

CHAPTER 4. ROAD AND STRUCTURE DESIGN

4.1 Road and Intersection Design

4.1.1 Design Criteria

(1) Applicable Design Standards

“Standard Specifications for geometric design of urban roads” published by the Directorate General of Highways of the Ministry of Public Works (MPW) in March 1992 is used as the main design standards for the road design.

(2) Road Classification

Roads in urban areas shall be classified into two types according to the kind of access control as follows. All roads in this project are defined as Type II.

- Type I : full access control
- Type II: partial access control or no access control

Type II roads are classified into 4 classes according to their functional classification and design traffic volume. The design classes of Type II are shown in Table 4.1.1.

Table 4.1.1 Design Classes of Type II

Function		Design traffic volume (PCU/day)	Class
Primary	Arterial		I
	Collector	10,000 or more	I
		Less than 10,000	II
Secondary	Arterial	20,000 or more	I
		Less than 20,000	II
	Collector	6,000 or more	II
		Less than 6,000	III
	Local	500 or more	III
		Less than 500	IV

Source: Standard specifications for geometric design of urban roads, DGH

- Class I :The highest standard streets of 4 or more lanes to serve inter-city or intra-city, high speed, through traffic with partial access control
- Class II :High standard streets of 2 or more lanes to serve inter-city or intra-city, high speed, through traffic with/without partial access control
- Class III :Intermediate standard streets of 2 or more lanes to serve inter-district, moderate speed, through or access traffic without access control
- Class IV :Low standard streets of 1 travel way to serve access to the road side land lots

(3) Design Speed

The design speed of Type II shall be the value according to the class as follows.

- Class I : 60 km/h
- Class II : 60 or 50 km/h
- Class III : 40 or 30 km/h
- Class IV : 30 or 20 km/h

(4) Geometric Design Criteria

Table 4.1.2 shows the geometric design criteria for each design speed.

Table 4.1.2 Geometric Design Criteria (Main road)

Item	Unit	Design Standard			
		60	50	40	30
Design speed	km/h	60	50	40	30
Road class		I, II	II	III	III, IV
1. Cross Section					
Lane Width	m	3.5	3.25	3.25 (3.0)	3.25 (3.0)
Median Width	m	2.0 (1.0)	1.5 (1.0)	1.5 (1.0)	1.5 (1.0)
Marginal Strip of Medians Width	m	0.5	0.25	0.25	0.25
Left Shoulder Width	m	2.0 (1.5)	2.0 (1.5)	2.0 (1.5)	0.5
Right Shoulder Width	m	0.5	0.5	0.5	0.5
Planted Strip	m	1.5	1.5	1.5	1.5
Frontage road	m	4.0	4.0	4.0	4.0
Sidewalk	m	3.0 (1.5)	3.0 (1.5)	1.5 (1.0)	1.5 (1.0)
Cross Fall	%	2		2	
2. Horizontal Alignment					
Minimum Curve Radius	m	400 (150)	150 (100)	100 (60)	65 (30)
Minimum Radius at Normal Cross fall	m	2,000 (220)	1,300 (150)	800 (100)	500 (55)
Minimum Curve Length	m	700/θ (100)	600/θ (80)	500/θ (70)	350/θ (50)
Minimum Transition Curve Length	m	50	40	35	25
Minimum Radius Without Transition Curve	m	600	400	250	150
Minimum Stopping Sight Distance	m	75	55	40	30
3. Vertical Alignment					
Maximum Grade	%	5	6	7	8
Critical Vertical Curve Length	m	300 (8%)	300 (9%)	200 (10%)	-
Minimum Crest Radius	m	2,000 (1,400)	1,200 (800)	700 (450)	400 (250)
Minimum Sag Radius	m	1,500 (1,000)	1,000 (700)	700 (450)	400 (250)
Minimum Curve Length	m	50	40	35	25

Source: Standard specifications for geometric design of urban roads, DGH

Table 4.1.3 Geometric Design Criteria for At-grade Intersection

Item	Unit	Design Standard			
		60	50	40	30
Design speed	km/h	60	50	40	30
Road class		I, II	II	III	III, IV
Minimum grade	%	2	2	2	2
Minimum length of low grade	m	40, 35	35	15	15, 6
Lane width of tangent section	m	3.5, 3.25	3.25	3.25, 3.0	3.25, 3.0
Lane width of thru traffic lane	m	3.25, 3.0	3.0, 2.75	3.0, 2.75	3.0, 2.75
Lane width of auxiliary lane	m	3.25, 3.0, 2.75	3.25, 3.0, 2.75		
Taper of lane shift		1/30 (40)	1/25 (35)	1/20 (30)	1/15 (25)
Minimum length by deceleration	m	30	20	15	10
Minimum length by shift	m	30	25	20	15

Source: Standard specifications for geometric design of urban roads, DGH

Table 4.1.4 Geometric Design Criteria for Interchange

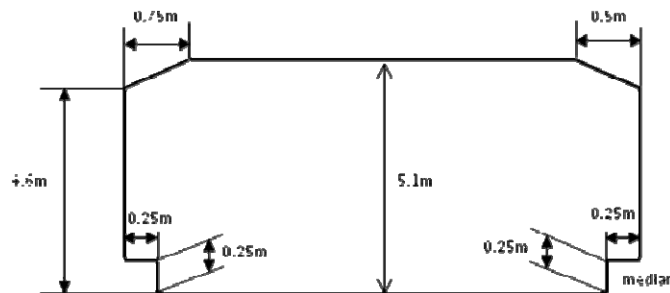
Item	Unit	Design Standard			
		60	50	40	30
Design speed	km/h	60	50	40	30
Road class		I, II	II	III	III, IV
1. Cross Section					
Lane Width	m	3.5	3.5	3.5	3.5
Median Width	m	2.0	2.0	2.0	2.0
Marginal Strip of Median Width	m	0.5	0.5	0.5	0.5
Left Shoulder Width	m	2.5 (0.75)	2.5 (0.75)	2.5 (0.75)	2.5 (0.75)
Right Shoulder Width	m	1.0 (0.75)	1.0 (0.75)	1.0 (0.75)	1.0 (0.75)
2. Horizontal Alignment					
Minimum Curve Radius	m	140 (110)	90 (70)	50 (40)	40 (30)
Minimum Parameter of Transition Curve	m	70	50	35	20
Minimum Transition Curve Radius	m	350	220	140	140
Minimum Stopping Sight Distance	m	75	55	40	35
3. Vertical Alignment					
Maximum Grade	%	5 (up to 10)	5 (up to 10)	5 (up to 10)	5 (up to 10)
Minimum Crest Radius	m	1,400	800	450	250
Minimum Sag Radius	m	1,000	700	450	250
Minimum Curve Length	m	50	40	35	30
4. Deceleration Lane					
Standard Length of Deceleration Lane	m	70	50	30	-
Standard Taper Length in Parallel Type	m	45	40	40	-
5. Acceleration Lane					
Standard Length of Acceleration Lane	m	120	90	50	-
Standard Taper Length in Parallel Type	m	45	40	40	-

Source: Standard specifications for geometric design of urban roads, DGH

(5) Clearance

1) Road

The road clearance shall be provided according to the design of the cross section. No structure, facilities, trees or other unmovable objects can be placed within the clearance. The vertical and horizontal clearance is shown in Figure 4.1.1.



Source: Standard specifications for geometric design of urban roads, DGH

Figure 4.1.1 Vertical and Horizontal Clearance for Roads

2) Railways

The design criteria for railway crossings with roads is stipulated in the “Crossing and intersection of railway track construction (KM 53 OF 2000)” issued by the Ministry of transportation. The basic requirements for design of railway crossings are as follows.

- At least 6.50 meters should be secured from the rail head.
- The distance between the pier foundation and the center line of the rail track (single track) shall be at least 10 meters.
- The pier foundation should be buried at least 1.50 meters below the ground surface.

4.1.2 Preliminary Design of Roads and Intersections

The preliminary design has been carried out for all potential projects to evaluate the feasibility of the projects and select the sub projects which will be analysed in more detail for the 2nd stage. Due to the lack of topographic maps and traffic data as of the 1st stage, the design is conducted based on satellite photos and site reconnaissance. In the existing investigations such as the feasibility study, basic design and detailed design implemented by the local or international consultants is referred to in the preliminary design.

After the sub projects are selected in the 1st stage, the design for sub projects will be revised and updated in accordance with the topographic and geographic surveys and the result of traffic analysis. The preliminary design of each potential project is described below.

(1) Semanggi

Semanggi is a clover-leaf type junction being composed of the following roads.

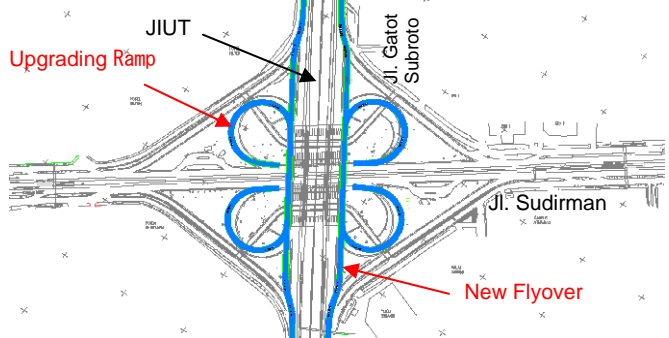
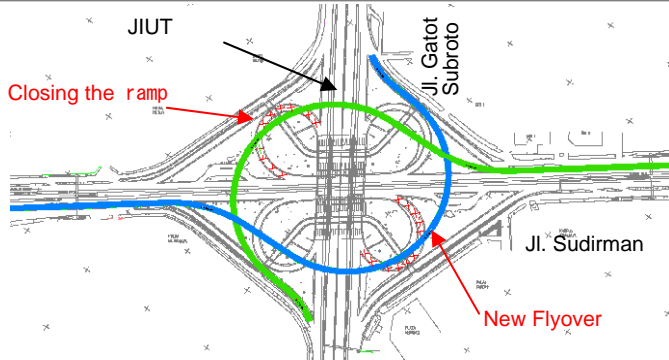
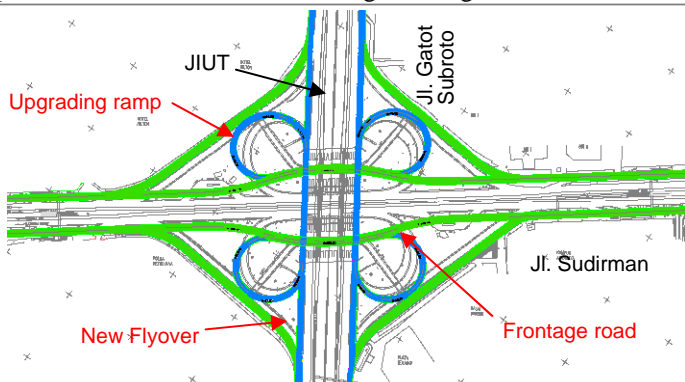
Table 4.1.5 Relevant Roads of Semanggi Intersection

Road name	Road class	Lanes	Design speed	Administration
Jl. Sudirman	Type-II/Class-I	3x2	60km/h	Provincial road (DKI)
Jl. Gatot Subroto	Type-II/Class-I	3x2	60km/h	National road (DGH)
Jl. UI	Type-I/Class-I	3x2	80km/h	Toll road (Jasa Marga.)

Source: DGH

Several kinds of countermeasures can be considered for improvement of the junction. However, many difficulties are also expected in terms of the structure, traffic control and construction. Based on the site investigation, three alternatives are proposed as the structural improvement as shown in Table 4.1.6.

Table 4.1.6 Alternatives for the Improvement Plan of Semanggi Intersection

Alternatives	Outline
<p>1. Flyover on merging lane of Jl. Gatot Subroto</p>	<ul style="list-style-type: none"> • New construction of a flyover with 2 lanes in each direction outside Jl. Gatot Subroto for the merging lane to Jl. Sudirman • Congestion of the straight through lane will be eased because the straight through lane of Jl. Gatot Subroto can be separated from the merging lane. 
<p>2. Installation of direct ramps</p>	<ul style="list-style-type: none"> • Removal of two out of the four existing loop ramps and construction of two direct ramps (Flyover) instead • Congestion of the straight through lane will be eased because the short weaving caused by two contiguous loop ramps which causes congestion of Jl. Gatot Subroto will be solved. 
<p>3. Extension of frontage road of Jl. Sudirman</p>	<ul style="list-style-type: none"> • Construction of a straight through lane on the frontage road of Jl. Sudirman (It is impossible to go straight on the existing frontage road because it is divided by a junction.) • Connection between the merging lane of Jl. Gatot Subroto and Jl. Sudirman frontage road with a loop ramp • Congestion of the straight through lane will be eased because the merging ramp will not be connected to the straight through lanes of both roads. 

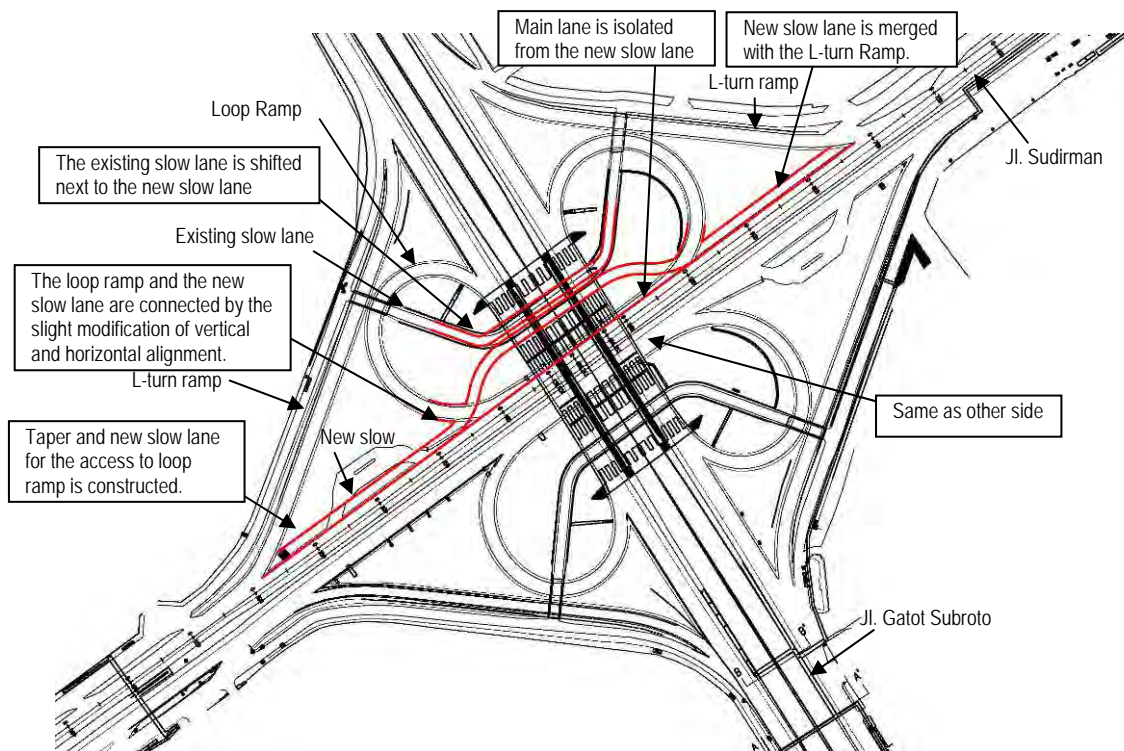
Source: JICA Survey Team

For alternative 1 and 2, it is expected that the construction cost would be considerably high and take a long time for construction. On the other hand, the construction in alternative 3 is comparatively easy and the construction cost will be low. The image of alternatives 2 and 3 are as follows.



Source: JICA Survey Team

Figure 4.1.2 Image of Improvement for Semanggi Intersection Alternative 2



Source: JICA Survey Team

Figure 4.1.3 Image of Improvement for Semanggi Intersection Alternative 3

The method of improvement for Semanggi intersection needs to be studied based on not only the structural aspect but also the traffic analysis and environmental factors.

(2) Margonda Cinere

No specific study or design work has been conducted for this intersection. An underpass for both Jl. Margonda and Bogor railway line is proposed in the east-west direction next to JORR2. This design can achieve the grade separation not only at the intersection but also at the railway crossing point which is a request from DGR. It is difficult to propose the grade separation on Jl. Margonda because of planned JORR2.

However there are some issues raised with this design. The underpass will not function without road improvement on the west side where there is no existing road at present.

In addition, the output from the underpass construction will be affected as the traffic flow will be drastically changed by JORR2. However, even though JORR2 was proposed more than 10 years ago, the implementation schedule is still uncertain due to the land acquisition issue. Considering the construction method as well, it is desirable that the construction of the underpass will be implemented simultaneously or after the JORR2 construction.

Table 4.1.7 Relevant Roads of Margonda Cinere

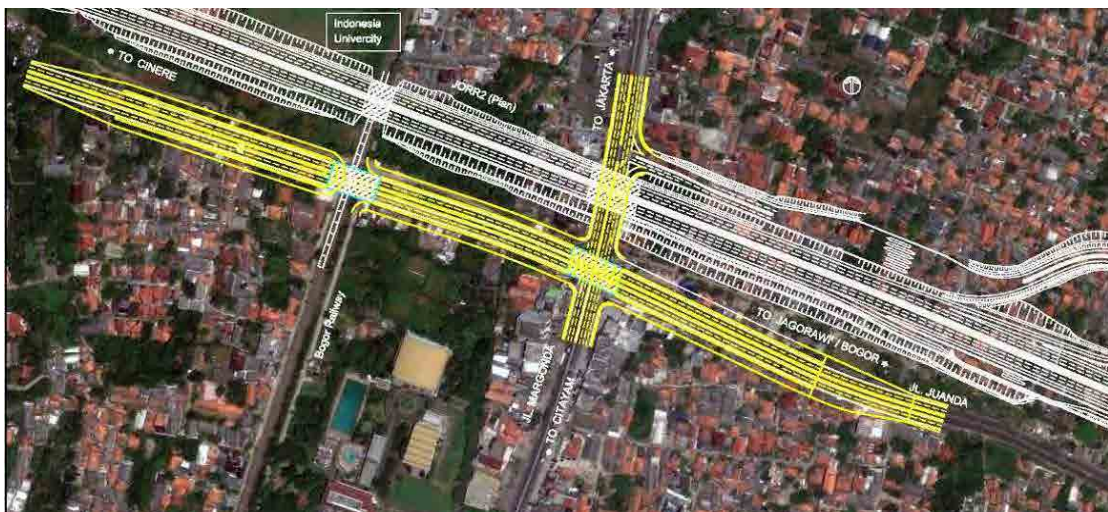
Road name	Road class	Lanes	Design speed	Administration
Jl. Margonda	Type-II/Class-I	3x2	60km/h	National road (DGH)
Jl. Ir H. Juanda	Type-II/Class-I	2x2	60km/h	National road (DGH)

Source: DGH

Table 4.1.8 Project Condition of Margonda Cinere

Structure type		Underpass (Jl. Juanda and railway line)
Approximate length of structure		760m
Number of lanes	Main road	2 lanes each way with median (W=22.0m)
	Frontage road	1 lane each way
Existing study		None
Railway crossing		Bogor railway line
Issues		Conflict with other project (JORR2)

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.4 Plan of Improvement for Margonda Cinere

(3) Cililitan

The detailed design for an underpass in the east-west direction was already conducted by DGH in 2007. As the elevation around the intersection is higher than the surrounding area, an underpass is more suitable than an overpass. A pumping system for drainage must be provided for the underpass structure. The road on the east side, Jl. Cililitan Besar, which has only two narrow lanes needs to be improved for functioning in the trunk road network. The clearance with the canal to the west should be considered.

In terms of the underpass in the north-south direction, buried cables are an obstacle for construction. The replacement of existing bus way shelters and the pedestrian deck near the intersection is also necessary.

Table 4.1.9 Relevant Roads of Cililitan

Road name	Road class	Lanes	Design speed	Administration
Jl. Jend Sutoyo	Type-II/Class-I	3x2	60km/h	National road (DGH)
Jl. Raya Bogor	Type-II/Class-I	2x2	60km/h	National road (DGH)
Jl. Cililitan Besar	Type-II/Class-II	1x2	40km/h	Provincial road (DKI)
Jl. Dewi Sartika	Type-II/Class-II	2x2	60km/h	Provincial road (DKI)

Source: DGH

Table 4.1.10 Project Condition of Cililitan

Structure type		Underpass (Jl. Dewi Sartika and Jl. Cililitan Besar)
Approximate length of structure		430m
Number of lanes	Main road	1 lane each way (W=13.0m)
	Frontage road	1 lane each way
Existing study		D/D (DGH:2007)
Railway crossing		None
Issues		Widening the Jl. Cililitan Besar

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.5 Plan of Improvement for Cililitan

(4) R.E. Martadinata

The detailed design was conducted in the scheme of the project for Tanjung Priok Access Road (TgPA) in 2007. However, the construction of section W1 for TgPA is not yet started because of the escalated project cost. Therefore, the construction of the flyover was also cancelled for the same reason.

The 4-lane flyover over the bus terminal and railway track was proposed in the detailed design. The clearance for the railway track was secured according to the railway regulation but it is necessary to review the design since DGR has a plan to develop and extend the railway track. The bus terminal, which is severely congested by the conflict between through traffic and long-distance buses, needs to be developed in accordance with the flyover construction. Compatibility with the port access flyover proposed by PERIND2 was already coordinated in the detailed design.

It is anticipated that the construction will be quite difficult because the road is congested all the time and there are many illegally occupied shops around the bus terminal. Also, a countermeasure for the ground subsidence needs to be considered because subsidence has caused the road in front of the port to become undulated. The port gate at the west side of the bus terminal will be closed after the construction of the flyover.

Table 4.1.11 Relevant Roads of R.E. Martadinata

Road name	Road class	Lanes	Design speed	Administration
Jl. Enggano	Type-II/Class-II	2x2	60km/h	National road (DGH)
Jl. Martadinata	Type-II/Class-I	2x2	60km/h	National road (DGH)

Source: DGH

Table 4.1.12 Project Condition of R.E. Martadinata

Structure type		Overpass (Jl. Martadinata)
Approximate length of structure		810m
Number of lanes	Main road	2 lanes each way (W=9.5m x 2)
	Frontage road	1 lane each way
Existing study		D/D (2007: DGH)
Railway crossing		Tanjung Priok railway line
Issues		Coordination with bus terminal and railway station

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.6 Plan of Improvement for R.E. Martadinata

(5) Sulawesi - Tg.PA

The same as Martadinata, the detailed design was conducted in the scheme of the project for Tanjung Priok Access Road (TgPA) in 2007 and the construction of the flyover was removed from the loan package. The construction of TgPA N-S section above this intersection will be commenced within 2011.

A 2-lane flyover and frontage road parallel to TgPA was proposed. The length of the flyover will be long due to providing a U-turn lane. The right of way for the flyover and frontage road was secured within the scheme of the TgPA project.

As the arterial road will be cut at the railway crossing point, the vehicles from Jl. Enggano have to be diverted using a U-turn.

Table 4.1.13 Relevant Roads of Sulawesi - Tg.PA

Road name	Road class	Lanes	Design speed	Administration
Jl. Sulawesi	Type-II/Class-I	3x2	60km/h	National road (DGH)
Jl. Yos Sudarso	Type-II/Class-I	3x2	60km/h	National road (DGH)
Jl. Enggano	Type-II/Class-II	2x2	40km/h	National road (DGH)
Jl. Pelabuhan Raya	Type-II/Class-I	3x2	60km/h	National road (DGH)

Source: DGH

Table 4.1.14 Project Condition of Sulawesi - Tg.PA

Structure type		Overpass (Jl. Yos Sudarso and Jl. Sulawesi)
Approximate length of structure		740m
Number of lanes	Main road	2 lanes each way (W=9.5m x 2)
	Frontage road	2 lanes each way
Existing study		D/D (2007: DGH)
Railway crossing		Tanjung Priok railway line
Issues		

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.7 Plan of Improvement for Sulawesi - Tg.PA

(6) Latumentan

No study or design work has been conducted for this intersection. Two lane flyovers and frontage road with 1-lane for each direction are proposed as the grade separation for the railway crossing. The existing road on Jl. Makaliwe from the north passes between the piers of the bridge of JIUT so that the vertical and horizontal clearance needs to be carefully confirmed. The busway shelter will be relocated to the outside of the flyover section. According to DGR, as the improvement for double track to north side at this point will be started within 2011, the design must consider the clearance to provide enough width.

An underpass has also been considered but there are many difficulties for construction because of the underground foundations of the pier for JIUT.

In addition, there is a plan to underpass the railway in the future in accordance with the development of the MRT East-West line. If it is implemented, the flyover will be useless.

Table 4.1.15 Relevant Roads of Latumentan

Road name	Road class	Lanes	Design speed	Administration
Jl. Dr Makaliwe	Type-II/Class-I	2x1	60km/h	Provincial road (DKI)
Jl. Satria	Type-II/Class-I	2x1	60km/h	Provincial road (DKI)
Jl. Latumenten	Type-II/Class-I	2x1	60km/h	National road (DGH)
JIUT	Type-I/Class-I	3x2	80km/h	Toll road (Jasa Marga)

Source: DGH

Table 4.1.16 Project Condition of Latumentan

Structure type		Overpass (Jl. Makaliwe and Jl. Satria)
Approximate length of structure		500m
Number of lanes	Main road	2 lanes each way (W=9.5m x 2)
	Frontage road	1 lane each way
Existing study		None
Railway crossing		Tangerang railway line
Issues		Conflict with other project (MRT) Replacement of bus shelter

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.8 Plan of Improvement for Latumentan

(7) Sudirman - Daan Mogot

A 4-lane flyover with 2-lane frontage roads is proposed over 2 existing roads in the east-west direction with the river bridge on Jl. Sudirman and Jl. Pembangunan 3. It would be difficult to construct an underpass due to the river crossing. The existing bridge will be replaced based on the alignment of the frontage road. Both of the schools located near Jl. Sudirman will be control points for setting the alignment.

It is necessary to widen Jl. Pembangunan 3, which is currently a narrow 2-lane up to the international airport to avoid its becoming a bottleneck.

Table 4.1.17 Relevant Roads of Sudirman - Daan Mogot

Road name	Road class	Lanes	Design speed	Administration
Jl.Pembangunan3	Type-II/Class-II	2x2	60km/h	Provincial road (Tangerang)
Jl. Sudirman	Type-II/Class-I	4x2	60km/h	National road (DGH)
Jl. Boraq	Type-II/Class-I	2x1	60km/h	Provincial road (Tangerang)
Jl. Daan Mogot	Type-II/Class-I	2x1	60km/h	National road (DGH)

Source: DGH

Table 4.1.18 Project Condition of Sudirman - Daan Mogot

Structure type		Overpass (Jl. Sudirman and Jl. Pembangunan 3)
Approximate length of structure		550m
Number of lanes	Main road	2 lanes each way with median (W=17.6m)
	Frontage road	1 lane each way
Existing study		D/D (2008: Banten Province)
Railway crossing		None
Issues		Widening of Jl. Pembangunan 3

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.9 Plan of Improvement for Sudirman - Daan Mogot

(8) Kuningan

A feasibility study was conducted by DGH and an underpass on Jl. Rasuna Said was selected as the best alternative. It is impossible to apply a flyover because of the elevated toll road.

The total length of the underpass will reach about 650m to cover Jl. Gatot Subroto. The main road will consist of three lanes each way, plus a busway, additionally, 2 lane frontage roads will be provided on each side for the entire section. As the underpass will be constructed under the elevated structures of JIUT and Jl. Kapten Tendean, it is necessary to consider the construction method for safety.

The busway shelters and the pedestrian decks presently located near both intersections need to be relocated to the outside of the underpass section.

Table 4.1.19 Relevant Roads of Kuningan

Road name	Road class	Lanes	Design speed	Administration
Jl. Gatot Subroto	Type-II/Class-I	3x2	60km/h	National road (DGH)
Jl. Rasuna Said	Type-II/Class-II	3x2	60km/h	Provincial road (DKI)
Jl. Kapten Tendean	Type-II/Class-II	2x2	60km/h	Provincial road (DKI)
Jl. Mampang Prapatan	Type-II/Class-II	3x2	60km/h	Provincial road (DKI)
JIUT	Type-I/Class-I	3x2	80km/h	Toll road (Jasa Marga)

Source: DGH

Table 4.1.20 Project Condition of Kuningan

Structure type		Underpass (Jl. Rasuna Said and Jl. Mampang Prapatan)
Approximate length of structure		940m
Number of lanes	Main road	2 lanes each way plus a busway with median (W=29.0m)
	Frontage road	2 lanes each way
Existing study		F/S (2006: DGH)
Railway crossing		None
Issues		Relocation of bus shelter

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.10 Plan of Improvement for Kuningan

(9) Pancoran

No study or design work has been conducted for Pancoran intersection. A flyover with 2-lanes and a 2-lane frontage road on the west bound side of the same type as on the opposite side is proposed. As a high-rise building is near the existing road, the alignment and road width will be carefully designed for avoiding compensation. The On ramp for JIUT, 300m to the west of the intersection, is also a control point.

The busway shelter must be relocated when the flyover is constructed. If the shelter is shifted to under the new flyover, the bus way will pass on the frontage road. It is almost impossible to raise the busway shelter to the same level as flyover due to the restriction of the alignment of JIUT.

Table 4.1.21 Relevant Roads of Pancoran

Road name	Road class	Lanes	Design speed	Administration
Jl. Gatot Subroto	Type-II/Class-I	3x2	60km/h	National road (DGH)
Jl. Raya Pasar Minggu	Type-II/Class-II	2x2	60km/h	Provincial road (DKI)
Jl. Supomo	Type-II/Class-II	2x2	60km/h	Provincial road (DKI)
JIUT	Type-I/Class-I	3x2	80km/h	Toll road (Jasa Marga)

Source: DGH

Table 4.1.22 Project Condition of Pancoran

Structure type		Overpass (Jl. Gatot Subroto)
Approximate length of structure		530m
Number of lanes	Main road	2 lanes for 1 direction (East to West) (W=9.5m)
	Frontage road	1 lane
Existing study		None
Railway crossing		None
Issues		Land acquisition

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.11 Plan of Improvement for Pancoran

(10) Cilandak

No study or design work has been conducted for Cilandak intersection. Considering the terrain condition, an underpass with 2 lanes each way at the same level as JORR and a frontage road with 1-lane in each direction are proposed. The specific geometric issues are not known but the construction of the underpass and box culverts adjacent to the existing retaining wall for JORR seems as though it would be difficult.

Table 4.1.23 Relevant Roads of Cilandak

Road name	Road class	Lanes	Design speed	Administration
Jl. Cilandak KKO	Type-II/Class-II	2x2	60km/h	Provincial road (DKI)
Jl. Ampera Raya	Type-II/Class-II	1x2	60km/h	Provincial road (DKI)
Jl. TB Simatupang	Type-II/Class-I	2x2	60km/h	National road (DGH)
JORR	Type-I/Class-I	3x2	80km/h	Toll road (Jalan Lingkar luar Jakarta)

Source: DGH

Table 4.1.24 Project Condition of Cilandak

Structure type		Underpass (Jl. TB Simatupang)
Approximate length of structure		370m
Number of lanes	Main road	2 lanes each way (W=10.5m x 2)
	Frontage road	1 lane each way
Existing study		None
Railway crossing		None
Issues		Construction difficulty

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.12 Plan of Improvement for Cilandak

(11) Fatmawati

No study or design work has been conducted for Fatmawati intersection. A flyover with 2 lanes each way and frontage road with 1-lane each way are proposed for Jl. TB Simatupang. It is necessary to consider the clearance with the houses, buildings and the gas station at the south side of the road.

The specific geometric issues are not known. But the most significant issue is the MRT which is planned to pass over the JORR. The basic design was completed and the detailed design will start in 2011 after the tender evaluation.

It is better to postpone the construction of the flyover until the MRT opens because the adjustment with the MRT will be difficult and the traffic flow is expected to change due to the transportation development.

Table 4.1.25 Relevant Roads of Fatmawati

Road name	Road class	Lanes	Design speed	Administration
Jl. Fatumawati	Type-II/Class-II	2x2	60km/h	Provincial road (DKI)
Jl. TB Simatupang	Type-II/Class-I	2x2	60km/h	National road (DGH)
JORR	Type-I/Class-I	3x2	80km/h	Toll road (Jalan Lingrar luar Jakarta)

Source: DGH

Table 4.1.26 Project Condition of Fatmawati

Structure type		Overpass (Jl. TB Simatupang)
Approximate length of structure		450m
Number of lanes	Main road	2 lanes each way (W=9.5m x 2)
	Frontage Road	1 lane each way
Existing study		None
Railway crossing		None
Issues		Conflict with other project (MRT)

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.13 Plan of Improvement for Fatmawati

(12) Ciawi - Bogor

No study or design work has been conducted for Ciawi-Bogor intersection. A flyover with 2-lanes and frontage road on Jl. Raya Sukabumi is proposed. The alignment of the flyover is curved following along the existing road. Jl. Raya Sukabumi on the south side of the intersection is a narrow 2-lane so it could be a bottleneck.

There are two development plans in the area, the Rencana Jalan Toll (extension of Jagorawi Toll Road) and Bogor Ring Road. Much traffic will be diverted to them and the traffic condition will be changed after the construction of both roads.

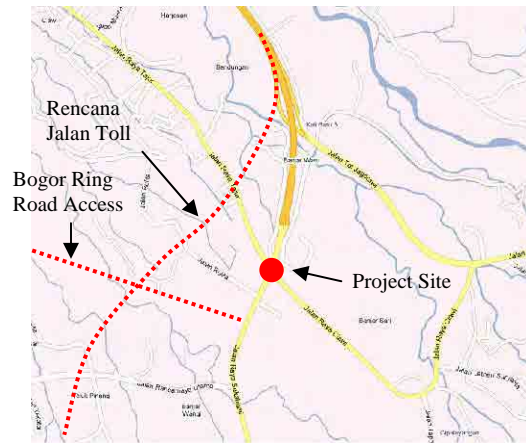


Figure 4.1.14 Road Development Plan (Ciawi)

Table 4.1.27 Relevant Roads of Ciawi - Bogor

Road name	Road class	Lanes	Design speed	Administration
Jl. Raya sukabumi	Type-II/Class-I	1x2	60km/h	National road (DGH)
Jl. Raya Ciawi	Type-II/Class-I	2x2	60km/h	National road (DGH)
Jagorawi Toll Road	Type-I/Class-I	3x2	80km/h	Toll road (Jasa Marga)

Source: DGH

Table 4.1.28 Project Condition of Ciawi - Bogor

Structure type	Overpass (Jl.Raya Sukabumi)	
Approximate length of structure	540m	
Number of lanes	Main road	2 lanes each way with median (W=17.6m)
	Frontage road	1 lane each way
Existing study	None	
Railway crossing	None	
Issues	Conflict with other projects (Jagorawi Toll road and Bogor Ring Road)	

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.15 Plan of Improvement for Ciawi – Bogor

(13) Pinang Baris

The detailed design of a 4-lane flyover with a 2-lane frontage road on the each side on Jl. Gatot Subroto was completed for Pinang Baris intersection by DGH. The road width and alignment should be designed taking into consideration the right of way because many houses and buildings are settled along the existing road. The bridge and clock tower at the west side of the intersection are control points for the road design.

Table 4.1.29 Relevant Roads of Pinang Baris

Road name	Road class	Lanes	Design speed	Administration
Jl. Gatot Subroto	Type-II/Class-I	2x2	60km/h	National road (DGH)
Jl. Klambir 5	Type-II/Class-II	1x2	60km/h	Provincial road (Medan)
Jl. Pinang Baris	Type-II/Class-II	3x2	60km/h	Provincial road (Medan)

Source: DGH

Table 4.1.30 Project Condition of Pinang Baris

Structure type	Overpass (Jl. Gatot Subroto)	
Approximate length of structure	540m	
Number of lanes	Main road	2 lanes each way with median (W=17.6m)
	Frontage road	1 lane each way
Existing study	D/D (2007: DGH)	
Railway crossing	None	
Issues	Land acquisition	

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.16 Plan of Improvement for Pinang Baris

(14) Asrama - Gatot Subroto

No study or design work has been conducted for Asrama-Gatot Subroto intersection. A 4-lane flyover with 2-lane frontage road for Jl. Gagak Hitam, Medan Ring Road, is proposed. The intersection is already improved with an exclusive left-turn lane split by a traffic island.

The specific geometric issues are not known as it is a simple cross intersection. The grade separation on Medan Ring Road is the strategy for Medan development.

Table 4.1.31 Relevant Roads of Asrama - Gatot Subroto

Road name	Road class	Lanes	Design speed	Administration
Jl. Gatot Subrot	Type-II/Class-I	2x2	60km/h	National road (DGH)
Jl. Asrama	Type-II/Class-I	2x2	60km/h	National road (DGH)
Jl. Gagak Hitam	Type-II/Class-I	2x2	60km/h	National road (DGH)

Source: DGH

Table 4.1.32 Project Condition of Asrama - Gatot Subroto

Structure type		Overpass (Jl. Gagak Hitam)
Approximate length of structure		530m
Number of lanes	Main road	2 lanes each way with median (W=17.6m)
	Frontage road	1 lane each way
Existing study		None
Railway crossing		None
Issues		

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.17 Plan of Improvement for Asrama - Gatot Subroto

(15) Katamso

A 4-lane underpass on Jl. AH Nasution is proposed in the feasibility study conducted by DGH. In the F/S, the total length of the underpass reaches 1.0km due to covering both intersections and the single track railway which is about 400m to the east.

According to the site investigation, the underpass is proposed only for the intersection because the railway is currently not in operation and the reactivation schedule is uncertain. It is possible to extend the underpass structure for the railway in the future.

The distance between the river and the intersection is critical for vertical alignment because it is only about 140m which is short to secure the required gradient.

Table 4.1.33 Relevant Roads of Katamso

Road name	Road class	Lanes	Design speed	Administration
Jl. AH Nasution	Type-II/Class-I	2x2	60km/h	National road (DGH)
Jl. Biru-Biru	Type-II/Class-I	2x2	60km/h	Provincial road (Medan)
Jl. Katamso	Type-II/Class-I	2x2	60km/h	Provincial road (Medan)

Source: DGH

Table 4.1.34 Project Condition of Katamso

Structure type		Underpass (Jl. AH Nasution)
Approximate length of structure		280m
Number of lanes	Main road	2 lanes each way with median (W=22.0m)
	Frontage road	1 lane each way
Existing study		F/S (2010: DGH)
Railway crossing		None (400m from Non-operation railway on East)
Issues		Distance to the river (East)

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.18 Plan of Improvement for Katamso

(16) Sudirman II

No study or design work has been conducted for Sudirman II intersection. A 4-lane flyover with 2-lane frontage roads is proposed over the T-shaped intersection and railway crossing. As the Tangerang railway will be developed for double tracks to the south side, the vertical alignment will be decided considering the clearance.

After the flyover is constructed, the frontage road ends at the railway crossing and will be provided with a U-turn lane. The bus way and shelter around the flyover will also be changed.

Table 4.1.35 Relevant Roads of Sudirman II

Road name	Road class	Lanes	Design speed	Administration
Jl. Sudirman	Type-II/Class-I	4x2	60km/h	National road (DGH)
Jl. Benteng Betawi	Type-II/Class-II	2x2	40km/h	Provincial road (Tangerang)

Source: DGH

Table 4.1.36 Project Condition of Sudirman II

Structure type		Overpass (Jl. Sudirman)
Approximate length of structure		550m
Number of lanes	Main road	2 lanes each way with median (W=17.6m)
	Frontage road	1 lane each way
Existing study		None
Railway crossing		Tangerang railway line
Issues		

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.19 Plan of Improvement for Sudirman II

(17) Cikarang

Cikarang project is composed of improvement of Jl. Raya Kalimalang and 3 local roads crossing Cikampek Toll Road in the north-south direction.

1) Jl. Raya Kalimalang

According to the site investigation, the proposed upgrade is for rigid pavement for the 2-lane, 7.3km long Jl. Raya Kalimalang from the intersection with Jl. Access from Toll Cibitung to Jl. Cibusah is preferable for prompt implementation because there are pipelines along the road for the entire section and some houses remain adjacent to the road. The intersection for

Jl Cibarusah will be improved with grade separation by the application of a 2-lane flyover on Jl. Kalimalang.

The widening to 4-lanes for 13km of Jl. Kalimalang from Jl. Access from Toll Cibitung to Jl. Tegal Cadas is proposed as a future development. At that time, it will be necessary to acquire additional land, replace the pipeline, improve the intersection, widen the flyover on Jl. Cibarusah and expand the existing bridge on Cikarang River.

2) Jl. Bari-Cibitung

The scope of this project is about 1.3km of road improvement and bridge construction on the toll road. As the 2-lane road surface is damaged in some parts, repair with rigid pavement is required. The bridge with 1.5-lanes above Cikampek Toll Road will be widened to 2-lanes by the construction of a new bridge to avoid the bottleneck on the current bridge.

3) Jl. Imam Bonjol 4

The scope of the project is about 1.6km of road improvement and bridge construction over Kalimalang River. The existing bridge of Jl. Imam Bonjol 4 over the river is old and not wide enough. In addition, as the road alignment is not smooth enough for a trunk road, the alignment is to be modified and a new bridge is to be constructed on the new alignment. A part of the road surface on Jl. Imam Bonjol 4 needs to be improved. The bridge on Cikampek Toll Road will remain so that it has 2 adequate lanes.

4) Dry Port Access Road

The construction of a dedicated road, the Dry Port Access Road, connecting the new interchange around the 29km post on Cikampek Toll Road and the Dry Port is on-going. This road is scheduled to open in the beginning of 2012.

A new road is proposed to connect this road with the industrial area to the south of Cikampek Toll Road. According to Jababeka, which designed and constructed the Dry Port Access Road, this road is dedicated for the cargo trucks and is not considered as access to the southern area of the industrial area as of now. The intersection for the Dry Port Access Road with the new road to the southern area should be located outside of the new toll gate to control the traffic. As there are many issues for the road and bridge construction, traffic management and land acquisition, a solution should be found based on the discussions by the stakeholders, such as DGH, each industrial park and Bekasi Regency.

The plan of the Dry Port Access Road and candidate new road is shown in Figure 4.1.23.

Table 4.1.37 Relevant Roads of Cikarang

Road name	Road class	Lanes	Design speed	Administration
Jl. Raya Kalimalang	Type-II/Class-III	2x1	40km/h	Provincial road (Bekasi)
Jl. Bali-Cibitung	Type-II/Class-III	2x1	40km/h	Provincial road (Bekasi)
Jl. Imam Bonjol 4	Type-II/Class-III	2x1	40km/h	Provincial road (Bekasi)
Road for Dry Port Access Road	Type-II/Class-III	1x1	40km/h	Provincial road (Bekasi)

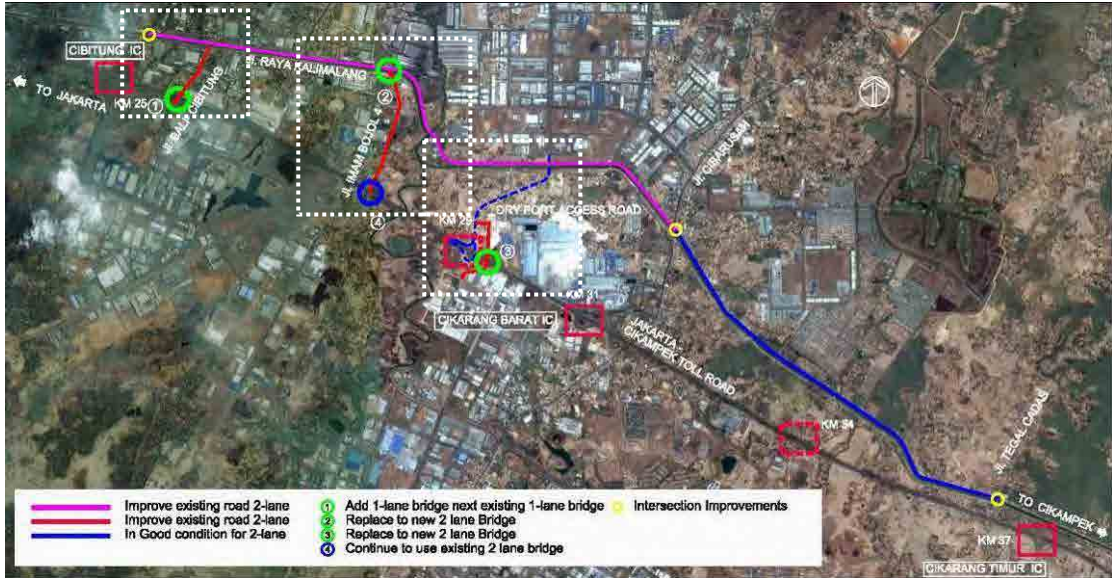
Source: DGH

Table 4.1.38 Project Condition of Cikarang

Structure type		Road improvement (Jl. Karimalan) and 3 bridges
Approximate length of improvement		Jl. Kalimalang: 7.3km (Road improvement) Jl. Bali-Cibitung: Road rehabilitation + 1 bridge Jl. Imam Bonjol 4: 1.6km New road connecting to Jababeka road: N/A
Number of lanes	Main road	Jl. Kalimalang: 1 lane each way (W=14.0m) Other roads: 1 lane each way (W=8.0m)
	Frontage road	-

Existing study	None
Railway crossing	None
Issues	Land acquisition Coordination with Dry Port Access Road plan

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.20 Plan of Improvement for Cikarang



Source: JICA Survey Team

Figure 4.1.21 Plan of Improvement for Jl. Bali-Cibitung



Source: JICA Survey Team

Figure 4.1.22 Plan of Improvement for Jl. Imam Bonjol 4



Source: JICA Survey Team

Figure 4.1.23 Plan of Improvement Dry Port Access Road

(18) Senayan

No study or design work has been conducted for Senayan intersection. In order to separate the traffic from Jl. Patimura to Jl. Sudirman away from the roundabout, a 2-lane flyover in one direction is proposed above the roundabout. The flyover passes over within the area of road property to avoid land acquisition and the distance between the flyover and the statue next to the pond is about 40m.

As Jl. Patimura is narrow to accommodate the flyover and 1-lane frontage road, the width of the flyover with frontage needs to be diminished as much as possible. The frontage road of Jl. Sudirman is shifted to the outside because the flyover merges next to the left side of the fast lane.

The busway shelter needs to be shifted depending on the alignment of the flyover.

Table 4.1.39 Relevant Roads of Senayan

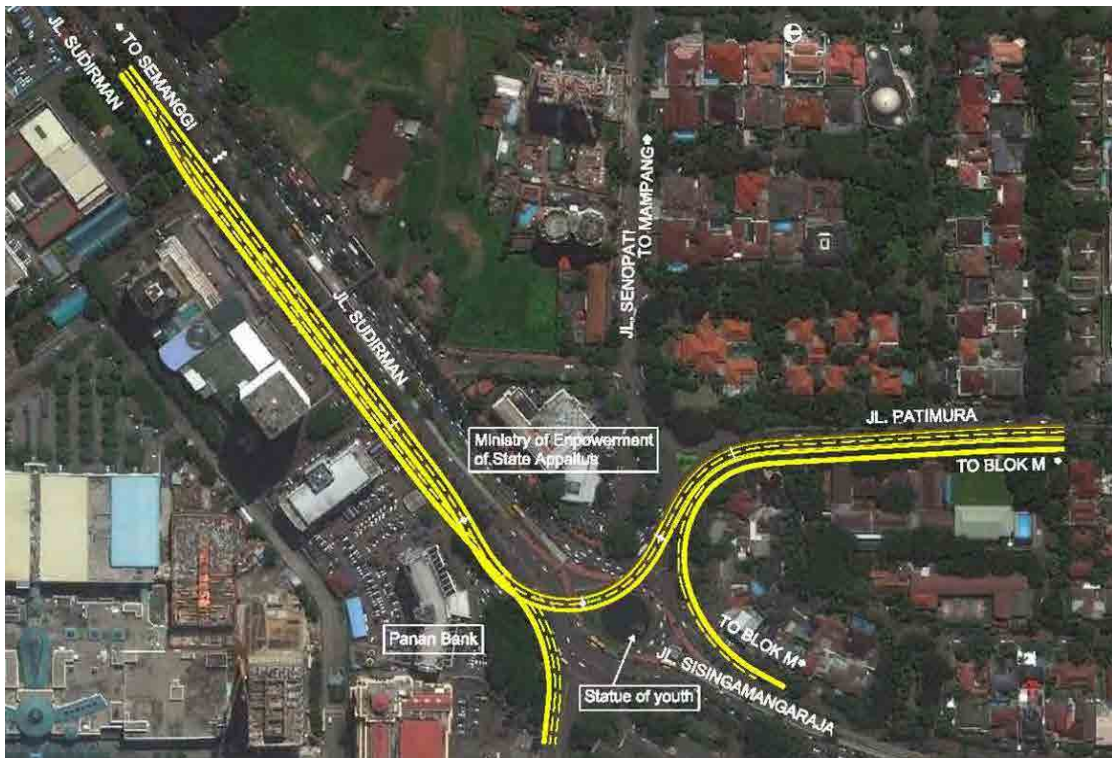
Road name	Road class	Lanes	Design speed	Administration
Jl. Asia-Africa	Type-II/Class-I	2x2	60km/h	Provincial road (DKI)
Jl. Senopati	Type-II/Class-I	2x2	60km/h	Provincial road (DKI)
Jl. Sisingmangaraja	Type-II/Class-I	2x2	60km/h	Provincial road (DKI)
Jl. Patimura	Type-II/Class-I	2x2	60km/h	Provincial road (DKI)
Jl. Sudirman	Type-II/Class-I	3x2	60km/h	Provincial road (DKI)

Source: DGH

Table 4.1.40 Project Condition of Senayan

Structure type		Overpass (Jl. Sudirman to Jl. Patimura)
Approximate length of structure		730m
Number of lanes	Main road	2 lanes for 1 direction (W=9.5m)
	Frontage road	1 lane
Existing study		None
Railway crossing		None
Issues		Land acquisition Clearance with the statue

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.24 Plan of Improvement for Senayan

4.1.3 Summary of Preliminary Design

The summary of preliminary design is shown in Table 4.1.41.

Note that the information will be revised by the result of the study in the 2nd stage. Especially, the improvement method for Semanggi will be determined based on the traffic analysis and the structure length will be varied after setting of the vertical alignment and the bridge design.

Table 4.1.41 Summary of Preliminary Design

Potential projects	FO/UP	Approx. structure length		Number of lanes and width		Existing study	Railway Crossing
		Overall	Bridge	Main road	Frontage road		
1 Semanggi	-	-	-	-	-		
2 Margonda Cinere	UP	760m	-	2x2 (22.0m)	1		●
3 Cililitan	UP	430m	-	1x2 (13.0m)	1	D/D (2007)	
4 R.E. Martadinata	FO	570m	370m	2x2 (19.0m)	1	D/D (2007)	●
5 Sulawesi - Tg.PA	FO	550m	350m	2x2 (19.0m)	2	D/D (2007)	●
6 Latumenten	FO	500m	270m	2x2 (19.0m)	1		●
7 Sudirman-Daan Mogot	FO	550m	300m	2x2 (17.6m)	2	D/D (2008)	
8 Kuningan	UP	940m	-	2x2 (22.0m)	1	F/S (2006)	
9 Pancoran	FO	530m	270m	2x1 (9.5m)	1		
10 Cilandak	UP	370m	-	2x2 (21.0m)	1		
11 Fatmawati	FO	450m	250m	2x2 (19.0m)	1		
12 Ciawi-Bogor	FO	540m	290m	2x2 (17.6m)	1		
13 Pinang Baris	FO	540m	220m	2x2 (17.6m)	1	D/D (2007)	
14 Asrama-Gatot Subroto	FO	530m	280m	2x2 (17.6m)	1		
15 Katamsa	UP	280m	-	2x2 (22.0m)	1	F/S (2010)	
16 Sudirman II	FO	550m	300m	2x2 (17.6m)	1		●
17 Cikarang	1 EW road 3 NS road	7.3km	450m	1x2 (14.0m)	-		
18 Senayan	FO	730m	380m	2x1 (9.5m)	1		

Source: JICA Survey Team

Note: The figure in the “number of lanes on main road” shows the number of lanes and directions

4.1.4 Basic Design of Roads and Intersections

The basic design of roads and intersections is conducted for 10 sub-projects selected in the 1st stage. First of all, the preliminary designs are reviewed based on the topographic condition, traffic analysis and discussion with the MPW and DKI. The basic design is carried out and the drawings are prepared for the most suitable plan. The list of sub-projects is shown in Table 4.1.42.

Table 4.1.42 List of Sub-projects

Sub-projects		Location	Existing study	Railway crossing
1	Semanggi	DKI		
4	R.E. Martadinata	DKI	D/D (2007)	●
5	Sulawesi - Tg.PA	DKI	D/D (2007)	●
8	Kuningan	DKI	F/S (2006)	
9	Pancoran	DKI		
13	Pinang Baris	Medan	D/D (2007)	
15	Katamso	Medan	F/S (2010)	
16	Sudirman II	Tangerang City		●
17	Cikarang	Bekasi Regency		
18	Senayan	DKI		

Source: JICA Survey Team

The design concept for each sub-project including the improvement method, the control points, the alignment and the number of lanes and the structure type which are determined after a series of discussions with the MPW and local governments are described as follows. A set of drawings are attached in the Appendix.

The design criteria for the preliminary design described in 4.1.1 is applied on the basic design as well.

(1) Semanggi

1) Study of suitable improvement

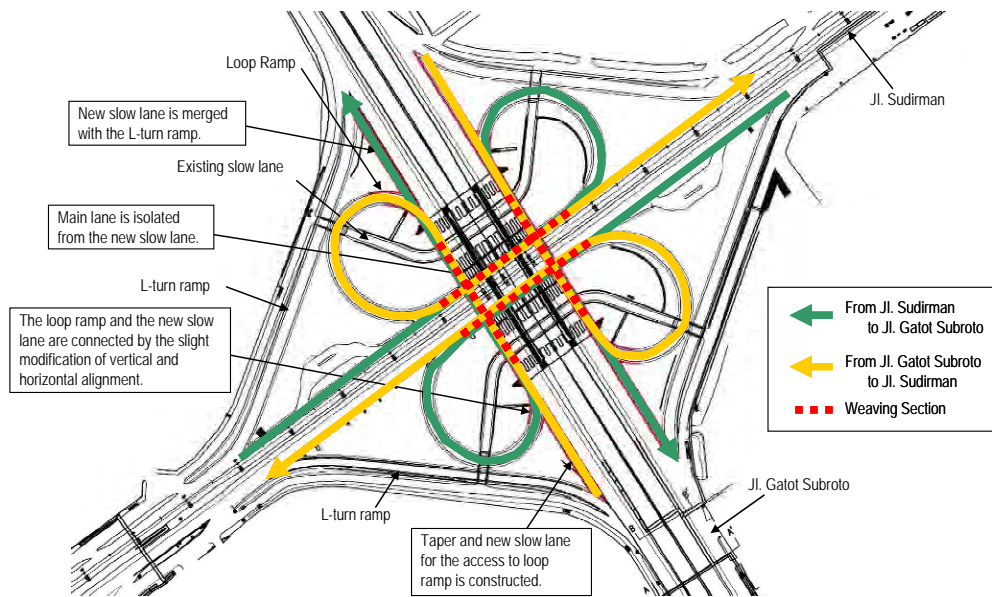
a) Alternatives

As Semanggi intersection is located in the midst of a metropolitan area, the improvement needs to be basically conducted in the area of the road and intersection property to avoid land acquisition. According to the site investigation, the following 5 alternatives are proposed.

- Alternative 1: Construction of additional lanes along Jl. Gatot Subroto (Bridge)

Main point of alternative 1 is to provide a new lane along and outside of Jl. Gatot Subroto which is constructed with a bridge and high embankment. The plan is shown in Figure 4.1.25.

Traffic capacity of Jl. Gatot Subroto will increase and the weaving section for the loop ramps could be isolated from the main traffic, which are the positive impacts. On the other hand, as it is difficult to make the elevation of the existing and new lane the same level because of the rigid structure of the existing bridge, traffic congestion may occur on the new lane with the 1-lane split from the existing lane. Furthermore, the radius of the loop ramp will be smaller which threatens the traffic safety.



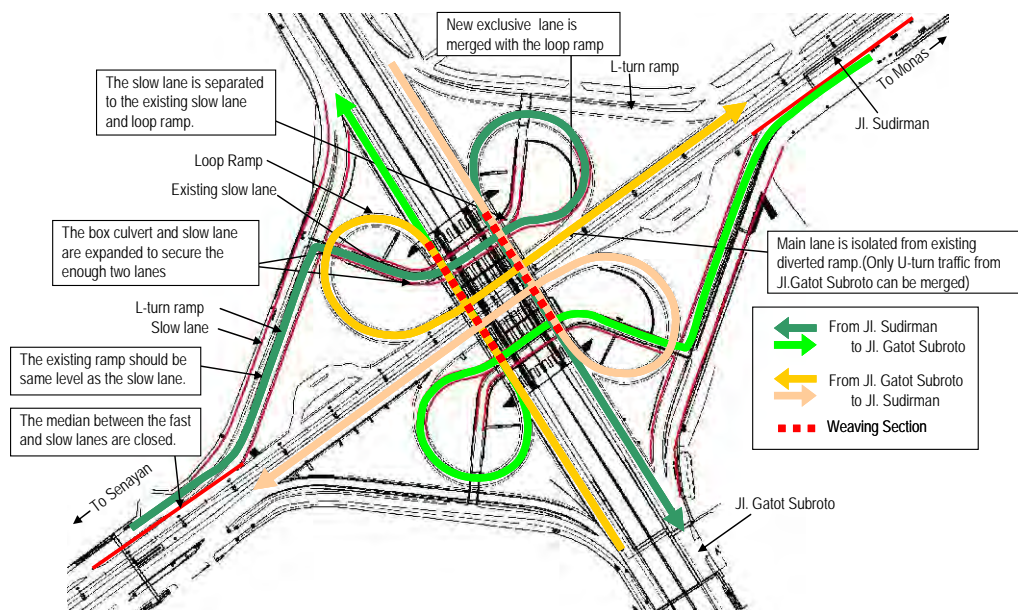
Source: JICA Survey Team

Figure 4.1.25 Plan of Alternative 1

- Alternative 2-1: Improvement of slow lane and loop ramp (At-grade)

In contrast to Alternative 1, Alternative 2-1 is the plan to resolve the weaving section on Jl. Sudirman as shown in Figure 4.1.26. The main point is that the slow lane and left turn ramp from Jl. Sudirman to Jl. Gatot Subroto are merged and the slow lane in the junction connects directly to the existing loop ramp. The right turn traffic from Jl. Sudirman to Jl. Gatot Subroto passes through the slow lane and the loop ramp. The existing traffic flow from the main lane of Jl. Sudirman to the loop ramp will be closed but U-turn traffic from Jl. Gatot Subroto could still use the same route as now.

By this improvement, the weaving section on Jl. Sudirman disappears which seems to be a significant improvement to mitigate the congestion. On the other hand, it will be a main concern that the turning traffic from Jl. Sudirman is mixed with the motorbike and local bus traffic on the same route.



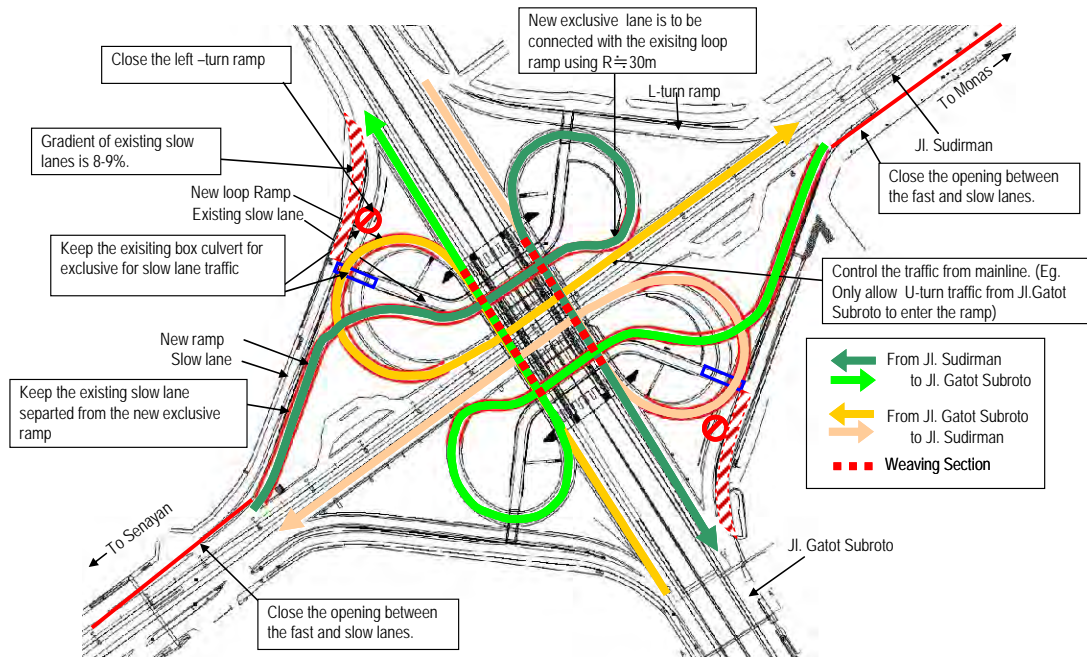
Source: JICA Survey Team

Figure 4.1.26 Plan of Alternative 2-1

- Alternative 2-2: Improvement of slow lane and loop ramp (At-grade)

This plan is modified from Alternative 2-1. The left turn ramp from Jl. Sudirman to Jl. Gatot Subroto is closed and changed to a ramp for right turns which connects to the loop ramp. To secure the vertical clearance of the new ramp with the existing loop ramp, the radius of the loop ramp is made bigger and the new ramp is located lower than the ground level.

In this improvement, the left turn ramp is merged into the slow lane. To utilize the existing box culvert, the gradient of the slow lane remains about 8% which is very steep for the left turn ramp. As the elevation of the new ramp is lower than the ground level, it is necessary to provide a water pump to drain the rain water.



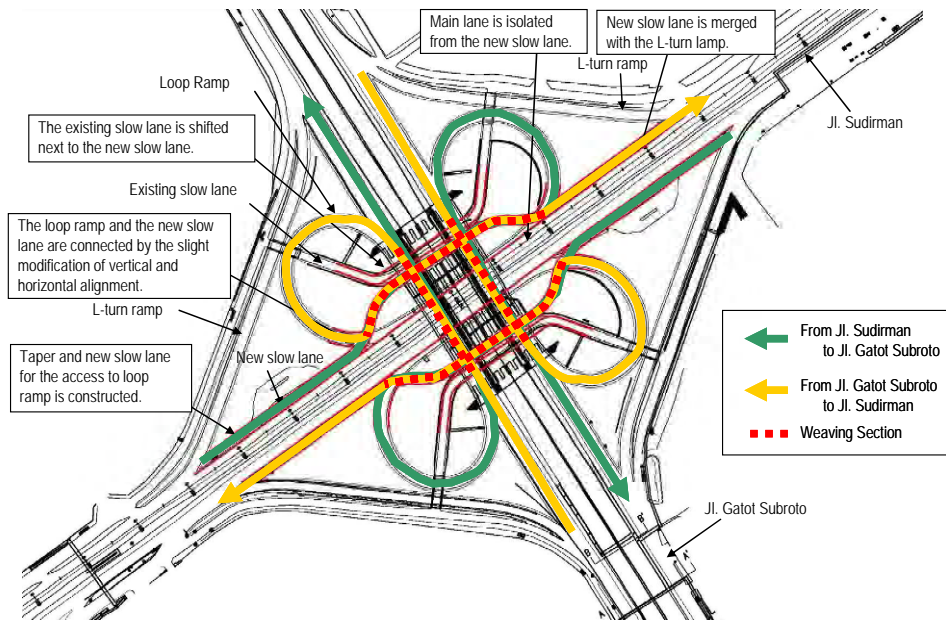
Source: JICA Survey Team

Figure 4.1.27 Plan of Alternative 2-2

- Alternative 3: Construction of additional lanes along Jl. Sudirman (At-grade)

Like Alternative 2-2, a new lane for Jl. Sudirman is provided. The new lane is completely isolated from the existing main lane and passes under the next span of Jl. Gatot Subroto from the main lane due to the V-shape of the existing pier.

The weaving section which is one of the reasons of traffic congestion is shifted on to the new lane. Therefore, the congestion on Jl. Sudirman for through traffic will be alleviated. However, it is expected that the traffic lane from the weaving section on the new lane will continue to the main lane. In addition, the connection of the loop ramp and the new lane needs to be changed to a smaller curve. The existing slow lane under the bridge will be shifted to make the space for the 2 new lanes.



Source: JICA Survey Team

Figure 4.1.28 Plan of Alternative 3

- Alternative 4: Construction of new loop ramps (Flyover)

Unlike the other alternatives, this is a dynamic improvement plan. A new loop ramp on a flyover from Jl. Gatot Subroto to Jl. Sudirman will be constructed above the intersection. The plan is shown in Figure 4.1.29.

The capacity of the interchange will be increased and the weaving section on Jl. Gatot Subroto and Jl. Sudirman will disappear with the addition of the additional ramps. However, it is difficult to secure the vertical clearance for the existing ramp. The construction cost is much higher and construction period much longer comparing with the other alternatives. In addition, the construction of elevated structures will damage the aesthetics of the clover-leaf junction which is a violation of environmental regulations of Indonesia.



Source: JICA Survey Team

Figure 4.1.29 Plan of Alternative 4

b) Comparison of alternatives

All alternatives are compared and evaluated based on several factors. As a result of the discussion with MPW and local governments, Alternative 2-2 was selected as the most suitable improvement for Semanggi Intersection.

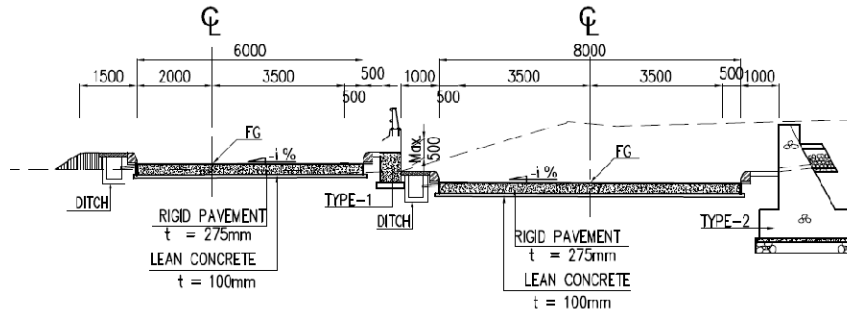
The comparison table for alternatives is shown in Table 4.1.43. The features of the selected alternative plan are stipulated after the comparison.

Table 4.1.43 Comparison of Alternatives for Semanggi Intersection

(confidential)

2) Cross section

The width of the 2-lanes for new ramp in 1 direction is 8.0m. The typical cross section is shown in Figure 4.1.30.



Source: JICA Survey Team

Figure 4.1.30 Typical Cross Section of New Ramp of Semanggi Intersection

3) Plan and profile

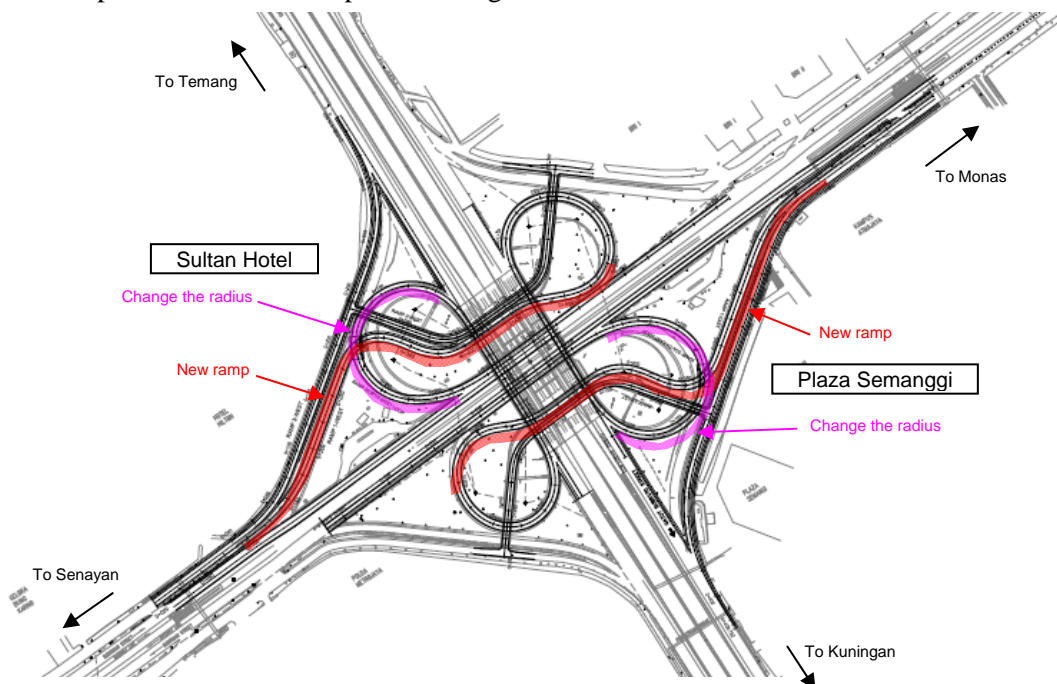
The characteristics and issues for the horizontal and vertical alignment are as follows.

a) Horizontal alignment

A new ramp starting from the existing left turn ramp and passing under the revised loop ramp with a small curve is newly constructed. Then, it is going to pass under the bridge of Jl. Gatot Subroto and connect the loop ramp with a small curve. The existing loop ramp from Jl. Gatot Subroto to Jl.Sudirman which will pass above the existing left-turn ramp is modified to enlarge the radius.

b) Vertical alignment

The gradient of the new ramp should be 2% parallel to the existing slow lane to secure the vertical clearance with the loop ramp. After crossing the loop ramp, the gradient is also 2% to return to the ground level. The gradient of the slow lane, which is also used as the left turn ramp, remains 8% to keep the existing box culvert available.



Source: JICA Survey Team

Figure 4.1.31 Plan of Semanggi Intersection

4) Other considerations

a) Traffic management

As traffic movement is changed after the modification of an intersection, it is necessary to conduct traffic management using traffic signs and/or police to avoid the confusion of the driver. Especially, the diverging point for the slow lane and turn ramp from Jl. Sudirman needs to be controlled to eliminate the misunderstanding of the drivers and the subsequent congestion.

b) Slow lane

The existing slow lane passing under the bridge of Jl.Gatot Subroto needs to be shifted to the opposite side of Jl. Sudirman about 5m to make space for the new ramp.

c) Utilities

It is required to relocate the utilities buried underground for the construction of the new ramp.

d) Drainage

The sag point of the new ramp is located underground to secure the vertical clearance. Consequently, it is necessary to install a water pump to drain the rain water properly.

(2) R.E. Martadinata

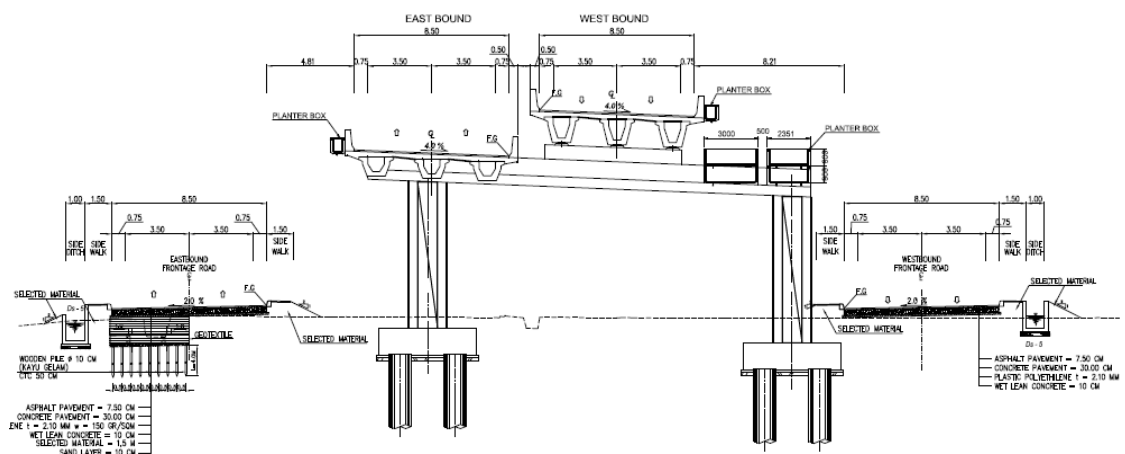
1) Concept of suitable improvement

As the project area is complicated and significantly congested, at-grade improvement is difficult. An underpass is also almost impossible due to the low land area and the soft ground referred as Table 4.1.44.

The detailed design of the arterial road with a flyover beyond the railway line and bus terminal was already carried out by the Tanjung Priok Access Road (TgPA) project. As the design result was coordinated with the other projects such as TgPA and Pasoso Flyover for the port, a flyover is selected as the suitable improvement.

2) Cross section

The flyover is composed of two separated directions and each direction has 2-lanes. In addition, frontage roads on both sides are provided to access the surrounding area at-grade level. The typical cross section is shown in Figure 4.1.32.

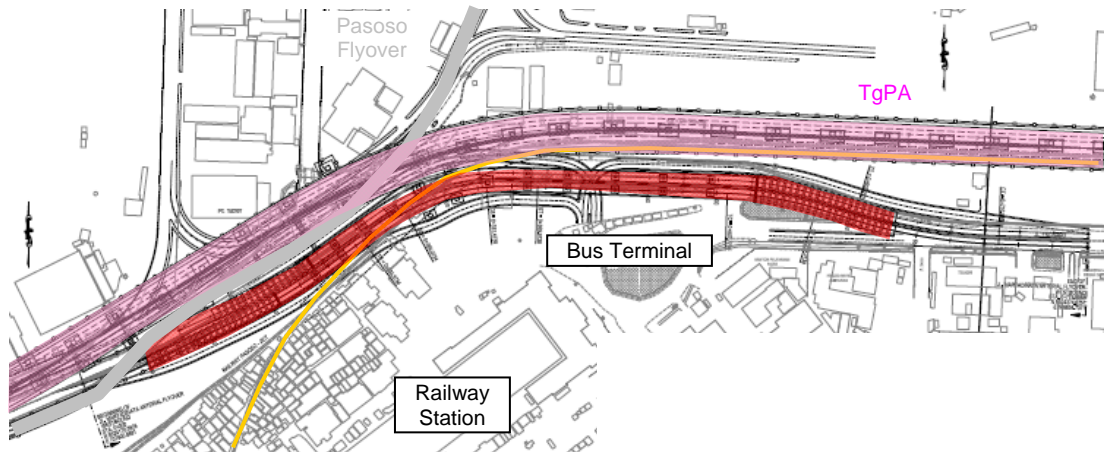


Source: Drawing of Tanjung Priok Access Road

Figure 4.1.32 Typical Cross Section of R.E.Martadinata Flyover

3) Plan and profile

A separated flyover connecting Jl. Martadinata with Jl. Enggano is planned above the railway line and the present bus terminal area. Frontage roads are provided on both sides of the flyover at-grade level and they cross the railway line.



Source: Drawing of Tanjung Priok Access Road

Figure 4.1.33 Plan of R.E.Martadinata Flyover

4) Other consideration

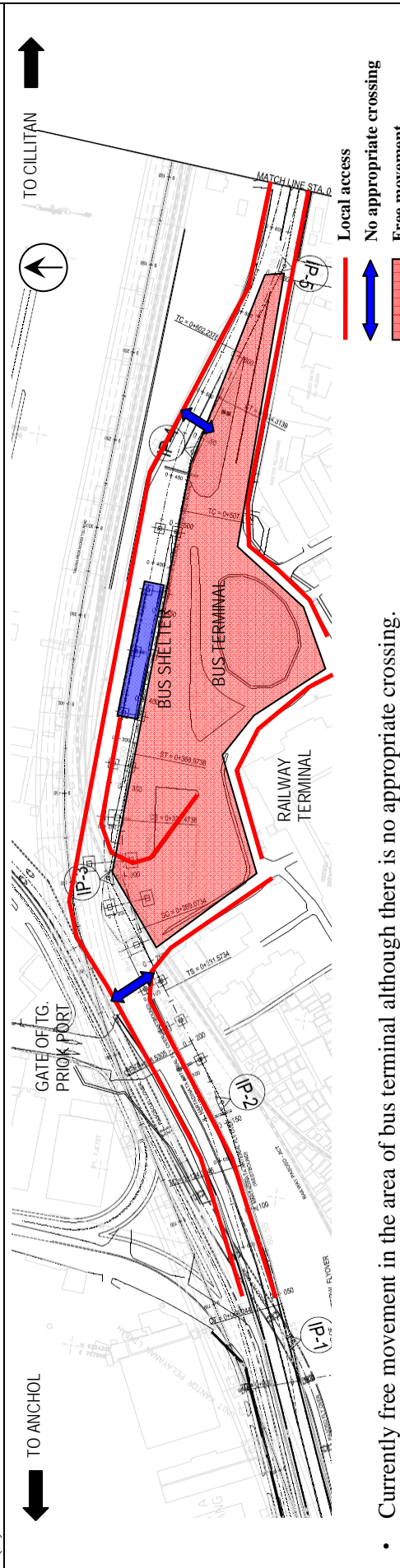

The road alignment of the flyover and frontage roads could be modified to adjust with the integrated bus terminal development plan currently being prepared by DKI.

For the local access and pedestrian movements, it will not be significantly changed after the improvement. Above all, the crossing conditions will be improved in terms of safety by using the space under the structure of flyover. The number of the crossing traffic at grade will also be reduced that would be safer than that of current conditions. Table 4.1.45 shows the results of comparative study to examine the change of local access and pedestrian movements after the improvement.

Table 4.1.44 Comparison of Alternatives for R.E Martadinata Intersection

(confidential)

Table 4.1.45 Consideration for local access of R.E.Martadinata Flyover

<p>(1) Local access at current condition</p> 	<p>(2) Local access after improvement</p> 
<ul style="list-style-type: none"> • Currently free movement in the area of bus terminal although there is no appropriate crossing. • Movement of pedestrian is limited alongside of the road and no appropriate crossing facility for across the road. 	<ul style="list-style-type: none"> • Local access will not significantly change after construction of new flyover. • Movement of pedestrians within the integrated bus terminal will be secured after the improvement. • Safe crossing will be secured under the flyover after the impovement.

Source: JICA Survey Team

(3) Sulawesi

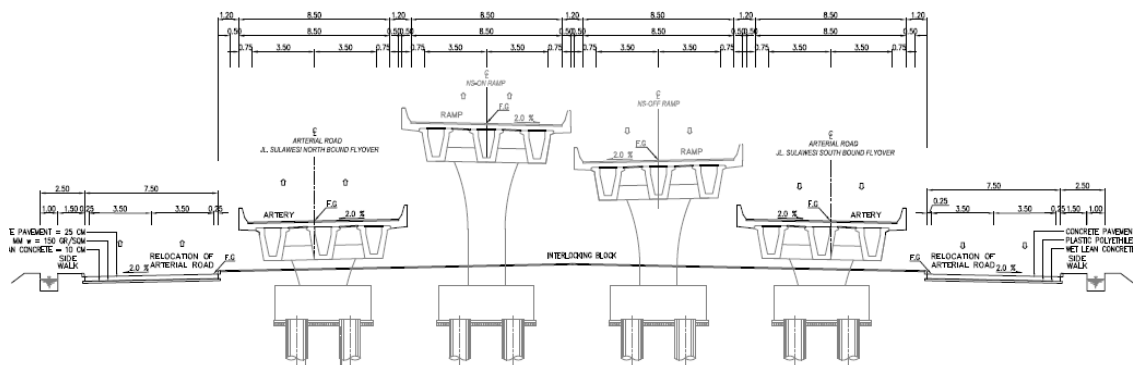
1) Concept of suitable improvement

Like R.E. Martadinata, a flyover, which is the result of detailed design, is adopted as the suitable improvement upon the result of comparative study as shown in Table 4.1.46

Note that the construction of NS link of TgPA parallel to the flyover has already started this year.

2) Cross section

The flyover between TgPA and the frontage road has 2 lanes on each bound. The typical cross section is shown in Figure 4.1.34.

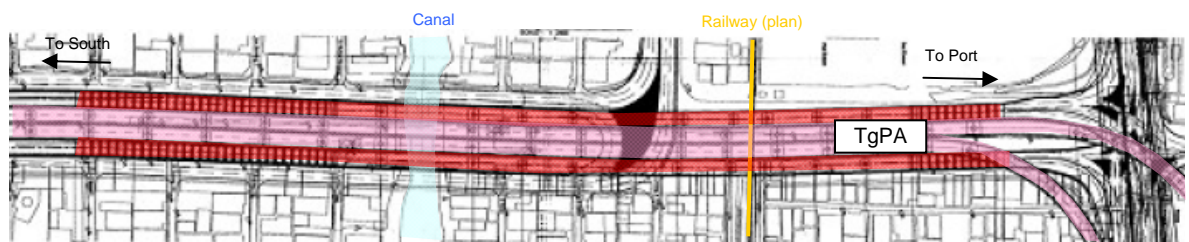


Source: Drawing of Tanjung Priok Access Road

Figure 4.1.34 Typical Cross Section of Sulawesi Flyover

3) Plan and profile

The flyover is located between the TgPA and frontage road in parallel and overpasses the existing intersection and proposed railway line to Tanjung Priok Port. The land for the flyover has already been acquired by the TgPA Project.



Source: Drawing of Tanjung Priok Access Road

Figure 4.1.35 Plan of Sulawesi Flyover

4) Other consideration

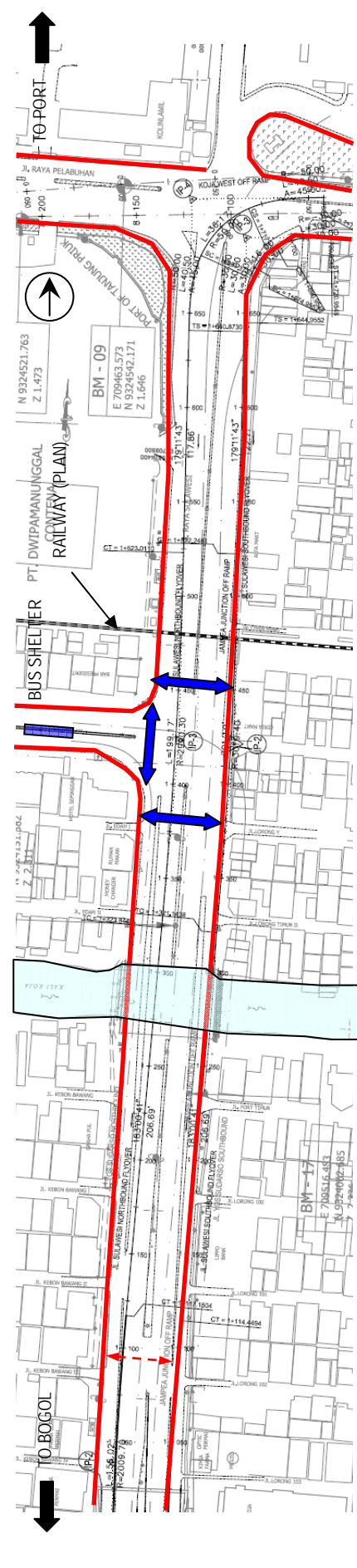
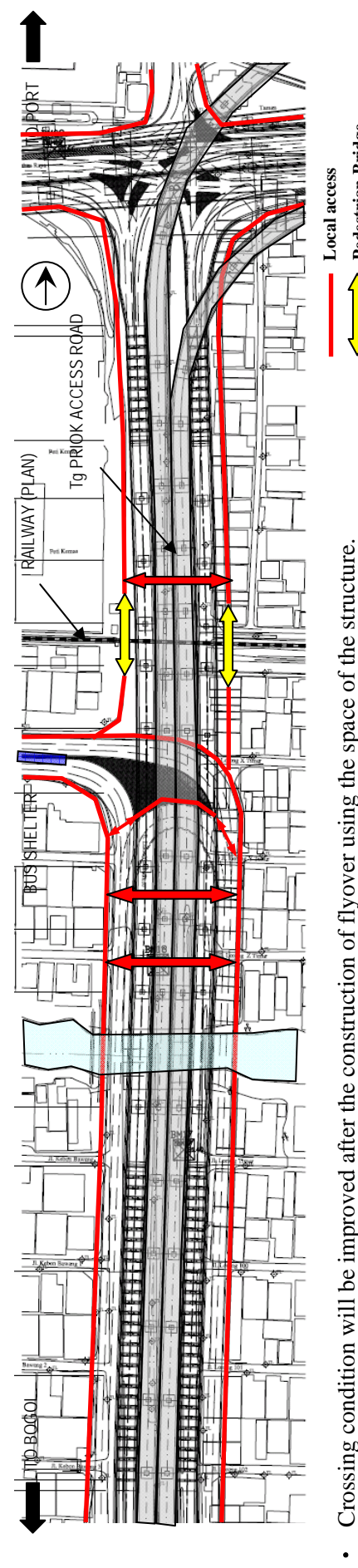
The construction of the NS link of TgPA except for the flyover has already started in 2011. The design of the flyover needs to be adjusted with the design of TgPA if there are any changes.

For the local access and pedestrian movements, it will not be significantly changed after the improvement. Above all, the crossing conditions will be improved in terms of safety by using the space under the structure of flyover. The number of the crossing traffic at grade will also be reduced that would be safer than that of current conditions. Table 4.1.47 shows the results of comparative study to examine the change of local access and pedestrian movements after the improvement.

Table 4.1.46 Comparison of Alternatives for Sulawesi Intersection

(confidential)

Table 4.1.47 Consideration for local access of Sulawesi Flyover

<p>(1) Local access at current condition</p> 	<p>(2) Local access after improvement</p> 
<ul style="list-style-type: none"> • Movement of pedestrian is limited only alongside of the road and no appropriate facility exists for crossing the road. • Pedestrian is in danger freely crossing the road without facility. 	<ul style="list-style-type: none"> • Crossing condition will be improved after the construction of flyover using the space of the structure. • Movement of pedestrians for crossing over the railway will be secured by the construction of pedestrian bridge.

Source: JICA Survey Team

(4) Kuningan

1) Concept of suitable improvement

The comparative study was conducted to select the suitable improvement whether to adopt flyover or underpass as shown in Table 4.1.49. As the result, a continuous underpass along Jl. Rasuna Said which was recommended by Feasibility Study was selected to mitigate the traffic congestion at two intersections, Kuningan and Mampang (See Table 4.1.48). The section of at-grade intersections are covered by slab deck while the top of section between the intersections keeps to be open for the reduction of the construction cost.

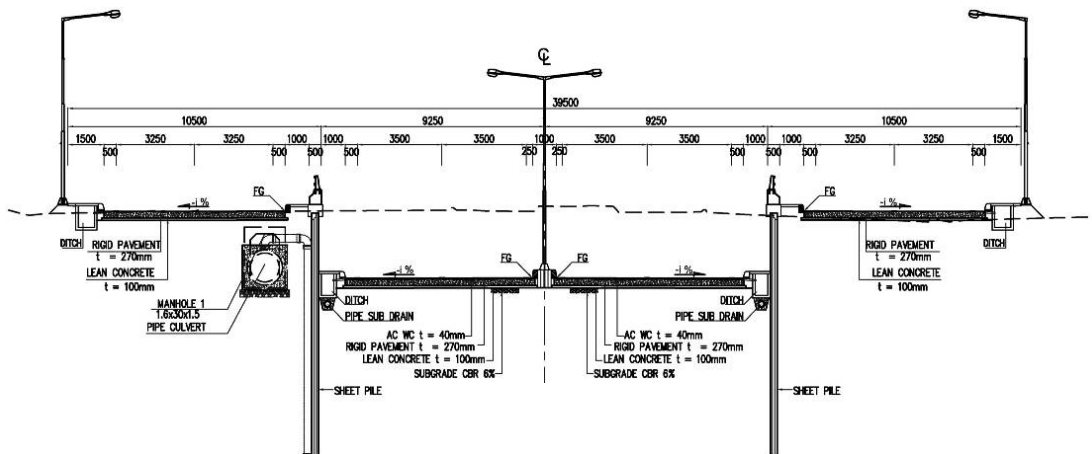
Table 4.1.48 Comparison of Alternatives for Kuningan Intersection

	Alt.1	Alt.2
Outline	Single underpass for 1 intersection (Jl. Gatot Subroto)	Continuous underpass for both intersections
Structure	Underpass (650m)	Underpass (1km)
Positive Impacts	<ul style="list-style-type: none"> The through traffic on Jl.Rasuna Said is isolated from the intersection of Jl. Gatot Subroto by the underpass. 	<ul style="list-style-type: none"> The through traffic on Jl.Rasuna Said is isolated from 2 intersections by the underpass.
Negative Impacts	<ul style="list-style-type: none"> It is too short (less than 100m) to accommodate the turn traffic between the end of underpass and Mampang Intersection. 	<ul style="list-style-type: none"> Enough capacity on the frontage road between 2 intersections needs to be secured due to many traffic demands for turning at Mampang Intersection.
Existing study result		Recommended (F/S)
Construction Cost	Low	High
Construction Period	Short	Long
EIA Scheme	UKL/UPL	AMDAL
Land Acquisition	A few	More than Alt.1 (Along Jl. Mampang Prapatan)
Evaluation		+

Source: JICA Survey Team

2) Cross section

In order to minimize the land acquisition along the road, 4 lanes should be applied for the underpass section. The frontage roads have 2 lanes both sides. The typical cross section is shown in Figure 4.1.36.

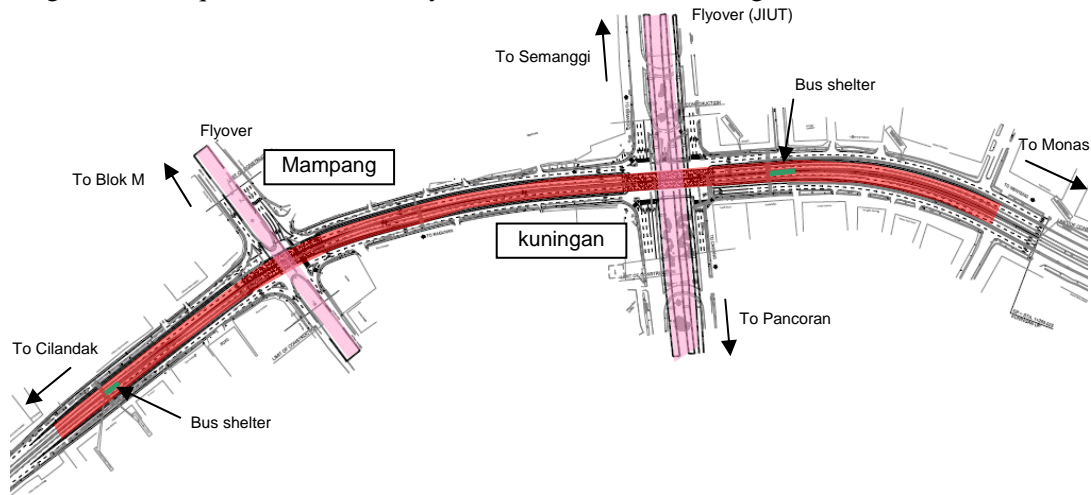


Source: JICA Survey Team

Figure 4.1.36 Typical Cross Section of Kuningan

3) Plan and profile

The horizontal alignment basically follows the existing road. For the vertical alignment, a 5% gradient is applied on both ends of the underpass section to minimize the structure length. Land acquisition is necessary for the entire section along Jl. Rasuna Said.



Source: JICA Survey Team

Figure 4.1.37 Plan of Kuningan Underpass

4) Other considerations

a) Busway and shelter

The busway will remain on the inside lanes of the underpass but it will not be an exclusive lane because there are only a total of 4-lanes. It is necessary to relocate two bus shelters which are currently located on the north of Kuningan Intersection and on the south of Mampang Intersection.

b) Intersection

The configuration and the number of lanes are to be studied and decided to secure the necessary traffic movement after the construction of the underpass.

c) Drainage

To drain the water from the underpass, tank reservoirs and pump facilities should be provided near the sag points.

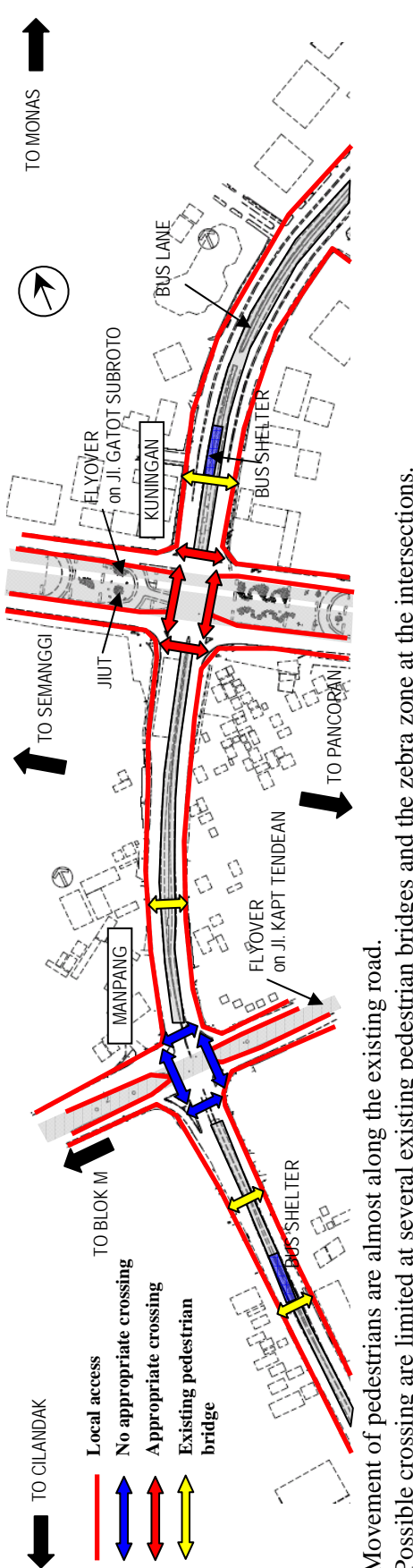
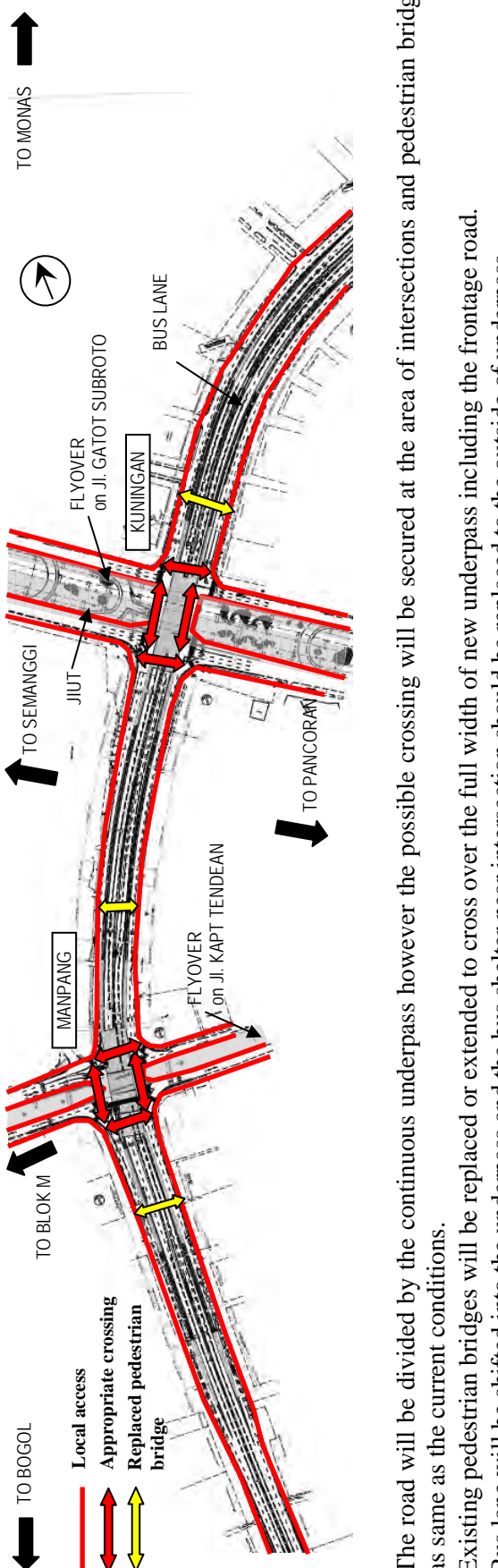
d) Local access and pedestrian movements

The comparative study has been carried out to examine the change of local access and pedestrian movements after the improvement as shown in Table 4.1.50.

Table 4.1.49 Comparison of Alternatives for Kuningan and Manpang Intersections

(confidential)

Table 4.1.50 Consideration for local access of Kuningan Underpass

(1) Local access at current condition	 <p>Map (1) shows the current local access conditions at the Kuningan Underpass. The road is divided into four directions: TO CILANDAK (left), TO BLOK M (top), TO SEMANGGI (right), and TO MONAS (bottom). Key features include: <ul style="list-style-type: none"> TO BLOK M: Flyover on Jl. KAPT TENDEAN, Bus Shelter, and Existing pedestrian bridge. TO SEMANGGI: Flyover on Jl. GATOT SUBROTO, Kuningan, and Bus Shelter. TO MONAS: Bus Lane. TO CILANDAK: Flyover on Jl. KAPT TENDEAN, Manpang, and Existing pedestrian bridge. Legend: <ul style="list-style-type: none"> Local access: Black arrow No appropriate crossing: Red line Appropriate crossing: Blue arrow Existing pedestrian bridge: Yellow arrow </p> <ul style="list-style-type: none"> • Movement of pedestrians are almost along the existing road. • Possible crossing are limited at several existing pedestrian bridges and the zebra zone at the intersections.
(2) Local access after improvement	 <p>Map (2) shows the proposed local access conditions after improvement. The road layout and directions remain the same as in Map (1). Key changes include: <ul style="list-style-type: none"> TO BLOK M: Replaced pedestrian bridge. TO SEMANGGI: Replaced pedestrian bridge. TO MONAS: Bus Lane. TO CILANDAK: Replaced pedestrian bridge. Legend: <ul style="list-style-type: none"> Local access: Black arrow Appropriate crossing: Red line Replaced pedestrian bridge: Yellow arrow </p> <ul style="list-style-type: none"> • The road will be divided by the continuous underpass however the possible crossing will be secured at the area of intersections and pedestrian bridges as same as the current conditions. • Existing pedestrian bridges will be replaced or extended to cross over the full width of new underpass including the frontage road. • Bus lane will be shifted into the underpass and the bus shelter near intersection should be replaced to the outside of underpass.

Source: JICA Survey Team

(5) Pancoran

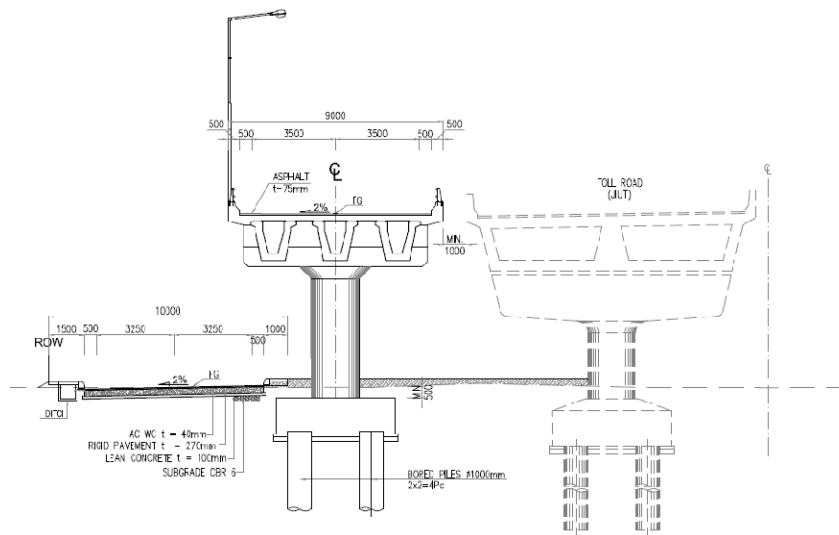
1) Concept of suitable improvement

The comparative study was conducted to select the suitable improvement whether to adopt the flyover or the underpass as shown in Table 4.1.51. As the results, a 2-lane flyover for east bound along Jl. Gatot Subroto on the south side is suitable. Alternatively, the underpass on Jl. Gatot Subroto is envisaged however it is more costly and needs longer construction period than flyover because of the existing channel across near the intersection, which makes the length of underpass longer.

To secure the accessibility to the Toll Road, a two lane on-ramp way is provided from the intersection between the flyover and Jl. Gatot Subroto. The frontage road on the east side of the intersection would be located under the flyover to avoid land acquisition.

2) Cross section

The flyover has 2-lanes one way for the west bound. To avoid land acquisition, the frontage road should be located under the flyover. The typical cross section is shown in Figure 4.1.38.



Source: JICA Survey Team

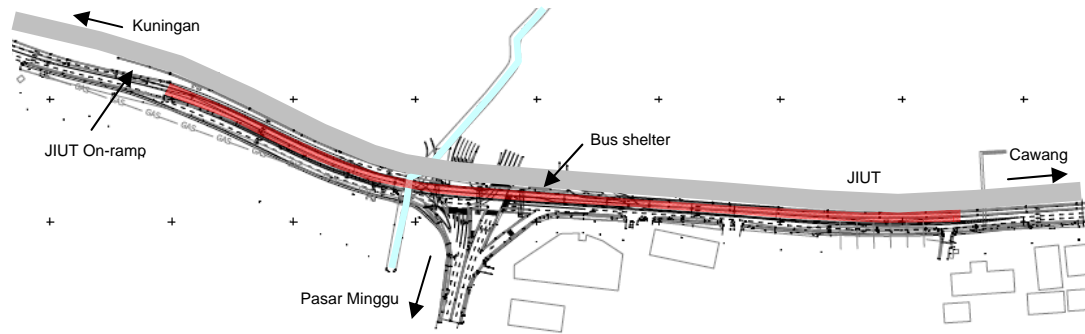
Figure 4.1.38 Typical Cross Section of Pancoran Flyover

3) Plan and profile

The horizontal alignment of the flyover is set along the JIUT on the south side. The at-grade road for the toll gate is provided between the flyover and JIUT on the west side of the intersection to keep the accessibility from the intersection to the toll gate as the traffic on the flyover can not enter the toll gate directly.

The frontage road is located under the flyover on the east side of the intersection to avoid land acquisition of commercial buildings near the intersection. Therefore, the flyover length reaches about 630m.

In order to secure the vertical clearance for the frontage road on the east side of the intersection, a gentle slope is applied on the flyover.



Source: JICA Survey Team

Figure 4.1.39 Plan of Pancoran Flyover

4) Other considerations

a) Bus way

The bus shelter currently located under JIUT needs to be relocated in accordance with the new flyover. It needs to be considered to lift the busway and shelter onto the flyover if it is not suitable to shift them at grade level.

b) Toll road

A part of the 6 inner toll roads planned by DKI is designed to pass near Pancoran intersection. It is necessary to coordinate with the plan of this road to avoid structural and operational conflicts.

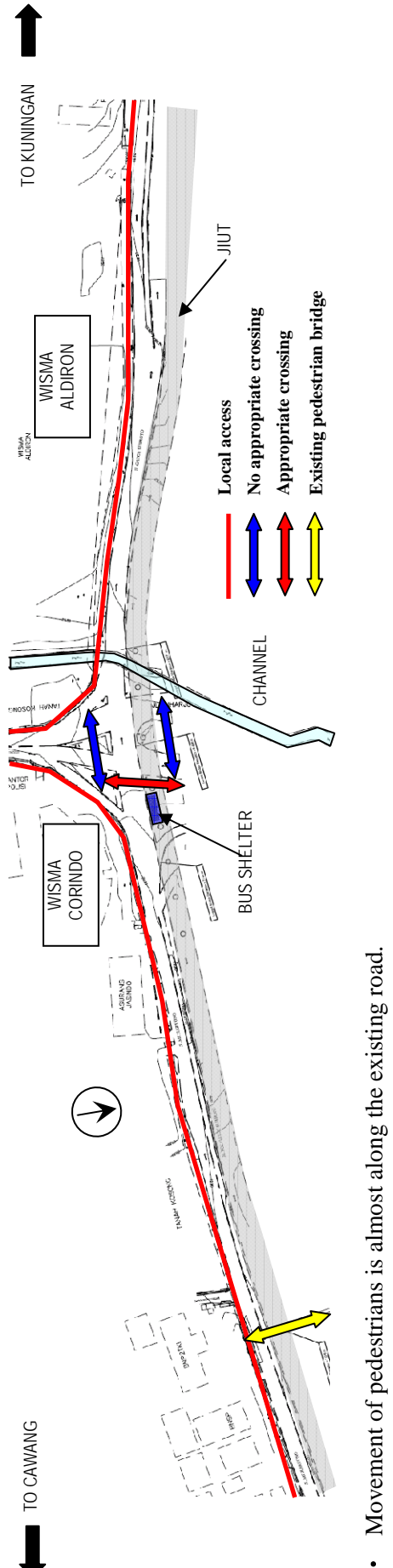
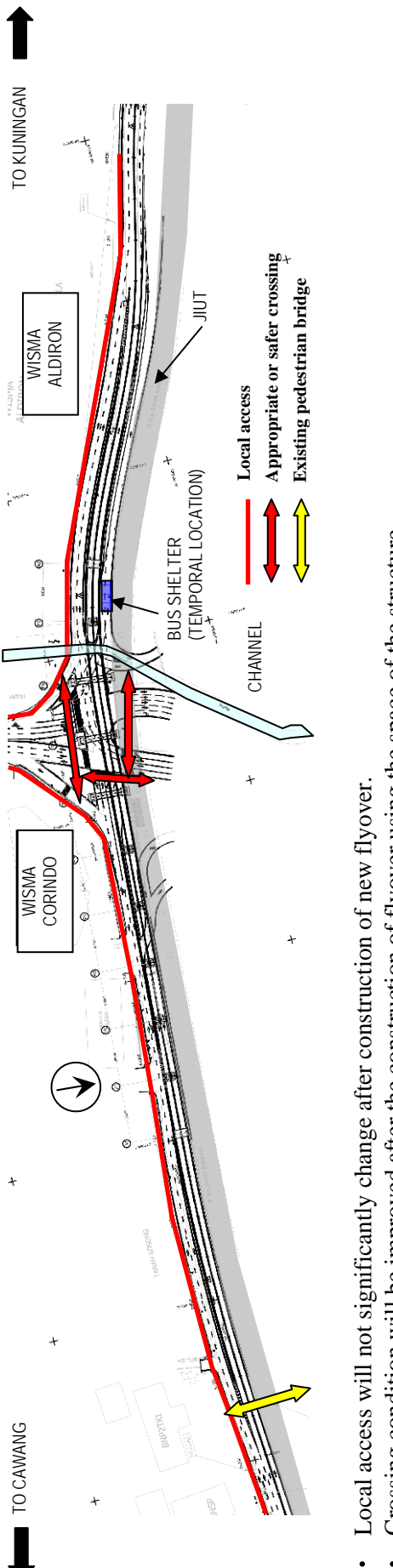
c) Local access and pedestrian movements

The comparative study has been carried out to examine the change of local access and pedestrian movements after the improvement as shown in Table 4.1.52.

Table 4.1.51 Comparison of Alternatives for Pacoran Intersection

(confidential)

Table 4.1.52 Consideration for local access of Pancoran Flyover

(1) Local access at current condition		(2) Local access after improvement	
		<ul style="list-style-type: none"> • Movement of pedestrians is almost along the existing road. • Possible crossing are limited at an existing pedestrian bridge and the zebra zone at the intersections. 	
			<ul style="list-style-type: none"> • Local access will not significantly change after construction of new flyover. • Crossing condition will be improved after the construction of flyover using the space of the structure. • Bus shelter and bus lane should be alternatively shifted onto new flyover.

Source: JICA Survey Team

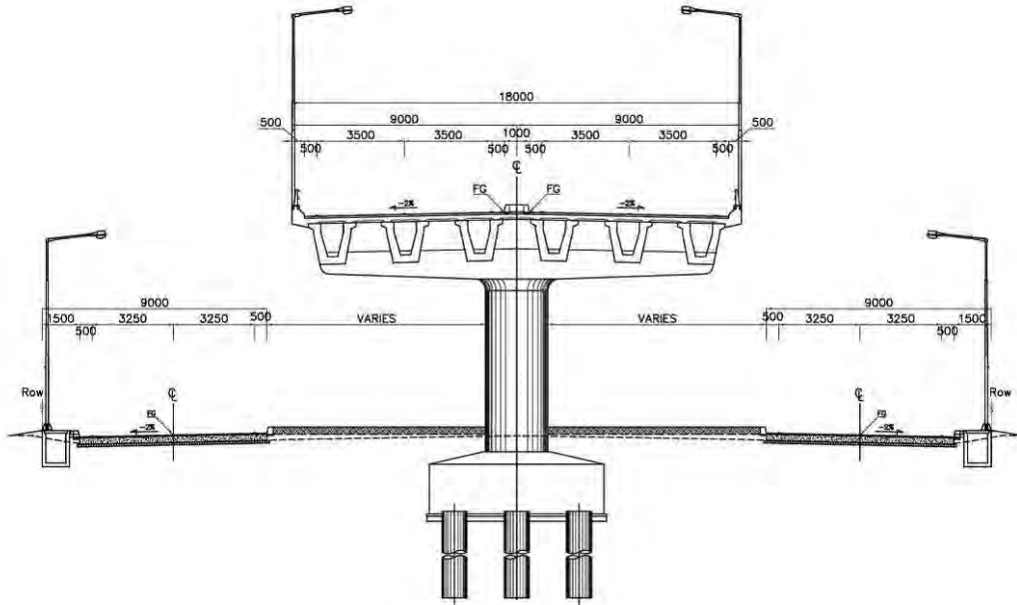
(6) Pinang Baris

1) Concept of suitable improvement

The comparative study was conducted to select the suitable improvement whether to adopt the flyover or the underpass as shown in Table 4.1.53. As the results, a 4-lane flyover is to be constructed along Jl. Sudirman which carries the main traffic.

2) Cross section

The cross section is composed of a 4-lane of flyover and 2-lane frontage roads on both sides. The total width would be 38m. The typical cross section is shown in Figure 4.1.40.

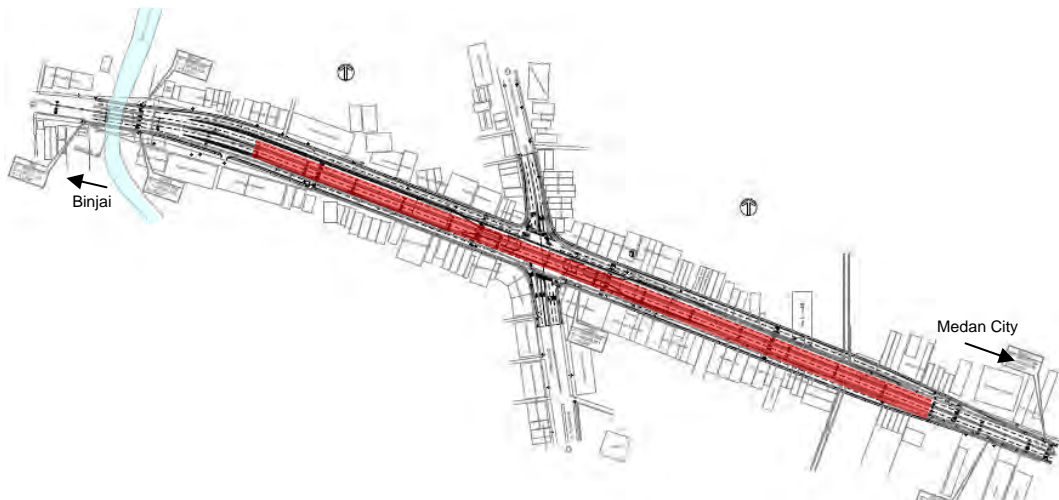


Source: JICA Survey Team

Figure 4.1.40 Typical Cross Section of Pinang Baris Flyover

3) Plan and profile

The horizontal alignment of the flyover is straight along Jl. Sudirman. For the vertical alignment, a 5% gradient is applied on both ends of the overpass section to reduce the structure length.



Source: JICA Survey Team

Figure 4.1.41 Plan of Pinang Baris Flyover

4) Other considerations

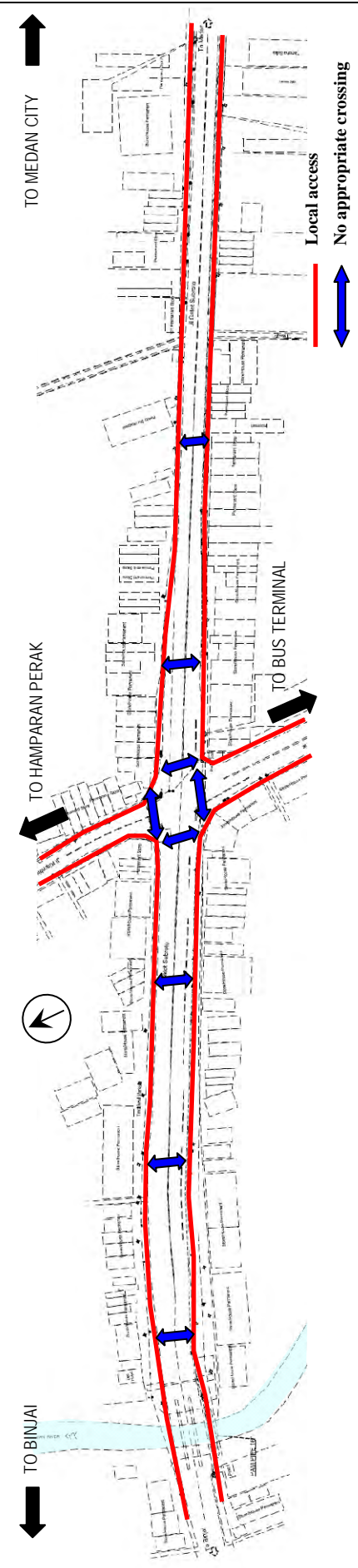
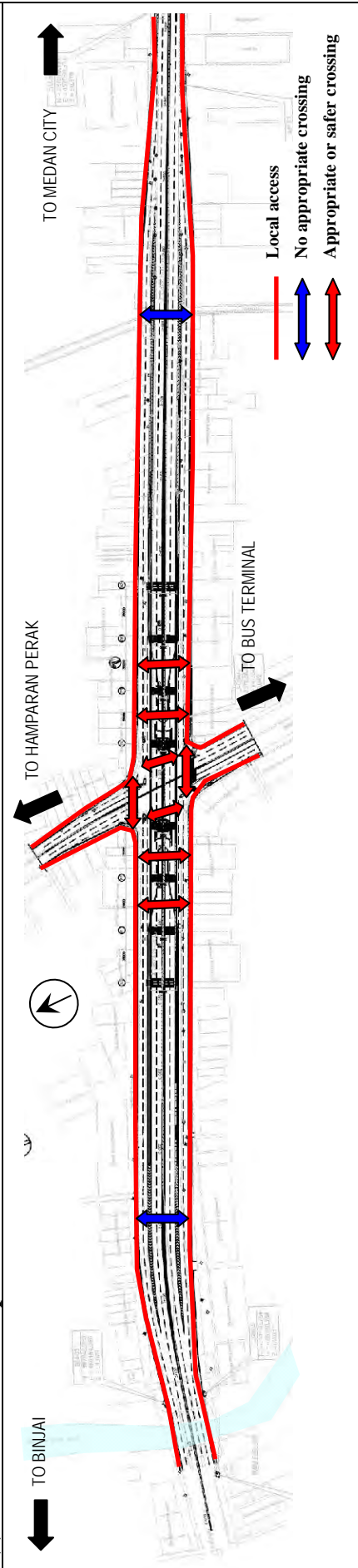
As the proposed road width is wider than the existing road, the land acquisition and resettlement will be required necessarily.

For the local access and pedestrian movements, it will not be significantly changed after the improvement. Above all, the crossing conditions will be improved in terms of safety by using the space under the structure of flyover. The number of the crossing traffic at grade will also be reduced that would be safer than that of current conditions. Table 4.1.54 shows the results of comparative study to examine the change of local access and pedestrian movements after the improvement.

Table 4.1.53 Comparison of Alternatives for Pinang Baris Intersection

(confidential)

Table 4.1.54 Consideration for local access of Pinang Baris Flyover

<p>(1) Local access at current condition</p>  <p>• Currently, difficult to cross the road safely due to no appropriate crossing facilities.</p>	<p>(2) Local access after improvement</p>  <p>• Local access will be almost same as the current condition. • Safe crossing near intersection will be secured by using the underneath of flyover after the improvement.</p>
--	--

Source: JICA Survey Team

(7) Katamso

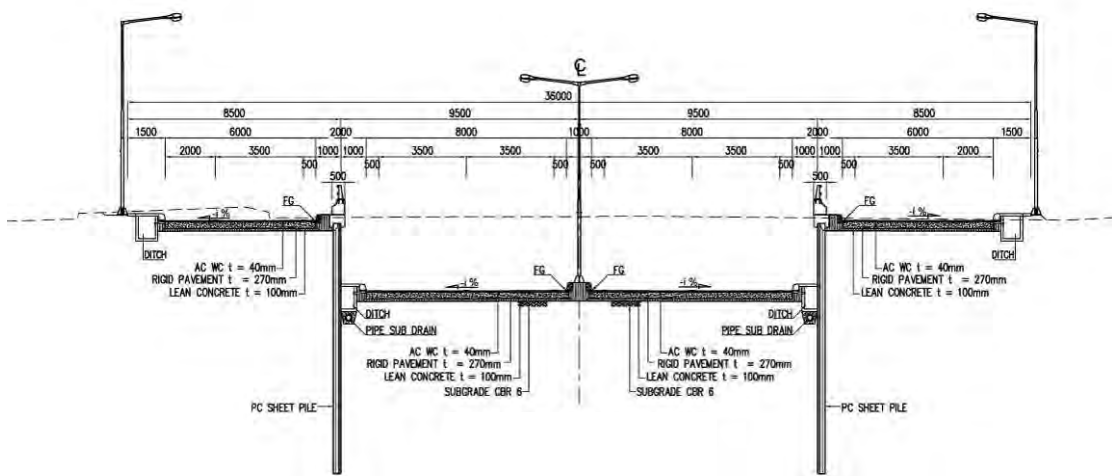
1) Concept of suitable improvement

Jl. AH Nasution is a part of the Medan Ring Road and has more traffic volume than Jl. Katamso. There are 6-lanes on Jl. AH Nasution while only 4-lanes on Jl. Katamso. In addition, the elevation around the intersection is higher, therefore, an underpass is more suitable (See Table 4.1.55).

A continuous underpass for the intersection and railway, about 400m to the east of the intersection, which is proposed in the Feasibility Study, is not regarded as the best improvement since the railway is currently not active and it is not cost effective.

2) Cross section

In order to minimize the land acquisition, 4 lanes should be applied for the main portion of the underpass section. The frontage roads have 2 lanes on both sides. The typical cross section is shown in Figure 4.1.42.



Source: JICA Survey Team

Figure 4.1.42 Typical Cross Section of Katamso Underpass

3) Plan and profile

The horizontal alignment basically traces the existing road. For the vertical alignment, a 5% gradient is applied on both ends of underpass section to reduce the structure length.



Source: JICA Survey Team

Figure 4.1.43 Plan of Katamso Underpass

4) Other consideration

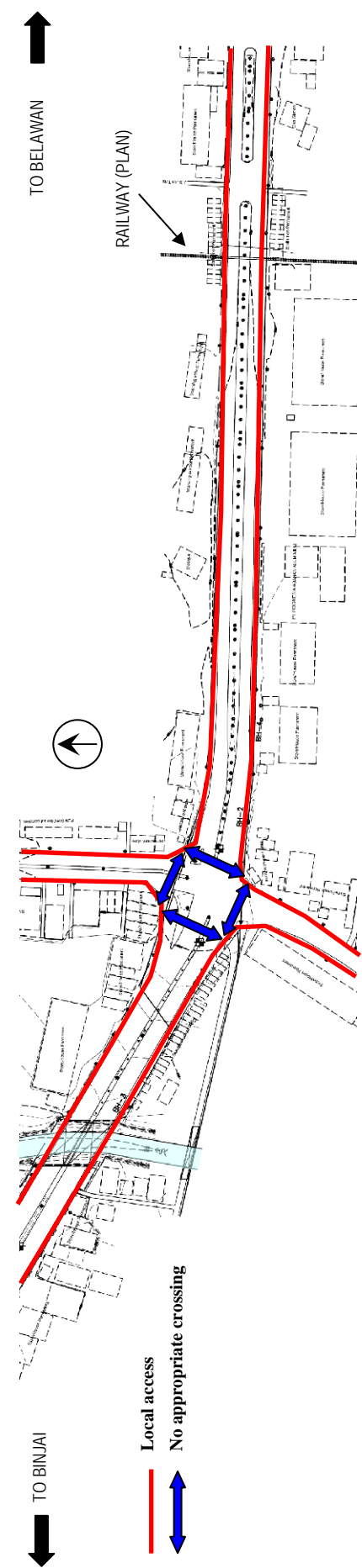
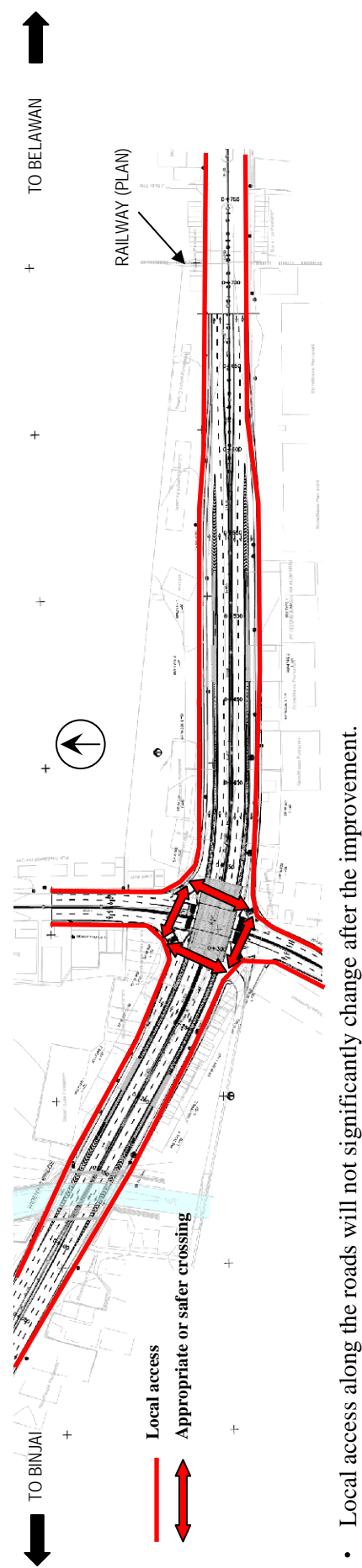
The existing bridge located about 200m to the west needs to be replaced as the road width should be widened to accommodate the taper lanes for the frontage roads.

For the local access and pedestrian movements, it will not be significantly changed after the improvement. Table 4.1.56 shows the results of comparative study to examine the change of local access and pedestrian movements after the improvement.

Table 4.1.55 Comparison of Alternatives for Katamso Intersection

(confidential)

Table 4.1.56 Consideration for local access of Katamso Underpass

<p>(1) Local access at current condition</p>  <p>TO BINJAI</p> <p>TO BELAWAN</p> <p>RAILWAY (PLAN)</p> <p>Local access</p> <p>No appropriate crossing</p> <ul style="list-style-type: none"> • Movements of pedestrians are almost along the existing road. • Possible crossing is limited for only the zebra zone at the intersections. 	<p>(2) Local access after improvement</p>  <p>TO BINJAI</p> <p>TO BELAWAN</p> <p>RAILWAY (PLAN)</p> <p>Local access</p> <p>Appropriate or safer crossing</p> <ul style="list-style-type: none"> • Local access along the roads will not significantly change after the improvement. • The road will be divided by the underpass however the possible crossing will be secured at the area of intersections same as the current conditions. • Crossing condition will be improved at the intersection because of less traffic after completion of underpass.
---	--

Source: JICA Survey Team

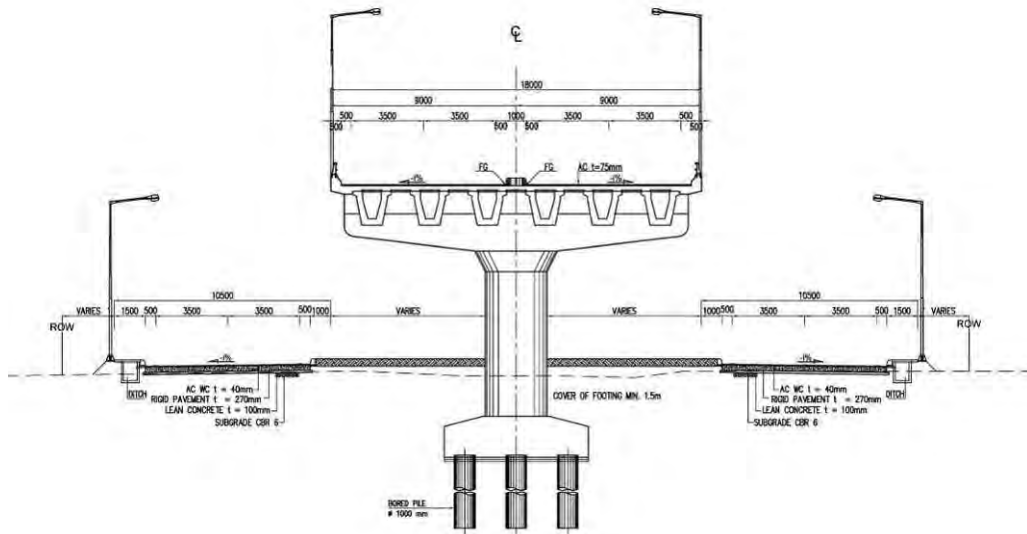
(8) Sudirman II

1) Concept of suitable improvement

A flyover beyond the single track of the Tangerang railway line and T-shape intersection is to be newly constructed along Jl. Sudirman. As the at-grade railway crossing will be closed considering safety, the traffic between the north of Jl. Sudirman and Jl. Banten Betawi needs to be diverted to use the new flyover.

2) Cross section

The cross section is composed of a 4-lane flyover and 2-lane frontage roads on both sides. The typical cross section is shown in Figure 4.1.44.

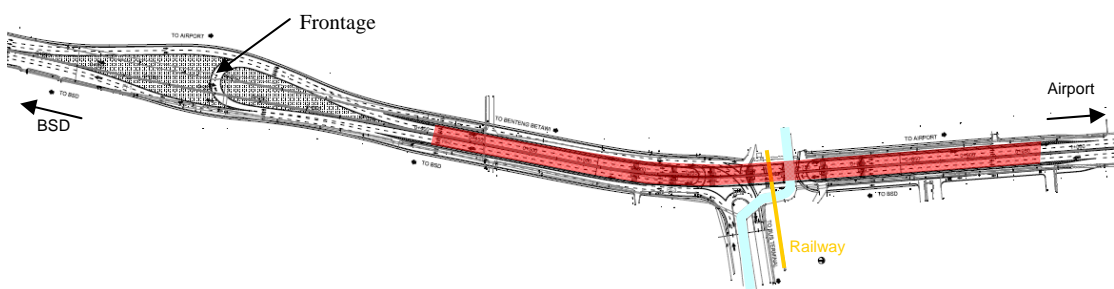


Source: JICA Survey Team

Figure 4.1.44 Typical Cross Section of Sudirman II Flyover

3) Plan and profile

The horizontal alignment basically traces the existing road. For the vertical alignment, a 5% gradient is applied on both ends of the overpass section to reduce the structure length.



Source: JICA Survey Team

Figure 4.1.45 Plan of Sudirman II Flyover

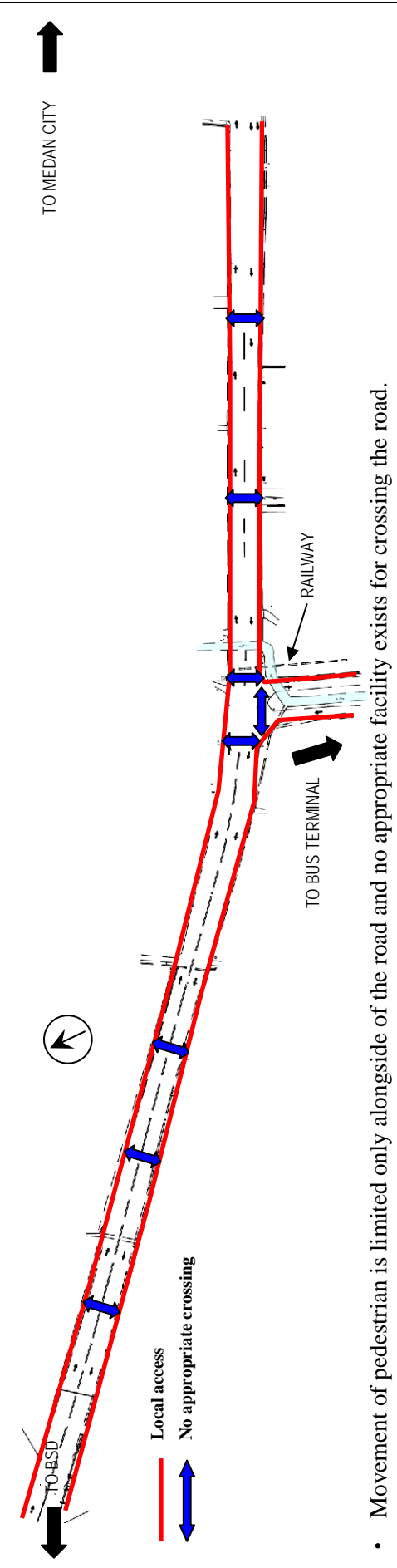
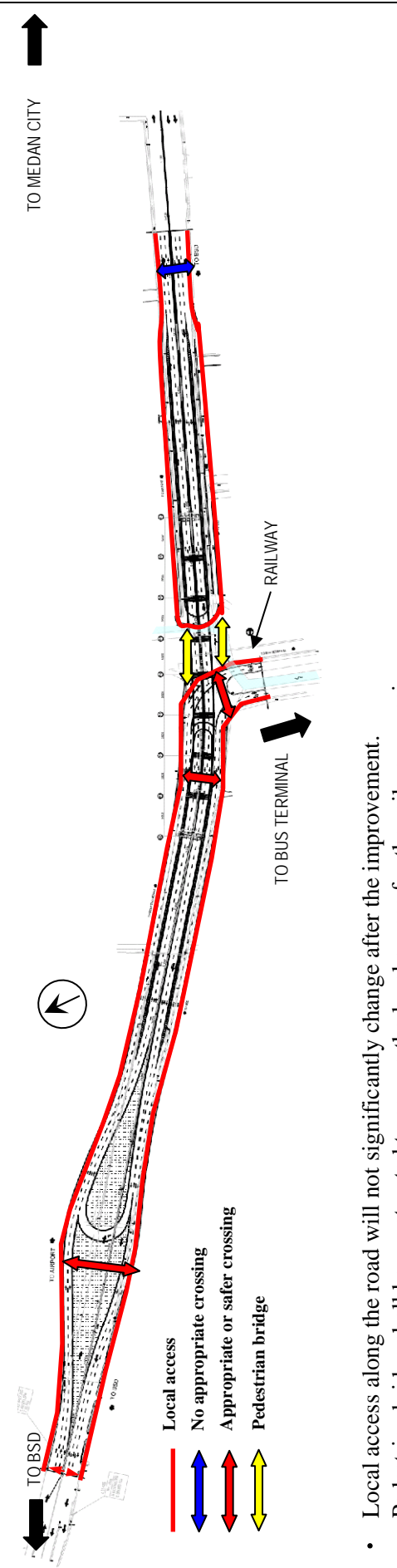
4) Other consideration

As the traffic flow from Jl. Banten Betawi to Jl. Sudirman north and south will be closed after the construction of the flyover, the traffic, including the bus way, needs to be diverted through the next intersection about 1km to the south to use the flyover. Otherwise, it is necessary to construct a U-turn lane as shown in Figure 4.1.45. For the local access and pedestrian movements, Table 4.1.58 shows the results of comparative study to examine the change of local access and pedestrian movements after the improvement.

Table 4.1.57 Comparison of Alternatives for SudirmanII Intersection

(confidential)

Table 4.1.58 Consideration for local access of SudirmanII Flyover

<p>(1) Local access at current condition</p>  <ul style="list-style-type: none"> • Movement of pedestrian is limited only alongside of the road and no appropriate facility exists for crossing the road. • Pedestrian is in danger freely crossing the road without facility. 	<p>(2) Local access after improvement</p>  <ul style="list-style-type: none"> • Local access along the road will not significantly change after the improvement. • Pedestrian bridge shall be constructed to secure the local access for the railway crossing. • Crossing condition will be improved after the construction of flyover using the space of the structure.
---	---

Source: JICA Survey Team

(9) Cikarang

1) Concept of suitable improvement

The project consists of the improvement of the following 4 roads including some flyovers and bridge around the Kalimalang River. The concept of each road is described as follows and the plan of the target roads is shown in Figure 4.1.46.

a) Jl. Kalimalang

This is a 2-lane 7.8km long road along the Kalimalang River from Jl. Cibitung to Jl. Cibarsah. The entire length of that road section is upgraded to rigid pavement.

While the beginning point will remain at the at-grade intersection, the 2-lanes of the Tegal Gede Flyover, for which the basic design has been completed by the MPW, will be constructed at the end point on Jl. Cibarsah. The intersection with Jl. Iman Bonjol is to be shifted and improved together with the upgrade of Jl. Iman Bonjol.

b) Jl. Bali

The section with damaged pavement from the bridge on Kalimalang River to the flyover on the Cikampek Toll Road is to be rehabilitated with rigid pavement within the width of the existing road. The single lane flyover on the Cikampek Toll Road is to be constructed next to the existing flyover to increase the lane capacity for 2-way direction.

c) Jl. Iman Bonjol

The road alignment around Kalimarang River is to be modified to be straight and the intersection with Jl. Kalimarang is to be improved. A newly constructed skew bridge has 4 lanes while the existing road from Kalimarang River to the overpass bridge on Cikampek Toll Road is to be improved with rigid pavement within the existing width for 2 lanes.

d) Dry port access road

The project is composed of the arterial road, which connects the dry port in JABABEKA with the south of Cikarang industrial area, a new interchange at 29km on Cikampek Toll Road and a toll gate. JABABEKA, the other industrial states and MPW are now coordinating to finalize the project scope, the design concept and the road design. The project image of the dry port access road is shown in Figure 4.1.47.



Source: JICA Survey Team

Figure 4.1.46 Plan of Cikarang



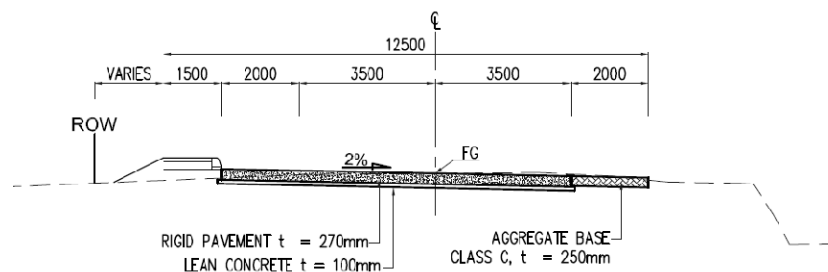
Source: JABABEKA

Figure 4.1.47 Plan of Dry Port Access Road

2) Cross section

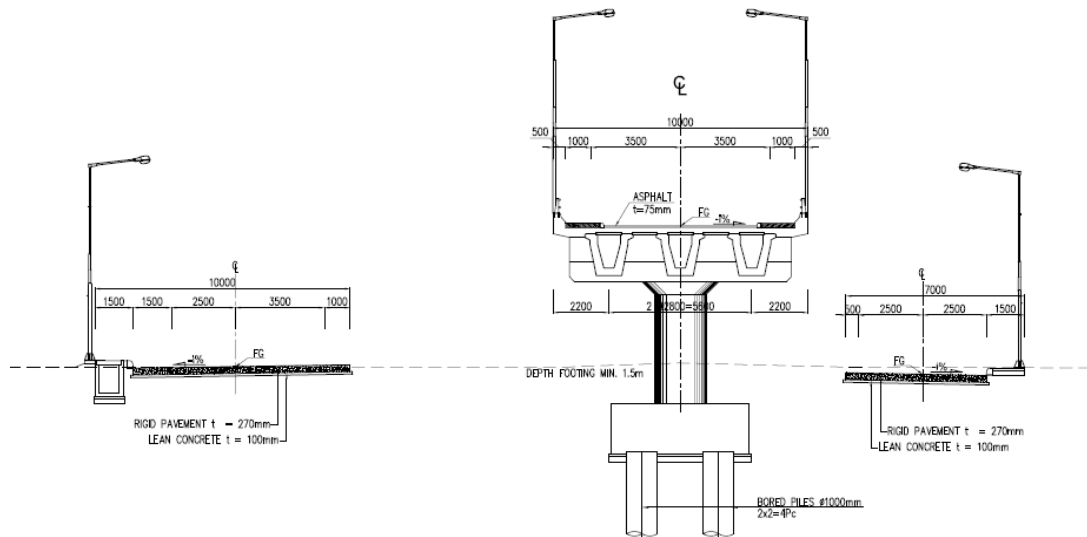
a) Jl. Kalimalang

The road is to be upgraded completed 2-lane road of carriageway with the sidewalk as the same level as the existing road. The 2-lanes of the Tegal Gede flyover and the frontage road at the intersection with Jl. Cibarusah are designed considering the future 4-lanes. The typical cross section is shown in Figure 4.1.48 and Figure 4.1.49.



Source: JICA Survey Team

Figure 4.1.48 Typical Cross Section of Jl. Kalimarang

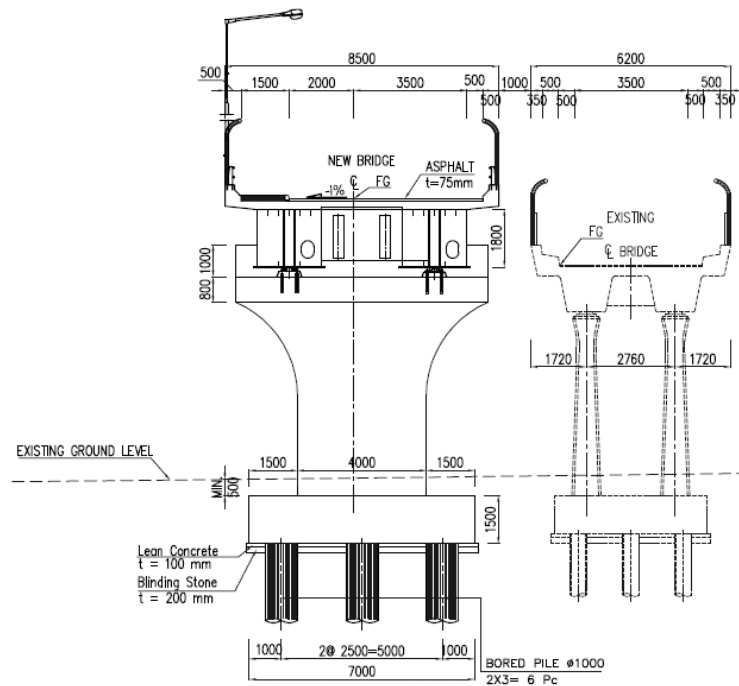


Source: JICA Survey Team

Figure 4.1.49 Typical Cross Section of Tegal Gede Flyover

b) Jl. Bali

The total width of the new bridge on Cikampek Toll Road is 7.5m for 1-lane of carriageway, shoulder and sidewalk. The typical cross section is shown in Figure 4.1.50.

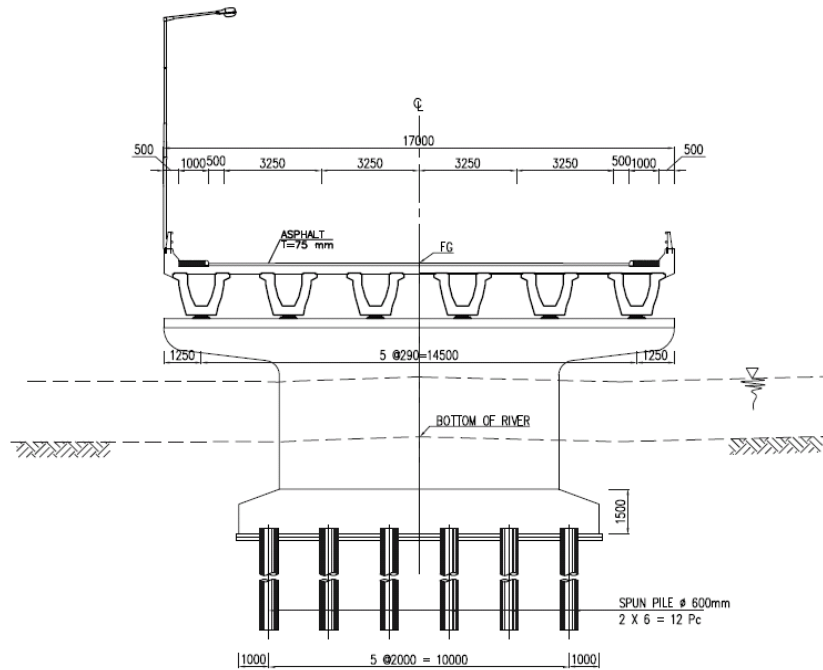


Source: JICA Survey Team

Figure 4.1.50 Typical Cross Section of Overpass Bridge on Cikampek Toll Road on Jl. Bali

c) Jl. Iman Bonjol

The width from the bridge on Kalimantan River to the bridge on Cikampek Toll Road should be same as the existing road. The only new bridge on Kalimantan River has 4-lanes which is the same as the concrete arch bridge on Jl. Bali. The typical cross section is shown in Figure 4.1.51.



Source: JICA Survey Team

Figure 4.1.51 Typical Cross Section of New Bridge on Jl. Iman Bonjol

3) Plan and profile

a) Jl. Kalimantan

The road alignment basically traces the existing road. At the intersection with Jl. Cibarusah, a 2-lane flyover is to be constructed along Jl. Kalimantan. The frontage road of the intersection is planned considering the future expansion for 4-lanes.

b) Jl. Bali

The overpass bridge on Cikampek Toll Road is to be newly constructed parallel to the existing bridge on the east side. The vertical alignment of the overpass bridge is about 1.5m higher than the existing bridge to secure the vertical clearance of Cikampek Toll Road.

c) Jl. Iman Bonjol

The road alignment basically follows the existing road and the road surface is to be rehabilitated. A new bridge is to be constructed on Kalimantan River on a skew to make the road alignment of Jl. Iman Bonjol straight. Accordingly, the intersection is also improved.

4) Other considerations

a) Jl. Kalimantan

As the existing road is located along the canal, it is necessary to coordinate with the irrigation office regarding the road alignment and the boundary of the river. A retaining wall or sheet piles will be installed where the road facilities invade the irrigation property.

b) Jl. Bali

A slope is applied between the existing and the new bridge to adjust the gap in elevation. A retaining wall is to be installed at the edge of the slope.

(10) Senayan

1) Study of suitable improvement

a) Alternatives

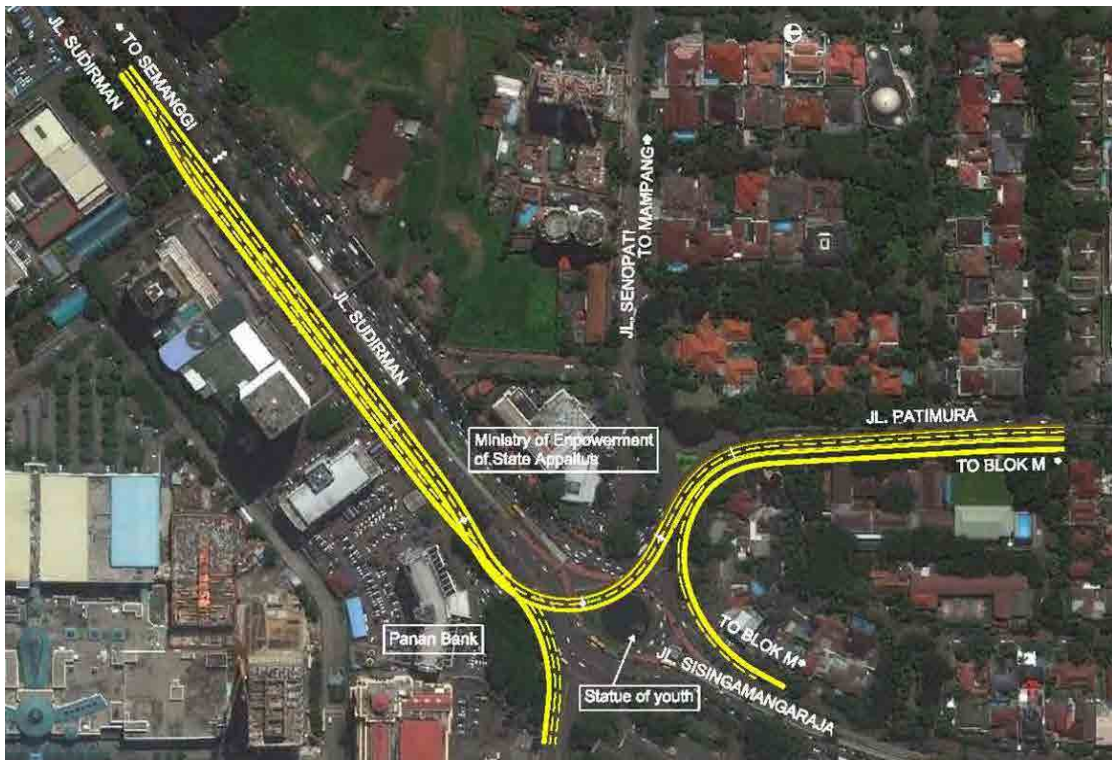
Five alternative plans are proposed for the improvement as follows.

- Alternative 1: Flyover through the roundabout

To move the traffic from Jl. Patimura to Jl Sudirman, a 2-lane 1 direction flyover will be constructed above the roundabout. As Jl. Patimura currently has a 2-lane carriageway with 1-lane frontage road, the main lane is used as the bridge and the frontage road would be changed to a left-turn lane. Therefore, the traffic flow from Jl. Patimura to the roundabout will be impossible.

On the other hand, the flyover reaches between the fast lane and slow lane on Jl. Sudirman. The width of the slow lane should be reduced to secure the space for the flyover and avoid land acquisition.

This alternative is rejected because of the environmental regulations in DKI which stipulate that it is not allowed to construct any structure on Jl. Sudirman.



Source: JICA Survey Team

Figure 4.1.52 Plan of Alternative 1 and 2

- Alternative 2: Underpass through the roundabout

The alignment is almost the same as Alternative 1 but it is an underpass structure. The main problem is the conflict with the MRT which will be constructed underneath Jl. Sudirman and Jl. Sisingamangaraja. If it is difficult to modify the alignment of MRT, the underpass for the road has to be constructed under the MRT.

For the above reason, Alternative 2 is significantly difficult to implement.

- Alternative 3: Improvement to signalized intersection

Different from Alternatives 1 and 2, this is not a structural improvement but an at-grade improvement. Changing from a roundabout type to signalized intersection makes the traffic flow smooth and average travel speed faster. As the affected area of the intersection is decreased, no land acquisition is required.

This alternative is rejected because it is not allowed to remove the pond and symbolic statue from the roundabout which are to be temporarily relocated during the construction of MRT.



Source: JICA Survey Team

Figure 4.1.53 Plan of Alternative 3

- Alternative 4: Flyover and traffic management around the roundabout

The contents of this alternative are the combination of a structural improvement and traffic management near the roundabout instead of the improvement at the roundabout itself. Some plans are proposed as follows.

- Flyover on Jl. Patimura and Jl. Sisingamangaraja
- Underpass on Jl. Asia Africa
- Traffic management (change the traffic direction)

To find the best solution, a detailed study will be necessary based on the traffic survey and analysis around the wider area of Senayan.



Source: JICA Survey Team

Figure 4.1.54 Plan of Alternative 4

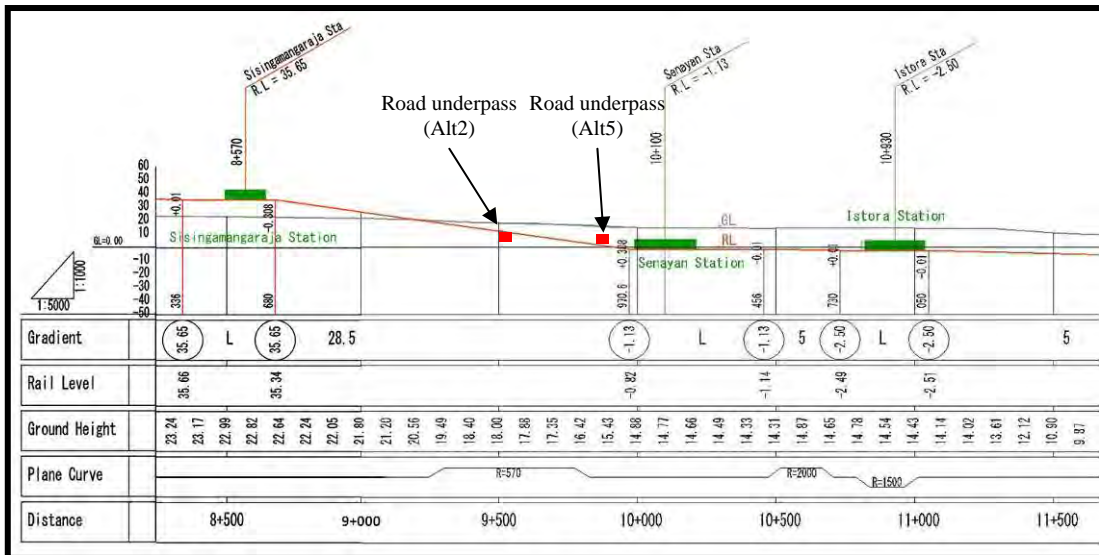
- Alternative 5: Underpass through Jl.Patimura

This is an underpass from Jl. Patimura to Jl. Sudirman along the existing road. The road underpass could be passed above the MRT but modification of the alignment of MRT is still necessary.



Source: JICA Survey Team

Figure 4.1.55 Plan of Alternative 5



Source: Ministry of Public Works

Figure 4.1.56 Profile of MRT

b) Comparison of alternatives

As it is not allowed and impossible to construct the flyover and underpass through the roundabout, the JICA Survey Team recommended Alternative 3 as an urgent measure until the MRT opens in 2016. However, the consensus among DKI, MPW and the JICA Survey Team has not built yet due to reasons as below;

- As the alignment of MRT is not fixed yet, it is required to coordinate with the MRT project in order to avoid conflict with the project. Therefore careful further study is necessary.
- The removal of the roundabout with the pond and statue is required time-consuming discussion and coordination among relevant organizations.

Also DKI and MPW request further study to find a solution based on Alternative 4. For further study to find the improvement method, an additional traffic survey is necessary.

The comparison table for the alternatives is shown in Table 4.1.59.

Table 4.1.59 Comparison of Alternatives for Senayan Intersection

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Outline	Flyover above the roundabout	Underpass below the roundabout	At-grade at the roundabout	Flyover on Jl. Sisinga-mangaraja and Jl. Patimura	Underpass from Jl. Patimura to Jl. Sudirman
Structure	Flyover	Underpass	At-grade	Flyover	Underpass
Positive Impacts	<ul style="list-style-type: none"> The traffic from Jl. Patimura to Jl. Sudirman is isolated from the roundabout by flyover. 	<ul style="list-style-type: none"> The traffic from Jl. Patimura to Jl. Sudirman is isolated from the roundabout by overpass. 	<ul style="list-style-type: none"> The compact signalized intersection make the traffic flow smooth. 	<ul style="list-style-type: none"> The traffic signal could be removed from the roundabout as there will no traffic flow from Jl. Patimura and Jl. Senopati 	<ul style="list-style-type: none"> The traffic from Jl. Patimura to Jl. Sudirman is isolated from the roundabout by underpass.
Negative Impacts	<ul style="list-style-type: none"> It is necessary to construct the flyover above the intersection. 	<ul style="list-style-type: none"> The underpass will be considerably deep and long in order to pass across under the planned MRT The traffic flow on Jl. Sudirman will be controlled during the construction. 	<ul style="list-style-type: none"> It is necessary to replace or remove the statue and pond at intersection. 	<ul style="list-style-type: none"> All traffic from south will be shifted to Jl. Sisinga-mangaraja. The direct traffic from Jl. Patimura and Jl. Senopati to Jl. Sudirman through the roundabout will be closed. 	<ul style="list-style-type: none"> It is necessary to revise the vertical alignment of MRT to secure the space for underpass for road. The traffic flow on Jl. Sudirman will be controlled during the construction.
Construction Cost	High	Very high	Low	High	Very high
Construction Period	2 years	3 years	1 year	2 years	3 years
EIA Scheme	UKL/UPL	UKL/UPL	UKL/UPL	UKL/UPL	UKL/UPL
Land Acquisition	A little	A little	None	A little	A little
Evaluation	++	+	+++	++	+

Source: JICA Survey Team

4.1.5 Summary of Basic Design

The summary of basic design is shown in Table 4.1.60.

Table 4.1.60 Summary of Basic Design

Potential projects	FO/UP	Improvement length		Number of lanes and width		Railway crossing	
		Overall	Structure	Main road	Frontage road		
1 Semanggi	At-grade	-	217m-	-	-		
2 R.E. Martadinata	FO	725m	532m	2x2 (8.5mx2)	2x2	●	
3 Sulawesi - Tg.PA	FO	665m	318m	2x2 (8.5mx2)	2x2	●	
4 Kuningan	UP	1,147m	1,018m	2x2 (18.5m)	2x2		
5 Pancoran	FO	887m	634m	2x1 (8.0m)	2x1		
6 Pinang Baris	FO	886m	533m	2x2 (17.0m)	2x2		
7 Katamso	UP	625m	360m	2x2 (19.0m)	1x2		
8 Sudirman II	FO	985m	570m	2x2 (17.0m)	2x2	●	
9. Cikarang	Kalimarang	At-grade (1 FO)	7,780m	190m	1x2 (12.5m)	-	
	Bali	Overpass bridge	360m	71m	1x1 (8.5m)	-	
	Iman Bonjol	At-grade (1 bridge)	1,750m	50m	1x2 (7.0m)	-	
	Dry port access road	-	-	-	-	-	
10 Senayan	-	-	-	-	-		

Source: JICA Survey Team

Note: The figure in the “number of lanes on main road” shows the number of lanes and directions