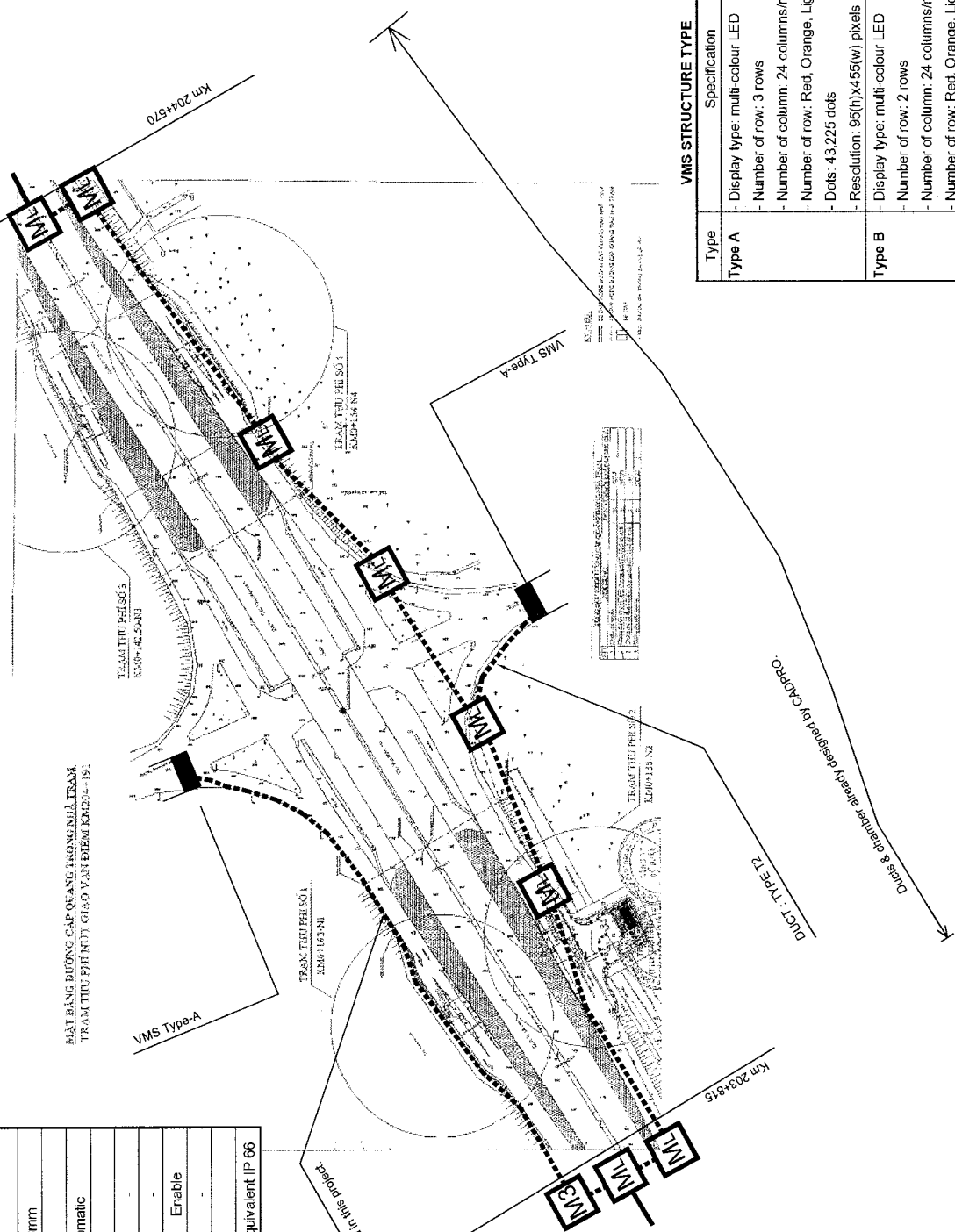
MẶT BẰNG ĐƯỜNG CẤP QUANG TRONG NHÀ TRẠM  
TRẠM THU PHỤ NÚT GIAO KHE HỒI (KM192+500)

CCTV STRUCTURE TYPE		VMS STRUCTURE TYPE	
Camera Unit	PTZ	Type	Specification
Valid pixel of Sensor	>1,000,000 pixel	Type A	- Display type: multi-colour LED - Number of row: 3 rows - Number of column: 24 columns/row
Lens Unit	<3.8mm	Type B	- Number of row: Red, Orange, Light green - Dots: 43,225 dots - Resolution: 95(h)x455(w) pixels
Forcal length of lens	>20xoptical (remote control)		- Display type: multi-colour LED - Number of row: 2 rows - Number of column: 24 columns/row
Zooming	Automatic		- Number of row: Red, Orange, Light green - Dots: 28,665 dots - Resolution: 63(h)x455(w) pixels
Forcusing	Automatic		
Other functions			
Panning	Enable		
Tilting	Enable		
Day/night	Enable		
Programmable Preset	Enable		
Housing Unit			
Ingress Protection	Equivalent IP 66		
			Equivalent IP 66

<b>CONSULTANT</b>				<b>SOCIALIST REPUBLIC OF VIETNAM</b>				<b>ITS INTEGRATION PROJECT IMPLEMENTATION</b>			
ORIENTAL CONSULTANTS CO., LTD				MINISTRY OF TRANSPORT				OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA			
NEXCO EAST ENGINEERING CO., LTD								DRAWING TITLE			
TRANSPORTATION RESEARCH INSTITUTE CO., LTD								DRAFT LOCATION PLAN FOR CCTV AND VMS			
LANDTEC JAPAN INC.								PHAP VAN - NINH BINH (KHE HOI)			
TITLE	NAME	SIGNATURE	DATE								
PREPARED BY											
CHECKED BY											
APPROVED BY											
				SCALE: 1:4000				PACKAGE			
								DRAWING No. ICC-14			
								SHEET No. _____ of _____			

**CCTV STRUCTURE TYPE**

Camera Unit	PTZ	Fixed
Valid pixel of Sensor	>1,000,000 pixel	>1,000,000 pixel
Lens Unit		
Focal length of lens	<3.8mm	<3.8mm
Zooming	>20x optical (remote control)	-
Focusing	Automatic	Automatic
Other functions		
Panning	Enable	-
Tilting	Enable	-
Day/night	Enable	Enable
Programmable Preset	Enable	-
Housing Unit		
Ingress Protection	Equivalent IP 66	Equivalent IP 66



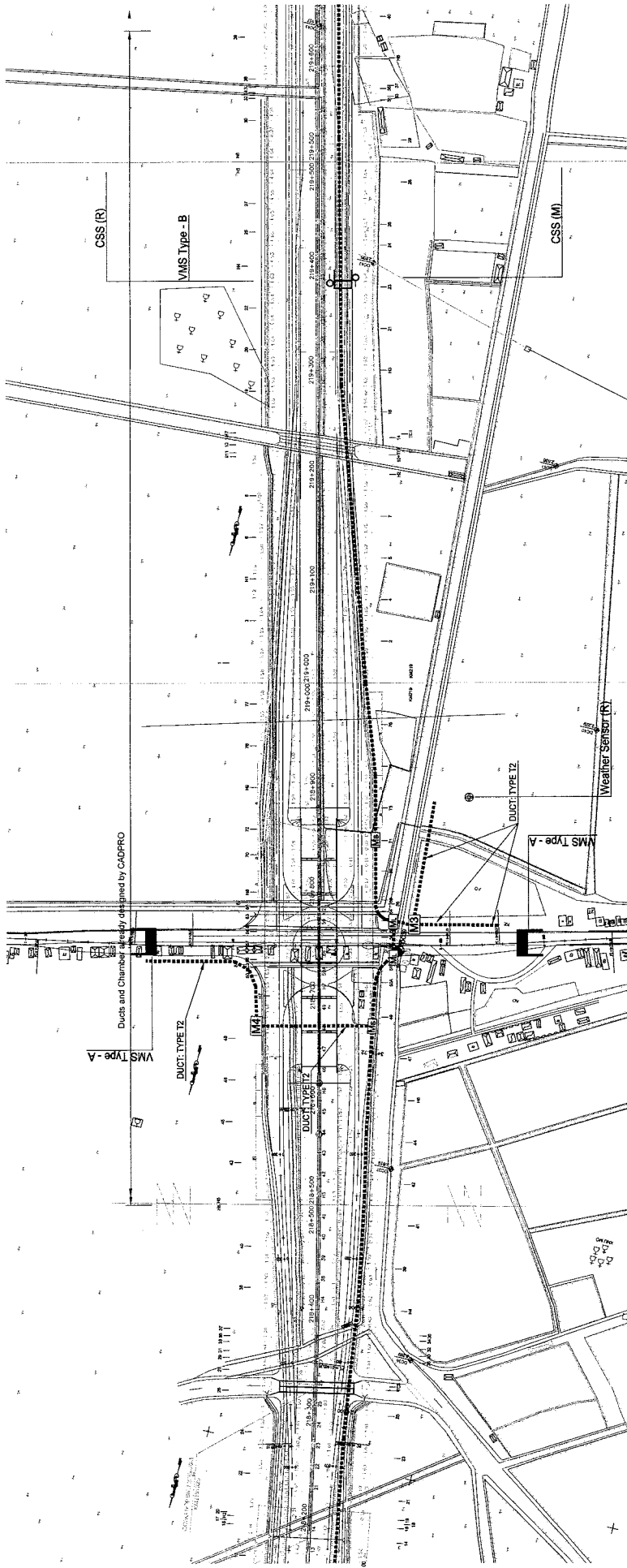
**VMS STRUCTURE TYPE**

Type	Specification
<b>Type A</b>	<ul style="list-style-type: none"> <li>- Display type: multi-colour LED</li> <li>- Number of row: 3 rows</li> <li>- Number of column: 24 columns/row</li> <li>- Number of row: Red, Orange, Light green</li> <li>- Dots: 43,225 dots</li> <li>- Resolution: 95(h)x455(w) pixels</li> </ul>
<b>Type B</b>	<ul style="list-style-type: none"> <li>- Display type: multi-colour LED</li> <li>- Number of row: 2 rows</li> <li>- Number of column: 24 columns/row</li> <li>- Number of row: Red, Orange, Light green</li> <li>- Dots: 28,665 dots</li> <li>- Resolution: 63(h)x455(w) pixels</li> </ul>

CONSULTANT		SIGNATURE		DATE	
TITLE	NAME	SIGNATURE	DATE		
PREPARED BY					
CHECKED BY					
APPROVED BY					

SOCIALIST REPUBLIC OF VIETNAM  
 MINISTRY OF TRANSPORT

ITS INTEGRATION PROJECT IMPLEMENTATION  
 OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA  
 DRAFT LOCATION PLAN FOR CCTY AND VMS  
 PHAP VAN - NINH BINH (VAN DIEM)



**CCTV STRUCTURE TYPE**

Camera Unit	PTZ	Fixed
Valid pixel of Sensor	> 1,000,000 pixel	> 1,000,000 pixel
Lens Unit		
Forcal length of lens	< 3.8mm	< 3.8mm
Zooming	> 20xoptical (remote control)	-
Focusing	Automatic	Automatic
Other functions		
Panning	Enable	-
Tilting	Enable	-
Day/night	Enable	Enable
Programmable Preset	Enable	-
Housing Unit		
Ingress Protection	Equivalent IP 66	Equivalent IP 66

**VMS STRUCTURE TYPE**

Type	Specification
<b>Type A</b>	- Display type: multi-colour LED - Number of row: 3 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 43,225 dots - Resolution: 95(h)x455(w) pixels
<b>Type B</b>	- Display type: multi-colour LED - Number of row: 2 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 28,665 dots - Resolution: 63(h)x455(w) pixels

**CONSULTANT**

TITLE	NAME	SIGNATURE	DATE
PREPARED BY			
CHECKED BY			
APPROVED BY			

**SOCIALIST REPUBLIC OF VIETNAM**

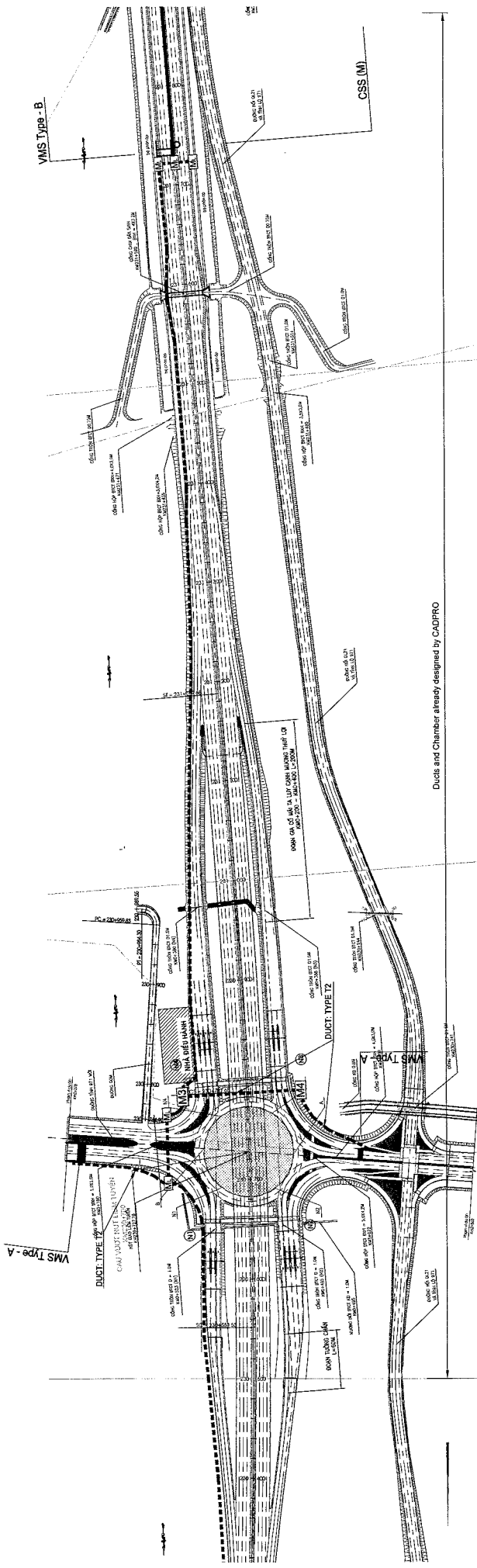
MINISTRY OF TRANSPORT

**OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA**

DRAFT LOCATION PLAN FOR CCTV AND VMS  
PHAP VAN - NINH BINH (VUC VONG)

PACKAGE	ROW/NO. IN	SHEET NO.	Sheet	of
	ICC-16			

SCALE 1:6000



**CCTV STRUCTURE TYPE**

Camera Unit	PTZ	Fixed
Valid pixel of Sensor	> 1,000,000 pixel	> 1,000,000 pixel
Lens Unit		
Forcal length of lens	<3.8mm	<3.8mm
Zooming	>20xoptical (remote control)	-
Focusing	Automatic	Automatic
Other functions		
Panning	Enable	-
Tilting	Enable	-
Day/night	Enable	Enable
Programmable Preset	Enable	-
Housing Unit		
Ingress Protection	Equivalent IP 66	Equivalent IP 66

**VMS STRUCTURE TYPE**

Type	Specification
<b>Type A</b>	- Display type: multi-colour LED - Number of row: 3 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 43,225 dots - Resolution: 95(h)x455(w) pixels
<b>Type B</b>	- Display type: multi-colour LED - Number of row: 2 rows - Number of column: 24 columns/row - Number of row: Red, Orange, Light green - Dots: 28,665 dots - Resolution: 63(h)x455(w) pixels

<b>CONSULTANT</b>		<b>SOCIALIST REPUBLIC OF VIETNAM</b>		<b>ITS INTEGRATION PROJECT IMPLEMENTATION</b>	
ORIENTAL CONSULTANTS CO., LTD		OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA		PACKAGE	
NEXCO EAST ENGINEERING CO., LTD		<b>MINISTRY OF TRANSPORT</b>		DRAWING TITLE	
TRANSPORTATION RESEARCH INSTITUTE CO., LTD				DRAFT LOCATION PLAN FOR CCTV AND VMS	
LANDTEC JAPAN INC.				PHAP VAN - NINH BINH (LIEM TUYEN)	
TITLE	NAME	SIGNATURE	DATE	DRAWING No	
PREPARED BY				ICC-17	
CHECKED BY				SHEET No	
APPROVED BY				Sheet of	
				SCALE 1:600	

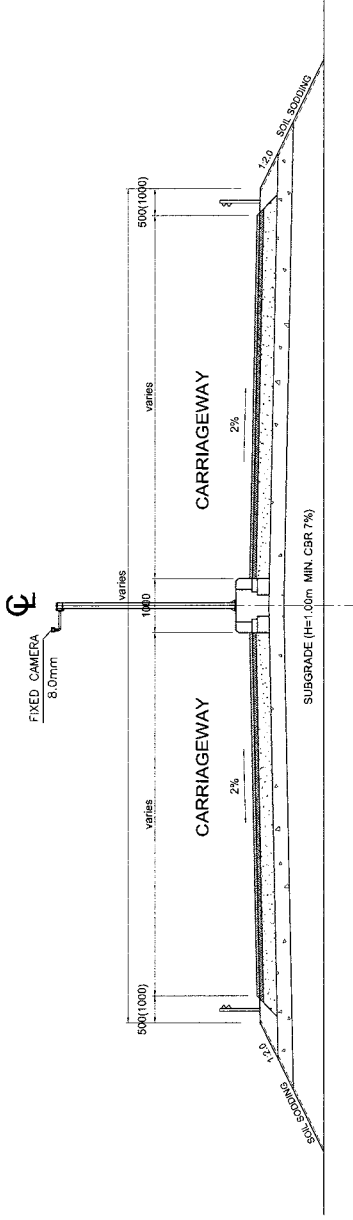
### III.3 TYPICAL CROSS-SECTIONS



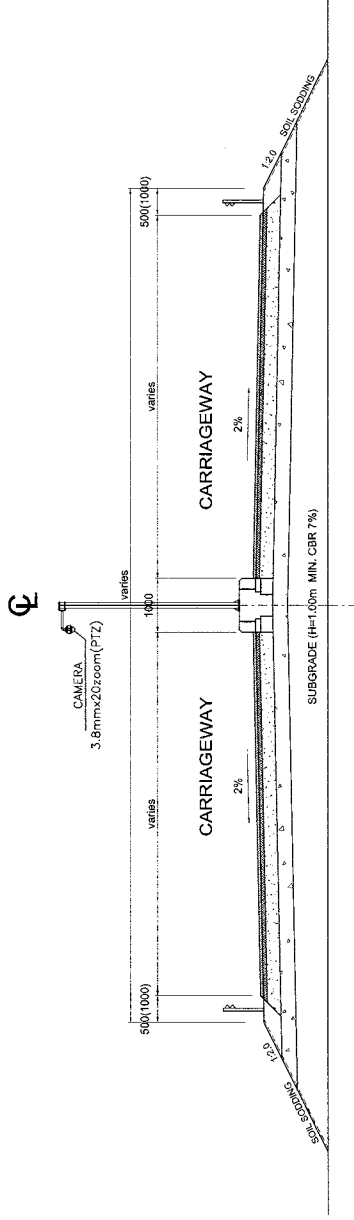




TYPICAL CROSS SECTION  
FIXED CAMERA



TYPICAL CROSS SECTION  
PTZ CAMERA



\* All dimensions are in millimeter

CONSULTANT		ORIENTAL CONSULTANTS CO., LTD	TITLE
NEXCO EAST ENGINEERING CO., LTD		NEXCO EAST ENGINEERING CO., LTD	PREPARED BY
TRANSPORTATION RESEARCH INSTITUTE CO., LTD		TRANSPORTATION RESEARCH INSTITUTE CO., LTD	CHECKED BY
LANDTEC JAPAN INC.		LANDTEC JAPAN INC.	APPROVED BY

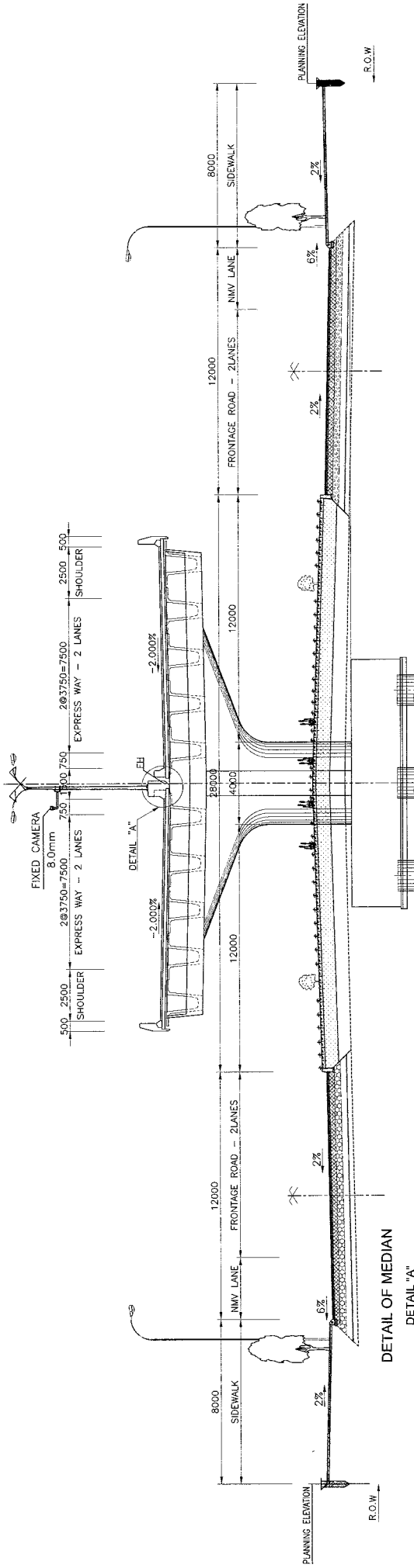
NAME	SIGNATURE	DATE

SOCIALIST REPUBLIC OF VIETNAM  
MINISTRY OF TRANSPORT

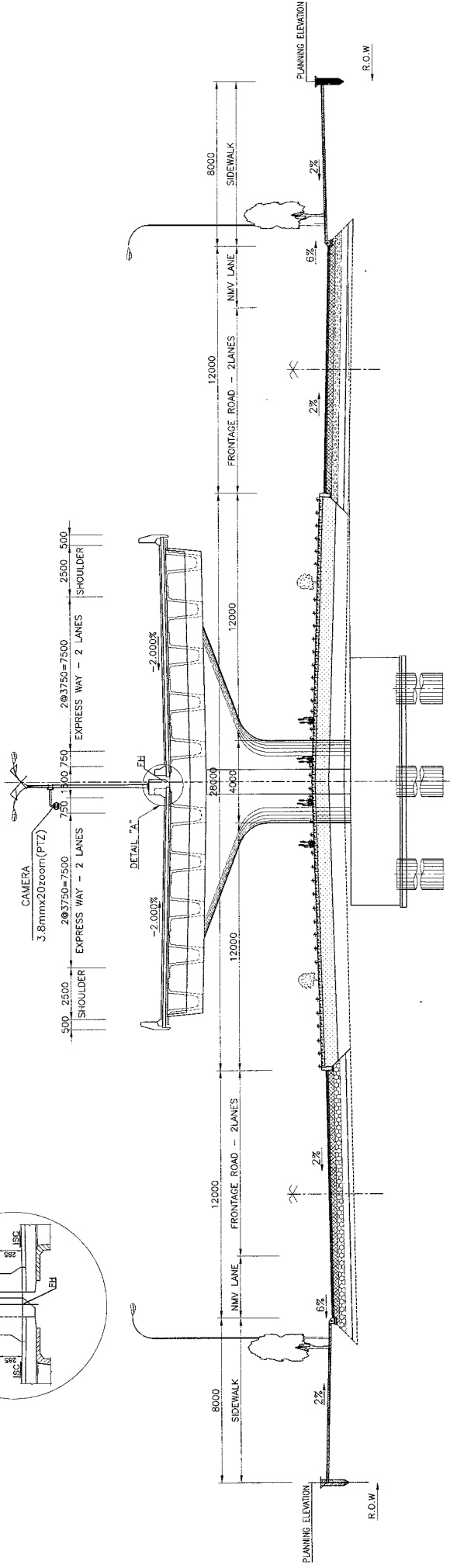
ITS INTEGRATION PROJECT IMPLEMENTATION  
OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA  
DRAWING TITLE  
DRAFT TYPICAL CROSS SECTION FOR CCTV  
NOI BAI - BAC NINH  
SCALE: 1:100

PACKAGE	
DRAWING No.	TYP. CS/CCTV-3
SHEET No.	
Sheet	of

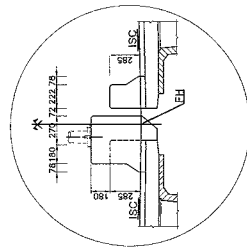
### TYPICAL CROSS-SECTION FIXED CAMERA



### TYPICAL CROSS-SECTION PTZ CAMERA

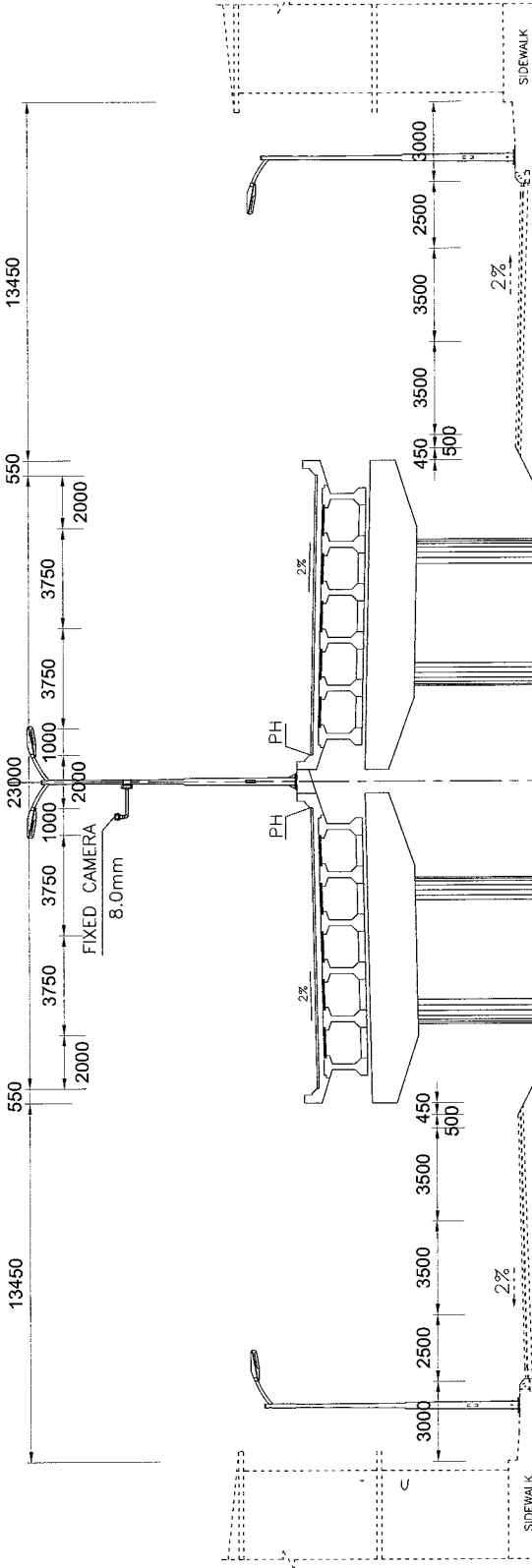


DETAIL OF MEDIAN  
DETAIL "A"

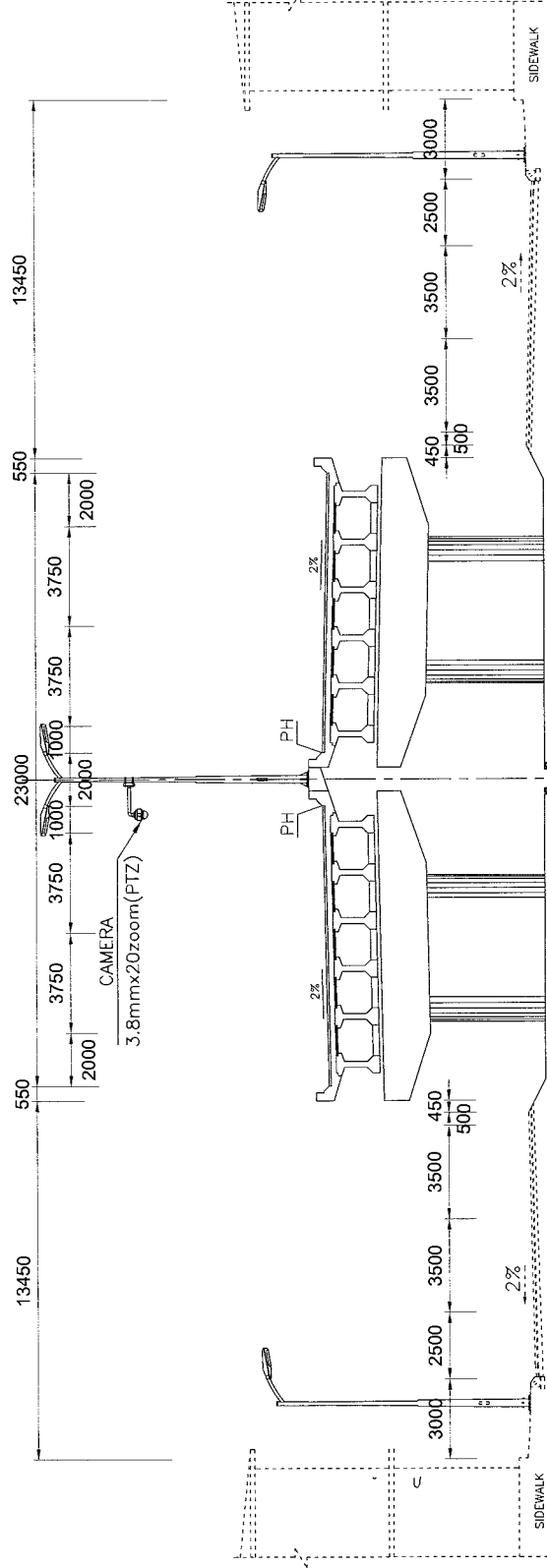


CONSULTANT		SOCIALIST REPUBLIC OF VIETNAM	
ORIENTAL CONSULTANTS CO., LTD NEXCO EAST ENGINEERING CO., LTD NIPPON KOEI CO., LTD TRANSPORTATION RESEARCH INSTITUTE CO., LTD LANDTEC JAPAN INC.		MINISTRY OF TRANSPORT	
TITLE	NAME	SIGNATURE	DATE
PREPARED BY			
CHECKED BY			
APPROVED BY			
PROJECT: ITS INTEGRATION PROJECT IMPLEMENTATION OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA		DRAWING TITLE: DRAFT TYPICAL CROSS SECTION FOR CCTV RING ROAD NO.3	
DRAWING NO.: TYP.CS.CCTV-4		SHEET No.: 5	
SCALE: 1:50		Rev:	

TYPICAL CROSS SECTION  
FIXED CAMERA

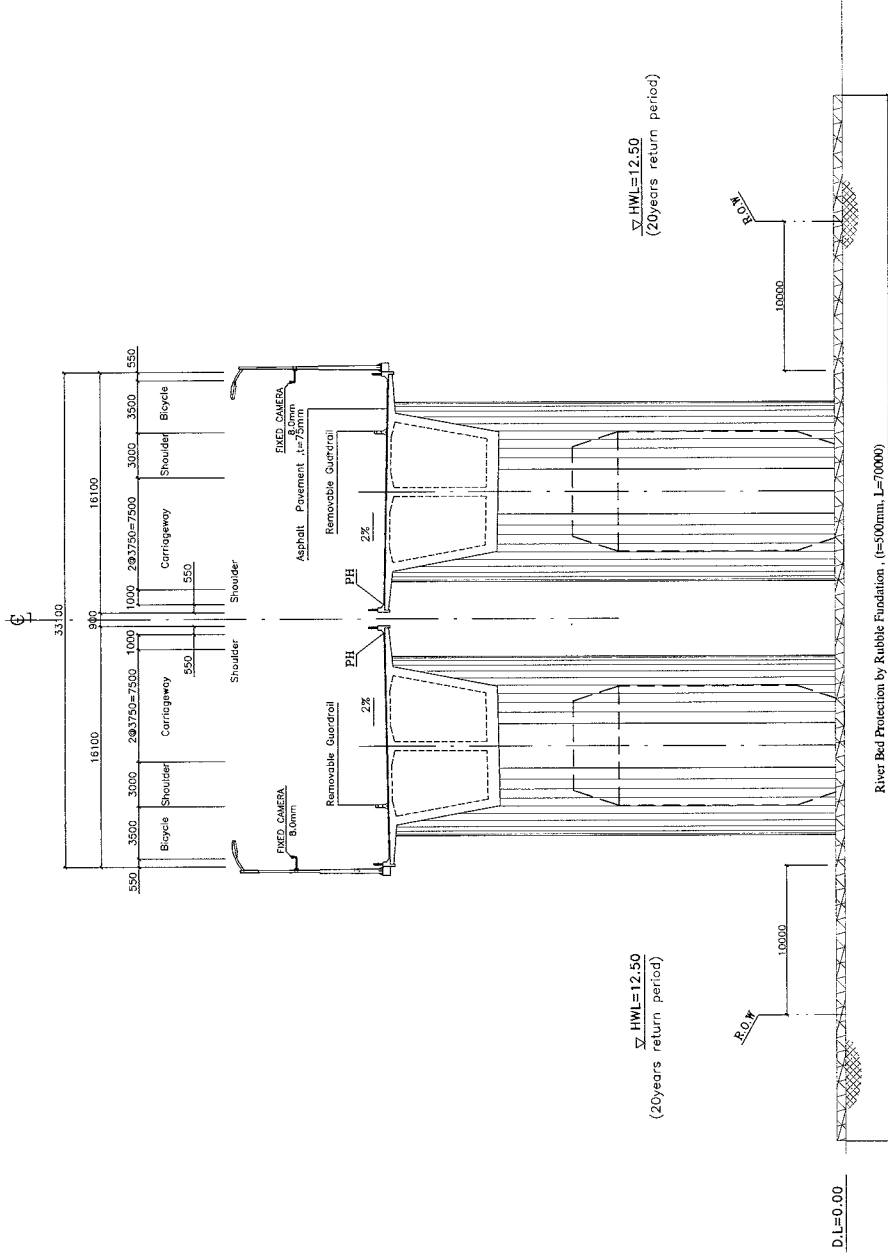


TYPICAL CROSS SECTION  
PTZ CAMERA



CONSULTANT		SOCIALIST REPUBLIC OF VIETNAM		PACKAGE:	
TITLE	NAME	SIGNATURE	DATE	ITS INTEGRATION PROJECT IMPLEMENTATION	
PREPARED BY				OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA	
CHECKED BY				DRAWING TITLE:	
APPROVED BY				DRAFT TYPICAL CROSS SECTION FOR CCTV	
ORIENTAL CONSULTANTS CO., LTD		MINISTRY OF TRANSPORT		THANH TRI BRIDGE (1)	
NEXCO EAST ENGINEERING CO., LTD				SCALE: 1:200	
TRANSPORTATION RESEARCH INSTITUTE CO., LTD				SHEET No.:	
LANDTEC JAPAN INC.				Sheet of	
				Rev:	

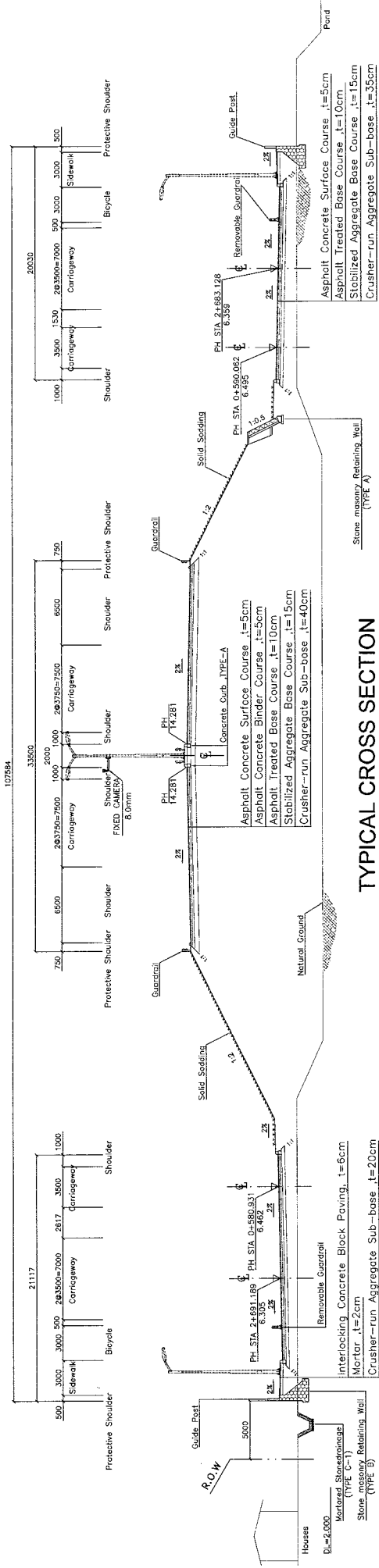
# TYPICAL CROSS SECTION FIXED CAMERA



CONSULTANT		SOCIALIST REPUBLIC OF VIETNAM		ITS INTEGRATION PROJECT IMPLEMENTATION OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA	
ORIENTAL CONSULTANTS CO., LTD		MINISTRY OF TRANSPORT		DRAWING TITLE: DRAFT TYPICAL CROSS SECTION FOR CCTV THANH TRI BRIDGE (2)	
TITLE	NAME	SIGNATURE	DATE	PACKAGE:	ROW
PREPARED BY				DRAWING NO.:	TYP.CS.CCTV-6
CHECKED BY				SHEET NO.:	
APPROVED BY					Sheet of
TRANSPORTATION RESEARCH INSTITUTE CO., LTD LANDTEC JAPAN INC.			SCALE: 1:350		

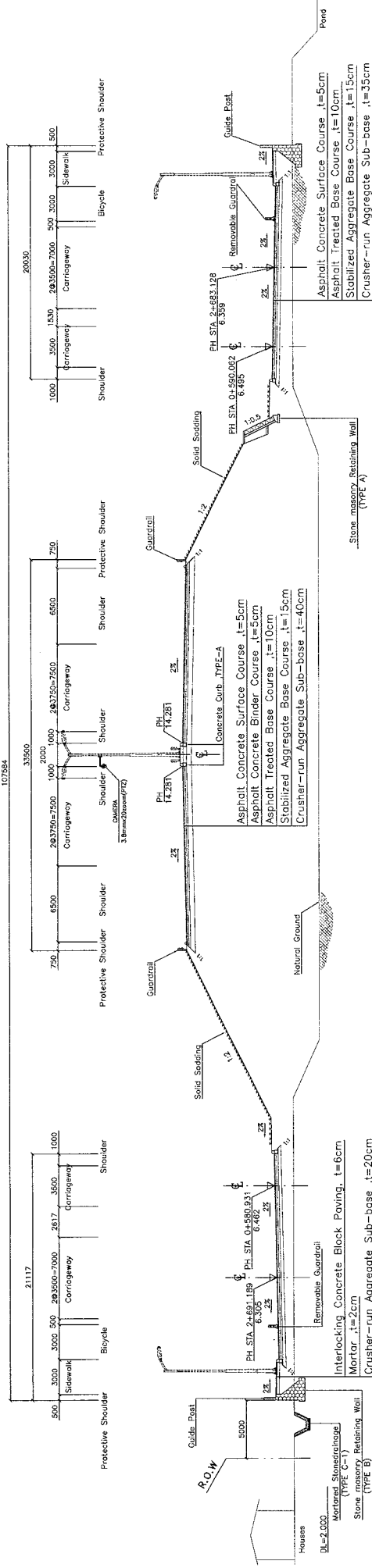
# TYPICAL CROSS SECTION FIXED CAMERA

## Throughway



# TYPICAL CROSS SECTION PTZ CAMERA

## Throughway



## Frontage Road A-Ramp

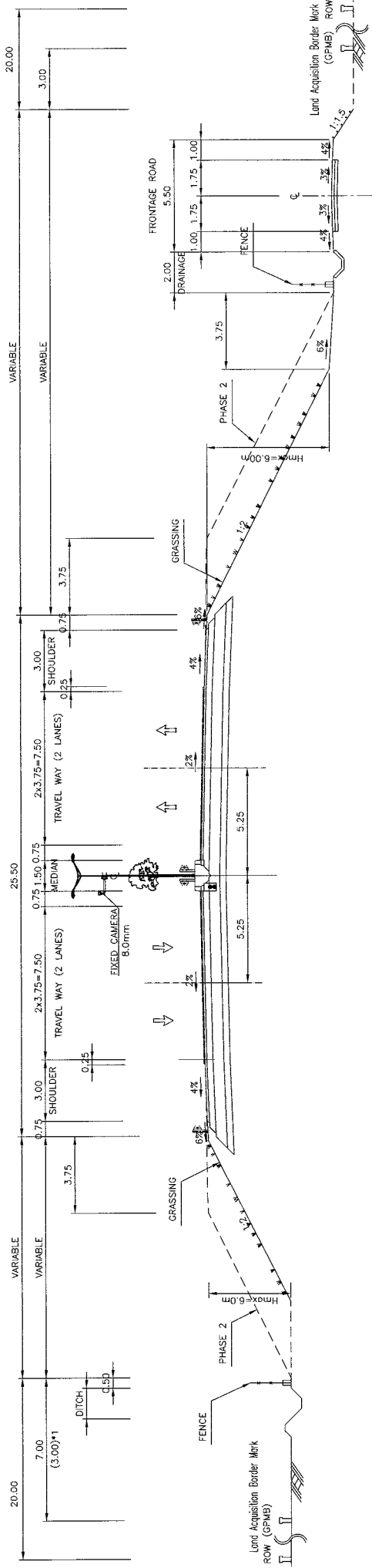
## B-Ramp Frontage Road

CONSULTANT		SOCIALIST REPUBLIC OF VIETNAM	
TITLE	NAME	SIGNATURE	DATE
PREPARED BY			
CHECKED BY			
APPROVED BY			
ORIENTAL CONSULTANTS CO., LTD NEXCO EAST ENGINEERING CO., LTD NIPPON KOEI CO., LTD TRANSPORTATION RESEARCH INSTITUTE CO., LTD LANDTEC JAPAN INC.		ITS INTEGRATION PROJECT IMPLEMENTATION OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA DRAFT TYPICAL CROSS SECTION FOR CCTV THANH TRI BRIDGE (3)	
PACKAGE:		DRAWING NO. TYP. GS.CCTV-7	
SHEET NO.:		Sheet of	

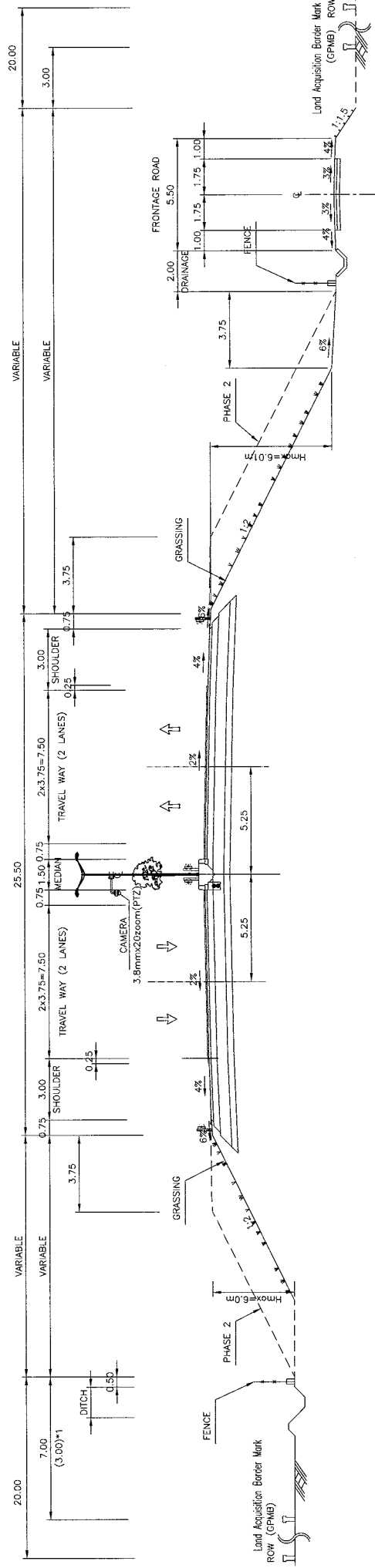
SCALE: 1:50



### TYPICAL CROSS SECTION FIXED CAMERA

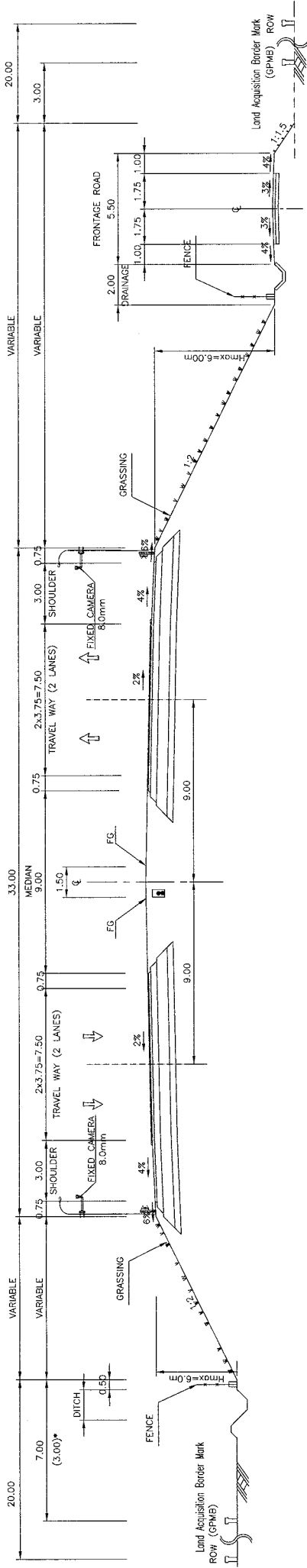


### TYPICAL CROSS SECTION PTZ CAMERA

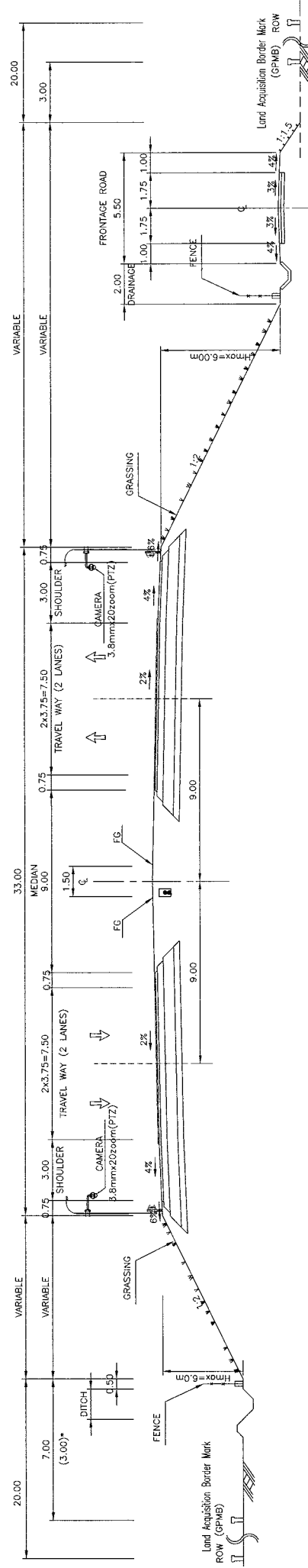


CONSULTANT		SOCIALIST REPUBLIC OF VIETNAM		PACKAGE	
TITLE	NAME	SIGNATURE	DATE	ITS INTEGRATION PROJECT IMPLEMENTATION	
ORIENTAL CONSULTANTS CO., LTD				OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA	
NEXCO EAST ENGINEERING CO., LTD	PREPARED BY			DRAWING TITLE	
NIPPON KOEI CO., LTD	CHECKED BY			DRAFT TYPICAL CROSS SECTION FOR CCTV	
TRANSPORTATION RESEARCH INSTITUTE CO., LTD	APPROVED BY			NOI BAI - VIET TRI(1)	
LANDTEC JAPAN INC.				DRAWING No: TYP.GS.CCTV409	
				SHEET No: Sheet of	
				SCALE: 1:200	

TYPICAL CROSS SECTION  
FIXED CAMERA



TYPICAL CROSS SECTION  
PTZ CAMERA

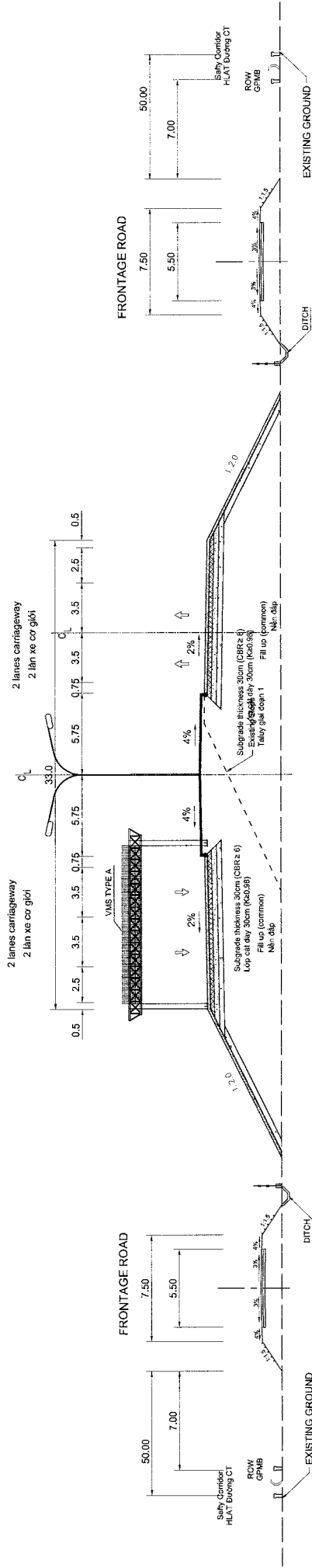


CONSULTANT		TITLE		DATE	
		PREPARED BY	SIGNATURE	CHECKED BY	DATE
ORIENTAL CONSULTANTS CO., LTD		NEXCO EAST ENGINEERING CO., LTD			
TRANSPORTATION RESEARCH INSTITUTE CO., LTD		NIPPON KOEI CO., LTD			
LANDTEC JAPAN INC.		LANDTEC JAPAN INC.			
CONSULTANT		SOCIALIST REPUBLIC OF VIETNAM			
		MINISTRY OF TRANSPORT			
		DRAFT TYPICAL CROSS SECTION FOR CCTV NOI BAI - VIET TRI(2)			
		OVER NATIONAL HIGHWAY NO 3 & HANOI METROPOLITAN AREA			
		PACKAGE			
		DRAWING NO. TYP-C&CCTV-10			
		SHEET No. _____ of _____			
		SCALE: 1:200			

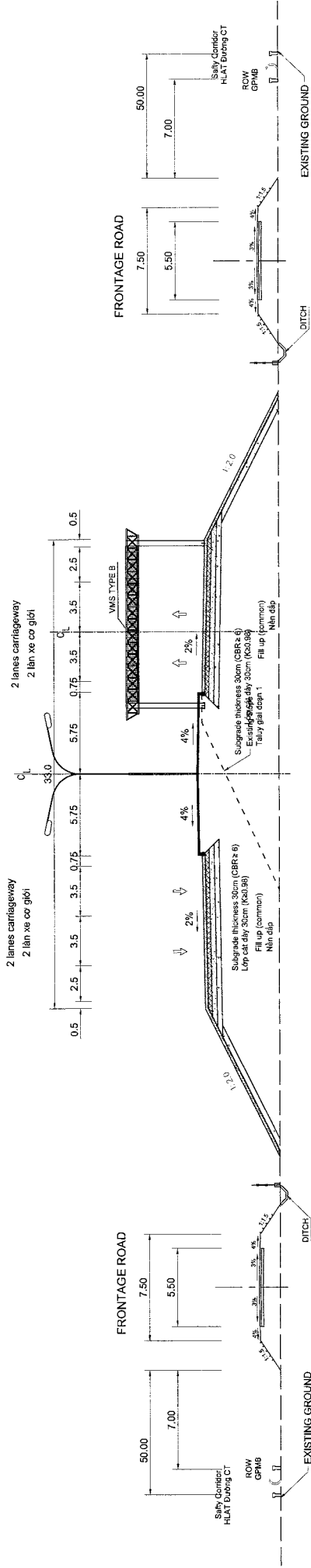




TYPICAL CROSS SECTION  
VMS TYPE A



TYPICAL CROSS SECTION  
VMS TYPE B

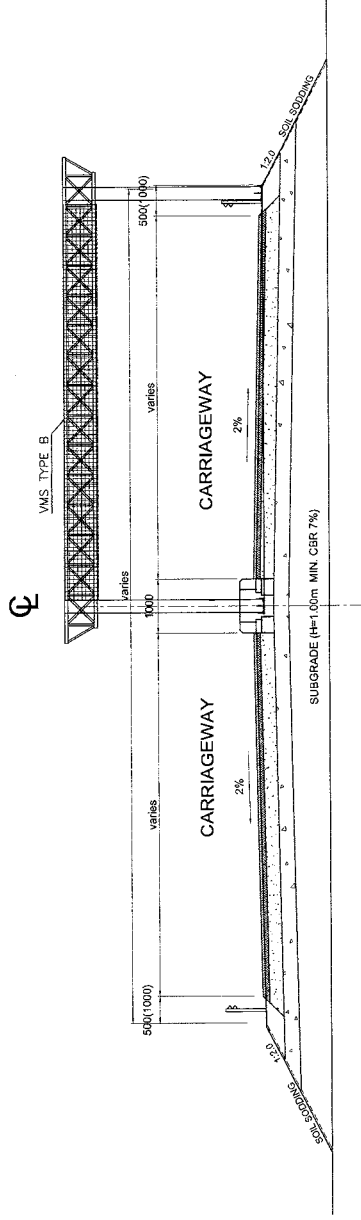


NOTES:

1. Not to scale
2. All dimensions are in meters unless otherwise indicated

CONSULTANT		SIGNATURE		DATE	
ORIENTAL CONSULTANTS CO., LTD					
NEXCO EAST ENGINEERING CO., LTD					
TRANSPORTATION RESEARCH INSTITUTE CO., LTD					
LANDTEC JAPAN INC.					
PREPARED BY		NAME		DATE	
CHECKED BY					
APPROVED BY					
SOCIALIST REPUBLIC OF VIETNAM					
MINISTRY OF TRANSPORT					
ITS INTEGRATION PROJECT IMPLEMENTATION OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA					
DRAWING TITLE: DRAFT TYPICAL CROSS SECTION FOR VMS HA NOI - BAC NINH					
PACKAGE: DRAWING No.: TYP/CS/VMS-2				SHEET No.: Sheet of	
SCALE: 1:1.5					

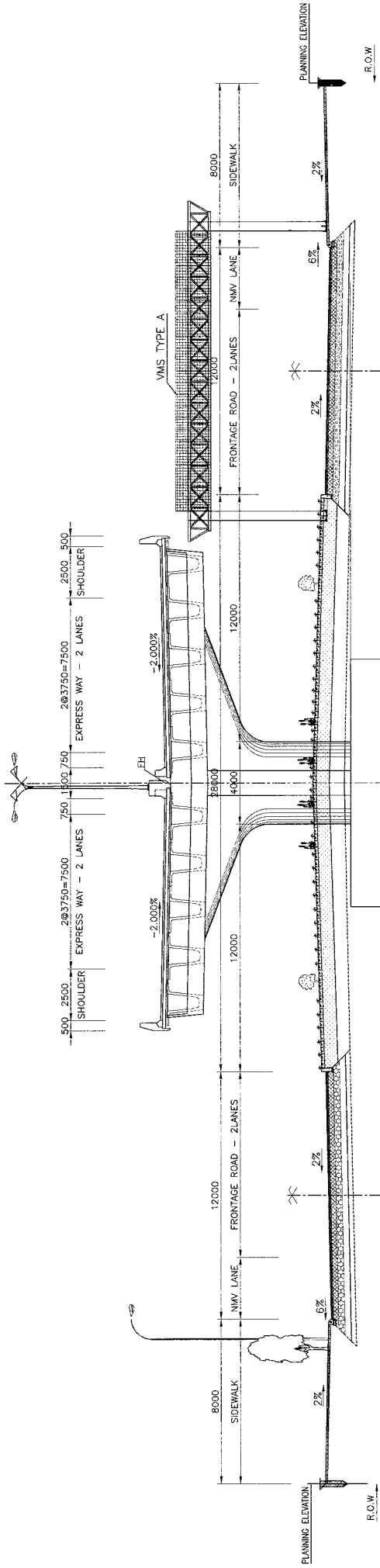
TYPICAL CROSS SECTION  
VMS TYPE B



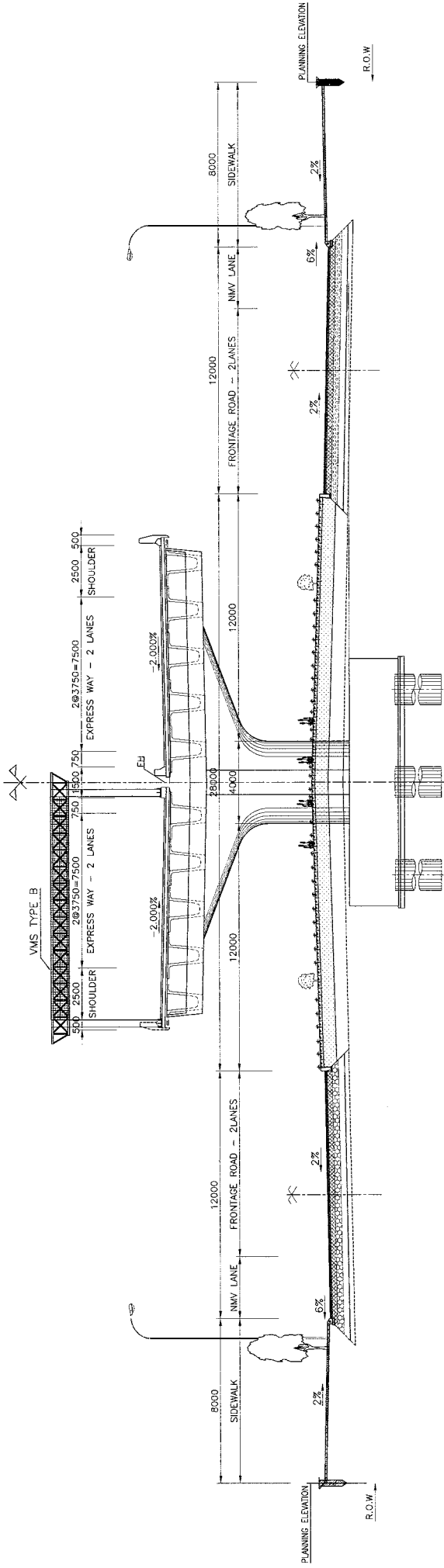
\* All dimensions are in millimeter

CONSULTANT		SOCIALIST REPUBLIC OF VIETNAM		IT'S INTEGRATION PROJECT IMPLEMENTATION OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA		PACKAGE
ORIENTAL CONSULTANTS CO., LTD				DRAWING TITLE		DRAWING NO.
NEXCO EAST ENGINEERING CO., LTD		MINISTRY OF TRANSPORT		DRAFT TYPICAL CROSS SECTION FOR VMS		TYP. CS VMS - 3
TRANSPORTATION RESEARCH INSTITUTE CO., LTD				NOI BAI - BAC NINH		SHEET No.
LANDTEC JAPAN INC.				SCALE: 1:100		Sheet of
TITLE	NAME	SIGNATURE	DATE	Rev.		
PREPARED BY						
CHECKED BY						
APPROVED BY						

TYPICAL CROSS-SECTION  
VMS TYPE A

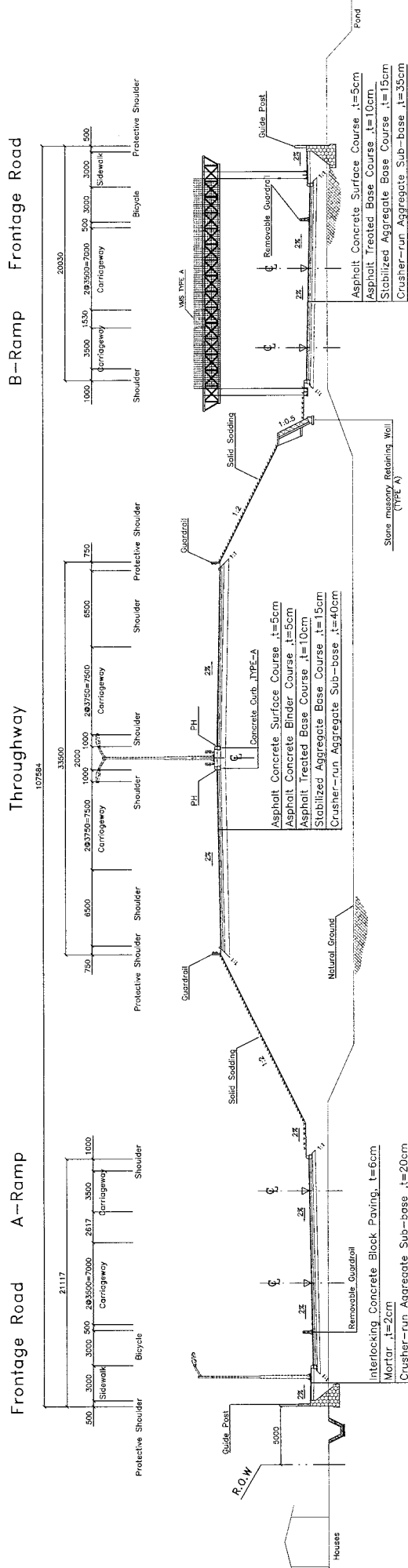


TYPICAL CROSS-SECTION  
VMS TYPE B



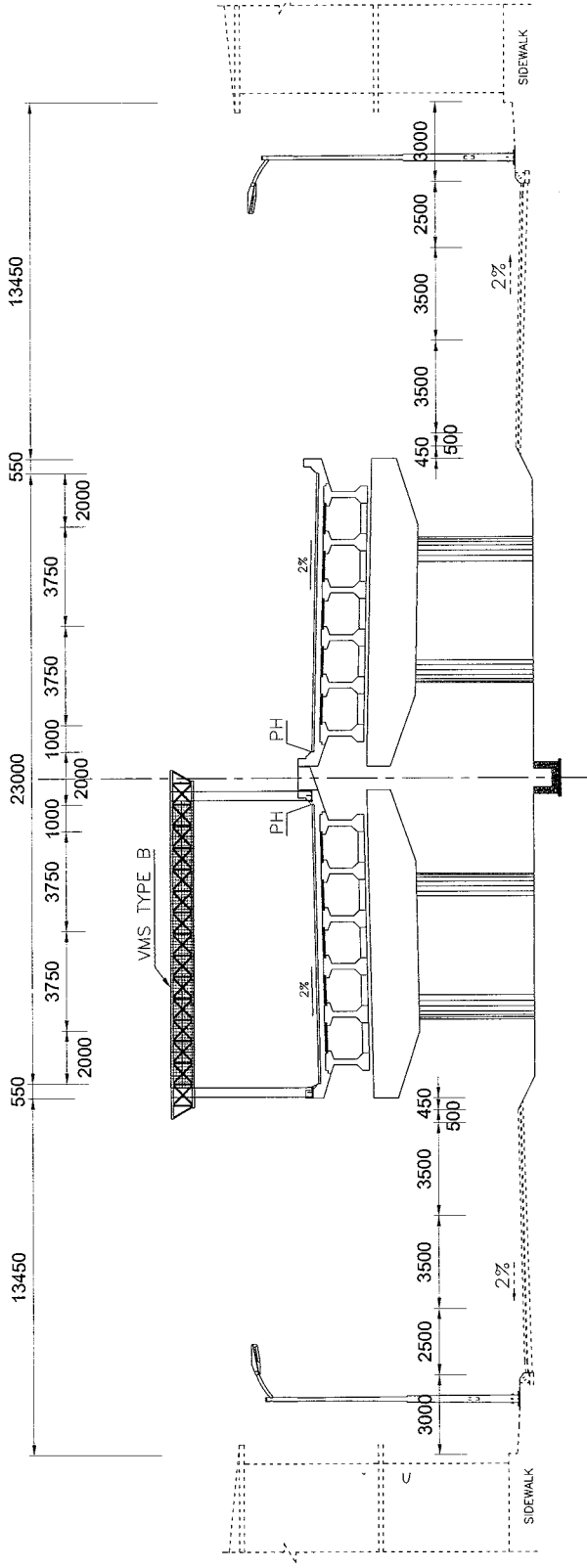
CONSULTANT		SOCIALIST REPUBLIC OF VIETNAM	
TITLE	NAME	SIGNATURE	DATE
ORIENTAL CONSULTANTS CO., LTD			
NEXCO EAST ENGINEERING CO., LTD			
NIPPON KOEI CO., LTD			
TRANSPORTATION RESEARCH INSTITUTE CO., LTD			
LANDTEC JAPAN INC.			
MINISTRY OF TRANSPORT		ITS INTEGRATION PROJECT IMPLEMENTATION	
DRAFT TYPICAL CROSS SECTION FOR VMS		OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA	
RING ROAD NO.3		DRAWING TITLE:	
SCALE: 1:100		PACKAGE:	
SHEET No.: 01		DRAWING No.: TYP.GS.VMS-4	
Rev		SHEET No.: 01	

# TYPICAL CROSS SECTION VMS TYPE A



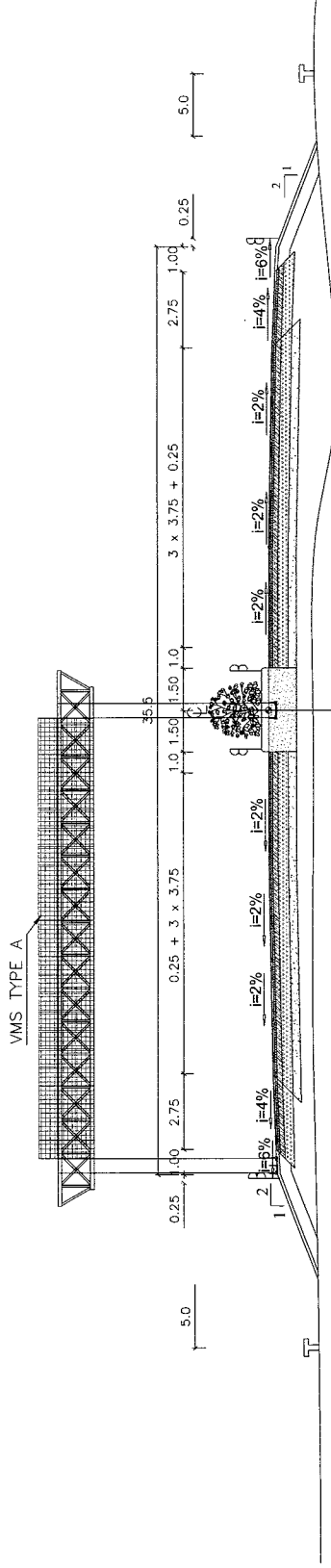
CONSULTANT		SOCIALIST REPUBLIC OF VIETNAM		ITS INTEGRATION PROJECT IMPLEMENTATION	
ORIENTAL CONSULTANTS CO., LTD		OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA		DRAWING No: TYP/CS/VMS - 6	
NEXCO EAST ENGINEERING CO., LTD		DRAFT TYPICAL CROSS SECTION FOR VMS		SHEET No: _____	
TRANSPORTATION RESEARCH INSTITUTE CO., LTD		THANH TRI BRIDGE (1)		Sheet _____ of _____	
LANDTEC JAPAN INC.		SCALE: 1:500		Rev _____	
TITLE	NAME	SIGNATURE	DATE		
PREPARED BY					
CHECKED BY					
APPROVED BY					

# TYPICAL CROSS SECTION VMS TYPE B

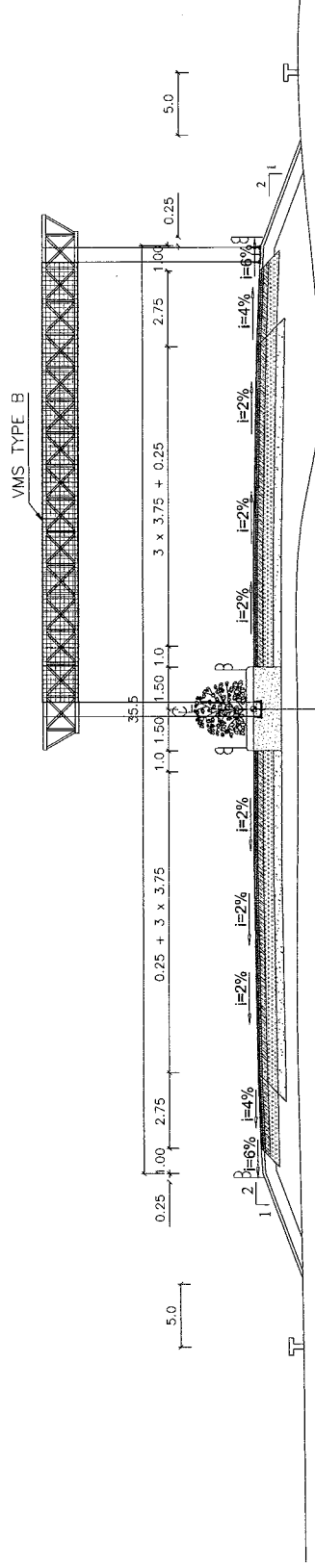


<b>CONSULTANT</b> ORIENTAL CONSULTANTS CO., LTD NEXCO EAST ENGINEERING CO., LTD NIPPON KOEI CO., LTD TRANSPORTATION RESEARCH INSTITUTE CO., LTD LANDTEC JAPAN INC.		TITLE	NAME	SIGNATURE	DATE
		PREPARED BY			
		CHECKED BY			
		APPROVED BY			
<b>SOCIALIST REPUBLIC OF VIETNAM</b>  MINISTRY OF TRANSPORT		ITS INTEGRATION PROJECT IMPLEMENTATION OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA			
		DRAWING TITLE: DRAFT TYPICAL CROSS SECTION FOR VMS THANH TRI BRIDGE (?)			
PACKAGE: DRAWING NO.: TYP.GS.VMS-6 SHEET NO.: _____ of _____ Rev: _____		SCALE: 1:200			

# TYPICAL CROSS SECTION VMS TYPE A

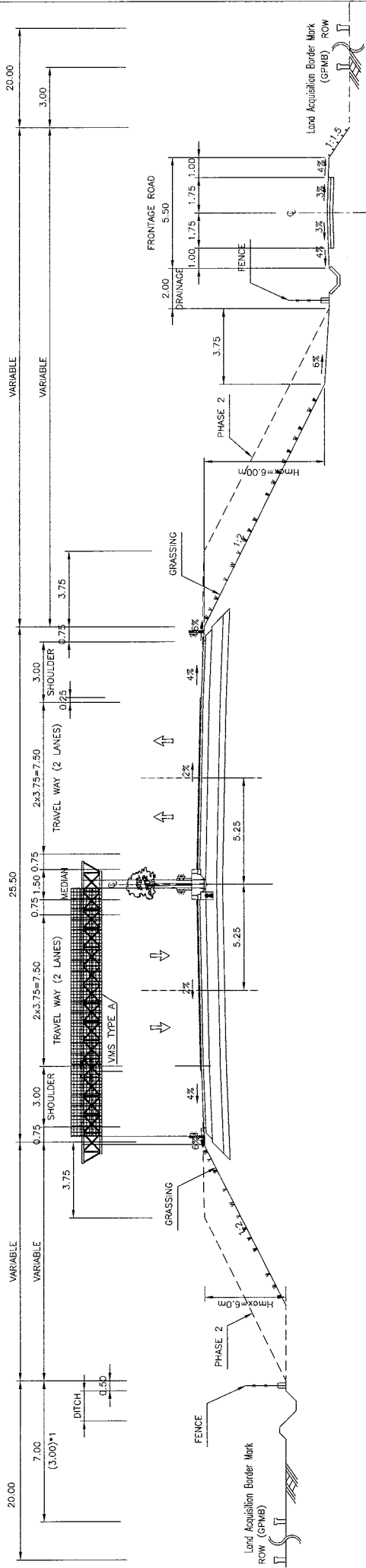


# TYPICAL CROSS SECTION VMS TYPE B

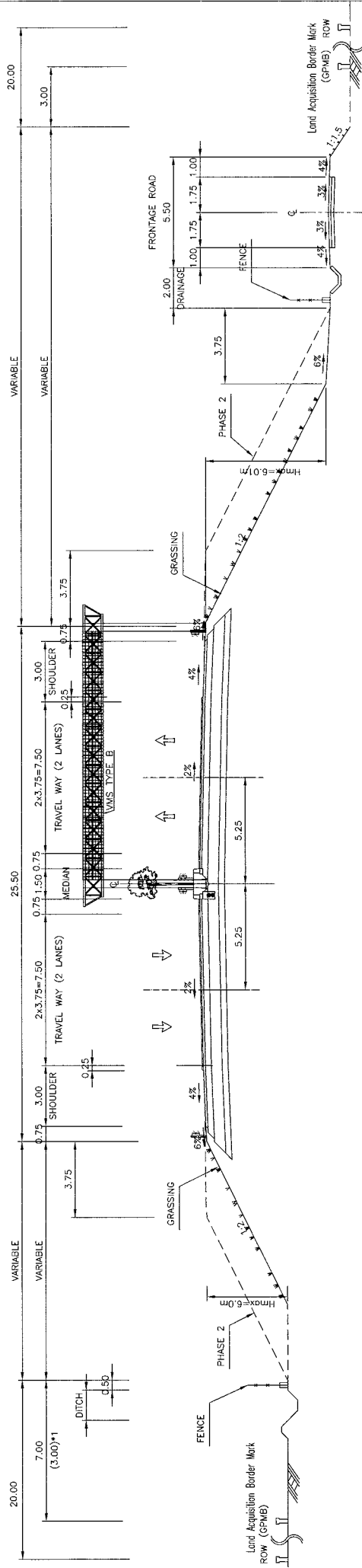


CONSULTANT		SOCIALIST REPUBLIC OF VIETNAM		ITS INTEGRATION PROJECT IMPLEMENTATION OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA	
ORIENTAL CONSULTANTS CO., LTD NEXCO EAST ENGINEERING CO., LTD NIPPON KOEI CO., LTD TRANSPORTATION RESEARCH INSTITUTE CO., LTD LANDTEC JAPAN INC.		MINISTRY OF TRANSPORT		DRAWING TITLE: DRAFT TYPICAL CROSS SECTION FOR VMS PHAP VAN - NINH BINH	
TITLE	NAME	SIGNATURE	DATE	PACKAGE	DRAWING No. TYP.CS.VMS - 7 SHEET No. Sheet of Rev.
PREPARED BY					
CHECKED BY					
APPROVED BY					
SCALE: 1:200					

TYPICAL CROSS SECTION  
VMS TYPE A



TYPICAL CROSS SECTION  
VMS TYPE B



CONSULTANT		SOCIALIST REPUBLIC OF VIETNAM		ITS INTEGRATION PROJECT IMPLEMENTATION OVER NATIONAL HIGHWAY NO.3 & HANOI METROPOLITAN AREA	
TITLE	NAME	SIGNATURE	DATE	DRAWING TITLE	
ORIENTAL CONSULTANTS CO., LTD				DRAFT TYPICAL CROSS SECTION FOR VMS	
NEXCO EAST ENGINEERING CO., LTD	PREPARED BY			NOI BAI - VIET TRI	
NIPPON KOEI CO., LTD	CHECKED BY			SCALE: 1:200	
TRANSPORTATION RESEARCH INSTITUTE CO., LTD	APPROVED BY			Sheet of	
LANDTEC JAPAN INC.				Drawing No. TP-C3-VMS-03	
				SHEET No.	



#### IV. NORTHERN REGIONAL MAIN CENTER



**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
MINISTRY OF TRANSPORT, VIETNAM**

**SPECIAL ASSISTANCE FOR PROJECT IMPLEMENTATION (SAPI)  
FOR ITS INTEGRATION PROJECT ON  
NEW NATIONAL HIGHWAY NO.3 & NORTHERN AREA OF VIETNAM**

**ENVIRONMENTAL & SOCIAL  
STUDY REPORT**

**FINAL REPORT IN AUGUST 2012**

**ORIENTAL CONSULTANTS CO., LTD  
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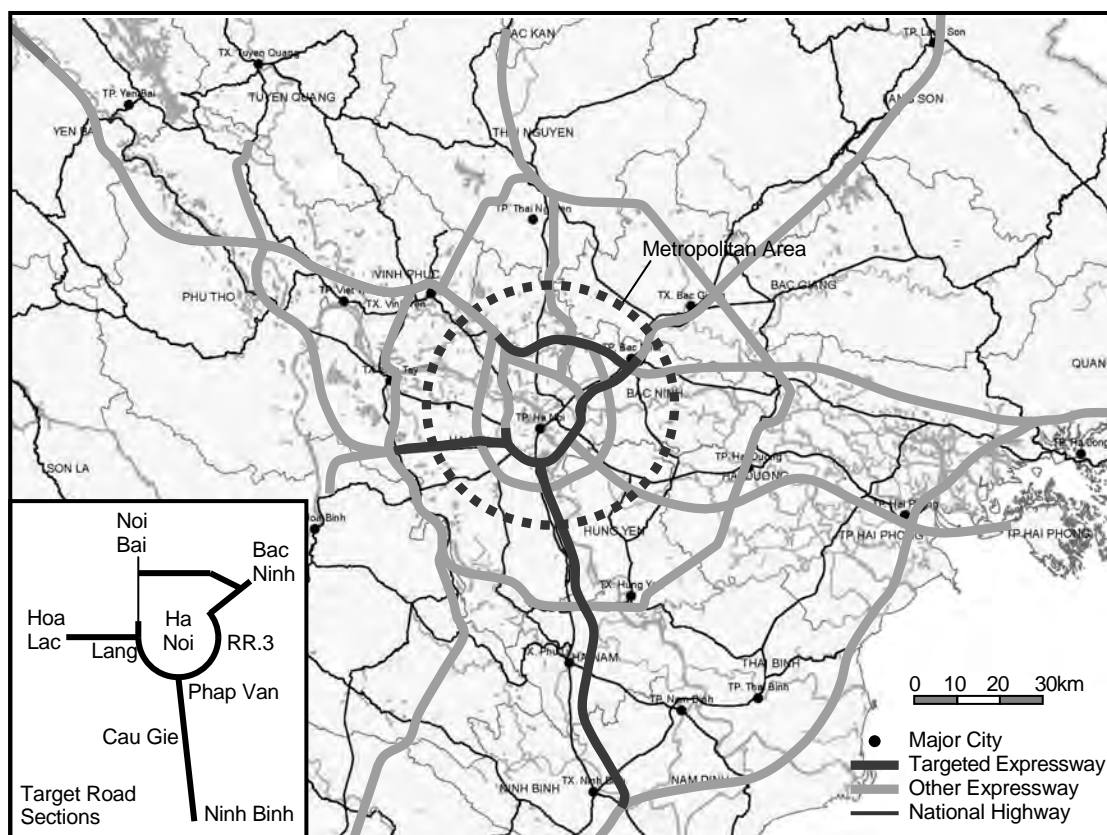
# 1. Introduction

## 1) Profile and Location of Project

Today in Vietnam, expressway network being constructed by sections funded by different donors, it has become an important issue how operate such sectioned road network and ITS in integrated form. It has become critically important to establish a procedure for integrating ITS introduced over different road sections and to show the way to utilize ITS for expressway operation and for addressing potential traffic problems in the metropolitan areas.

Striving toward the development of the ITS Standards in Vietnam, the Project aims to unify the ITS implementation levels covering the whole road network including a number of expressway sections, to verify/establish a procedure for integrating systems, to build up the Northern Regional Main Centre, to initiate expressway operation/maintenance (O&M) using ITS and to show the way to utilize ITS for solving traffic problems in the metropolitan areas.

**Figure 1.1 Location of Project**



Road Sections of Comparison Case 2	Length
Mai Dich–Thanh Tri (Ring Road 3)	27 km
Lang–Hoa Lac	28 km
Phap Van–Cau Gie	30 km
Cau Gie–Ninh Binh	50 km
Ha Noi–Bac Ninh	20 km
Noi Bai–Bac Ninh	33 km
<b>Total</b>	<b>188 km</b>

Source: ITS Integration Project (SAPI) Study

The Project aims to unify the ITS implementation levels covering the road network including a number of expressways, to verify/establish a procedure for integrating systems, to build up the Northern Regional Main Center, to initiate expressway operation/maintenance (O&M) using ITS and to show the way to utilize ITS for solving traffic problems.

The target road network of the ITS Integration Project is formed as: the expressway sections that are to be completed by 2013 and to include a ring road, which provides driving route selectivity and consists partially of an unimproved existing arterial road section, and connections to candidate locations of the Regional Main Center and the road management offices.

Total length of the target road network is 188km, which is shown in the figure foregoing.

## **2) Purpose of the Environmental and Social Considerations Study**

The purpose of this Environmental and Social Considerations Study is to predict potential physical and socio-economic impacts that may result from the ITS project and prescribe mitigation measures to ensure sustainable project development. This study is designed based on the incorporation of information collected from the Environmental and Social Team and information referred from others.

## **3) Key Environmental and Social Considerations Features**

The project's main environmental issues are related to the impacts on water, air, and noise arising from the construction of office building; the impacts of auxiliary project components including construction of conduit system and installation of equipments.

The main social issues associated with the project include land acquisition and minimization of impacts during the construction phase when a camp of approximately 50 workers will be housed in the site. Mitigation measures were designed to minimize the potential impacts on the surrounding environments.

In order to address the minor environmental impacts of the project, Environmental Management Plan has been designed and is included as a part of this study. The plan includes the actions, responsibilities and measures to guarantee that the impacts from the project are minimized.

## **2. Legal and Technical Basis for Environmental Assessment**

### **1) Project Regulatory and Legal Framework**

#### **(1) Vietnamese Legislation**

The New Environmental protection Law of Vietnam was in effect in July 2006. The Law provides an umbrella framework for environmental management and protection in Vietnam, and the prime authority is the Ministry of Natural Resources and Environment (MoNRE). At the provincial level, the Provincial Department of Natural Resources and Environment (DONRE) is the operating unit for overall environmental management in the province. In addition, other national laws are also important for environmental protection and natural resources management. Vietnam has a State Plan on Environmental and Sustainable Development, 1991-2000 (1991), National Biodiversity Action Plan up to 2010 and Orientations towards 2020 (2007); Land Use Law (1993); Water Resources Law (1998); Criminal Affair Law (reform, 1999); Ordinance of Radiation Safety and Control (1996). Most recently, a Biodiversity Law came into effect in 2009 and a revised Cultural Heritage Law came into effect in 2010.

The environmental regulatory and legal framework in Vietnam has recently been implemented, but is extensive and includes the following provisions:

- Law on Environmental Protection, number 52/2005/QH11 approved by the National Assembly XI, meeting 8th on November 29, 2005; became effective July 2, 2006.
- Land Law of Vietnam in 2003; became effective July 1, 2004.
- Decree No.80/2006/ND-CP dated August 09, 2006 issued by the Government to instruct implementation of clauses of Law on Environmental Protection.
- Decision No.22/2006/QĐ-BTNMT dated December 18, 2006 issued by MONRE on mandatory using of Vietnamese standard on environment.
- Decree No.29/2011/NĐ-CP dated 18 April, 2011 issued by the Government regarding Providing strategic environmental assessment, environmental impact assessment, and environmental protection commitment
- Circular No.26/2011/TT-BTNMT dated 18 July, 2011 issued by the Ministry of Natural Resources and Environment guiding the strategic environmental assessment, environmental impact assess and environmental protection commitment.

According to Decree No.29/2011/NĐ-CP dated 18 April, 2011 regarding “Providing strategic environmental assessment, environmental impact assessment, and environmental protection commitment”, the project with a length of optical fiber cable installation less than 100 km is not required to prepare Environmental Impact Assessment but necessary to submit Environmental Protection Commitment to any District People’s Committee among Districts that under the project area.

#### **(2) Other Applicable Environmental Policy and Standards**

In addition to the requirements of national legislation, the ITS project must also comply with other applicable environmental policy and standards issued by JICA.

## 2) Related Agencies

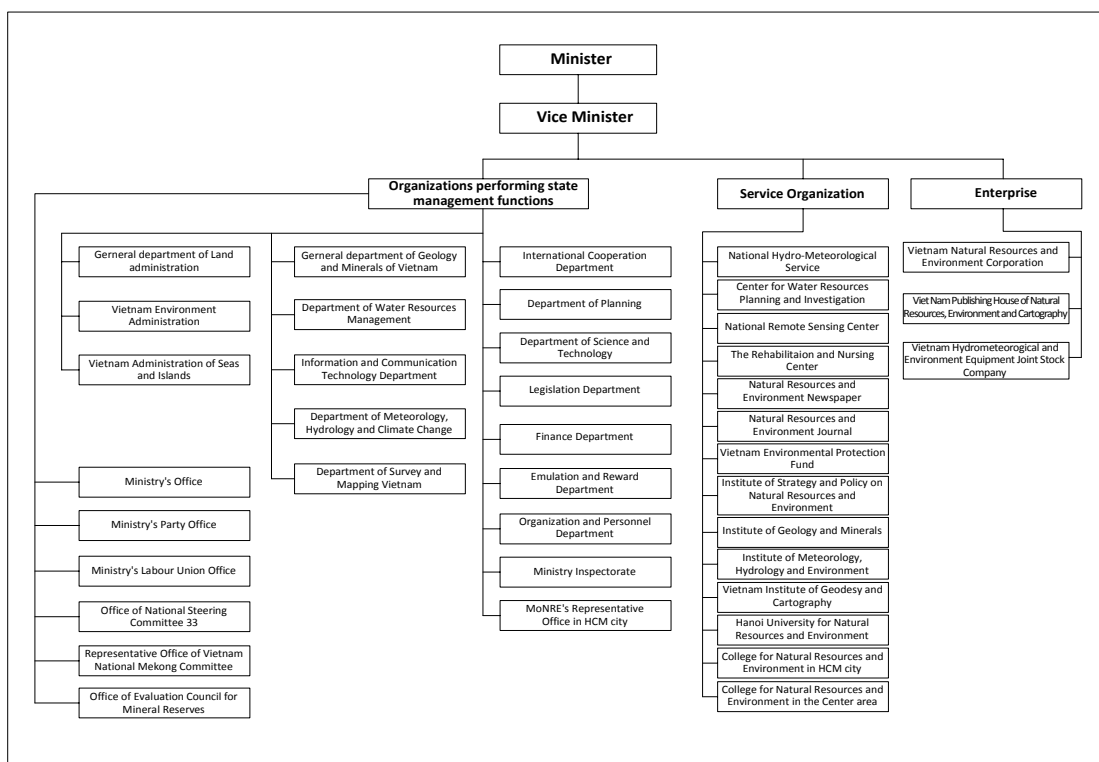
### (1) Ministry of Natural Resources and Environment (MoNRE)

In accordance with approval by the 9th People's Congress of the National Assembly held in August 5, 2002, Resolution No.2/2002/QH11 stipulating the list of governmental ministries, offices and agencies including MONRE was adopted. MONRE was established by setting subordinate bodies as integrated authorities.

- Former General Department of Land Administration
- Former General Department of Hydro and Meteorology
- National Environment Agency of (former) Ministry of Science, Technology and Environment
- Vietnam Department of Geology and Minerals and Institute of Geology and Minerals
- Section of Water Resources Management, Ministry of Agriculture and Rural Development

In November 2001, Governmental Degree No.91/2002/ND-CP was issued, stipulating MONRE's function, role, authorization and organization. In the following December 2002, MONRE took the lead in stipulating the affiliated agencies' function, role, authorization and organization, and numerous ministerial ordinances were issued, stipulating MONRE's initiative authorization over the affiliated agencies. Figure 2.1 shows an organizational structure of Ministry of Natural Resources and Environment (MONRE).

**Figure 2.1 Organizational structure of Ministry of Natural Resources and Environment (MONRE) Source: website of MONRE**





## **(2) Departments of Natural Resources and Environment (DoNRE)**

MONRE, in cooperation with the Ministry of Home Affairs, drafted the Decision No. 45/2003/QĐ-TTg regarding establishment of provinces' Department of Natural Resources and Environment (DONRE) and in April 2003, the Prime Minister enacted the draft. Following the decision, DONRE was established at 64 locations including each provinces and the 5 cities under central control (Hanoi, Ho Chi Minh, Hai Phong, Da Nang, Can Tho), and through these Departments, local environmental administrative policies are conducted.

## **3. Measures & Standards on Environmental & Social Consideration**

### **1) The SEA & EIA System**

With regard to the environmental procedure, upon amendment of the LEP in July 2006, below three points were stipulated under chapter 3 of the subjected legislation.

- Item one : Strategic Environmental Assessment (SEA)
- Item two : Environmental Impact Assessment (EIA)
- Item three : Environmental Protection Commitment (EPC)

### **2) Environmental Impact Assessment (EIA) procedure**

Previously, the administrative law on EIA procedure was based on Article 18, item 2 of the old LEP. However, EIA subjected projects were not made clear at that point. Thus, a project list in need of EIA was stipulated through "Circular on EIA report auditing, etc., for investment projects (Circular No. 490/1998/TT-BKHCHNMT)" enacted in 1998. By amendment of the LEP (which came into effect, from July 2005), projects in need of EIA reporting was presented and initially clarified at the legitimate level (Article 18, item 1).

### **3) Legitimate ground for screening procedure**

Also, after the amendment of LEP, through appendix II of "Decree 29/2011/ND-CP on providing strategic environmental assessment, environmental impact assessment and environmental protection commitment" dated April 18, 2011, a detailed list of projects in need of EIA reporting and approval was presented, and detailed stipulation on 146 projects were decided. Incidentally, traversing projects of sectors and provinces enlisted in the Decree's appendix III comes under the jurisdiction of MONRE, and for other projects, it was decided that the division in charge at DONRE of the district level to handle the case (jurisdiction as per shown below).

Divisions in charge

(a) Central governmental level: MONRE and competent government offices

(b) Local governmental level: People's Committee (authority in charge: DONRE)

Under Appendix II of Decree No. 29/2011/ND-CP dated April 18, 2011 (see table 2), the above stated detailed project list have now been renewed, and currently, based upon this appendix the "screening" procedure in which the necessity of EIA is determined are been processed. Here under, the table shows an extracted part of this appendix, of which items

centering around items that may have connection with the subjected project of this report in particular. Table 3.2 shows Decree 29/2011/ND-CP, enlisting projects for which an EIA Report must be prepared.

**Table 3.1 Decree 29/2011/ND-CP, enlisting projects for which an EIA Report must be prepared**

No.	Project	Scale
1	Projects in which investment is decided by the National Assembly or the Prime Minister	All
2	Projects using part or all of the land of a natural conservation zone, national park, historical and cultural site, world heritage site which is classified, or which is not yet classified but is the object of a protection decision made by a people's committee of a province or city under central authority	All
<b>Construction projects</b>		
3	Projects to build technical infrastructure of urban centers and residential areas	With an area of 5 ha or larger
<b>Transport projects</b>		
23	Projects to build automobile highways and automobile roads from grade I to III; overhead railways; and airports	All
24	Projects to renovate and upgrade automobile highways, automobile roads from grade I to III, and railways	All
25	Projects to build grade-IV and –V automobile roads	With a length of 100 km or longer
26	Projects to build road and rail bridges	With a length of 200 m or longer (excluding feeder roads)
<b>Electronics and telecommunications projects</b>		
37	Projects to build radio transceiver stations and telecommunications transceiver stations	With a capacity of 2 kW or more
38	Projects to manufacture electric and electronic devices	With an annual capacity of 10,000 units or more
39	Projects to manufacture electric and electronic components	With an annual capacity of 500 tons of electric components and 100,000 electronic components or more
40	Projects to build telecommunications routes	With a length of 100 km or longer

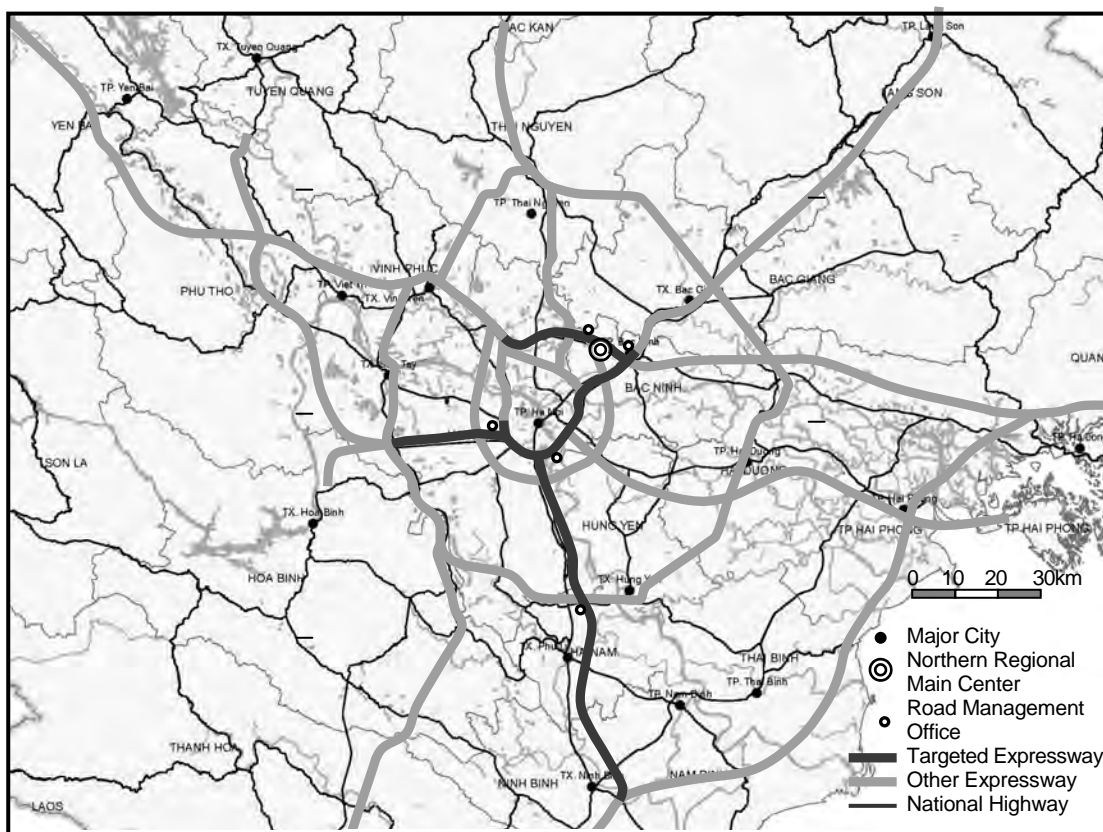
Source: Appendix, Decree No.29//2011/ND-CP dated April 18, 2011, partially extracted

## 4. Brief Description of Project

### 1) Project Overview

The location of the Project and the Northern Regional Main Center and the road management offices are shown in the figure below.

**Figure 4.1 Location of Northern Regional Main Center and Road Management Offices**



Source: ITS Integration Project (SAPI) Study Team

When completed the project components will be as follows:

- Total road length for cable installation (within right of way): about 85 km
- Area of Northern Regional Main Center: 3000 m<sup>2</sup>
- Area of Road Management Office: 3000 m<sup>2</sup> (only one for Lang – Hoa Lac section)
- Power (for transmission): less than 100 W

### 2) Major Environmental and Social Impacts of project components

The major environmental consequences of the project stem mainly from the Main Center and the Road Management Office and partially from construction of plastic conduit system. Not any resettlement program and livelihood restoration program is required for construction work as well as equipment installation.

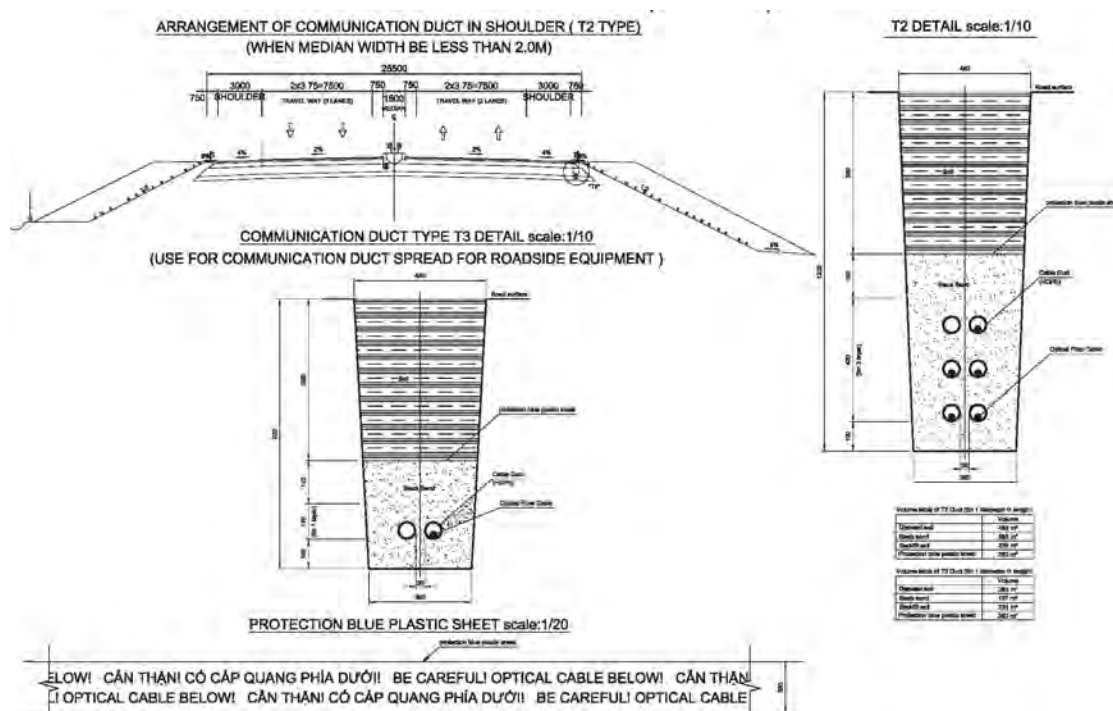
The project will not damage any natural habitat. The area of the project does not have a rich biodiversity. Direct impacts on cultural heritage value are not existed. The

construction of the office building itself poses perhaps the highest environmental and social risk. At its peak, a labor force of around 50 workers will be housed in camps for office construction. Indirect impacts stemming from the inflow of workers into zone prompted by the construction of the office and enhance consumption and other economic activities in the areas.

### 3) Installation of Ducts for Optical Fiber Cables

The way of installation of duct optical cable is shown in the following figure.

**Figure 4.2 Installation of Duct for Optical Fiber Cable**



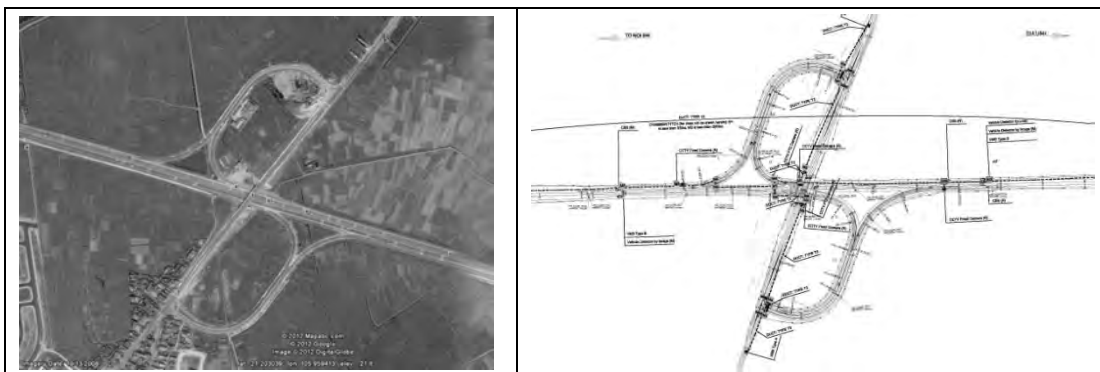
**Table 4.1 Total Length of Cable Installation**

Target road section	Base length (km)	Road length for cable installation (km)
Mai Dich–Thanh Tri (Ring Road 3)	15.0 (Excluding Grant)	3.62 (Excluding Via Duct =11.38km)
Lang–Hoa Lac	28.0	28.0
Phap Van–Cau Gie	30.0	-
Cau Gie–Ninh Binh	50.0	-
Ha Noi–Bac Ninh	20.0	20.0
Noi Bai–Bac Ninh	33.0	33.0
Total road length for cable installation	176.0	84.62

#### 4) Location of Northern Regional Main Center at NH.18 – PR.295 Interchange

The location of Regional Main Center is located in Ngan Cau hamlet, Cho town, Yen Phong District, Bac Ninh province. Main Center is proposed to build in the South of Interchange where temporary used to plant vegetables for daily consumption of nearby households.

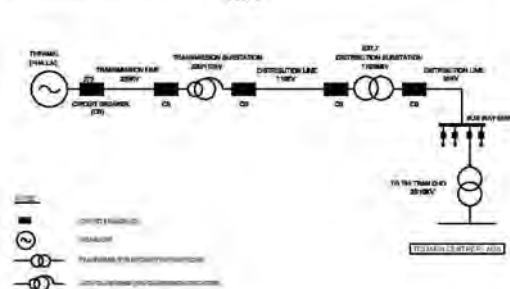
**Table 4.2 Location of Northern Regional Main Center NH.18 – PR.295 Interchange**



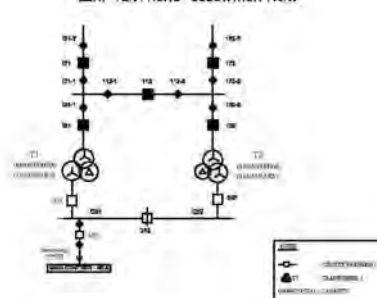
- 1) **Landuse and land property:** The proposed site is flat vacant land in wide area of agricultural use and owned by DRVN. The proposed site is within a provincial road and round shaped interchange access circuit.
- 2) **Land Area:** About 3 ha (6 ha in total)
- 3) **Socioeconomic condition:** Surrounding area is basically agricultural land use, commercial business activities are only along PR295 and the interchange.
- 4) **Resettlement:** Not required
- 5) **Accessibility:** Good. But, the site needs some traveling time from the Hanoi central area before the construction of NH3B is completed.
- 6) **Connectability of comm. network:** Good. This area is located along the target road network of the Project.
- 7) **Power supply:** Power supply given higher priority by Power Company Bac Ninh and confirmed distribution network.

Candidate site - 8

NO.8



E27.7 YEN PHONG - SUBSTATION 110KV



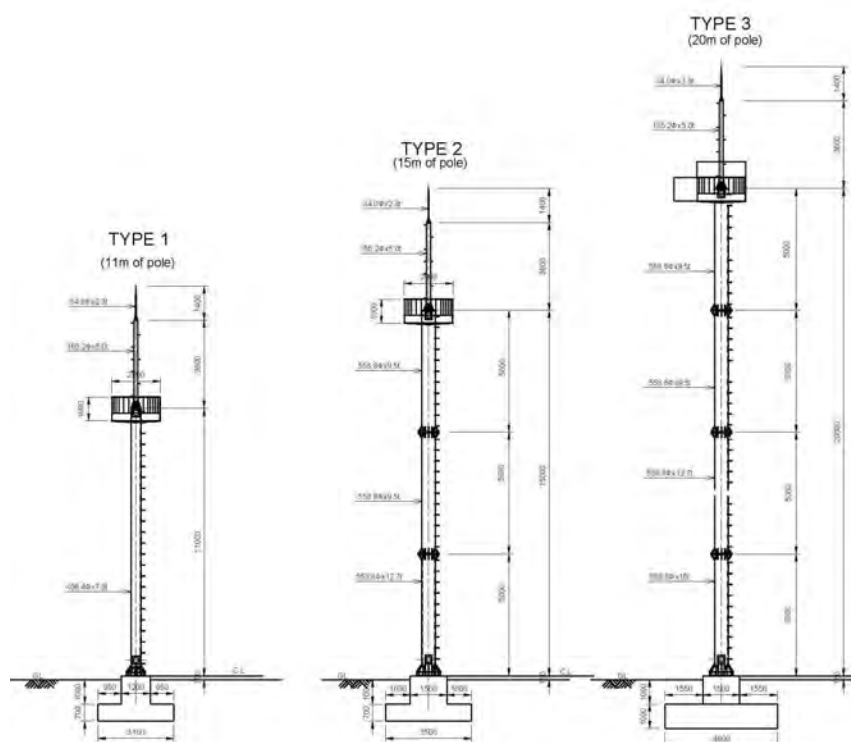
- 8) **Natural condition:** Geographic condition of this area is flat and flood free area.
- 9) **Pollution:** There is no pollution expected.

## 5) Installation of Antenna for Radio Communication

There are three types of antenna for radio communication namely height of 11 m, 15m and 20m. These antennas functioned as signal transmitters with capacity of 30-40 W (power of transmission less than 100W).

Totally about 33 sets of base station for radio communication will be constructed in the Main Center, Road Management Office, and in expressway.

**Figure 4.3 Installation of Antenna for Radio Communication**



## 5. Natural Environmental, Economic and Social Conditions

### 1) Natural environmental condition

#### a) Climate

Consisting of high terrain (1,000 meters above sea level) areas to coastal plains and delta area, Vietnam has various climates.

In Hanoi, there are two major seasons, a cold dry season (October - March) and a hot rainy season (April - September). The average annual temperature is 24°C. Hanoi is located in the North-Eastern Tropical Monsoon region. The climate differs according to the four seasons, whereby winter is cold, summer is hot with high humidity, and spring and fall relatively cool. The average annual temperature is 23 to 25°C. Following table 5.1 shows average temperature in Ha Noi from 2005, 2007 to 2009.

**Table 5.1 Average temperature in Ha Noi from 2005, 2007 to 2009** Unit: °C

Month	Lang station					Son Tay station				
	2005	2007	2008	2009	2010	2005	2007	2008	2009	2010
<b>Average</b>	24.2	24.5	23.7	24.9	24.9	23.4	23.9	23.3	24.6	24.4
<b>1</b>	16.2	16.9	15.2	16.1	18.1	15.7	16.3	15.0	19.2	18.0
<b>2</b>	17.8	21.9	13.8	22.5	20.9	17.5	21.4	13.7	22.2	20.8
<b>3</b>	19.2	20.0	21.4	20.9	21.9	18.8	20.8	21.3	20.5	21.9
<b>4</b>	24.3	23.4	24.7	24.7	23.5	23.4	22.7	24.5	24.3	23.2
<b>5</b>	29.2	27.3	27.5	27.1	28.7	28.0	26.1	27.0	26.7	28.2
<b>6</b>	30.3	30.2	28.6	30.3	30.9	29.3	29.3	28.3	29.7	30.2
<b>7</b>	29.7	30.4	29.4	29.5	30.7	28.8	29.5	28.7	29.0	30.0
<b>8</b>	28.8	29.2	29.0	29.9	28.6	27.9	28.4	28.7	29.2	28.0
<b>9</b>	28.7	27.2	28.3	29.1	28.7	27.5	26.5	27.8	28.4	27.9
<b>10</b>	26.3	25.8	26.5	26.8	25.7	25.3	24.9	26.1	26.0	24.8
<b>11</b>	22.7	21.4	21.4	21.9	22.1	21.9	20.4	21.0	20.1	21.0
<b>12</b>	17.4	20.4	18.4	19.9	19.4	16.5	19.9	17.7	19.4	18.8

Source: Lang and Son Tay weather watching station, Hanoi

The referenced data on temperature in the project area are below.

**Table 5.2 Average temperature in Northern Delta Region**

Unit: °C

Month	2005	2006	2007	2008	2009	2010
<b>1</b>	15.7	17.7	16.3	14.8	16.6	16.8
<b>2</b>	17.5	18.1	21.4	13.5	20.8	17.5
<b>3</b>	18.8	19.9	20.8	20.9	21.7	20.3
<b>4</b>	23.4	24.6	22.7	24.2	25.7	23.6
<b>5</b>	28.1	26.3	26.2	26.7	28.3	25.7
<b>6</b>	29.3	29.3	29.3	27.9	29.8	28.8
<b>7</b>	28.8	29.1	29.5	28.7	29.5	28.7
<b>8</b>	27.9	27.2	28.4	28.4	28.4	28.4
<b>9</b>	27.5	27.1	26.4	27.4	26.9	27.2
<b>10</b>	25.3	26.3	24.9	25.8	25.5	24.6
<b>11</b>	21.9	23.7	20.3	21.0	22.9	22.2
<b>12</b>	16.7	17.3	19.9	17.7	17.5	18.1
<b>Average</b>	<b>23.4</b>	<b>23.9</b>	<b>23.8</b>	<b>23.1</b>	<b>24.5</b>	<b>23.5</b>

Source: National Hydro-Meteorological Service, MONRE

## b) Humidity

Humidity in Hanoi City is annually approximately 80% in average, the average of humidity over the years at the weather watching stations is shown in Table 5.3.

**Table 5.3 Average humidity (%) in Month, Hanoi from 2005, 2007 to 2009**

Month	Lang station					Son Tay station				
	2005	2007	2008	2009	2010	2005	2007	2008	2009	2010
<b>Average</b>	79	77	79	77	78	85	84	83	83	84
<b>1</b>	79	77	79	72	81	84	76	80	86	84
<b>2</b>	79	69	80	84	80	88	87	76	87	83
<b>3</b>	85	81	72	82	78	86	92	82	87	81
<b>4</b>	83	88	82	82	85	89	85	86	86	87
<b>5</b>	83	79	84	81	81	87	84	83	85	85
<b>6</b>	78	75	79	74	74	83	83	84	80	81
<b>7</b>	77	77	81	79	74	85	84	83	85	83
<b>8</b>	79	78	79	78	82	90	88	87	84	89
<b>9</b>	83	81	83	76	79	88	87	87	82	87
<b>10</b>	78	81	80	75	70	80	85	84	82	81
<b>11</b>	76	77	80	66	71	85	75	81	75	80
<b>12</b>	79	67	76	74	77	76	83	79	79	84

*Source: Lang and Son Tay weather watching station, Hanoi*

**Table 5.4 Average humidity (%) in the project area**

*Unit: %*

Month	2005	2006	2007	2008	2009	2010
<b>1</b>	84	79	76	83	84	83
<b>2</b>	88	89	87	76	87	87
<b>3</b>	86	87	92	85	83	85
<b>4</b>	89	86	85	88	87	90
<b>5</b>	87	85	84	84	87	89
<b>6</b>	83	83	83	87	81	82
<b>7</b>	85	85	84	84	85	85
<b>8</b>	90	91	88	87	90	89
<b>9</b>	88	81	87	87	90	88
<b>10</b>	83	84	85	85	80	79
<b>11</b>	85	82	75	80	78	81
<b>12</b>	84	79	76	83	84	83

*Source: National Hydro-Meteorological Service, MONRE*



### c) Rainfall

Average of approx. 1,700mm, 70~80% of amount of rainfall occurs during June to September's rainy season, however according to climate data, at times of rainstorms, the amount of rainfall could reach up to 200mm - 700mm daily, and there are uneven distribution of rainfall according to location. Table 5.5 shows monthly averages of rainfall in Hanoi from 2005, 2007 to 2009.

**Table 5.5 Monthly averages of rainfall in Hanoi from 2005, 2007 to 2009**

Month	Lang station					Son Tay station				
	2005	2007	2008	2009	2010	2005	2007	2008	2009	2010
<b>Average</b>	1,764.5	1,659.3	2,267.1	1612.1	1,239.2	1,710.0	1,186.0	1,893.3	1,380.4	1,504.6
<b>1</b>	11.4	3.0	26.6	4.9	80.9	13.8	6.6	35.7	17.7	51.8
<b>2</b>	35.6	25.0	13.9	8.0	8.1	31.9	20.6	29.6	3.4	3.9
<b>3</b>	27.4	29.4	20.2	49.1	5.8	23.7	30.1	15.9	52.0	5.7
<b>4</b>	32.9	97.5	121.6	74.3	55.6	27.2	96.3	46.3	95.6	79.5
<b>5</b>	221.4	118.1	184.0	229.0	149.7	74.4	112.7	217.9	174.4	77.4
<b>6</b>	278.0	210.9	234.3	242.4	175.4	239.8	143.0	231.4	149.7	276.1
<b>7</b>	277.9	286.3	423.5	550.5	280.4	355.0	157.8	202.2	398.8	313.1
<b>8</b>	377.2	330.4	304.5	215.7	274.4	469.7	197.6	259.1	298.1	329.2
<b>9</b>	366.0	388.3	199.4	154.6	171.8	307.2	220.1	217.8	109.1	209.6
<b>10</b>	17.8	145.0	469.0	78.8	24.9	32.8	184.3	400.6	71.0	131.9
<b>11</b>	91.9	4.8	258.7	1.2	0.6	113.1	7.1	26.2	6.9	4.3
<b>12</b>	26.8	20.6	11.4	3.6	11.6	21.4	9.8	10.8	3.7	22.1

Source: Lang, Son Tay weather watching station, Hanoi

**Table 5.6 Monthly averages of rainfall in the Northern Delta Region**

*Unit: mm*

Month	2006	2007	2008	2009	2010
1	38.4	9.5	13.8	1.7	31.0
2	35.9	26.5	31.4	25.1	17.4
3	14.0	36.2	24.2	70.7	27.4
4	44.3	130.8	27.7	17.6	27.2
5	252.7	260.1	74.4	140.9	228.7
6	172.0	202.2	239.8	165.9	443.1
7	203.7	296.3	355.0	306.9	583.4
8	272.1	210.2	469.7	383.8	322.3
9	311.8	112.5	312.2	109.8	241.7
10	28.8	17.4	32.8	28.4	696.4
11	2.8	16.7	93.1	58.0	345.,2
12	4.6	18.1	21.2	5.6	14.1
<b>Average</b>	<b>115,1</b>	<b>111,4</b>	<b>141,3</b>	<b>109,5</b>	<b>248,2</b>

*Source: National Hydro-Meteorological Service, MONRE*

**d) Wind direction, wind speed**

The major wind direction is North East during winter season (from October to March) and South East during summer season, most from January to September. Wind is stable in term of direction and speed.

Average wind speed:  $V = 1.3 - 2.0$  m/s.

Maximum wind speed:  $V = 18.0$  m/s.

**Table 5.7. Monthly average win speed in the Northern Delta Region**

Unit: m/s

Year		Month												Average
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2005	V <sub>tb</sub>	1.0	2.0	2.0	2.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.3
	V <sub>max</sub>	8	8	8	7	9	7	13	8	6	6	6	6	13
	Direction	NE	SE	NE	SE	SSE	SSE	W	W	SE	SE	SSE	NE	W
	Date	27	21	6	17	3	29	9	27	14	4	5	19	9
2006	V <sub>tb</sub>	1.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	1.3
	V <sub>max</sub>	8	10	7	8	14	10	9	10	6	1	8	7	14
	Direction	NE	NE	SE	ENE	SW	NW	SSE	NW	NE	NE	NE	NE	SW
	Date	18	3	20	16	28	26	15	4	19	2	15	30	28
2007	V <sub>tb</sub>	1	2	1	2	2	1	2	1	1	1	1	1	1.3
	V <sub>max</sub>	8	8	9	18	12	10	18	9	14	6	7	7	18
	Direction	SE	SE	NE	NE	SW	NW	N	NW	N	S	NNE	NE	SW
	Date	25	14	12	12	13	5	31	16	27	18	18	4	
2008	V <sub>tb</sub>	2	2	2	2	2	2	1	1	1	1	2	1	2
	V <sub>max</sub>	7	10	8	12	13	14	10	7	9	9	13	6	14
	Direction	NE	SE	NE	NE	N	SW	SW	NE	N	NW	N	NNE	SW
	Date	6	13	13	28	13	12	19	10	10	9	20	1	12
2009	V <sub>tb</sub>	2	2	2	2	2	2	2	1	2	2	2	2	2
	V <sub>max</sub>	8	6	7	8	9	7	9	9	9	8	8	6	9
	Direction	NN W	SE	NN W	NNE	NN W	WS W	NW	ESE	NW	NN W	NN W	NW	NN W
	Date	6	13	18	3	4	2	24	5	18	3	27	2	4
2010	V <sub>tb</sub>	2	2	1	2	2	1	1	1	1	2	2	2	2
	V <sub>max</sub>	7	7	6	7	9	12	9	8	10	9	8	6	12
	Direction	NN W	N	ESE	NN W	SSE	W	SS W	WN W	ENE	NN W	NW	NN W	W
	Date	24	26	12	23	25	27	28	7	13	14	2	4	27

Source: National Hydro-Meteorological Service, MONRE

In the Northern Delta Region, storms normally occur during June to October and most of all in August. Wind speed could reach up to 20m/s during that period.

**Table 5.8. Number of day having storm in the project area**

Unit: day

Year	Month												Total day
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2005	0	2	0	7	16	10	7	16	7	2	0	0	67
2006	0	0	3	11	12	7	4	17	7	1	0	1	63
2007	0	2	2	2	15	19	15	19	7	1	1	0	83
2008	0	0	1	6	14	17	13	15	4	4	2	0	76
2009	0	1	2	2	3	13	16	15	7	3	0	0	62
2010	0	0	5	2	8	16	13	10	11	3	1	0	69

Source: National Hydro-Meteorological Service, MONRE

### e) Sunlight hours

The sunlight hours is one the factors having direct effects on the regional thermal regime and on atmospheric stability and the diffusion stations. Table 5.9 shows data of sunlight hours.

**Table 5.9 Sunshine duration hours in Hanoi from 2005, 2007 to 2010**

Month	Lang station					Son Tay station				
	2005	2007	2008	2009	2010	2005	2007	2008	2009	2010
<b>Total</b>	<b>1285.2</b>	<b>1444.7</b>	<b>1215</b>	<b>1398.7</b>	<b>1245.3</b>	<b>1250.9</b>	<b>1436.5</b>	<b>1277.8</b>	<b>1388.1</b>	<b>1270.7</b>
<b>1</b>	40.5	67.9	59.1	103.9	32.8	29.5	61.4	63.0	41.7	27.4
<b>2</b>	21.2	71.8	26.3	74.7	93.6	19.5	64.1	27.0	71.0	88.5
<b>3</b>	35.0	23.9	67.6	50.9	50.7	33.6	23.4	64.5	44.0	39.6
<b>4</b>	86.3	87.2	73.0	84.5	48.3	73.6	78.5	69.3	103.3	54.7
<b>5</b>	190.9	145.8	137.7	143.1	130.8	182.8	147.9	151.8	135.1	124.0
<b>6</b>	122.9	217.7	115.2	160.8	159.2	121.6	226.6	116.2	171.5	145.5
<b>7</b>	187.0	203.2	150.1	142.5	180.1	191.7	216.1	166.4	149.0	205.3
<b>8</b>	135.9	156.0	123.5	171.6	120.8	128.0	158.0	154.0	197.3	136.2
<b>9</b>	162.4	128.7	123.0	132.1	145.0	162.4	135.9	130.7	153.1	150.1
<b>10</b>	102.6	106.1	83.3	122.1	102.3	113.0	91.6	91.6	131.8	122.5
<b>11</b>	130.6	178.9	145.2	135.4	103.1	128.0	181.2	150.7	123.9	102.2
<b>12</b>	69.5	57.5	111.0	77.1	78.6	67.2	51.8	92.6	66.4	74.9

Source: Lang and Son Tay weather watching station, Hanoi

**Table 5.10 Sunshine duration hours in the project area**

Unit: day

Month	2006	2007	2008	2009	2010
<b>1</b>	34.5	30.0	68.0	63.7	63.8
<b>2</b>	60.9	19.3	35.9	75.4	28.1
<b>3</b>	46.2	34.1	26.4	19.7	58.1
<b>4</b>	67.6	74.8	104.6	90.9	70.7
<b>5</b>	127.0	184.7	164.4	169.3	156.0
<b>6</b>	165.3	122.8	182.5	191.3	101.1
<b>7</b>	110.9	202	154.9	220.2	133.3
<b>8</b>	165.4	130.6	92.7	138.2	127.8
<b>9</b>	133.9	163.7	169.6	115.5	109.9
<b>10</b>	120.6	113.5	111.3	131.4	78.6
<b>11</b>	128.7	127.6	146.9	175.2	130.0
<b>12</b>	152	67.6	100.9	42.5	104.2
<b>Total</b>	<b>1,313</b>	<b>1,270.7</b>	<b>1,358.1</b>	<b>1,433.3</b>	<b>1,161.6</b>

Source: National Hydro-Meteorological Service, MONRE

#### **f) Hydrogeology and Groundwater (usage in Hanoi)**

Most of the groundwater is contained in two Quaternary aquifers, the upper aquifer (part of the Holocene Thai Binh Formation) and the lower aquifer (Lower Vinh Phuc and Hanoi formations of Pleistocene). The upper aquifer consists of a series of non-continuous silty fine to medium sand lenses and thin layers of low to medium permeability. The aquifer is unconfined or semi-confined. The average thickness of the aquifer is 9.2m in the north and 13.3 m in the southern part of the Red River Delta. The permeability of the aquifer is 20 to 800 m<sup>2</sup>/day. The source of groundwater of the upper aquifer is mainly from direct surface infiltration, including precipitation and surface water bodies. Due to its relatively low transmissibility and limited water-bearing capacity, the upper aquifer is only used for small-scale water supply. The upper aquifer does not exist along the project alignment.

The lower aquifer is separated from the upper aquifer by a Pleistocene clay layer. Where the upper aquifer is absent, the Pleistocene clay layer is combined with recent clay deposits to form a top confining layer. The depth to the top of the confined aquifer increases from north to south in Hanoi. The top of the aquifer is at depth of about 12 to 40 m bgs, and the bottom of the aquifer is about 45 to 90m deep. The permeability of this aquifer ranges from 200 to 1,600 m<sup>2</sup>/day.

Direct surface recharge is not likely to be the groundwater source of the lower aquifer in Hanoi because the thick top confining layer forms a barrier for surface percolation. The main source of the groundwater is the lower aquifer is through recharge in the outcrop area where the aquifer formation is directly exposed to the surface. The recharge area is upstream in the headwaters of the Red River Delta where the top clay layer pinches out. The groundwater moves laterally downstream to Hanoi. The lower aquifer has been used as the main water supply for Hanoi since 1909.

In the past decade groundwater of the lower aquifer has been over-pumped, mainly as a municipal water supply. As a result, depression of the groundwater table has occurred in most of Hanoi city.

Regular data on inundation and flood of the subjected rivers and surrounding major waterways are not disclosed to public so much.

Groundwater exists in all stratum and land surface. Its depth differs according to season, climate and river and lake districts. The quantity of water level also differs according to irrigation and drainage human activity. The groundwater level are often less than 1m, at the Red Delta district, where the subjected ITS main center locates. Following table 5.11 shows an average water level of the main rivers which flows in Hanoi city area.

**Table 5.11 Average water level of the rivers in month Unit :cm**

Month	Red River					Duong River					Day River				
	2005	2007	2008	2009	2010	2005	2007	2008	2009	2010	2005	2007	2008	2009	2010
<b>Average</b>	<b>378</b>	<b>348</b>	<b>387</b>	<b>597</b>	<b>507</b>	<b>375</b>	<b>346</b>	<b>378</b>	<b>280</b>	<b>213</b>	<b>113</b>	<b>95</b>	<b>140</b>	<b>93</b>	<b>78</b>
<b>1</b>	230	201	193	597	351	250	215	204	201	118	32	36	21	9	15
<b>2</b>	217	189	172	587	377	233	201	179	201	179	44	43	41	48	35
<b>3</b>	226	173	177	418	318	242	185	181	158	91	36	61	41	48	11
<b>4</b>	234	158	180	468	318	248	170	184	192	98	35	37	35	47	27
<b>5</b>	231	285	280	696	497	243	290	284	360	196	52	62	78	134	41
<b>6</b>	434	406	424	715	560	430	400	409	362	237	79	89	154	100	63
<b>7</b>	644	688	743	988	708	625	660	704	605	349	182	147	255	259	115
<b>8</b>	708	638	703	858	810	683	613	666	471	430	279	132	184	144	196
<b>9</b>	586	563	567	666	724	570	544	546	319	350	296	163	185	116	228
<b>10</b>	404	423	410	515	578	399	417	402	218	253	190	245	127	91	112
<b>11</b>	338	247	554	402	412	338	254	532	146	154	100	68	473	46	56
<b>12</b>	231	200	235	352	435	241	208	241	123	159	26	56	90	36	39

Source: Hanoi statistical yearbook 2010

#### **g) Geographic feature**

The city of Hanoi is located in the southwest side of the Red River. The surface is covered by a complex sequence of alluvial delta deposits. The typical trend of the ground elevation in Hanoi city area is the inclination in the South-West direction. Especially, the difference between the city ground elevation and the bed elevation of the Red River is not so significant.

#### **h) Topography, geology**

As overview of geological settings in Hanoi, Alluvial cobble and gravel with lenses and thin layers of silty sand and occasional stiff sand clay, known to be up to 65m thick in Hanoi (2m to less than 50m)

#### **i) Flora, fauna**

According to recent statistics, among terrestrial species, in Vietnam, there are 15,986 plant species (including 4,528 lower plants and 11,458 vascular plants) 10% of these are endemic species, and in terms of fauna, 307 species of roundworm (Nematoda), 161 tapeworm species, 200 earthworm species (Oligochaeta), 145 Arcartia species (Arcartia), 113 springtail species (Collembolla), 7,750 insect species (Insecta), 260 reptiles species (Reptilia), 120 amphibian species (Amphibia), 840 bird species (Aves), 310 mammal species.

According to Vietnam Red Data Book (MONRE) lists 1,056 threatened wildlife species at national level. In comparison with records of the first version of Vietnam's Red Data Book (1996 version), the current number of such species increased considerably, 1056 species against 721 species.

Since the ITS main center is within urbanized area or suburban area of metropolitan Hanoi, historically the area has been influenced by human activities and there is not of any specific vegetation or inhabited area of endangered or rare species enlisted in the Red Data Book.

**j) Protected area**

In Vietnam, there are 129 protected areas, in which 27 are national parks; 60 are natural and habitat reservation areas, 37 cultural - historical - environmental reservation areas, and 5 world heritage areas.

Incidentally, the subjected ITS main center site is already designated existing ROW of main trunk road or nearby these areas.

**2) Economic and social condition**

**a) Area, population, administrative units up to December 2010, Hanoi**

Hanoi city has area of 3,328.89m<sup>2</sup> in total and there are 29 administrative districts covering in the metropolitan city. Population as of 2010, total population in Hanoi City is 6.69 million people. Urban Population has share of 41% among its total.

As of ethnic groups, 54 ethnic groups exist in Vietnam, however, 86.2% of total national population belongs to the Viet (or Kinh) majority ethnic group, and other ethnic minorities in need of special consideration, resides in Southern or Northern mountainous areas or plain areas, outside of Hanoi City.

No indigenous people or minorities were confirmed to reside in the proposed main center sites.

Table 5.12 shows the area, population and administrative units of Hanoi.

**Table 5.12 Area, population, administrative units up to December 2010, Hanoi**

District		Area (km <sup>2</sup> )	Population (x1,000)	Population density (persons/km <sup>2</sup> )	Communes	Wards under district
Whole city		3328.89	6688.6	2009	555	22
1	Ba Dinh	9.25	230.0	24865	14	-
2	Hoan Kiem	5.29	149.5	28261	18	-
3	Tay Ho	24.01	139.2	5798	8	-
4	Long Bien	59.93	237.0	3955	14	-
5	Cau Giay	12.03	238.7	19842	8	-
6	Dong Da	9.96	380.0	38153	21	-
7	Hai Ba Trung	10.09	306.0	30327	20	-
8	Hoang Mai	40.32	346.9	8604	14	-
9	Thanh Xuan	9.08	235.8	25969	11	-
10	Soc Son	306.51	293.2	957	25	1
11	Dong Anh	182.14	350.5	1924	23	1
12	Gia Lam	114.73	239.2	2085	20	2
13	Tu Llem	75.63	429.4	5678	15	1
14	Thanh Tri	62.93	204.8	3254	15	1
15	Me Linh	142.51	198.0	1389	16	2
16	Ha Dong	48.34	241.9	5004	17	-
17	Son Tay	113.53	129.0	1136	15	-
18	Ba Vi	424.03	252.1	595	30	1
19	Phuc Tho	117.19	162.8	1389	22	1
20	Dan Phunong	77.35	144.4	1867	15	1
21	Hoai Duc	82.47	198.4	2406	19	1
22	Quoc Oai	147.01	165.1	1123	20	1
23	Thanh That	184.59	182.3	988	22	1
24	Chuong My	232.41	295.7	1272	30	2
25	Thanh Oai	123.85	171.8	1387	20	1
26	Thuong Tin	127.39	225.3	1769	28	1
27	Phu Xuyen	171.10	183.1	1070	26	2
28	Ung Hoa	183.75	183.9	1001	28	1
29	My Duc	231.47	174.6	754	21	1

#### **b) Economic condition**

In the past decade during 2001 - 2010, there were rapid economic growth in Hanoi, and the economic structure has been modernized, and efficient. The GDP of Hanoi City during 2000 to 2005, grew at a level of annual 10.7%, and 6.72% during 2007 to 2010. The real GDP of Hanoi city in 2010 reached to 246 trillion 723 billion Vietnam Don, with share of 13.0% of the real GDP nationwide.



### c) Industrial trend

Industrial sectors' growth rate in Hanoi City: Agriculture, fishery and forestry showed 4.39% growth during 2000 to 2005, but reduced its growth to 1.04% during 2007 to 2010. On the other hand, the construction and industrial sector showed rapid growth of 13.4% in 2000 - 2005, while in 2007 - 2010 slightly reduced its growth, but still kept a strong growth of 11.25%.

## 6. Environmental Baseline

The area of the project presents popular ecological and cultural characteristics which make this project simple. The project area is located within the Red River Delta where the local population density is high. In order to assess the quality of environment in the project area, the study team collected information regarding air, noise, surface water, and underground water monitored in March, 2012.

### 1) Ambient Environmental Quality

#### (1) Air Quality

Vietnam's climate varies from one region of the country to another due to differences in latitude and a marked variety of topographical relief. During the winter (or dry) season, extending roughly from November to April, monsoon winds usually blow from the northeast along the China coast and across the Gulf of Tonkin, picking up considerable moisture. Consequently, the winter season in most parts of the country is dry, only by comparison with the rainy or summer season. The following table provides parameters presented microclimate in the project area.

**Table 6.1 Microclimate indicator in the project area**

No.	Sampling location	Microclimate Indicator				
		Temperature (°C)	Pressure (mbar)	Humidity (%)	Wind speed (m/s)	Wind direction
1	RR3 (Thanh Xuan)	25.3	1,004	82	1.5	ES
2	NH18-NH3	19.3	1,000	83.2	1.8	WN
3	Hanoi – Bac Ninh	19.2	1,003	75.8	2.0	ES
4	Noi Bai-Bac Ninh	26.6	1,002	66.9	0.7	WS

In general, climate parameters in the project area present typical characteristics of tropical weather. The temperature ranges from 19.2°C to 26.6°C with low daily fluctuation. Average relative humidity falls into 66.9% ÷ 83.2%, average wind speed of 1.5m/s ÷ 2.0m/s, and atmospheric pressure of 1,000 ÷ 1,004mbar.

Table below shows the results of air quality in the project area.

**Table 6.2 Air quality in the project area**

No.	Sampling location	Indicator ( $\mu\text{g}/\text{m}^3$ )				
		Dust	Carbon Monoxide (CO)	Sulphur Dioxide (SO <sub>2</sub> )	Nitrous Oxide (NO <sub>2</sub> )	Particulate Matter (PM <sub>10</sub> )
1	RR3 (Thanh Xuan)	240	215	200	80	77.5
2	NH18-NH3	250	204	200	80	75.2
3	Hanoi – Bac Ninh	270	220	220	70	73.4
4	Noi Bai-Bac Ninh	260	203	210	80	76.1
<b>QCVN 05:2009 (TB/24h)</b>		<b>200</b>	<b>5,000</b>	<b>125</b>	<b>100</b>	<b>150</b>

These results were compared to the QCVN05: 2009/BTNMT, and the air quality was found to be within the permissible limit. The absence of industries and transportation facilities are responsible for low emission in the project area.

### Noise

**Table 6.3 Noise levels in the project area**

No.	Sampling location	Average value (dBA)			
		L <sub>eq</sub>	L <sub>Amax</sub>	L <sub>50</sub>	QCVN 26:2010/BTNMT
1	RR3 (Thanh Xuan)	66.0	70.5	68.4	70
2	NH18-NH3	58.07	61.85	58.99	
3	Hanoi – Bac Ninh	65.67	68.59	65.53	70
4	Noi Bai-Bac Ninh	68.5	70.4	72.7	

Noise levels in the project area are much lower than permissible limits compared to National Technical Regulation on ambient air quality (QCVN26:2010/BTNMT).

### **Vibration**

**Table 6.4 Vibration levels in the project area**

No.	Sampling location	Average value		
		Velocity (m/s <sup>2</sup> )	Acceleration (m/s <sup>2</sup> )	Vibrate acceleration QCVN 27:2010/BTNMT
1	RR3 (Thanh Xuan)	0.0504	0.067	<b>0.055</b>
2	NH18-NH3	0.024	0.00171	
3	Hanoi – Bac Ninh	0.024	0.00178	
4	Noi Bai-Bac Ninh	0.033	0.00246	

According to QCVN 27:2010/BTNMT – National Technical Regulation on vibration, value of permissible limit is not exceed 0.055 (m/s<sup>2</sup>) for public and residential areas. Table above shows that vibration levels at the project area are under National Standard.

### **(2) Water quality**

Surface water sampling results are summarized in table below.

**Table 6.5 Surface water quality parameters**

No.	Parameter	Unit	Value		QCVN 08: 2008/BTNMT	
			Linh Đàm lake	Cà Lồ river	Colum A <sub>2</sub>	Colum B <sub>1</sub>
1	Temperature	°C	24.5	25	-	-
2	pH	-	7.25	7.13	<b>6-8.5</b>	<b>5.5-9</b>
4	Turbidity	NTU	65.5	66	-	-
5	Biological Oxygen Demand (BOD <sub>5</sub> )	mg/l	8.5	13.4	<b>6</b>	<b>15</b>
6	Chemical Oxygen Demand (COD)	mg/l	25.5	25.3	<b>15</b>	<b>30</b>
7	Dissolved Oxygen (DO)	mg/l	4.1	4.7	<b>≥ 5</b>	<b>≥ 4</b>
8	Total Dissolved Solid (TSS)	mg/l	50	42.7	<b>30</b>	<b>50</b>
12	Fe	mg/l	0.2	0.85	<b>1</b>	<b>1.5</b>
14	Lubricant	mg/l	0.065	0.07	<b>0.02</b>	<b>0.1</b>

Quality of surface water (in case of using as water supply or irrigation presented in column A<sub>2</sub> va B<sub>1</sub> respectively) recorded in the project area showed that levels of pH, TSS, COD, BOD<sub>5</sub>, and lubricant are lower than National limit. There is no pollution on surface water in the project area.

**Table 6.6 Underground water quality**

No.	Parameter	Unit	Value		QCVN 09: 2008/BTNMT
			Thanh Xuan	Gia Lam	
1	Temperature	°C	18	20.1	-
2	pH	-	6.5	7.4	<b>5.5-8.5</b>
3	Turbidity	NTU	7	5	-
4	EC	µS/cm	135	125	-
5	DO	mg/l	5.0	3.54	-
6	NO <sub>3</sub> <sup>-</sup>	mg/l	6.6	2.11	<b>15</b>
7	Lubricant	MPN/100ml	Not exist	Not exist	-
8	TSS	mg/l	605	5.3	-
9	Coliform	MPN/100ml	0	1	<b>3</b>
10	E.Coli	MPN/100ml	Not exist	1	<b>Not exist</b>

All parameter monitored in the project area such as pH, NO<sub>3</sub><sup>-</sup>, coliform are under national regulation on underground water quality.

## 2) Socio-Economic Baseline

### (1) Population

The ITS project and main facilities are located in the greater Hanoi which includes Hanoi, and small parts of others province such as Ninh Binh, Bac Ninh, and Ha Nam with respectively more than 7 millions peoples. The project area sparsely populated with population densities ranging from 1,962 inhabitants per square kilometer in Hanoi, 1,257 in Bac Ninh, 914 in Ha Nam, and 648 in Ninh Binh.

No indigenous people or minorities were confirmed to reside in the ITS project site. Mostly Kinh ethnic resides in the Northern River Delta.

### (2) Culture, Family and Community Structure

Cultural customs of Kinh commune is very simple that originate in agricultural production activities of wet rice cultivation. There are minor cultural differences between the Kinh and

other groups, most of which are centered on traditional ceremonies. Worship tends to last for whole day and people pray for good rain and wind and health crops for prosperity.

In the Northern Delta Region, traditional family structures have dramatically changed amongst Kinh and other groups as nuclear family, consisting of three to four generations no longer exists. Since land is under state control and subdivided amongst households, it is more economical for families to live separately from one another as this allows for more land to be owned.

Most villages are physical separated by agricultural land and people tend to disperse after marriage. Though some communes do not have immigrants, people of the same descent often join other villages for meetings or to help family members.

### **(3) Transportation**

Transportation throughout the Northern Delta Region is generally good as roads are mainly asphalt based and the terrain is full flat. Currently, all districts have roads that reach their communes and relatively good condition.

The existing inter-village roads are also good and mostly cement based. It is very easy to access communes as the road networks are worked well even during the flood season.

## 7. Analysis of Alternatives

Development of infrastructure including transportation sector is the most important target in the Five-Year Social and Economic Development Plan. The development strategy for transport sector established in 2009 pointed out importance of development of trunk road network in major cities such as Hanoi, and construction of expressway network is in progress so as to cope with rapidly increasing traffic demand.

In a part of expressways in Vietnam, ITS (Intelligent Transport System) has been developed. However, the system is introduced in several sections of expressways recently completed without compatibility of technical standards. As a result, convenience for users is not sufficient, and investment for the system is not so efficient.

This project aims to install ITS, especially Northern Regional Main Center and traffic control equipment for the priority sections of the expressways in Hanoi metropolitan area. Consequently it is expected smooth traffic in the expressways. The subsequent evaluation of alternative project configurations was based on environmental and social considerations – including minimization of flood risk, minimizing number of project affected people, and avoiding land acquisition. Thus, the analysis of alternatives included three dimensions: alternatives to cable installation, alternative to power transmission, and alternatives main center.

### 1) Alternatives for optical fiber cable installation

Total length of fiber cable network installed along expressway is around 85 km, excluding 11.38 km of viaduct cable that be integrated with other facilities of other project. There are three installation alternatives for optical fiber cable network. That includes

**Alternative I:** Hang on the light poles installed in the Right of Way

**Advantages:**

- Lower cost of installation
- Shorter period of time for project implementation
- Land acquisition not required

**Disadvantages:**

- High risk of natural disaster such as storm, strong wind
- Risky traffic safety during construction
- Environmental impacts not existed

**Alternative II:** Lay underground inside of the Right of Way

**Advantages:**

- Land acquisition not required
- Low risk of natural disaster

**Disadvantages:**

- Construction activities are more difficult due to earth work taken place in asphalt layer
- Highest cost for construction of conduit system (compared to other alternatives)
- Risk of traffic safety
- Pollutions of air, noise, watercourse expected

**Alternative III : Lay underground outside of the Right of Way**

**Advantages:**

- Easiness of earth work
- Lower risk of traffic safety
- Low risk of natural disaster

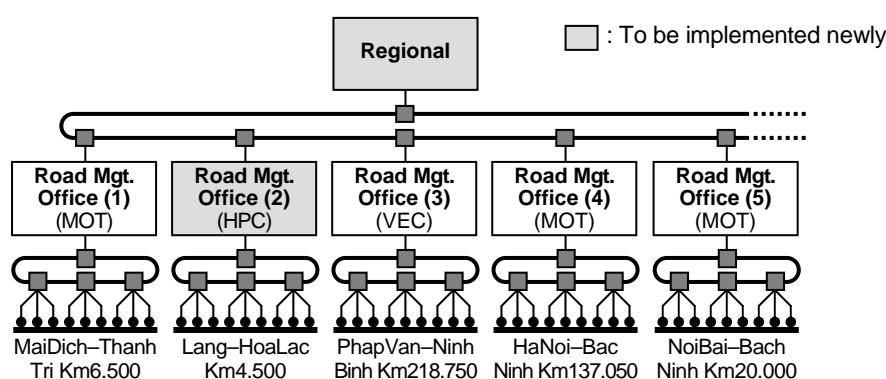
**Disadvantages:**

- Land acquisition required
- Higher cost for construction of conduit system (compared to alternative I)
- Pollutions of air, noise, watercourse expected

**2) Alternatives for Regional Main Center**

The structure and location of the Northern Regional Main Center are as follow. The Northern Regional Center, occupied the site of 3,000 m<sup>2</sup>, proposed in the area surrounded by the ramps in the interchange NH18 and PR295. Traffic information/control is to be conducted from the Regional Main Center by using traffic analysis, traffic supervision, traffic information, weather monitoring. The Main Center directly controls vehicle detectors, weather sensors, and VMSs for integrating traffic information dissemination. Consequently, connections from road site equipments to road management office and the Regional Main Center will be installed. Therefore, those should be taken into account for selection of the Main Center location.

**Figure 7.1 The Northern Regional Main Center and Road Management Office**



Source: ITS Integration Project (SAPI) Study Team

**Alternative I: Locate in the Central City of Ha Noi**

***Advantages:***

- Convenient for travelling
- Available infrastructures such as water and power supply

***Disadvantages:***

- It is impossible to do site clearance for constructing connection system from the Regional Main Center to Road Management Office and to expressway in Hanoi urban area
- Very difficult to construct conduit system for optical fiber cable installation, that link Main Center with Road Management Office and road side equipments, due to high density of population in Hanoi metropolitan area
- Much higher cost for project implementation, compared to other alternative that location of the Main Center located outside of Hanoi center, due to very high budget for land acquisition and compensation.
- Serious environmental and social impacts expected

**Alternative II: Locate along the intercity expressway network**

***Advantages:***

- Very convenient to construct the conduit system for optical fiber cable installation that linkage of the Regional Main Center and Road Management Office and road side equipments
- Compensation and land acquisition are not required for most of candidate locations. If needed, it is not difficult to take over land or the budget of compensation and land acquisition is still low.
- Lower cost for construction component
- No environmental and social impacts expected

***Disadvantages:***

- Inconvenient for travelling
- New infrastructures need to be setup



**Table 7.1 Evaluation matrix for candidate sites**

No	Site location	Sufficiency of land area	Easiness of land acquisition of sufficient area	Good accessibility and easiness on commutes	Connectivity to optical fiber cable network in the Project	Security against natural disaster and stableness on power supply	Pollution related impacts	Evaluation advantage of positive side	Remarks
1	RR3 – Trung Hoa	+++	-	++	++	++	-	9	
2	Lang – Hoa Lac 3km Point	+++	++	++	++	++	-	11	Second recommended
3	RR3 – Phap Van IC.	+++	-	+	++	++	-	8	
4	RR3 – Thanh Tri	-	-	++	++	++	+	7	
5	NH1B – NH5 IC.(Plan)	+++	-	-	++	++	-	7	
6	NH1B – NH5 IC.(Existing)	++	-	++	++	++	-	8	
7	NH1B – NH3B IC.	+++	++	-	++	++	+	10	
8	NH18 – PR295 IC.	+++	+++	+	++	++	+	12	Most recommended
9	NH18 – NH3B IC.	+++	-	+	++	++	+	9	
10	NH18 – NH3 IC.	+++	++	+	++	++	+	11	Second recommended
11	Thang Long – NH18 IC.	+++	+++	-	++	++	-	10	
12	Noi Bai Expressway Tollgate	++	+++	+	-	++	-	8	

N Note: +, ++ is shown prioritized advantage, - is shown disadvantage weight

### 3) Alternative for power transmission

There are three types of antenna for radio communication namely height of 11 m, 15m and 20m built in the Road Management Office, the Main Center, and expressway. These antennas functioned as signal transmitters with capacity of 30-40 W (less than 100W).

## **8. Scoping for the Project**

The ITS project will include the construction of the Regional Main Center, Road Management Office in Lang-Hoa Lac section, construction of conduit system, and installation of optical fiber cable network and others equipment.

### **1) The ITS's main components**

#### ***Communication network***

- Total length of fiber optical cable network is approximate 85 km
- Communication duct
- Antenna height: 11 m; 15 m; 20 m
- Power (for transmission): less than 100 W

#### ***Buildings***

- Area of Northern Regional Main Center is 3,000 m<sup>2</sup>
- Area of Road Management Office (only one for Lang – Hoa Lac Section) is 3,000 m<sup>2</sup>

#### ***Center equipment***

- Traffic event data monitor
- Traffic event data server
- Traffic data server
- Traffic information server
- Traffic supervising/control server
- Weather data server
- Traffic supervising/control console
- CCTV monitoring console
- VMS center controller
- Main monitor screen
- Image recognition processor

#### ***Roadside equipment***

- PTZ camera
- Fixed camera
- Vehicle detector
- VMS
- CSS
- ETC
- Touch and go
- Axle load scale

## **2) Auxiliary Components**

The ITS's auxiliary components consist of the access road, the construction camp; these will only be used during the construction phase. Auxiliary components will be constructed as temporary structures.

### **(1) Construction Camps**

Camps for construction workers and contractors, and engineering board members will be constructed for the project site. There will be two types of houses built at the construction site. One will be made of steel frame (such as reused cargo container) and be used for office halls and administrative purposes. Another one will be made of wood, having a wooden frame and roof and be used for accommodation.

### **(2) Water Supply System**

Surface water will be sourced for domestic purposes at the construction site. Drinking water will come from groundwater sources that will be exploited via drilled well. Water from this well will be distributed via a pipeline system. The demand for water for domestic purposes is estimated 10 m<sup>3</sup>/day. Water for construction purposes will be taken from nearby waterbody or will be pumped from the drilled well. Demand for water during construction is estimated to be approximately 100 m<sup>3</sup>/day.

### **(3) Transport of Equipment and Materials to the Project Site**

The project site is located in the flat area, therefore materials and equipment will be transported primarily via existing roads. Other construction materials such as steel and cement will be transported from local suppliers.

## **3) Construction Schedule**

Project activities will be carried out over a period of three years, including one year for preparation and two years for construction of civil works. Initiation of the project will take place in the first quarter of 2013 and project completion is expected in 2015.

## **4) Project Scope**

Table 8.1 shows environmental impacts on the ITS project on each environmental concerns and project activities through the project stage of pre-construction, construction and operation, management after the construction.



### Scoping results

Table 8.2 shows scoping results covering social and natural environment, and pollution in both during construction, Operation and maintenance period of the ITS project with rating evaluation.

**Table 8.2 Matrix of scoping results**

No	Impacts	Rating		Reasons of Evaluation
		Impacts Construction		
		During	After	
Social Environment: *Regarding the impacts on "Gender" and "Children's Right", might be related to all criteria				
1	Involuntary Resettlement	D	D	No household is allocated on the proposed main center site. The proposed site is within or nearby interchange area and the site is either closed by access ramp ways or faced highway. Mostly the area belongs to public namely within Right of way (ROW). Some householders are farming oriented persons. Most of them will have compensation right without any problems.
2	Local economy such as employment and livelihood, etc.	D	D	During the construction period, most of affected householders will move to new resettled area by their own choice due to small scale resettlement size. Meanwhile employment opportunity for construction labor will be expected. In the operation period of the main center will be quite calm and quiet activities are expected. Basically there is no direct impact to the local economy and very few opportunity to engage local employment due to high technical operation of the ITS required for operation.
3	Land use and utilization of local resources	D	D	The existing area is already acquired as ROW of interchange or junction of either expressway or main trunk road such as highway. The area will be used as institutional operation and management for ITS. As a consequence an effective landuse of the area will be much enhanced than the existing condition due to institutional organization allocation.
4	Social institutions such as social infrastructure and local decision-making institutions	D	D	Infrastructure will be substantially developed due to the ITS operation and management facility. The main center is consisted 2 to 3 story building structure within independent site and there is no physical segregation given to the existing local community system. So that almost no local decision making institution is expected.
5	Existing social infrastructures and services	D	D	Since the main center is independently allocated facility without any beneficial relation to the local community, therefore no impact on existing social infrastructures and services expected.
6-1	The poor	D	D	There is almost no poor class inhabitant settled but basically vacant space or agricultural land.
6-2	Indigenous and ethnic people	D	D	No such indigenous and ethnic people are living in the vicinity.

7	Misdistribution of benefit and damage	D	D	There is no misdistribution of benefit and damage due to almost no inhabitant settled but basically vacant space or agricultural land.
8	Cultural heritage	D	D	Since The project area is within or nearby mostly project site of expressway and major trunk road ROW. No specific cultural and heritage assets exist in the project area and no impact is expected.
9	Local conflict of interests	B	D	Land acquisition and resettlement are the vital requirement for the project implementation. Some conflicts between local peoples may arise on land acquisition and compensation.
10	Water Usage or Water Rights and Rights of Common	D	D	Water system of daily use by local peoples is not existed. Therefore no impact on right of water usage. Some pond for land acquisition may be arise local usage of irrigation water or small scale of fish culture activity.
11	Sanitation	B	D	Hygienic condition in construction site will be degraded by activities of foundation works, excavation, unloading construction and borrowed materials, removal of disposals; however this sanitary condition may be degraded temporary. These impacts are expected as a small level when proper construction and safeguard management will be periodically conducted. Less impact will be expected during the construction period. After construction sanitary condition nearby roadside will be much improved due to development of the main center and related improvement of the vicinity.
12	Hazards (Risk), Infectious diseases such as HIV/AIDS	C	C	Dusts and emission guess caused by construction activities will be affected as respiratory diseases to construction workers and local peoples, but it could be temporally and not so serious. Safety management of the construction activities, dust control, periodical watering for settling dust, proper maintenance of construction vehicles and equipment will be necessary. Education on sanitation, safeguard operation to the workers and information on construction schedule and activities to local peoples are necessary. After the construction There will any problems related hazards infectious diseases are not expected.
<b>Natural Environment</b>				
13	Topography and Geographical features	D	D	No large scale alteration with cutting and embankment is required by this project. No impact on topography and geographical features is expected.
14	Soil Erosion	B	D	Almost no large scale of earthwork by excavation is applied. It may not be caused soil erosion impact so much only few impact within the site due to construction work of building facility.
15	Groundwater	B	D	Characteristics of the construction work of building facility are normal practice to drive foundation piles with building foundation. Required excavation for the building foundation is 5m -10 in depth, so that the construction activities may not give so much impact to ground water layer.

16	Hydrological Situation	D	D	There is no river or lake near the project site. therefore the project would not be expected any impact to hydrological situation of the river.
17	Coastal Zone (Mangroves, Coral reefs, Tidal flats, etc.)	D	C	The project area is not belonged to coastal and marine zone. There is not any impact to the Coastal Zone (Mangroves, Coral reefs, Tidal flats, etc.)
18	Flora, Fauna and Biodiversity	D	D	The project area is either part of construction site of Interchange area which has been developed or under process of construction and planned status, or agriculture land. Natural ecosystem in this area is always in artificial creation as agriculture land sometime in vacant condition. Fauna biodiversity is almost none but only rats, frogs, sparrow and some insects. Protective species both flora and fauna are not existed in this project area vicinity.
19	Meteorology	D	D	There is any meteorological impact will be expected due to 2 story building of ITS as ordinary scale of architectural facility.
20	Landscape	D	D	Excavation and piling activities, temporally supporting work of Building structure will gives busy and congested looks during construction.
21	Global Warming	D	D	During construction, activities of earth work and transportation of materials will require use of machineries, equipment and construction vehicles, those will emit CO2 gas and affect some global warming. The project will not be so much affected on global warming because of architectural building construction.
<b>Pollution</b>				
22	Air Pollution	B	C	Some air pollution will be expected due to generate vehicle emission and dust by construction activities during the construction period. After construction there is no air pollution expected.
23	Water Pollution	D	D	Excavation activities of foundation work may cause temporally impact by construction activities. After construction no water pollution will be expected.
24	Soil Contamination	B	D	When lubricant oils and chemicals leaked into the ground from construction vehicles and equipment, soil contamination will be expected within the site.
25	Waste	B	D	Wastes and refuse materials from construction site and workers camp yard are usually generated, these wastes must be checked either dangerous, toxic, spoiled or not, if these risky wastes are identified disposed to the specific place directed by Local government. Basically these wastes can be managed by the contractor during construction period.
26	Noise and Vibration	B	D	Operation activities of construction equipment and vehicles generate certain level of noise and vibration and affect nearby living local peoples. These impacts will be temporally during construction period. After There is no noise and vibration expected.

27	Ground Subsidence	D	D	Operation activities for viaduct and bridge foundation work will not dredge ground water, also no ground subsidence phenomena will be expected according to previous data of boreholes. Therefore impact of ground subsidence is not expected.
28	Offensive Odor	D	D	Sanitary facility as toilet and garbage collection area in the worker camp site will cause temporally offensive odor to the nearby settled local peoples. Hygienic and sanitation management by the contractor will be controlled. Basically the project will not cause offensive odor but minimal.
29	Bottom sediment	D	D	No impact will be expected due to excavated soils are removed to disposal yard , not disposed near to the river. No impact on river hydraulics and no bottom sedimentation will be expected.
30	Accidents	D	D	According to require numbers of construction vehicle during the construction period, ration of traffic accident may increase. Management of transportation operation in the construction site is one of the important responses for the contractor. After the construction there will be no such accident expected.
31	Traffic congestion	B	D	Some traffic congestion will be expected by transportation of construction materials at access road. Traffic control management will be required during construction period. After the construction, there will be no traffic congestion expected.
32	Flooding	D	D	There will be no flooding expected due to no water course and system existed nearby the project site.

Rating: A: Serious impact is expected.

B: Some impact is expected.

C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.)

D: No impact is expected. IEE/EIA is not necessary.



## **9. Anticipated Environmental and Social Impacts**

The purpose of any impact assessment, whether it is environmental or socio-economic, is to anticipate and prevent the consequences of a potential action. For the ITS project, it is to identify potential construction and operation impacts to minimize or eliminate their effects within the project area and region. Therefore, the followings are five key functions:

- Identify potential construction and operation impact agents and their associated impacts within the project area;
- Highlight mitigation measure standards or ideal criteria for each project-related impact;
- Describe mitigation measures which would minimize and/or eliminate potential construction or operation impacts (see details presented in the environmental management plan);
- Rank the residual impact or the significance of the potential impact after mitigation measures have been applied; and
- Identify areas where additional information is required to properly assess project-related issues.

Impacts are the potential impacts of an issue after mitigation measures have been applied. The ranking of residual impacts illustrates the summation of each impact criterion considering the implementation of project mitigation measures. Cumulative project impacts, or the impacts associated from the ITS project components interacting, are discussed in the following item.

### **1) Environmental and Social Impacts during Construction Phase**

Generally, there are some impacts which occur during the construction of ITS project. Most construction activities impact water and air. Other construction specific impacts are associated with the excavation of borrow pits; creation of worker camps; high demand for work areas and labor force; development of power stations, construction of access roads, transmission lines; and finally, those impacts associated with the biophysical, socio-economic and cultural resources within the project area.

#### **(1) Air Quality**

##### ***Impact Agent***

Air quality can be affected through clearing, grading, leveling, blasting, truck hauling, stockpiling, waste disposal, road development, and transport vehicles.

##### ***Potential Impact***

Main Center and Road Management Office site preparation, conduit system development and transport vehicles may affect the air quality in the project area. Dust is a potential impact during construction activities. The dust generated during construction activities may decrease air quality for construction workers, local villagers and the surrounding environment. Additionally, quarry site activities including operation of crushers, concrete batch mixing, combined with idling of vehicles, can generate air born dust (suspended particulate matter) and gaseous emissions such as NO<sub>x</sub>, SO<sub>x</sub> and carbon monoxide. The dust generated during road construction activities may also affect the health of the

construction workers, and the communities living in the vicinity of the project area.

### ***Mitigation Measures***

To mitigate impacts in the construction area, dust control measures shall be implemented on all construction surfaces, particularly during dry and windy conditions. Dust watering operations shall occur only during designated hours (to be confirmed by contractor). Air quality standards shall be maintained throughout the construction process. Villages close to construction sites shall be notified in advance to help them prepare and/or adapt to the new environment. All construction sites shall be sprayed with water as needed in order to adequately control dust. The dust generated from stockpiles shall be controlled by compaction and the stockpiles shall not be allowed to expose for extended periods.

All trucks carrying construction materials shall be covered. Regular maintenance of vehicles (daily/weekly) shall be performed at designated areas. The traffic on access and service roads shall be regulated in order to minimize air pollution. In addition, all processes shall follow the code of practice during construction and operation phase that meets the requirements of Vietnamese standard (QCVN 05/2009/BTNMT). All water abstraction locations for watering shall be identified and volumes of water withdrawn shall be recorded so as not to create conflicts with local communities.

The duration and magnitude of the impact is anticipated to be low if appropriate mitigation measures are applied during the construction phase. The geographic extent of impact should be moderate as construction activity is expected to affect construction workers, households and communities living in the vicinity of the area. The likelihood of occurrence should be moderate due to vehicular traffic and construction activities which generate airborne dust and gaseous emissions. The residual impact is anticipated to be low if appropriate mitigation measures are applied during construction.

## **(2) Noise and Vibration**

### ***Impact Agent***

Clearing, grading, excavation, leveling, blasting, truck hauling, stockpiling, waste disposal, road development, and transport vehicles.

### ***Potential Impact***

Main Center and Road Management Office site preparation, conduit system development and transport vehicles may cause disturbance to local households and livestock. During the construction phase, equipment and vehicle operation used for drilling, leveling and concrete batch mixing are the key sources of noise. These activities may interfere with daily activities of local communities.

The other source of noise and vibration may be caused from the use of explosives for crushing activity. Noise levels from equipment and vehicles in the construction area are estimated to be approximately 80-95 dBA.

The noise created during the construction of office building may impact worker camps and communes living near the construction site.

### ***Mitigation Measures***

Construction and crushing activity and road traffic shall occur only during daylight hours. If the construction and road traffic is required outside of working hours, communities and households shall be notified and consulted.

Construction machinery and vehicles shall be maintained in good condition and mufflers shall be installed on all the machines to reduce noise levels. Equipment such as the concrete batch mixing plant shall be located as far as possible from nearby communities. The contractor shall maintain a complaint register to any address noise issues as they arise.

The duration of impact is anticipated to be low as appropriate mitigation measures shall be applied during the construction phase. The magnitude of the impact should be moderate as some of the activities like drilling, excavation, and transport vehicles, are going to affect local households and livestock. The geographic extent of the impact should be low as the noise and vibration could not be heard several kilometers from the construction site. The likelihood of occurrence might be low due to the noise from construction activities and road traffic affecting a part of commune. Reversibility should be low as appropriate mitigation measures shall be applied during the construction phase. The residual impact has been assessed to be moderate as additional mitigation or compensatory measures will be required, to reduce the level of residual impact to a low, or acceptable level.

### **(3) Road Traffic**

#### ***Impact Agent***

Stockpiles, powerhouse, truck hauling, transport vehicles, etc.

#### ***Potential Impacts***

Increased dust and vehicles on the project area will affect local villagers and households. Increased traffic on local roads could impede local villager's transportation capabilities and increase the potential of road-related accidents. Transport vehicles will also increase the levels of dust and particulate matter, decreasing the air quality for local residents.

#### ***Mitigation Measures***

To mitigate increased road traffic and subsequent dust levels, additional traffic shall be confined to populated areas. Roads and transport vehicles shall be properly maintained and repaired, as required. Installation of speed limits and road signage will minimize traffic and reduce road-related accidents.

The duration, magnitude, geographic extent, likelihood of occurrence, and reversibility will be low. The residual impact has been assessed to be low subject to the application of mitigation measures.

### **(4) Land - Borrow Pit**

#### ***Impact agent***

Clearing, grading, excavation, leveling, truck hauling, stockpiling, waste disposal, and transport vehicles.

### ***Potential Impact***

Discharges from borrow pits, concrete plants and dust and debris created during transportation of materials can impact surface and subsurface waters because of the sediment in water and runoff from material storage and handling areas. Also, abandoned borrow pits might spread vector-borne diseases, especially when stagnant water accumulates.

### ***Mitigation Measures***

To mitigate impacts in the construction area, land gradients and drainages shall be maintained for proper discharge of wastes. Measures shall be taken to confine activities to designated locations and to minimize the creation of dust and debris during transportation. Protective measures shall be implemented during transportation (i.e. covering loads, reduced travel speeds etc.). All disturbed areas shall be properly reclaimed after construction.

The duration, magnitude, geographic extent and reversibility of the impact has been assessed as low if appropriate mitigation measures shall be applied during construction activities. The residual impact has also been assessed to be low as impacts are considered negligible subject to application of appropriate mitigation measures during construction activities.

## **(5) Loss of Productive Land, and Income**

### ***Impact Agent***

Clearing, stripping, grading, leveling, truck hauling, stockpiling, waste disposal, transport vehicles, camp site construction, and labor force.

### ***Potential Impacts***

Several households will lose vegetable land and therefore, will not be able to sell or distribute the product. Families with no additional sources of income will be impacted. This may result in households having to self-relocate to another productive area or alter their traditional practices to financially support themselves.

### ***Mitigation Measures***

Construction activities shall be confined to designated areas to avoid land clearing or disruption to adjacent households. During initial clearing, the project owner shall allow project-affected household to collect natural resources that have economic value prior to site clearance.

The duration of the impact has been assessed to be moderate if construction activities are going to affect communes throughout the construction process. The magnitude of the impact will be low if clearing leads to loss of productive land and income for some households. The geographic extent of the impact will be low if the area to be cleared includes vegetable planting area of some households. The likelihood of occurrence and reversibility has been assessed to be low if appropriate mitigation measures shall be applied during construction. The residual impact has been assessed to be very low as very

few households will be affected by construction activities resulting in loss of productive land and income. Additional mitigation measures will be required to reduce the impact to zero.

## **(6) Worker Camp**

### ***Impact Agent***

Construction camp creation (site clearing, camp site construction, and labor force).

### ***Potential Impacts***

- Introduction of approximately 50 construction workers in the project area at peak
- Impacts on health and quality of life through increased levels of disease transmission, prostitution, gambling, drugs, theft and trespass
- Local Job Creation and Transition Away From Local Livelihoods

### **Introduction of approximately 50 construction workers**

The creation of the ITS will introduce approximately 50 construction workers to the project area (at the peak). The addition of male workers will distort the current demographics in the area. The influx of males could potentially lead to social conflict between local villagers and construction workers. Construction workers may also bring their couple with them to relocate in a nearby village. This would also alter community dynamics and strain limited resources. There will be an increase in demand for improved sanitary facilities and adequate disposal services for construction workers. However, these services will benefit local villagers and people inhabiting adjacent communes when the construction process is completed.

### ***Mitigation Measures***

Measures shall be taken to create temporary and reasonable living conditions for construction workers, and to control the scale of impacts by minimizing population influx. The Contractor shall ensure there is no conflict between construction workers and local villagers. A construction camp worker management plan shall be implemented by the contractor to deal with issues such as resource conflicts, drugs, disease etc.

Also, efforts shall be taken to maintain equal sharing of resources. Construction workers shall be provided with adequate and compliant sanitation and disposal facilities. Waste disposal points shall be identified and monitored i.e. no discharge under non-compliant conditions to maintain the integrity of the local ecosystem.

The duration, magnitude, geographic extent, likelihood of occurrence and reversibility will be low if appropriate mitigation measures shall be applied during construction. The residual impact is anticipated to be low if appropriate mitigation measures are applied during construction.

### **Impacts on Health and Quality of Life**

The majority and the most immediate adverse health impacts are expected to occur where construction workers concentrate. These impacts would consist of communicable diseases (food- and water-borne, sexually transmitted diseases and HIV/AIDS), road traffic and

construction-related accidents. Higher concentrations of people may result in prostitution, drugs, gambling, trespassing, theft and other social disturbances, altering community dynamics and straining relationships.

### ***Mitigation Measures***

Construction workers (include local villagers who are employed) shall receive proper health care services. Camp clinics shall have trained medical staff and medical supplies. Health services shall promote awareness and educate communes and camp workers on personal hygiene, sexually transmitted diseases and drugs related activities. Contractors shall ensure that publicly shared areas shall be clean and sanitized. Security levels shall be increased. Construction workers and those local villagers who are employed shall be routinely tested for drugs and diseases. Village security shall be increased to prevent trespassing and theft.

The duration of the impact has been assessed to be low if continuous monitoring of camp workers is required throughout the construction process. The magnitude of the impact will be low since a small number of households and construction workers will be affected and communes may never be able to retain their identities. The geographic extent and likelihood of occurrence of the impact will be moderate if communicable diseases are transmitted to the nearby communes and households. Reversibility of the impact will be low if appropriate compensatory mitigation measures shall be applied during construction. The residual impact has been assessed to be moderate as application of additional mitigation measures shall reduce the level of impact to a low, or acceptable level, as necessary.

### **Local Job Creation and Transition Away From Local Livelihood**

The ITS may also hire local villagers, leading to the possible exploitation of locals as a cheap source of labor. Construction employment could detract from traditional agricultural practices. Since the project will take approximately two years, people may not be able to maintain their traditional agricultural activities, which would impact these communities income and subsistence levels post-construction. Although jobs will benefit local villagers and people inhabiting adjacent communes during the interim, people will require new employment or return to traditional activities once construction has completed. People will have to maintain their agricultural/forestry activities throughout construction to maintain their levels of productivity.

### ***Mitigation Measures***

Standard pay regulations and hiring practices shall be in agreement with contractors and local workers to create equal employment opportunities. Traditional activities, such as crop cultivation shall be maintained to avert people from switching to non-agricultural jobs.

The duration and geographic extent of the impact have been assessed to be low if construction contractors hire more villagers, leading to possible exploitation of locals as a cheap labor. Also, males in the communes and households may never be able to practice traditional activities once construction is completed. The magnitude, likelihood of occurrence, and reversibility of the impact will be low if appropriate mitigation measures shall be applied during construction. The residual impact has been assessed to be low as

impacts are considered negligible subject to the application of appropriate mitigation measures during construction activities.

## **2) Environmental and Social Impacts during Operation Phase**

Operation impacts may potentially occur upon completion of the office building's construction. This includes the operation of the Main Center itself, housing and other supports for operation staff.

### **Operational Staff Support**

#### ***Impact Agent***

Addition of approximately 20 operational staffs

#### ***Potential Impacts***

The addition of 20 staffs will lead to over exploitation of resources in the project area. There will be an increase in demand for resources and community and health services. The operational staff may share the services with communes and local villagers which could result in social conflicts.

#### ***Mitigation Measures***

Sustainability of resources management shall be maintained through education and awareness programs. Co-management of existing resources between communes and operational staff shall be encouraged in order to maintain the integrity of natural and social resources in the project area.

The duration, magnitude, geographic extent, likelihood of occurrence, and reversibility will be low if appropriate mitigation measures shall be applied during operation. The residual impact has been assessed to be low if impacts are considered negligible subject to application of mitigation measures during operation activities.

### **Operation of equipments**

#### ***Potential Impacts***

Several publications in the scientific literature have raised concern about the individual and public health impact of adverse non-ionizing radiation from electromagnetic field exposure emanating from certain power, electrical and wireless devices commonly found in the home, workplace, school and community. Despite the many challenges in establishing irrefutable scientific proof of harm and the various gaps in elucidating the precise mechanisms of harm, epidemiological analyses continue to suggest considerable potential for injury and affliction as a result of adverse non-ionizing radiation exposure.

Another study regarding theoretical and experimental investigation into the effects on an optical fiber communication system of electromagnetic interference induced by a conducting wire antenna indicate that the susceptibility of an optical fiber communication device to electromagnetic interference is determined by the power and frequency of the interference source, the input resistance of the device, the reverse saturation current and ideality factor of the light-emitting diode, the total length and attenuation coefficient of the

transmitting fiber and the quantum efficiency of the PIN photodiode.

### ***Mitigation Measures***

To mitigate impacts of electromagnetic radiation, time of human exposures to radio frequency electromagnetic radiation and work place arrangement should be taken into account.

### **3) Cumulative Impact in the Project Area**

The analysis of cumulative impacts for the ITS project considered the interaction of the following four project components:

- Construction and operation of the Regional Main Center
- Construction and operation of the Road Management Office
- Construction and operation of the plastic conduit system
- Installation and operation of the road side equipments

The immediate cumulative impacts from project activities will be increased the pressure on air quality such as dust, noise, and traffic safety.

Mitigation: Briefly Environmental Management Program has been prepared. Environmental monitoring program and traffic safety solution by contractors are required.



## 10. Implementation Arrangements

### 1) Environmental and Social Management Plans

The management of environmental and social impacts and measures to mitigate them are encompassed in a report of Environmental and Social Considerations. The contents and objectives of environmental management plan are as follow.

**Table 10.1 Objective and content of environmental management plan**

<p><b>Objectives:</b></p> <p>Environmental management plan for the ITS Project identifies the principles, approach, procedures and methods that will be used to control and minimize the environmental and social impacts of all construction and operational activities associated with project.</p> <p>The environmental management plan contains guiding environmental principles and procedures for communication, reporting, training, monitoring and plan review to which all contractors and subcontractors are required to comply with throughout the preconstruction, construction and operation phases of the ITS</p>
<p><b>Contents:</b></p> <ul style="list-style-type: none"><li>• Construction Impact Management Plan – measures to minimize negative impacts of construction activities on local communities and the natural environment, to reduce the induced impacts of camp followers, to prevent pollution;</li><li>• Environmental Monitoring Plan – measures to ensure project compliance, and the success of proposed mitigation, continue baseline monitoring and review environmental and social performance;</li><li>• Community relations measures to inform local communities on progress of the project and ensure community safety;</li></ul>

### 2) Roles and responsibilities for environmental management implementation

The ITS project management board will be responsible for the management, implementation, monitoring and compliance of the environmental management plan and any approval conditions including supervision of all contractors and all subcontractors (if any). The organizational structure and responsibilities for implementation of environmental management program is presented in table 10.2.

**Table 10.2 Responsibility for environmental management Implementation**

<b>Organization</b>	<b>Responsibility</b>
<b>Project owner</b>	<ul style="list-style-type: none"> <li>• Overall responsibility for environmental performance of ITS project</li> </ul>
	<ul style="list-style-type: none"> <li>• Decision-maker on applicable policies to the ITS project</li> </ul>
	<ul style="list-style-type: none"> <li>• Oversight supervisory role during the construction and operational phase</li> </ul>
	<ul style="list-style-type: none"> <li>• Review reports of the Independent Environmental Monitoring Consultant (if needed)</li> <li>• Approves changes to the environmental management plan, as necessary, as part of an adaptive approach to environmental and social management of the ITS</li> </ul>
<b>The ITS project management board</b>	<ul style="list-style-type: none"> <li>• Establish an environmental unit to implement environmental management plan responsibilities</li> </ul>
	<ul style="list-style-type: none"> <li>• Management, implementation, monitoring and compliance of the EMP and any approval conditions, including supervision of all contractors and all subcontractors</li> </ul>
	<ul style="list-style-type: none"> <li>• Review of environmental management plan performance and implementation of correction actions, or stop work procedures, in the event of breaches of environmental management plan conditions, that may lead to serious impacts on local communities, or affect the reputation of the project</li> </ul>
	<ul style="list-style-type: none"> <li>• Assisting the contractor with implementation of environmental management plan</li> </ul>
	<ul style="list-style-type: none"> <li>• Ensuring compliance to all project commitments</li> </ul>
	<ul style="list-style-type: none"> <li>• Report environmental performance of the ITS directly to the project owner</li> </ul>
<b>Supervising engineer</b>	<ul style="list-style-type: none"> <li>• Preparation and implementation of the Environmental Supervision Program during construction</li> </ul>
	<ul style="list-style-type: none"> <li>• Preparation and implementation of the Environmental Monitoring Program during construction</li> </ul>
	<ul style="list-style-type: none"> <li>• Reporting any incidents or non-compliance with the EMP to the ITS management board</li> </ul>
	<ul style="list-style-type: none"> <li>• Making recommendations to the ITS management board regarding environmental management plan performance as part of an overall commitment to continuous improvement</li> </ul>
<b>Contractor</b>	<ul style="list-style-type: none"> <li>• Preparation and implementation of the Construction Management Plan</li> </ul>
	<ul style="list-style-type: none"> <li>• Prepare and maintain records and all required reporting data as stipulated by the environmental management plan, for submission to the Supervising Engineer</li> </ul>
	<ul style="list-style-type: none"> <li>• Ensure that all construction personnel are informed of the intent of the environmental management plan and are made aware of the required measures for environmental and social compliance and performance</li> </ul>
	<ul style="list-style-type: none"> <li>• During construction, maintain traffic safety along access roads, with special emphasis on high trafficked areas</li> </ul>

The project owner takes responsibility to ensure project implemented in accordance with both government and JICA requirements. Included within this is the responsibility to

ensure the environmental management is implemented in compliance with the plan set out. The project owner will oversee implementation by the ITS project management board and coordinate with district level on environmental issues. The project owner has entrusted ITS management board with all aspects in relation to implementation of the project.

### 3) Budget

An estimated cost for the implementation of the environmental management plan is presented in table 10.3.

**Table 10.3 Environmental Management Budget**

<b>Environmental management cost</b>	<b>Estimated cost (VND)</b>
Contractor – built into contract	1% of total construction costs
Supervision – environment – to be built into the contract for Engineering Supervision (includes sampling for environmental quality); built into contract	10% of engineering supervision cost plus VND 300,000,000 (separate estimate for environmental monitoring)
Independent Environmental Monitoring (if needed)	VND 300,000,000 (2-3 years)

## **11. Environmental Management Program**

The expected efforts of the environment management program are depended on the knowledge and understanding also effects of the training workers and officials. Manager and staff will be informed regularly environment issues through meetings.

The program on environmental training should be conducted specifically by working groups and includes as follows:

- (a) Environmental policy, purpose and target to reduce pollution.
- (b) Environment control system, procedures and guidelines on environment.
- (c) Policy and law on environment, organization and technical methods to minimizing environmental impacts.
- (d) Potential environment issues on which the project faces, Protecting environment in the working period.
- (e) Inventory and appraisal of environmental quality, periodical training programs to response emergency in case of happening the risk.

Detail mitigation measures for negative impacts are shown following table 11.1.

**Table 11.1 Environmental management program (EMP)**

Environmental Impact/Issue	Mitigation measures	Location	Time frame	Responsibility		Capital cost
				Implementation	Supervision	
<b>1. Construction stage</b>						
Report to the employer and the consultant for all following items during construction						
<b>1.1 Soil</b>						
<b>1.1.1 Disposal of excavation materials and construction debris</b>	(a) Residual spoils will be used and according to an erosion protection plan by each contractor. (b) All arrangements for transportation during construction, including provision, maintenance, dismantling and clearing debris, where necessary, will be considered incidental to the work and should be planned and implemented as approved and directed by the consultant.	at construction sites	During construction	Contractors	The project implementation body /Consultant	General BQ item
<b>1.1.2 Soil erosion</b>	(a) The work will comprise measures to control soil erosion, sedimentation, and water pollution	At construction site, service roads, and equipment storage sites	During construction	Contractors	The project implementation body /Consultant	Construction costs in the relevant BQ items
<b>1.1.3 Contamination of soil by fuel and lubricants</b>	(a) An oil interceptor will be provided for wash down and refueling areas. Fuel storage will be in proper bounded areas.	At project site, all access roads.	During construction	Contractors	The project implementation body /Consultant	Construction costs in the relevant BQ items
<b>1.2 Water</b>						
<b>1.2.1 Erosion and siltation</b>	The contractor will take all necessary precautions to prevent water pollution (due to siltation and increased turbidity).	At project site. all access roads.	During construction	Contractors	The project implementation body /Consultant	Construction costs in the relevant BQ items
<b>1.2.2 Contamination of water due to construction wastes</b>	(a) All measures will be taken to prevent the wastewater produced in construction from entering directly into canals, rivers, water bodies, or irrigation system, as directed by the consultant.	At project site. all access roads.	During construction	Contractors	The project implementation body /Consultant	Construction costs in the relevant BQ items
<b>1.2.3 Contamination from fuel and lubricants</b>	(a) Vehicle, machinery, and equipment maintenance and refueling will be done in a manner to prevent pollution of water.	At project site. all access roads.	During construction	Contractors	The project implementation body /Consultant	Construction costs in the relevant BQ items

Environmental Impact/Issue	Mitigation measures	Location	Time frame	Responsibility		Capital cost
				Implementation	Supervision	
<b>1.2.4 Public health, sanitation, waste disposal in construction camps and safety</b>	(a) The sewage system for construction laborer's camps will be properly designed, built, and operated so that pollution to ground or adjacent water bodies/watercourses does not take place. Garbage bins will be provided in the camps and regularly emptied, and the garbage disposed of in a hygienic manner, to the satisfaction of the relevant standards and the consultant. (b) Health examinations will be regularly provided. Clinics facilities will be provided in construction camps (if necessary).	At project site. all access roads.	During establishment, operation and dismantling of such camps	Contractors	The project implementation body /Consultant	Construction costs in the relevant BQ items
<b>1.3 Air pollution</b>						
<b>1.3.1 Dust emission</b>	(a) All vehicles delivering granular and/or fine materials to the site will be covered to avoid spillage.	At project site. all access roads.	During construction	Contractors	The project implementation body /Consultant	Construction costs in the relevant BQ items
<b>1.3.2 Emission from construction vehicles, equipment and machinery</b>	(a) All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that pollution emission levels comply with the relevant regulations.	At project site. all access roads.	During construction	Contractors	The project implementation body /Consultant	Construction costs in the relevant BQ items
<b>1.4 Noise pollution</b>						
<b>1.4.1 Noise from vehicles, machinery and equipment</b>	(a) All vehicles, equipment and machinery used for construction will strictly conform to the noise standards,	At project site. all access roads.	During construction	Contractors	The project implementation body /Consultant	Construction costs in the relevant BQ items
<b>1.5 Traffic accident</b>						
<b>1.4.1 Traffic accident on the expressway</b>	(a) Safety protection tools equipment as rubber cone, fence, safety light and flag man on the shoulder or median side of trench excavation of duct at the road to give travelling vehicle drivers to aware the attention to reduce speed and keep shift to safety carriage lane. (b) Information and warning signage preparation at the shoulder to drivers attention for activity on the construction undergoing.	At excavation of trench and installation for duct with optical cable.	During construction	Contractors	The project implementation body /Consultant	Construction costs in the relevant BQ items

## 12. Environmental Monitoring Program

The items of the environmental monitoring in the construction period are 1) noise, 2) Ambient air quality, 3) surface water and 4) traffic safety. Following table shows environmental monitoring program for construction period. Table contains the monitoring items, monitoring details and parameters, reference standard related each monitoring items, timing to monitoring (frequency), executing unit (Agencies) and reporting on the monitoring

**Table 12.1 Environmental monitoring program for construction period**

Item	Monitoring details	Reference standard	Timing	Executing unit	Reporting
<b>Construction period</b>	Prepare and use a monitoring checklist				
<b>Noise</b>	Measure construction noise at varying distances from sources and near sensitive structures if any (e.g. school and hospital). L <sub>Aeq</sub> (6 am – 6 pm and 6 pm – 10 pm) will be measured.	National technical regulation QCVN 26:2010/BT NMT	Once every two months at construction site.	The project implementation body/Consultant	In monitoring report (every 4 month) to Department of Natural Resource and Environment.
<b>Ambient Air quality</b>	Measure in the area around sources and at prescribed receptors at various distances. Parameters of SPM, PM10, CO, NO <sub>2</sub> and SO <sub>2</sub> will be monitored.	National technical regulation QCVN 05:2009/BT NMT	Once a month at construction site.	The project implementation body/Consultant	Same as above
<b>Surface Water</b>	Conduct monitoring at the site. Parameters of pH, BOD <sub>5</sub> , COD, DO, SS, arsenic, cadmium, lead, copper, chromium (+6), zinc, manganese, iron, mercury, ammonium, fluoride, nitrate, nitrite, cyanide, coliform, and oil/grease will be monitored.	National technical regulation QCVN 08:2008/BT NMT	Once every two months at construction site.	The project implementation body/Consultant	Same as above
<b>Traffic Safety</b>	Current vehicle traffic safety control for road shoulder and median shall be monitored.	Decision No. 2525/2003/QD-BGTVT	During earth work and installation period.	The project implementation body/Consultant	Monitor whenever work activities are carried.

### **13. Public Consultation**

The project telecommunication line with ducts and optical cable will be installed within right of way (ROW) of expressways like Hanoi Ring road No.3, Hanoi - Bac Ninh, Noi Bai - Bac Ninh, Lang - Hoa Lac and part of Phap Van – Cau Gie, Cau Gie – Ninh Binh.

According enlisted project for requires EIA on Appendix II, Decree No.29/2011/ND-CP, it is not necessary to prepare EIA report. Actually the duct with optical cable installation will be implemented on the shoulder or median space of the road within the right of way, no land acquisition required and quite simple work in general. Work place for duct/optical cable installation is within the protected and separated area from the outside area of each expressway. There are not any households located in the project area. The objectives of consultation are:

- Screening locations for Northern Regional Main Center in term of power supply, flood and inundation, land acquisition.
- Collect opinion/information to complete Environmental and Social Considerations report

Consultation with stakeholders was carried out from Sep 2011 to Apr 2012.

The results of public consultation are: (i) selection of locations for Main Center; (ii) implementation of mitigation measures specified in environmental management plan; and (iii) security and environment shall be sustained.

### **14. Conclusion**

It is concluded that the ITS Integration Project will not give serious environmental impact, but the project will give many beneficial effects to the region wide socio-economic condition as well as peoples in the region. The Project is concluded to be feasible.

The Environmental Commitment will be prepared in advance of the Project Implementation and the Project will be implemented based on the environmental management/monitoring program.



## **15. Summary of Environmental Protection Commitment**

### **Objectives of Project**

For the purpose of construction of ITS standard in Vietnam, the project will be implemented with aim at unifying all ITS level on the whole highway network including series of highway sections in order to establish/check integrated system process; to build Main Centre in the North; to start operation and maintenance (O&M) of highway using ITS as well as showing usage of ITS method in order to deal with traffic problems in urban areas.

### **Scope of project**

The main components of the project are construction and operation of the Regional Main Center, the Road Management Office, and conduit system as well as Installation of the road side equipments.

### **Environmental Conditions**

At construction site of the project, there is no air pollution, noise, vibration, surface water, underground water; measured indicators are under permissible limit. The project is mainly located in Hanoi, where industrialization and urbanization grown very fast, therefore there are simple ecosystem, low biological resources, and low biodiversity in project area.

### **Environmental Impacts and Mitigation Measures**

The project will not create serious impacts to physical and social environment. The most impacts arise from construction stage such as air, noise. Land acquisition and compensation for affected people are not required. During construction stage, labor force of around 50 workers, construction equipments and materials will cause impact to air quality, noise, vibration; surface water, underground water, traffic safety and other social impact such as relations between worker and local people.

Mitigation measures: selection of most favorable condition for location of the Main Center to avoid land acquisition and compensation; Applied environmental management program to strictly control quality of air, water, and waste management; Applied traffic control plan.

During construction, priority is given to usage of local labor in order to mitigate social impacts. Good management and treatment of waste of labor quarter and construction site; ensuring of good machine and equipment's activities; machine should be maintained regularly; detailed construction plan should be announced to local people; Installation of noise reducer; machine should be operated in the prescribed time; vehicle which is in and out from construction site should be covered to avoid the fall of soil, rock and material; enhance worker's sense of prevention methods for infections, especially for HIV/AIDS and implementation of healthy lifestyle.

However, the Project is came into operation that brings many interests, especially for environment, minimization of energy consumption of vehicle, reduction of CO<sub>2</sub> exhaust, reduction of cost, etc.

### **Environmental Monitoring Program**

During construction and operation, tools should be equipped to the Project such as: site light, speed restriction board, flag, water truck, hard waste bin and domestic bin, fire extinguisher, construction of digestion tank, etc.

Environmental monitoring program is continuously carried out every three months during construction stage and every six months during operation stage. Environmental monitoring points are representative of the project area.

### **Commitment**

In order to ensure that implementation of integrated ITS Project reaches high effectiveness but minimization of environmental impacts, the project owner commits: good implementation of plan for land acquisition and compensation (if needed); apply mitigation measures for environmental impacts such as air, noise, vibration, surface water, ground water and soil pollution due to waste from construction site; strictly implementation of traffic control to minimize traffic jam, traffic accident, serious traffic problems ensuring smooth traffic during construction of the Project; execution of Vietnam standards, regulations on environment (air, noise, vibrating, surface water, ground water, communication, etc). The Project commits that environmental management, supervision and monitoring will be carried out well.