(4) Promotion of Bus Service Level

This section discusses the short-term plan in relation to bus transport in the CPA. In order to promote the service level of bus transport system in the CPA, a bus priority lane system is proposed to achieve a smooth bus operation.

1) Bus Priority Lane System

a. Plan Locations

The plan is based on the Master Plan for public transport system and the analysis of the current serious traffic congestion. This plan will cover the key bus routes on major roads in order to achieve a smooth bus flow. Proposed locations, including the existing bus priority lanes, are shown below (see Figure 9.2.12).

- Jalan Pahang: Jalan Tun Razak - Jalan Ipoh (0.8km)
- Jalan Ampang: Jalan Tun Razak - Jalan Munshi Abudullah (2.85km)
- Jalan Ipoh: Jalan Tun Razak - Jalan T. Abdul Rahman (0.8km)
- Jalan Raja Laut Jalan Tun Perak - Jalan Ipoh (1.9km)
- Jalan T. Abdul Rahman Jalan Tun Perak - Jalan Ipoh (2.0km)
- Jalan Raja Chulan Jalan Tun Perak - Jalan Bukit Bintang (2.15km)
- Jalan Tun Perak Jalan T. Abdul Rahman - Jalan Raja Laut ( 0.5km)
- Jalan Parlimen Lebuhraya Mahameru - Jalan T. Abdul Rahman (0.25km)
- Jalan Pudu Jalan Yew - Jalan Cheng Lock (2.45km)
- Jalan Loke Yew Jalan Sungai Besi - Jalan Sultan Sulaiman (2.2km)
- Jalan Cheng Lock Jalan Nirwana - Jalan Tun Perak (0.6km)

b. Operating Method

i Time Periods for Bus Priority Lane System

The bus priority lane system will be used so that priority is given to inbound bus traffic during the morning peak hours and to outbound bus traffic during the evening peak hours. These time periods are the same as those for the reversible flow lane system. In this system which is combined with the reversible flow lane system, one lane will be allotted as a bus priority lane during the peak hours. The time periods for usage of the bus priority lane system are as follows:

- Morning peak hour (inbound bus traffic) 7:00 - 9:00
- Evening peak hour (outbound bus traffic) 16:30 - 18:30

ii Traffic Operation System

In the bus priority lane system, one inbound lane will be allotted as the bus priority lane in the morning peak hours, and one outbound lane will be allotted as the bus priority lane in the evening peak hours. In the case of a 4-lane dual-way road, priority is given to buses on one inbound lane in the morning with two others used as inbound lanes and one as an outbound lane, and vice versa in the evening.

Upon the implementation of the bus priority lane plan, parking restriction must be carried out to maintain the bus lane capacity, and it is also necessary for the traffic police to keep other vehicles out of the bus priority lane. Road markings and guide signs should be installed to secure a smooth bus flow. In addition, conflict between buses and left-turn traffic at intersection should be controlled by a bus priority signal light.

c. Bus Priority Lane System outside CPA

In order to enable bus passengers to move more smoothly into and out of the CPA bordered by the Middle Ring road, the bus priority lane system should be expanded to outside the CPA. The locations of the bus priority lane system will be proposed based on the strategies of bus operating/re-routing plan and the observation of the current traffic conditions. The locations of the bus priority lane system outside the CPA are shown below and in Figure 9.2.13.

- Jalan Pahang: Jalan Tun Razak - Jalan Genting Kelang (2.05km)
- Jalan Ampang: Jalan Tun Razak - Jalan Lingkaran Tengah (2.70km)
- Jalan Ipoh: Jalan Tun Razak - Jalan Kuching (4.50km)
- Jalan Cheras Jalan Tun Razak - Jalan Lintasan Tengah (3.70km)
- Jalan Loke Yew Jalan Tun Razak - Jalan Cheras (2.30km)
- Jalan Syed Putra Jalan Istana - Lebuhraya Persekutuan (2.50km)
- Jalan Semantan Lebuhraya Mahameru - Jalan Beringin (2.50 km)

(5) Improvement of Pedestrian Facilities

The current problems and issues relating to pedestrians are as below;

- The proportion of accidents involving pedestrians in KL is high and have been growing in number over the last decade. The statistics of locations of pedestrian accidents indicate that most of the accidents occurred on carriageways. It implies that more traffic safety facilities are necessary, as well as an enhancement of education on traffic safety.
- Pedestrian bridges are insufficient in number. More pedestrian bridges are needed along the arterial roads.
- Most sidewalks are not well designed for pedestrians. The sidewalks on major roads inside the CPA should be improved to create better urban amenities and a safer environment.

The above-mentioned current problems involving pedestrians such as the lack of pedestrian crossing facilities and other pedestrian facilities must be improved at a higher priority than practised now in order to ensure a safe pedestrian environment.

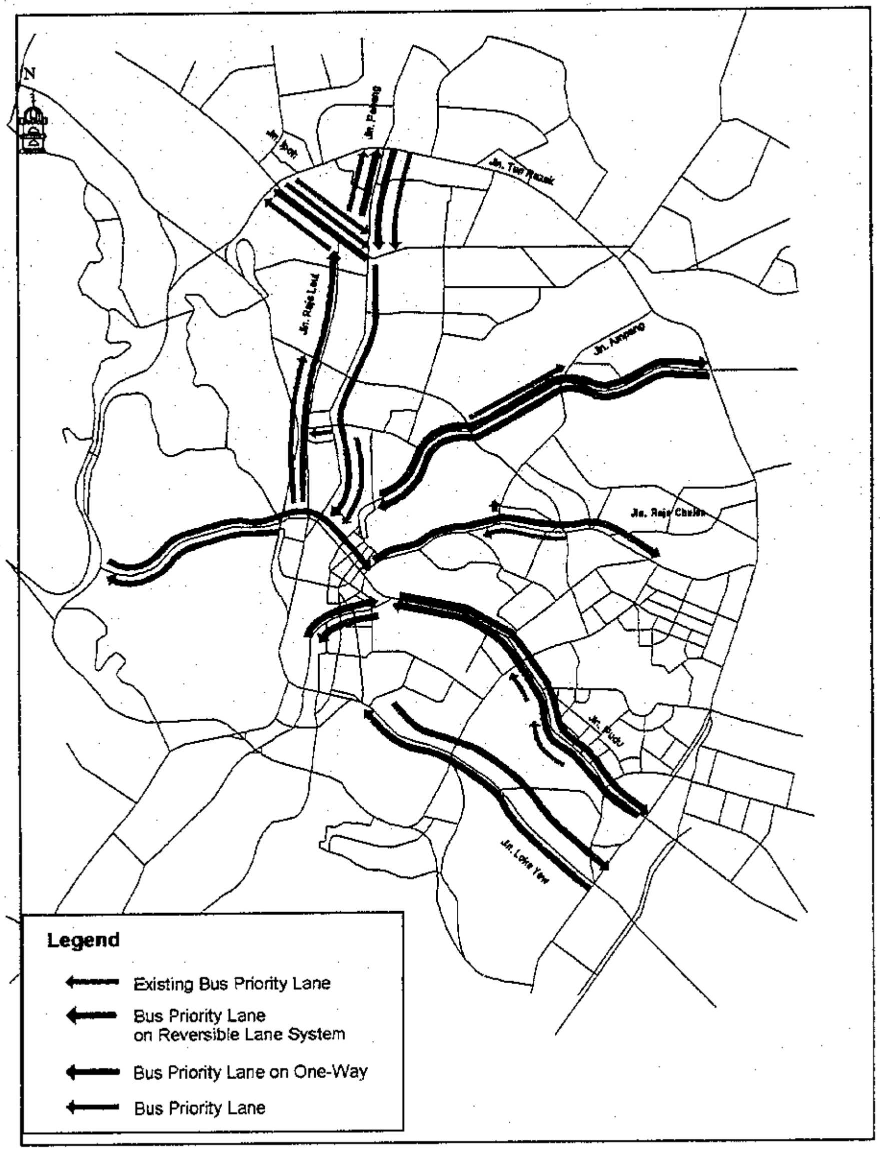



**Figure 9.2.12 Bus Priority Lane Plan (inside CPA)**

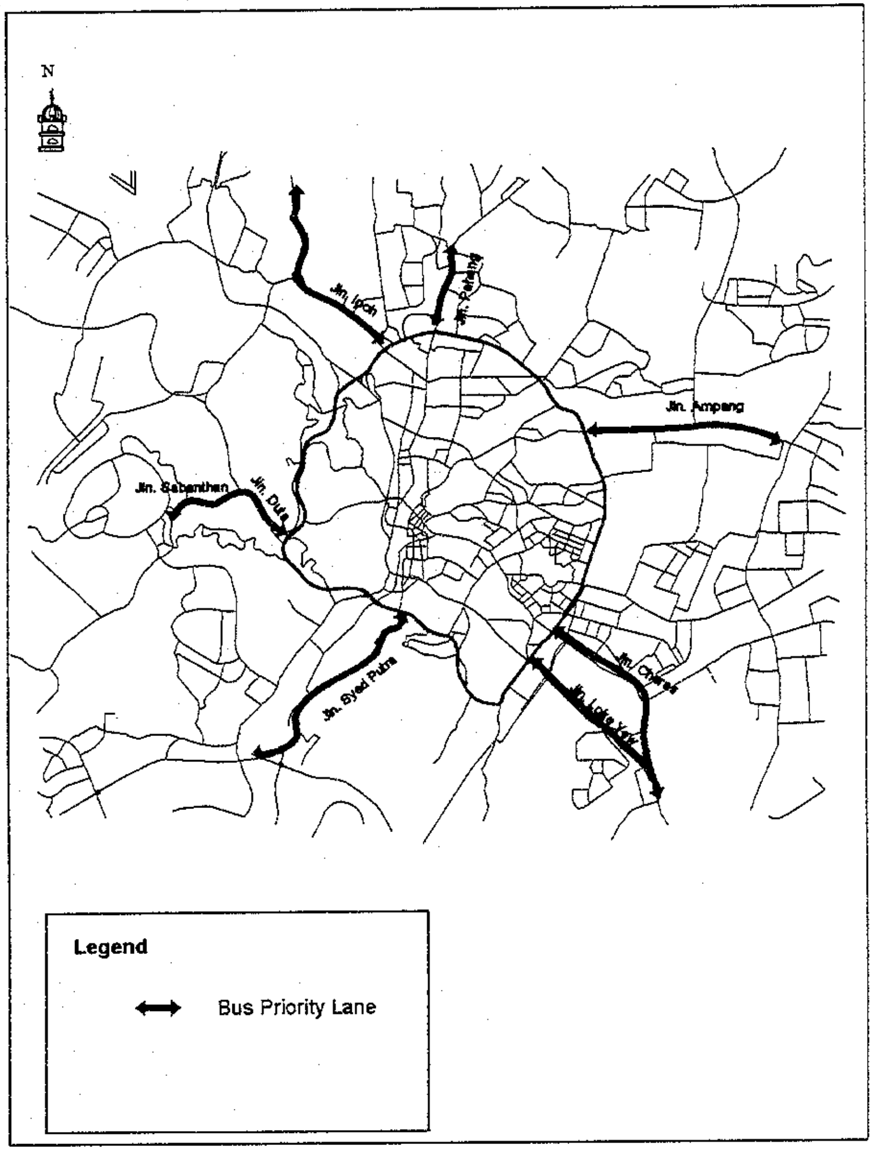



**Figure 9.2.13 Bus Priority Lane Plan (outside CPA)**

Pedestrians in Malaysia are generally accorded a low priority compared to those in other major cities in Asia. It is observed that drivers generally pay little attention to pedestrians even when pedestrians are using a zebra crossing at an intersection. This attitude must be changed, with the pedestrian traffic considered to be as important as vehicular traffic through the provision of safe and convenient facilities and right-of-way.

The objectives of the development of pedestrian facilities in the CPA are;

- To prevent pedestrians from "Jay-walking",
- To ensure a safe pedestrian environment, and
- To create "Pedestrian-friendly" facilities.

Based on foregoing current problems and consideration, the following four plans are proposed for pedestrian safety.

1) Signalised pedestrian crossing
2) Pedestrian crossing bridge
3) Scramble pedestrian crossing
4) Sidewalk improvement

1) Signalised Pedestrian Crossing

In order to prevent pedestrians from "jay-walking" and to ensure a safe pedestrian environment, it is recommended that signalised pedestrian crossings should be installed on the roadside between signalised intersections.

a. Locations

The signalised pedestrian crossing should be provided on the points where both vehicular and pedestrian traffic intermingles to a high degree and when the distance to the adjacent signalised intersection is more than 200 metres. In determining the locations for the signalised pedestrian crossings, the following criteria should be used:

- Both vehicular and pedestrian traffic intermingles to a high degree,
- The distance to the adjacent signalised intersection is more than 200 metres,
- 4-lane dual-way roads, and
- No pedestrian bridges provided.

Signalised pedestrian crossings should be constructed at eighty-seven (87) locations on the road segments, which total approximately 17.0 km in length, as shown in Figure 9.2.14. However, large-scale roads with six (6) lanes are excluded from the installation of signalised pedestrian crossings.

b. Signalised System

The signalised system for pedestrians is not independently controlled; each pedestrian signal must be established in co-ordination with the signal control of the adjacent intersections. Signal control system on major roads should also be improved for a better pedestrian environment.

2) Pedestrian Crossing Bridge

A pedestrian bridge plan in the CPA is proposed in order to complement the signalised pedestrian crossings.

a. Locations

The following segments are considered to be possible locations for pedestrian crossing bridges.

- Segments where both vehicular and pedestrian traffic intermingles to a high degree,
  - By schools and hospitals which have many pedestrians and a high vehicular traffic volume,
  - By bus transfer locations which have many pedestrians and a high vehicular traffic volume, and
  - In commercial areas with large buildings, many pedestrians, and a high vehicular traffic volume.

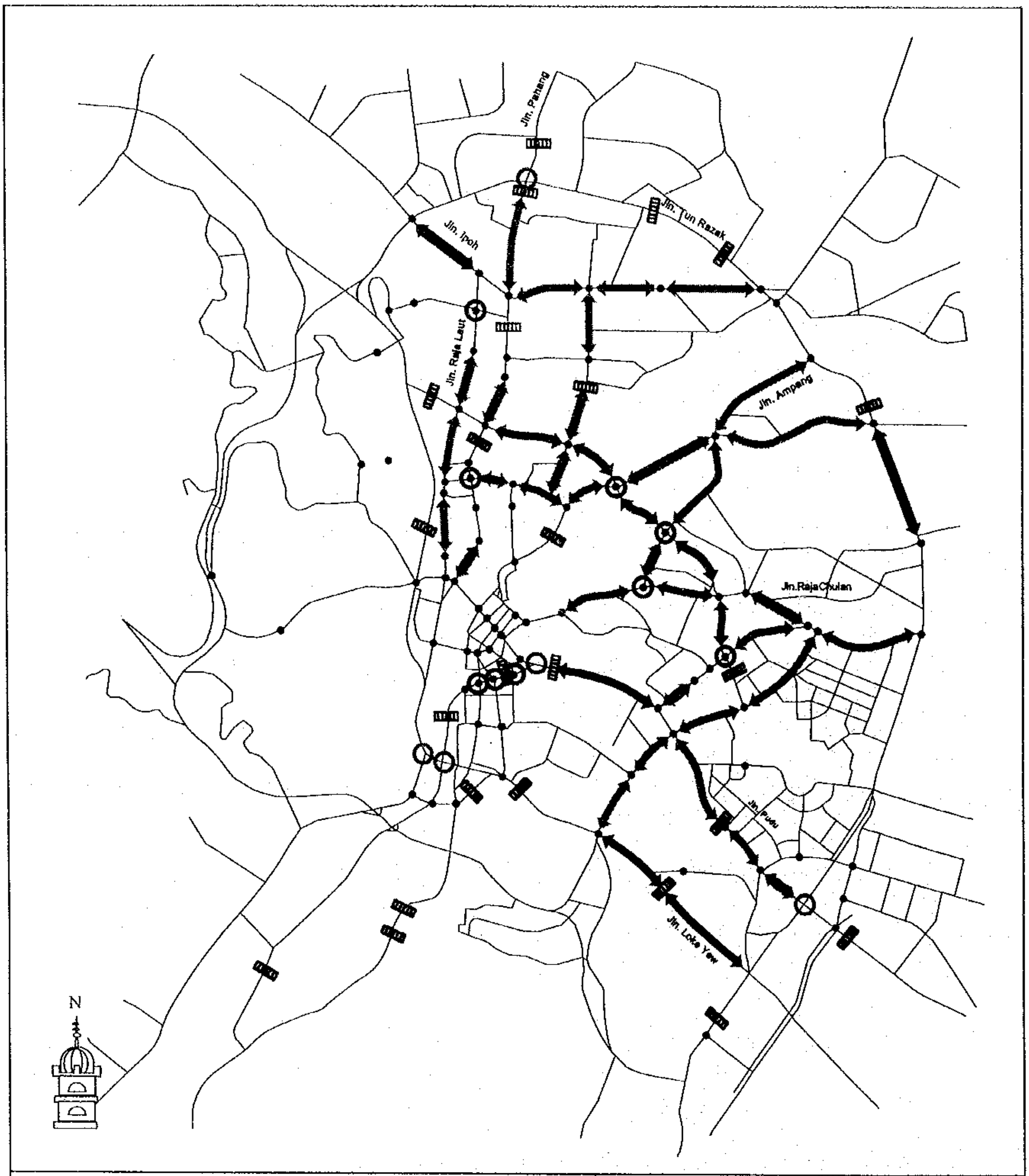
- Areas where vehicle-pedestrian accidents occur frequently,

- Dual-way roads with 6 lanes or more without any safety zones to allow pedestrians to stand safely.

Pedestrian crossing bridges should be constructed at twenty-five (25) locations on the road segments, which total approximately 5.5 km in length, as shown in Figure 9.2.14.

3) Scramble Pedestrian Crossing

At intersections on arterial roads with many pedestrians, where there is a conflict between the pedestrians and left-turn vehicular traffic, traffic accidents involving pedestrians will frequently occur. In order to minimise the crossing time and distance of pedestrians on the carriageway and to contribute to pedestrian safety, scramble pedestrian crossings are recommended at signalised intersections with many pedestrians.




**LEGEND**

- Existing Signal Light
- Newly Signalised Intersections
- Existing Pedestrian Bridges
- Segments for Signalised Pedestrian Crossing
- Pedestrian Bridges
- Scramble Pedestrian Crossing

**Figure 9.2.14**

**Location Plan for Pedestrian Facilities**

SMURT-KL
STUDY ON INTEGRATED URBAN TRANSPORT STRATEGIES FOR ENVIRONMENTAL IMPROVEMENT IN KUALA LUMPUR
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

a. Locations

Scramble pedestrian crossings should be provided at signalised intersections where both vehicular and pedestrian traffic intermingles to a high degree in commercial and business areas. Nine (9) locations, such as Jalan Sultan Ismail - Jalan Bukit Bintang, Jalan T. Abdul Rahman - Jalan Dang Wangi, and Jalan Cheng Lock - Jalan Petaling, are proposed here. They are shown in Figure 9.2.14.

b. Layout of a Scramble Pedestrian Crossing

There are two types of scramble pedestrian crossing: part-time operation and whole-day operation. A layout of a scramble pedestrian crosswalk is shown in Figure 9.2.15.

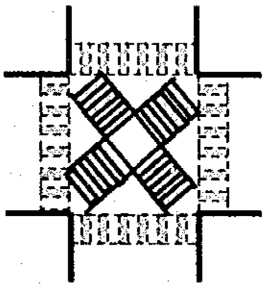


**Figure 9.2.15 Layout of a Scramble Pedestrian Crossing**

c. Scramble Control of Signal

A scramble control can be used for an intersection with many pedestrians. A pedestrian-exclusive signal phase is incorporated, and it is equivalent to the all-red phase for vehicular traffic. In calculating the cycle length and the saturation ratio, the time required for the pedestrian-exclusive phase is regarded as a loss time. The duration of the pedestrian-exclusive phase is determined from the physical size and structure of the intersection and calculated as the time required to cross the intersection. Since this signal control system gives priority to crossing pedestrians, the vehicular capacity at the intersection will be decreased. Therefore, the implementation of the scramble control must be adjusted to the traffic congestion situation. An example of scramble control is shown in Figure 9.2.16.

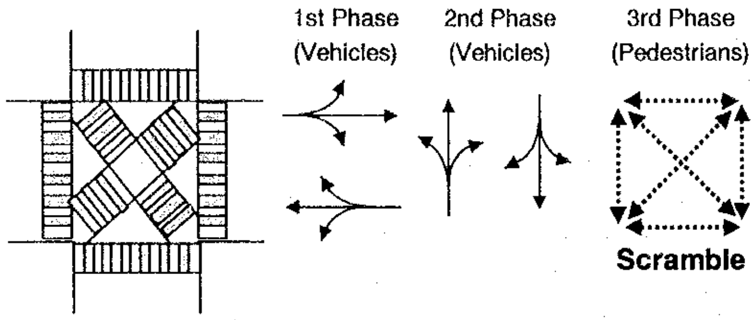



**Figure 9.2.16 An Example of the Scramble Control**

4) Sidewalk Improvement

In order to decrease traffic accidents involving pedestrians and create more pedestrian-friendly sidewalks, sidewalks on major roads inside the CPA should be improved.

a. Current Conditions of Sidewalks

Figure 9.2.17 shows the width of sidewalks on the arterial roads in the CPA. Most sidewalks are not pedestrian-friendly due to their insufficient width, averaging approximately 1.5 - 2.0 metres, and their excessive height from the road. It is necessary for sidewalks with poor conditions to be improved as much as possible. Locations of sidewalks with poor conditions on major roads are listed as below;

- Eastern and southern part of Jalan Sultan Ismail, Jalan Imbi, and Jalan Hang Tuah (Inner Ring Road),
- Jalan Tun Razak (Middle Ring Road),
- Jalan Ampang,
- Jalan Pudu - Jalan Tun Perak,
- Jalan Raja Chulan, and
- Jalan Loke Yew.

b. Strategies for Improvement of Sidewalks

The improvement of sidewalks takes into account the following strategies based on the issues. The strategies are as follows.

It is very difficult to widen all of the existing sidewalks inside the CPA in the short-term. Therefore, in order to create more pedestrian-friendly sidewalks in the important areas such as access roads with many pedestrians near the KTM, PRT, and LRT (System I and II) stations, the following measures are recommended in order to improve the pedestrian environment. These measures are composed of pedestrian safety / amenity facilities, pedestrian malls / semi-pedestrian malls, and partial widening of sidewalks.

- Pedestrian safety / amenity facilities,
- Pedestrian malls / semi-pedestrian malls (as community streets), and
- Partial widening of sidewalks.

c. Locations

This plan will cover the access roads to the PRT, KTM, and LRT (System I and II) railway stations inside the CPA.

d. Passenger Flow

Figure 9.2.18 shows the passenger flow diagram based on the walking distance. Taking the walking distance into consideration, the railway service area for passengers on foot is established as having a radius of 350 metres. From this passenger flow diagram at these railway stations, the following issues are considered;

- There is a poorly serviced area on Jalan Raja Chulan surrounded by the routes of PRT, LRT I, and LRT II. A linkage pedestrian route between Jalan Tun Perak and Jalan Sultan Ismail should be considered.
- The distance between Wawasan Stn. and P. Ramlee Stn. of the PRT is long. Pedestrian route with amenity facilities should be considered between the two stations.
- Based on the foregoing, Sultan Ismail Stn. of LRT II is located far from the stations of PRT. A pedestrian route with pedestrian safety/amenity facilities for transferring should be considered.
- Pedestrian safety / amenity facilities should be considered for transfers between Sultan Ismail Stn. of LRT I and Wawasan Stn. of PRT.
- The PRT route along Jalan Sultan Ismail, Jalan Hang Tuah, and Jalan T. Abdul Rahman, which forms the circumferential access and the partial north-south axis, would be an effective distributor of the CBD traffic. Pedestrian safety / amenity facilities should be considered along the PRT route.
- In the same way, pedestrian / amenity facilities should be considered along Jalan Ampang of LRT II.
- The crossing point of Benteng Stn. of LRT I and Masjid Jamek Stn. of LRT II is important as a major inter-modal point of public transport for the CBD, once mass transit facilities such as railway and bus terminals are established. The pedestrian routes must have enough capacity to allow a concentrated volume of pedestrian traffic to flow into and out of the business/commercial centre.
- Amenity facilities should be considered on access roads from Kg. Baharu Stn. of LRT II for more placid traffic environment, in order to promote the service level of pedestrian environment.


Figure 9.2.17 Current Sidewalk Width on Major Roads

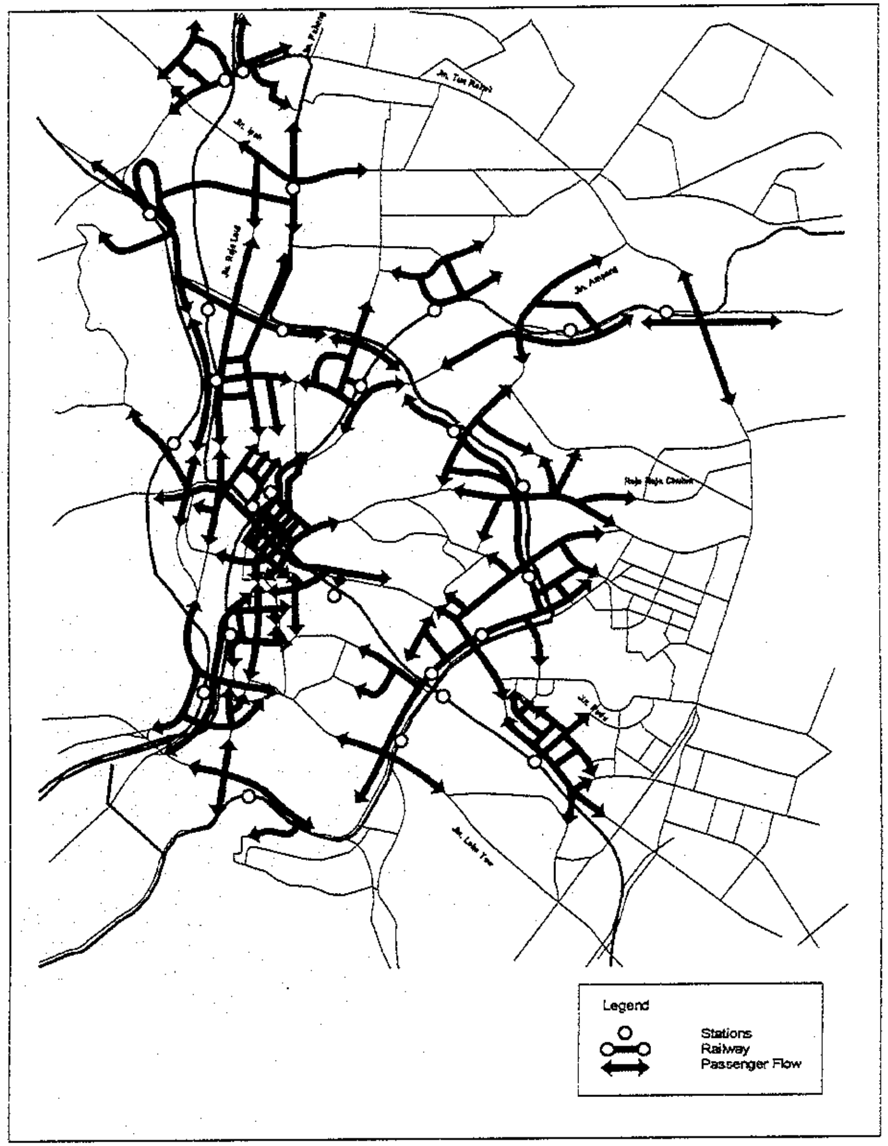



Figure 9.2.18 Passenger Flow Diagram Based on Walking Distance

e. Concept of Major Pedestrian Flow

Figure 9.2.19 shows the pedestrian flow in important areas of the CPA. Based on the above-mentioned issues, the concept of major pedestrian flow is defined as below.

- The pedestrian flow axis from the inter-modal point of Benteng Stn. to Masjid Jamek Stn. should be established so that it may enhance the linkage of the neighbouring business / commercial centres such as Sogo, Chinatown, and Golden Triangle.

- The pedestrian flow routes for transferring between Sultan Ismail Stn. of LRT II and Wawasan Stn. / Sultan Ismail Stn. of PRT, and between Sultan Ismail Stn. of LRT I and Wawasan Stn. of PRT should be established.

- The pedestrian flow axis for accessing stations along the major roads along the PRT route and partial segments of LRT II route should be established.

- The pedestrian flow axis between Kg. Baharu Stn. of LRT II and the residential area should be established.

f. Pedestrian Facilities Plan

Figure 9.2.20 shows the pedestrian facilities plan. Based on the above-mentioned situation of the current sidewalks and the concept of pedestrian flow, pedestrian facilities are proposed in important areas such as access roads with many pedestrians near the KTM, PRT, and LRT (System I and II) stations.

i. Pedestrian Mall / Semi-Pedestrian Mall

Pedestrian malls and semi-pedestrian malls should be established along the segments of local roads which link to the business / commercial centre and residential area of Kg. Baharu, and which will be used for transfer between the PRT and LRT II stations. The routes for these pedestrian malls must avoid congested roads with poor sidewalks. The proposed routes for pedestrian malls are shown as below.

- Locations
- Between Sogo area and Benteng / Masjid Jamek Stns:
  Jalan Melayu, Lorong T. Abdul Rahman (existing pedestrian mall).
- Between China town area and Benteng / Masjid Jamek Stns:
  Jalan Benteng,. Medan Pasar, Jalan Hang Kasturi (including the existing pedestrian mall).
- Between Wawasan Stn. of PRT and Sultan Ismail Stn. of LRT II:
  Medan Tuanku (including parking space).
- Between Kg. Baharu Stn. and residential area:
  Lorong Raja Muda Musa.

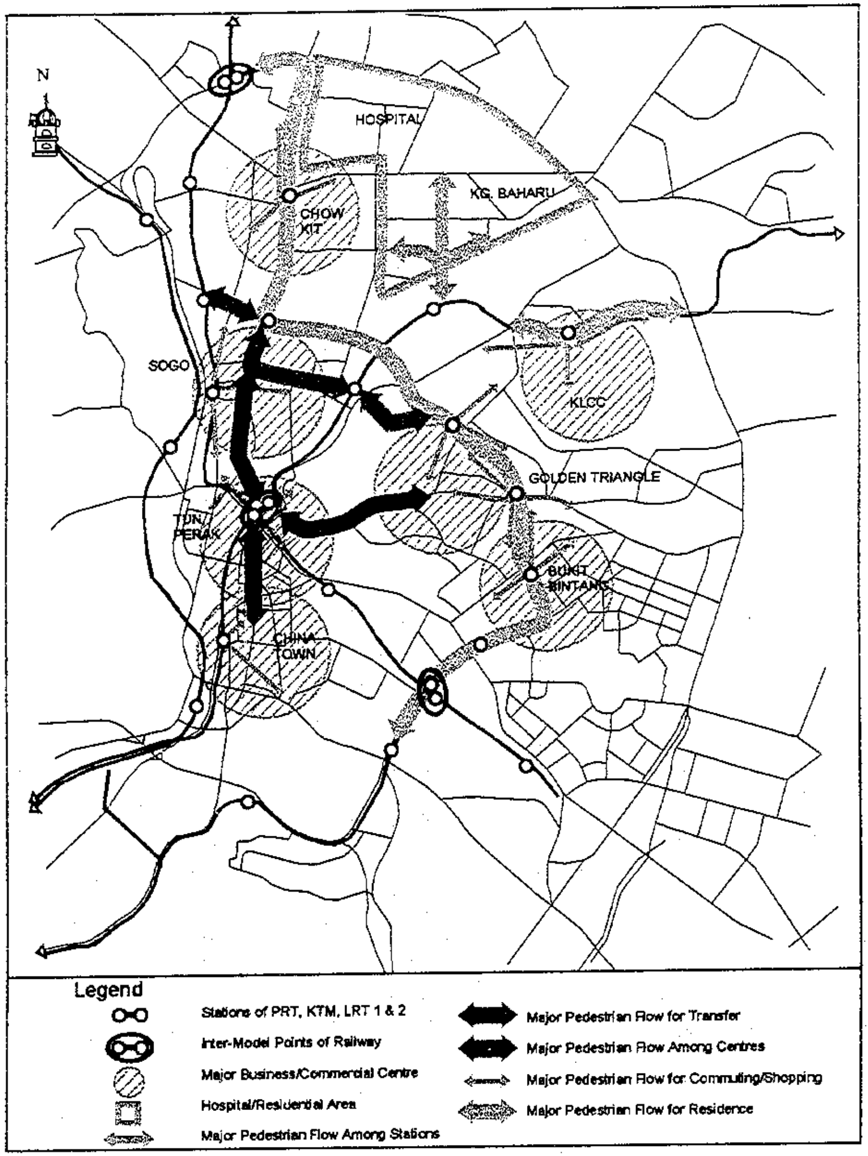



Figure 9.2.19 Concept of Major Pedestrian Flow

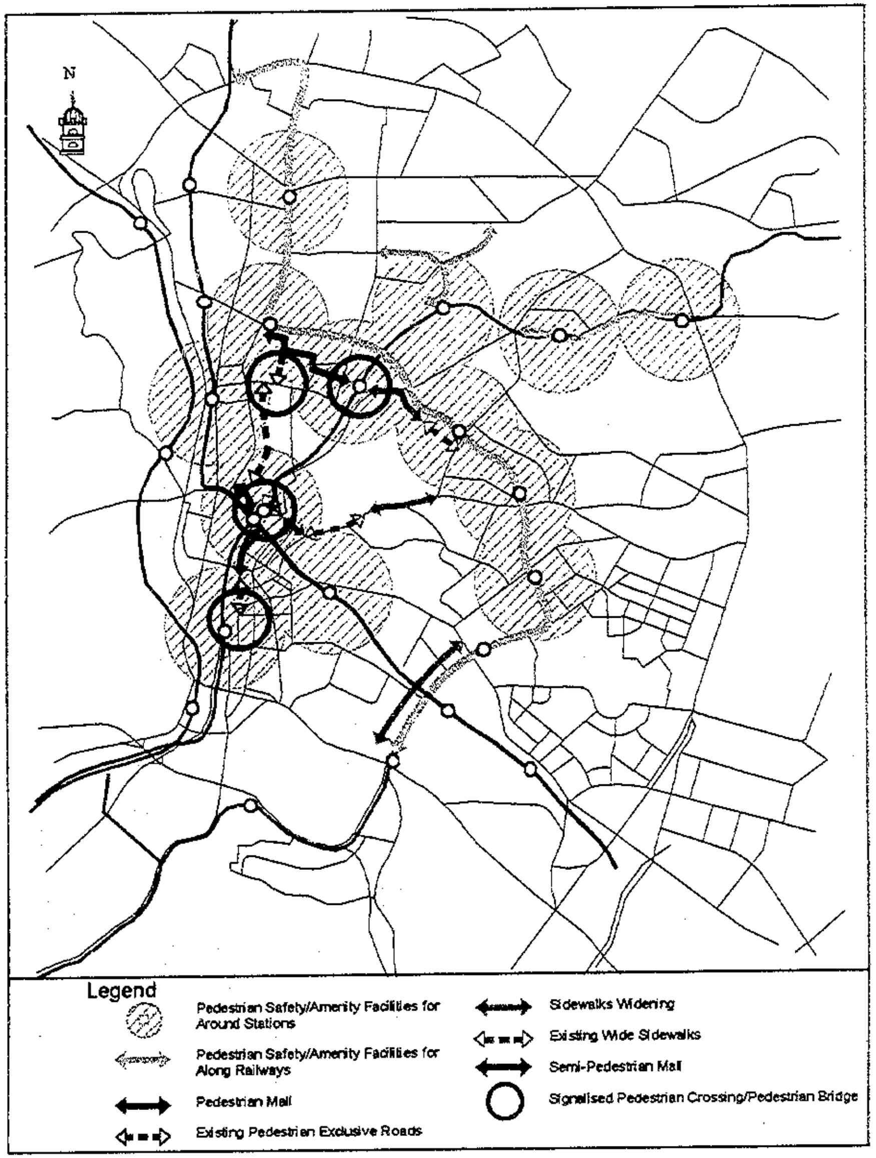



Figure 9.2.20 Proposed Pedestrian Facilities

- Plan Description
  The pedestrian mall will be turned into a community space with shopping malls, street furniture, and greenery. The pedestrian malls will facilitate access to the business / commercial centre and transfer between stations with a total length of approximately 1.3 km. As for semi-pedestrian malls, though they function as pedestrian malls, internal vehicular traffic with a one-way regulation must be considered as well. Semi-pedestrian malls with a total length of approximately 1.1 km are planned. The standard sidewalk width of a semi-pedestrian mall should be 3.0 metres (0.75 metres / person) in order to enable four persons to walk side by side. A layout of these pedestrian malls is shown below (see Figure 9.2.21).

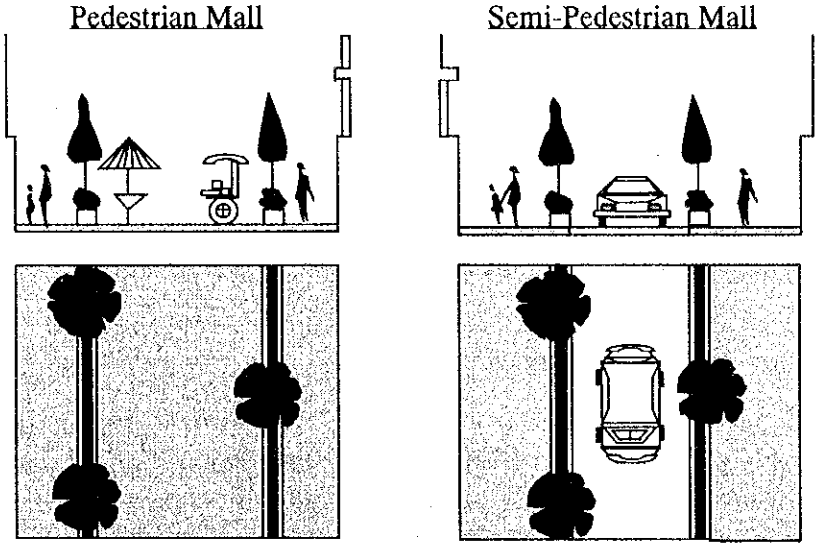



**Figure 9.2.21 Layout of Pedestrian Mall**

ii. Partial Widening of Sidewalks

The pedestrian flow route on Jalan Raja Chulan linking the business / commercial centre of Golden Triangle and the route on Jalan Ampang / Jalan Sultan Ismail for transferring between the stations of PRT / LRT II are located along traffic congested roads with poor sidewalks. Therefore, partial widening of these sidewalks should be conducted along the segments of arterial roads. The areas for partial widening of sidewalks are shown below.

- Locations
  - Between Golden Triangle and Benteng / Masjid Jamek Stns:
    Jalan Gereja, Jalan Raja Chulan.
  - Between PRT and LRT II:
    Jalan Ampang, Jalan Sultan Ismail.

- Plan Description
  The partial widening of sidewalks will create pedestrian space, and ensure safety along Jalan Raja Chulan, Jalan Sultan Ismail, and Jalan Ampang. A total length of approximately 1.0 km is planned. The standard sidewalk width will be assumed to be 3.0 metres. The improved sidewalks should have shelters for the amenity of the pedestrians. The plan for the widening exercise is shown below.

- Route of Jalan Geraja - Jalan Raja Chulan
  The segments to be widened are at two locations: Jalan Gereja and Jalan Raja Chulan. On Jalan Gereja between Lebuh Ampang and Jalan Raja Chulan, a length of approximately 0.1 km is planned. The sidewalks on the northern side of Jalan Gereja will be widened by making use of the parking space. On Jalan Raja Chulan between Pesiaran Raja Chulan and Jalan P. Ramlee, a length of approximately 0.45 km is planned. The sidewalks at Bukit Nanas on Jalan Raja Chulan will be improved by widening the hillside.

- Route of Jalan Ampang - Jalan Sultan Ismail
  At the segment between Shangrila Hotel and Sultan Ismail Stn. of LRT II on Jalan Ampang, a length of approximately 0.45 km is planned for widening. The sidewalks at Bukit Nanas will be improved by widening hillside.

iii. Pedestrian Safety and Amenity Facilities

Pedestrian safety and amenity facilities should be established along the segments of arterial roads with access to the PRT and LRT II stations. Since these routes cannot avoid the traffic congested roads, most of the sidewalks along the arterial roads are not pedestrian-friendly due to their insufficient width and excessive height. Therefore, for the pedestrians' amenity, the edge of the kerbstones should be removed and sloped for pedestrian safety and comfort. The proposed locations are shown below.

- Locations
  - Along PRT: through Jalan Hang Tuah, Jalan Imbi, Jalan Sultan Ismail, Jalan T. Abdul Rahman, Jalan Pahang, and Jalan Tun Razak.
  - Along LRT II: through Jalan Ampang.
  - Among PRT and LRT I: through Jalan Sultan Ismail.

- Plan Description
  The pedestrian safety and amenity facilities are composed of signalised pedestrian crossings, pedestrian bridges, and improved kerbstones to even out the different heights of each sidewalk. Detailed locations will be finalised by the supplemental study. The layout of improvement for kerbstones is shown in Figure 9.2.22.

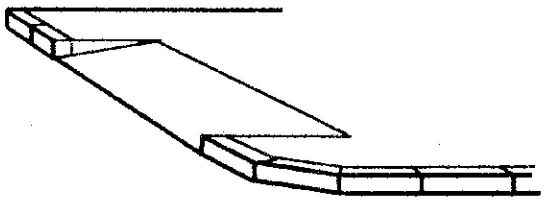


**Figure 9.2.22 Layout of Improvement for Kerbstone on Sidewalk**

### 9.2.3 Traffic Flow Analysis of CPA by Dynamic Simulation

Microscopic Dynamic Traffic Simulation Program has been applied in order to evaluate the short-term CPA traffic control/management plans which were proposed in the previous sections. (Refer to 10.1.6 for more details of this program.) The main objective is to predict how and to what extent private vehicles will be affected by the application of these plans in year 2000.

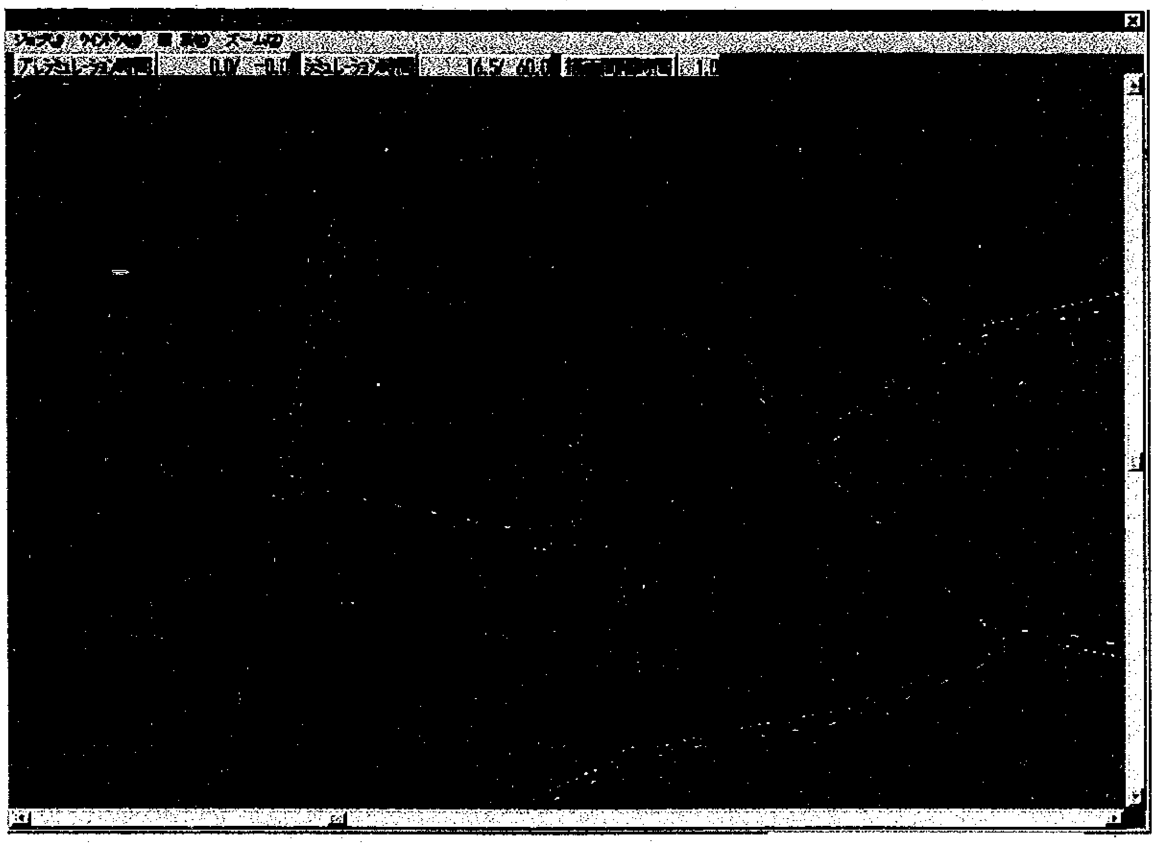


**Figure 9.2.23 An Example of Animation by Dynamic Simulation Program**

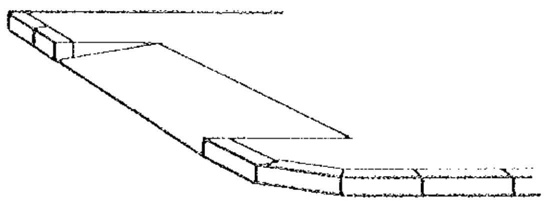


**Figure 9.2.22 Layout of Improvement for Kerbstone on Sidewalk**

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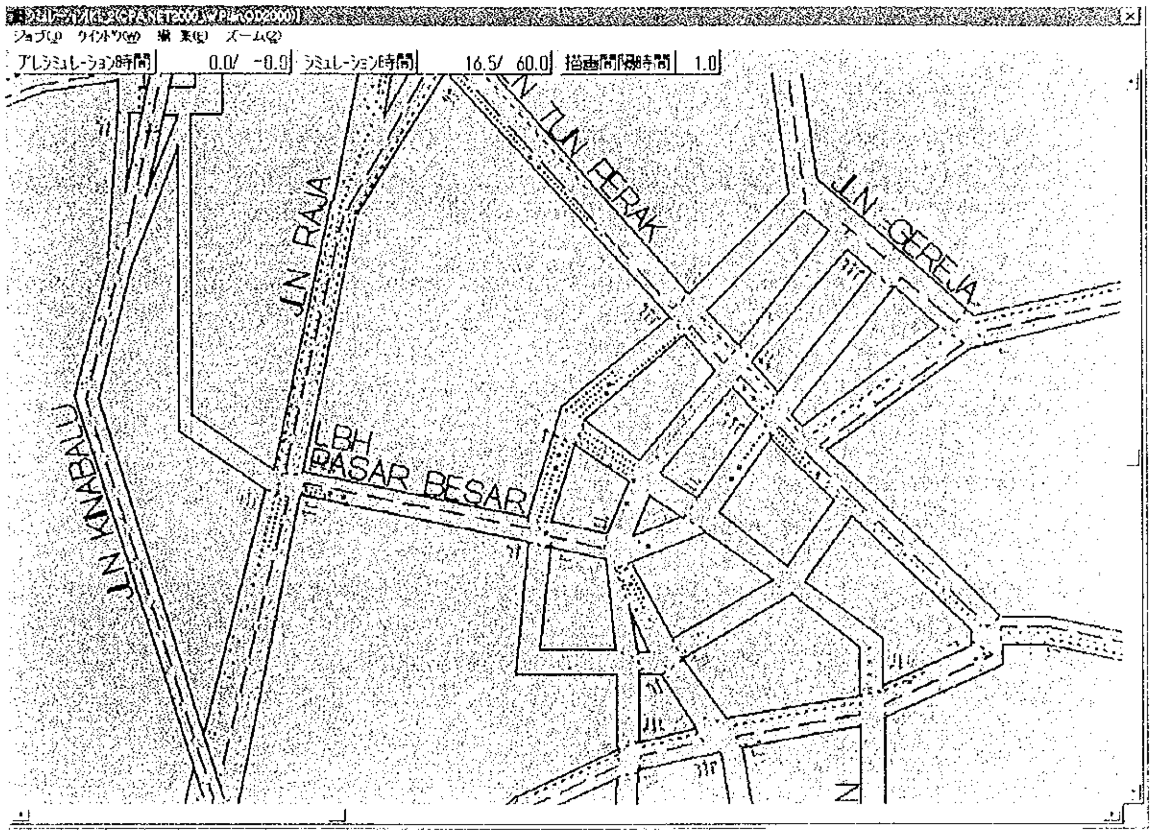



**Figure 9.2.23 An Example of Animation by Dynamic Simulation Program**

(1) Premises

For this objective, two cases were dynamically simulated on the computer: one without any of those plans (i.e., current situation) and the other with the proposed package plan. The common premises for both of these cases are explained in detail in Table 9.2.7.

**Table 9.2.7 Premises for Dynamic Simulation of CPA**

| | |
|---|---|
| Year | 2000 (Short-term target year) |
| Time | One morning peak hour (7:30-8:30 a.m.) on a weekday. |
| Simulation Area | CPA (Boundary roads are not included.) |
| OD | Results of the static traffic assignment based on the demand forecast for the year 2000. |
| Network Configuration | Existing road network and Ampang Elevated Expressway (planned to be in use in the year 2000). |
| Traffic Regulations | Current traffic regulations as of November 1997 (when traffic count survey at intersections was conducted). |

On top of the above premises, the case with the package plan also includes the improvements which were proposed and fully explained in the previous sections. Specifically, the following have been incorporated into the dynamic simulation settings for further analysis and evaluation.

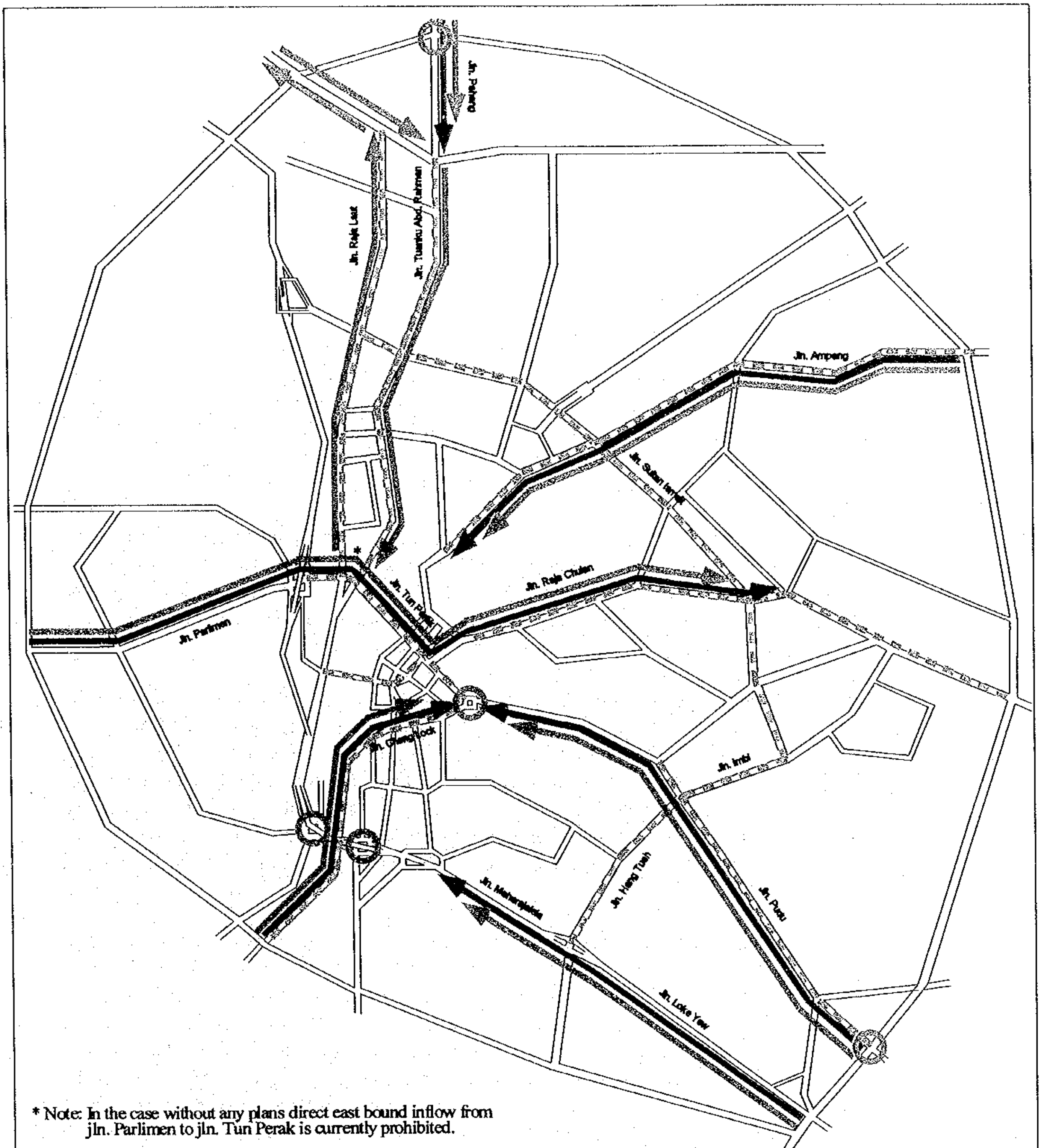
- Co-ordination system of traffic signal lights and improvement of signal phase system.

- Provision of new traffic signal lights at roundabouts.

- Reversible flow lane system for morning peak.

- Bus priority lane system for morning peak.

The package plan is illustrated in Figure 9.2.24. The analysis by dynamic simulation has been conducted from several different viewpoints: average vehicle speed, average travel time, traffic capacity, and total stopping delay.




* Note: In the case without any plans direct east bound inflow from jln. Parlimen to jln. Tun Perak is currently prohibited.

LEGEND

- Reversible Flow Lanes
- Bus Priority Lanes
- Improvement of Signal Control System
- Improvement of Non-Signalised Roundabouts

0 0.5 1 1.5 2
Kilometers

N S W E

**Figure 9.2.24**

**Package Plan for Dynamic Simulation**

***SMURT-KL***

Study on Integrated Urban Transportation Strategies for Environmental Improvement in Kuala Lumpur

(2) Analyses

1) Evaluation of Individual Major Roads

a. Average Vehicle Speed

The effect of the package plan on each of the major roads has been analysed by computing the average vehicle speed values for cars (including vans and small lorries) and buses in the case without any plans and in the case with the package plan (Table 9.2.8). Average vehicle speed can be calculated by dividing the route length by the time required to travel the whole route. The travel time includes the time when a vehicle stops at a traffic signal or in a congested area.

The result shows that the package plan brings about a significant increase in speed for inbound buses, and they can now run as fast as at around 30 km/h on most of the routes; whereas outbound vehicles suffer from negative impacts on some routes. Below are more detailed findings from the comparative analysis between the case without any plans and the case with the package plan.

Jalan Parlimen, Jalan Tun Perak, Jalan Raja Chulan, and Jalan Ampang are among the routes that may receive the most ideal effects from signalisation and a combination of bus priority lanes and reversible flow lanes. Buses can run at a much higher speed than cars because of the bus priority lanes. Furthermore, although having fewer lanes than the current road network, the outbound traffic situation is better than or almost the same as in the case without any plans; this is because the improvement of the traffic signal control system has made the average waiting time at a junction shorter.

On the routes where some bus priority lanes already exist in the current road network, i.e., Jalan Pudu, Jalan Cheng Lock, Jalan Pahang, Jalan Raja Laut, and Jalan T. Abdul Rahman, similarly desirable effects are observed with the inbound bus traffic, though, on some routes, the improvement effect may be "moderate" compared with the other routes mentioned above. In the case with the package plan, inbound bus priority lanes now form a more continuous network, contributing to a more effective use of the bus priority lanes. As for outbound traffic, however, the average speed decreases in the case with the package plan. This implies that the outbound traffic with fewer lanes may be adversely affected by the reversible flow lane scheme.

This negative impact on outbound traffic may manifest itself more apparently on Jalan Loke Yew and Jalan Maharajalela. Although the route shows a good improvement effect in inbound bus traffic, car traffic in the outbound direction has far lower average speed than in the case without any plans. It is a typical result of the case in which the reversible flow lane scheme has brought about a considerable negative impact in outbound traffic.

Although there is no plan to provide reversible flow lanes or bus priority lanes on Jalan Sultan Ismail, Jalan Hang Tuah, and Jalan Imbi, the average vehicle speed may more or less increase in the case with the package plan. More cars are supposed to use these routes as a detour as a result of the implementation of reversible flow lanes on the other routes. (See Figures 9.2.29 and 9.2.30.) The unchanging speeds on these routes are due to the improvement of the traffic signal control system.

**Table 9.2.8 Comparison of Two Cases: Average Vehicle Speed on Major Streets**

(Morning Peak 7:30-8:30 a.m. in 2000)

[unit: km/h]

<table>
<tr><th rowspan="2">Streets</th><th rowspan="2">Direction</th><th colspan="2">Without Any Plans</th><th colspan="2">With Package Plan</th></tr>
<tr><th>Cars</th><th>Buses</th><th>Cars</th><th>Buses</th></tr>
<tr><td rowspan="2">Parlimen</td><td>inbound</td><td colspan="2">13</td><td>18</td><td>30</td></tr>
<tr><td>outbound</td><td colspan="2">19</td><td colspan="2">31</td></tr>
<tr><td rowspan="2">Tun Perak</td><td>inbound</td><td colspan="2">10</td><td>18</td><td>29</td></tr>
<tr><td>outbound</td><td colspan="2">14</td><td colspan="2">16</td></tr>
<tr><td rowspan="2">Raja Chulan</td><td>inbound</td><td colspan="2">16</td><td>25</td><td>28</td></tr>
<tr><td>outbound</td><td colspan="2">22</td><td colspan="2">33</td></tr>
<tr><td rowspan="2">Ampang</td><td>inbound</td><td colspan="2">12</td><td>27</td><td>32</td></tr>
<tr><td>outbound</td><td colspan="2">18</td><td colspan="2">18</td></tr>
<tr><td rowspan="2">Pudu</td><td>inbound</td><td>5</td><td>6</td><td>7</td><td>18</td></tr>
<tr><td>outbound</td><td>20</td><td></td><td colspan="2">12</td></tr>
<tr><td rowspan="2">Cheng Lock</td><td>inbound</td><td>12</td><td>19</td><td>11</td><td>26</td></tr>
<tr><td>outbound</td><td colspan="2">26</td><td colspan="2">21</td></tr>
<tr><td rowspan="2">Loke Yew & Maharajalela</td><td>inbound</td><td colspan="2">18</td><td>18</td><td>35</td></tr>
<tr><td>outbound</td><td colspan="2">43</td><td colspan="2">23</td></tr>
<tr><td rowspan="2">Pahang & Raja Laut & T. Abdul Rahman</td><td>inbound</td><td>10</td><td>20</td><td>9</td><td>24</td></tr>
<tr><td>outbound</td><td>15</td><td>28</td><td>9</td><td>27</td></tr>
<tr><td rowspan="2">Sultan Ismail</td><td>eastbound</td><td colspan="2">10</td><td colspan="2">16</td></tr>
<tr><td>westbound</td><td colspan="2">10</td><td colspan="2">10</td></tr>
<tr><td rowspan="2">Hang Tuah & Imbi</td><td>northbound</td><td colspan="2">17</td><td colspan="2">16</td></tr>
<tr><td>southbound</td><td colspan="2">16</td><td colspan="2">23</td></tr>
</table>

The average vehicle speed values on all the major roads within the CPA are illustrated in Figure 9.2.25 (for the case without any plans) and in Figure 9.2.26 (for the case with the package plans). They are the average values of all types of vehicles though the majority are private passenger cars. The figures show that the average speed values on some roads will increase in the case with the package plan in spite of the provided reversible flow lanes and bus priority lanes which usually have a negative impact on private passenger car traffic.

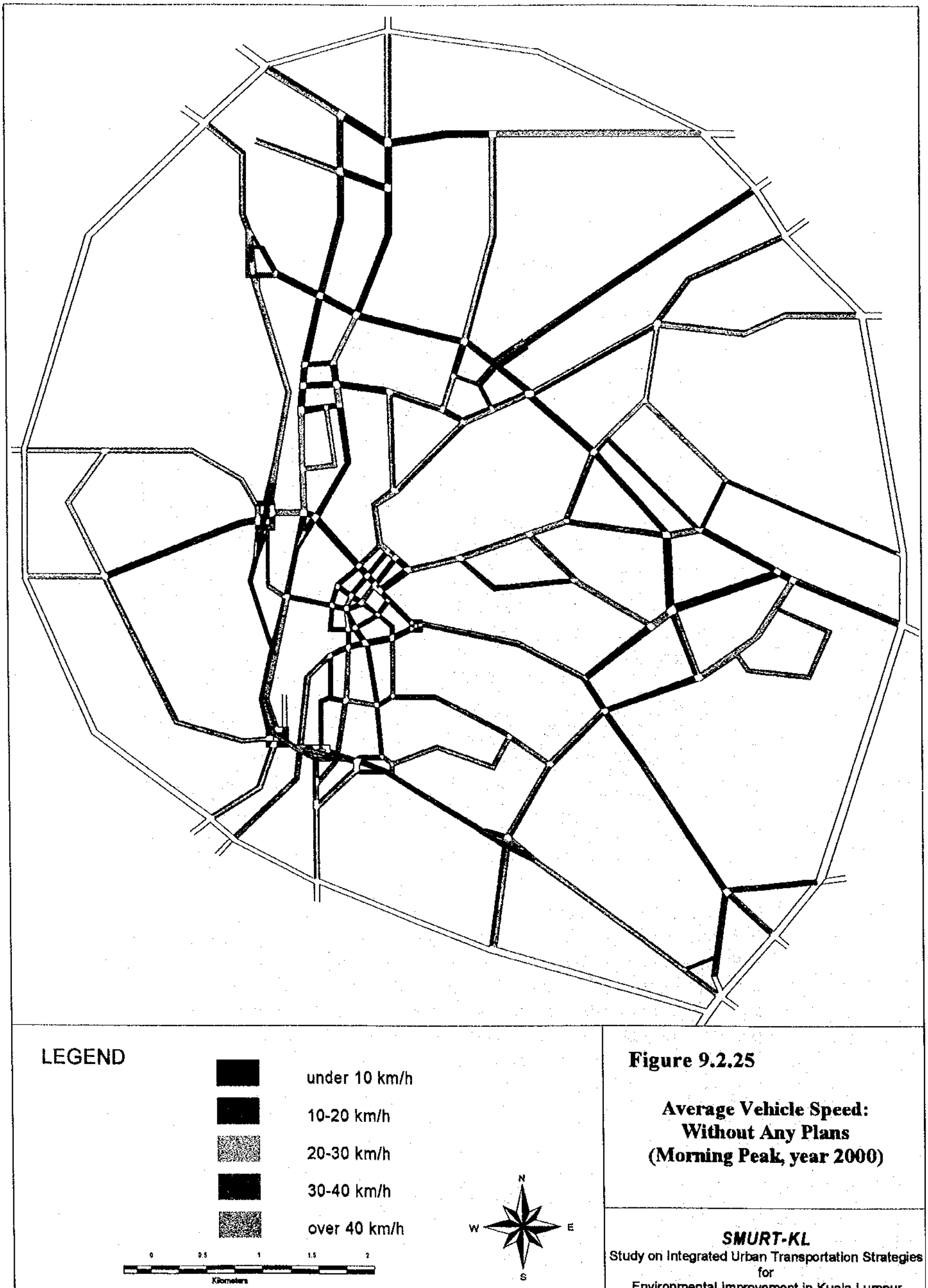



**Figure 9.2.25**

**Average Vehicle Speed: Without Any Plans (Morning Peak, year 2000)**

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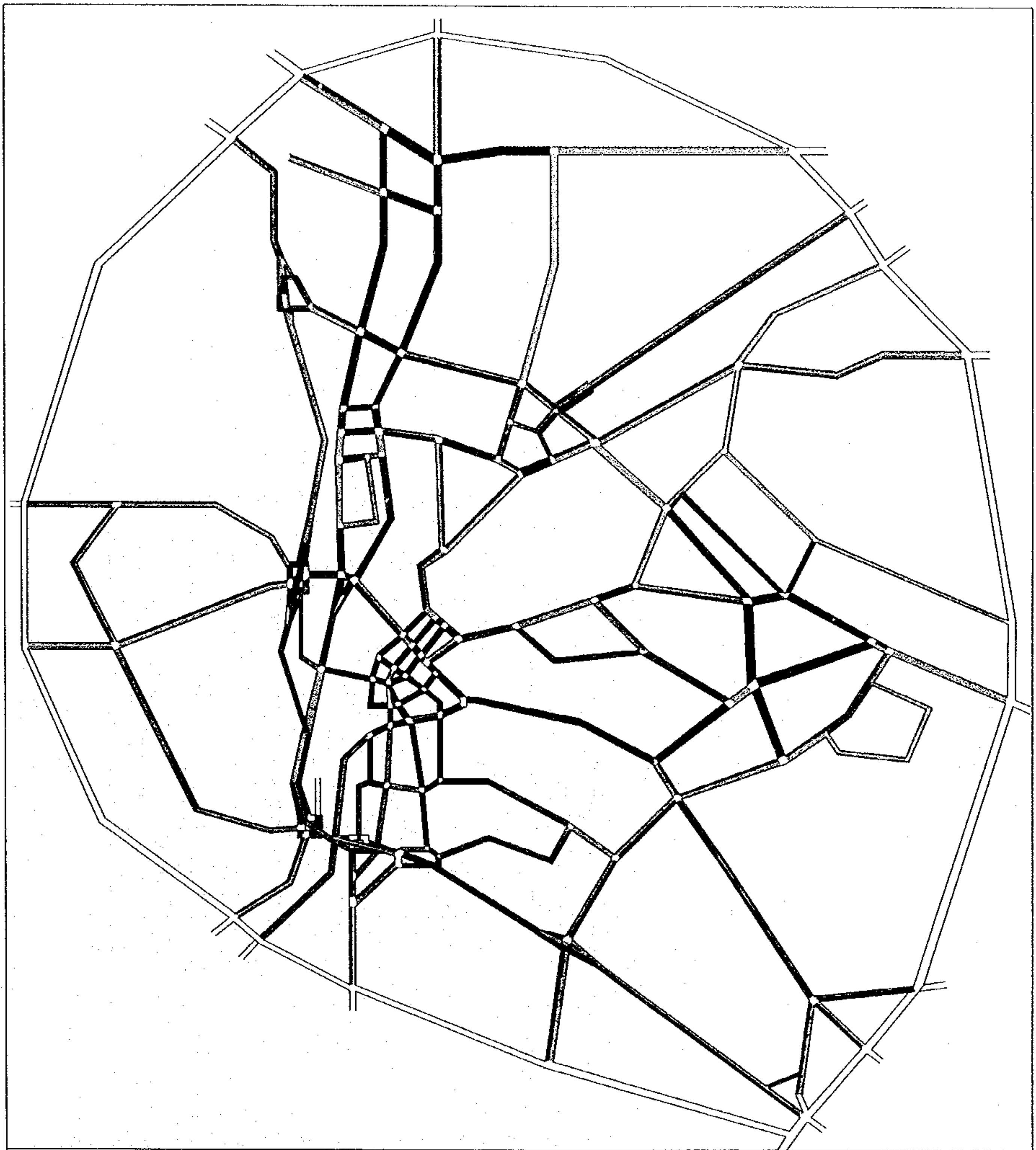
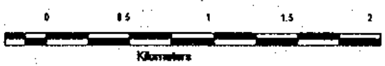


LEGEND

| | |
|---|---|
| | under 10 km/h |
| | 10-20 km/h |
| | 20-30 km/h |
| | 30-40 km/h |
| | over 40 km/h |



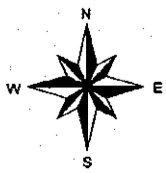




**Figure 9.2.26**

**Average Vehicle Speed: With Package Plan (Morning Peak, year 2000)**

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b. Average Travel Time

The average travel time on individual major roads here is a simple quotient of the road length divided by the computed average speed previously mentioned. It includes the time when a vehicle comes to a stop at a traffic signal or in a congested area. The results shown in Table 9.2.9 indicate that most of the travel time values for both cars and buses, inversely proportional to those of the average speed, become smaller in the case with the package plan. On some outbound routes where a negative impact may be observed, the average travel time is predicted to become longer than in the case without any plans.

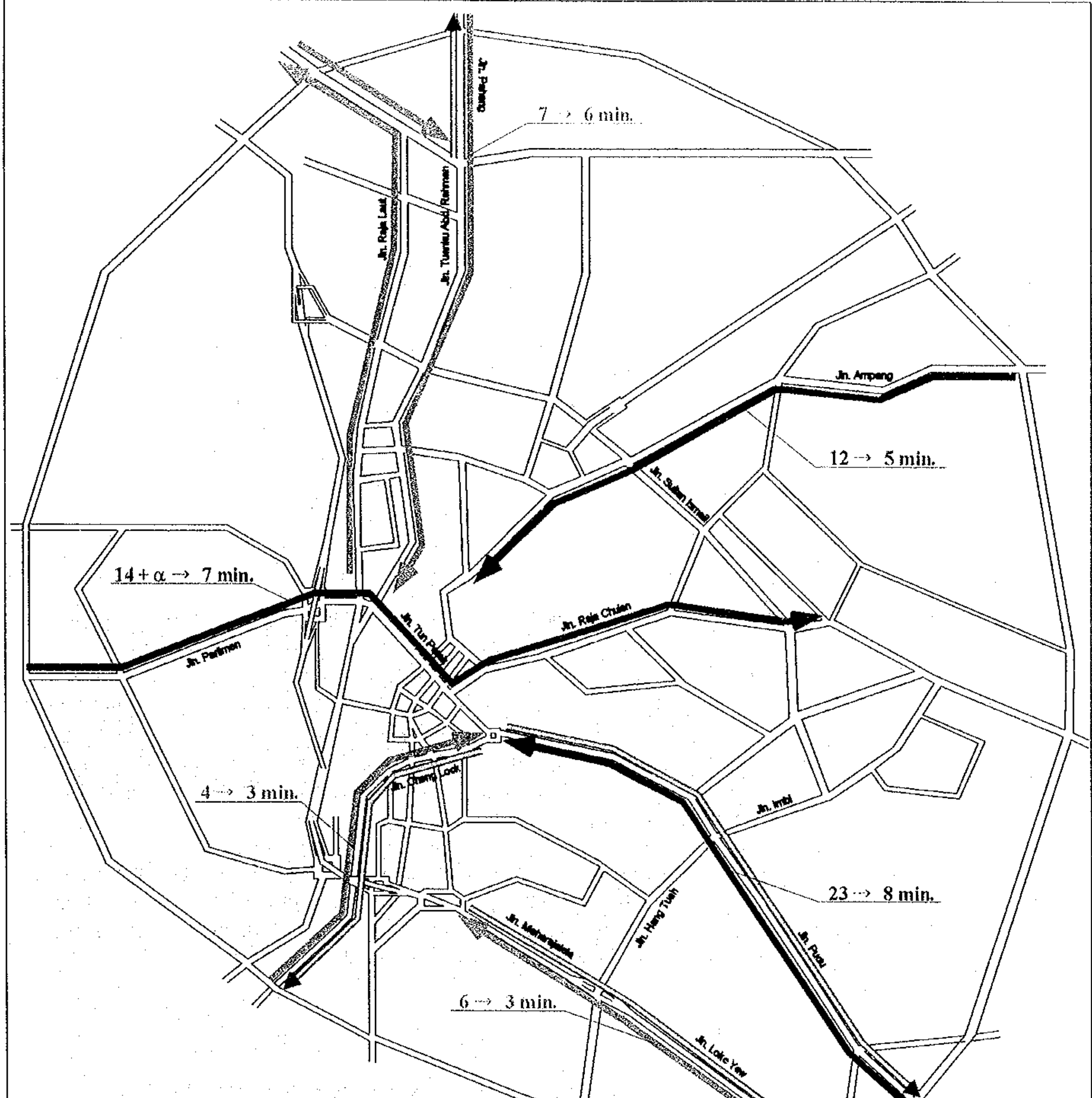
**Table 9.2.9 Comparison of Two Cases: Average Travel Time on Major Streets**

(Morning Peak 7:30-8:30 a.m. in 2000)

[unit: min]

<table>
<tr><th rowspan="2">Streets</th><th rowspan="2">Direction</th><th rowspan="2">Length in CPA [km]</th><th colspan="2">Without Any Plans</th><th colspan="2">With Package Plan</th></tr>
<tr><th>Cars</th><th>Buses</th><th>Cars</th><th>Buses</th></tr>
<tr><td rowspan="2">Parlimen</td><td>inbound</td><td rowspan="2">1.3</td><td colspan="2">6.2</td><td>4.5</td><td>2.7</td></tr>
<tr><td>outbound</td><td colspan="2">4.2</td><td colspan="2">2.6</td></tr>
<tr><td rowspan="2">Tun Perak</td><td>inbound</td><td rowspan="2">0.4</td><td colspan="2">2.4</td><td>1.3</td><td>0.8</td></tr>
<tr><td>outbound</td><td colspan="2">1.7</td><td colspan="2">1.5</td></tr>
<tr><td rowspan="2">Raja Chulan</td><td>inbound</td><td>1.5</td><td colspan="2">5.7</td><td>3.7</td><td>3.3</td></tr>
<tr><td>outbound</td><td>0.9</td><td colspan="2">2.5</td><td colspan="2">1.7</td></tr>
<tr><td rowspan="2">Ampang</td><td>inbound</td><td rowspan="2">2.4</td><td colspan="2">12.2</td><td>5.4</td><td>4.6</td></tr>
<tr><td>outbound</td><td colspan="2">8.1</td><td colspan="2">8.1</td></tr>
<tr><td rowspan="2">Pudu</td><td>inbound</td><td rowspan="2">2.3</td><td>27.8</td><td>23.2</td><td>19.9</td><td>7.7</td></tr>
<tr><td>outbound</td><td>6.9</td><td>7.7</td><td colspan="2">11.6</td></tr>
<tr><td rowspan="2">Cheng Lock</td><td>inbound</td><td rowspan="2">1.4</td><td>7.0</td><td>4.4</td><td>7.6</td><td>3.2</td></tr>
<tr><td>outbound</td><td colspan="2">3.2</td><td colspan="2">4.0</td></tr>
<tr><td rowspan="2">Loke Yew & Maharajalela</td><td>inbound</td><td rowspan="2">1.9</td><td colspan="2">6.4</td><td>6.4</td><td>3.3</td></tr>
<tr><td>outbound</td><td colspan="2">2.7</td><td colspan="2">5.0</td></tr>
<tr><td rowspan="2">Pahang & Raja Laut & T. Abdul Rahman</td><td>inbound</td><td>2.3</td><td>13.7</td><td>6.9</td><td>15.2</td><td>5.7</td></tr>
<tr><td>outbound</td><td>2.5</td><td>10.2</td><td>5.4</td><td>16.9</td><td>5.6</td></tr>
<tr><td rowspan="2">Sultan Ismail</td><td>eastbound</td><td>2.5</td><td colspan="2">14.9</td><td colspan="2">9.3</td></tr>
<tr><td>westbound</td><td>2.8</td><td colspan="2">16.7</td><td colspan="2">16.7</td></tr>
<tr><td rowspan="2">Hang Tuah & Imbi</td><td>northbound</td><td>2.3</td><td colspan="2">8.3</td><td colspan="2">8.8</td></tr>
<tr><td>southbound</td><td>3.0</td><td colspan="2">11.1</td><td colspan="2">7.7</td></tr>
</table>

The change in bus travel time on the major roads with bus priority lanes is illustrated in Figure 9.2.27. A remarkable reduction in bus travel time is observed on three inbound bus routes: (1) Jalan Parlimen, Jalan Tun Perak, and Jalan Raja Chulan; (2) Jalan Ampang; and (3) Jalan Pudu. On these routes, travel time for buses is predicted to be less than half in the case with the package plan. On route (1), especially, since the straight eastbound inflow of vehicles from Jalan Parlimen to Jalan Tun Perak is prohibited in the current network during the morning peak hours, extra time for detour (indicated as "α" in the figure) is added to the average travel time in the case without any plans; therefore, the actual difference of travel time between these two cases would be even larger than the computed output.




Note: "A → B" means that the average travel time is predicted to change from A to B in the case with the package plans. "α" means that some additional travel time caused by detours is expected in the case without any plans because direct east bound inflow from jln. Parlimen to jln. Tun Perak is currently prohibited.

LEGEND

- Bus Priority Lanes with an Excellent Effect
- Bus Priority Lanes with a Good Effect
- Outbound Directions where Some Negative Impacts May Be Seen

**Figure 9.2.27**

**Change of Bus Travel Time on Major Roads with Bus Priority Lanes**

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On the other routes with bus priority lanes, shorter bus travel time is also seen in the case with the package plan, though the improvement ratios may be rather small compared with the three routes mentioned above.

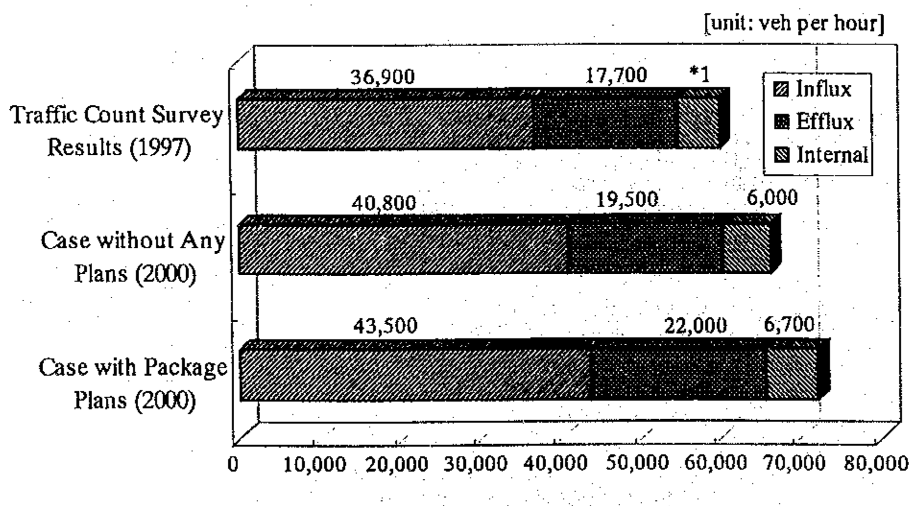
The effects of the new bus priority lanes are such that the inbound bus services can operate very smoothly in the case with the package plan. However, most of the inbound bus routes do not actually end in the city centre proper, but normally continue on to the outbound direction. Therefore, special attention should be paid to the package plan so that the bus services may not suffer from a negative impact on some outbound routes.

2) Overall Appraisal

a. Traffic Capacity of CPA

The traffic capacity of the CPA has been dynamically computed to compare the two cases, not as individual roads, but as an area per se. The traffic movement of the CPA is basically divided into three groups: traffic flow into the CPA (i.e., influx); traffic flow out of the CPA (i.e., efflux); and traffic flow within the CPA (i.e., internal flow). Since the dynamic simulation focuses on the morning peak, the traffic capacity of the CPA depends largely upon the influx volume. Thus, the CPA traffic capacity was computed as a sum of all vehicles when the influx of vehicles reached its maximum limit in the simulation.

In Figure 9.2.28, the traffic capacity of the CPA is shown for each of the two cases. In addition, the results of the traffic count survey (i.e., supplementary screen line survey conducted at CPA boundaries in autumn, 1997) are shown for reference, though it may not exactly be the maximum capacity of CPA as of 1997.




*1: Internal trips were not based on the survey but extrapolated from the simulation results.

**Figure 9.2.28 Estimated Traffic Capacity of CPA during the Morning Peak**

The results of the traffic count survey show the average traffic volume in the CPA on a typical weekday morning. Although the traffic volume actually fluctuates from day to day, the traffic capacity of the CPA as of 1997 seems to have barely exceeded 60,000 vehicles per hour.

In the case without any plans, only Ampang Elevated Expressway will have been added in the CPA road network in the year 2000, somewhat increasing the traffic capacity of the CPA. Consequently, the traffic capacity of the CPA is predicted to be around 66,000 vehicles per hour.

As for the case with the package plan, the introduction of reversible flow lanes and bus priority lanes and the improvement of the traffic signal lights will most likely contribute to a further increase of the traffic capacity of the CPA. The predicted traffic capacity of the CPA for this case is as much as 72,000 vehicles per hour, which is about a 9 percent increase from the case without any plans.

In addition, traffic flow in the CPA is illustrated for each of the two cases (Figures 9.2.29 and 9.2.30). In the case with the package plan, most of the roads appear to be capable of handling more traffic, and this accumulation of increased traffic on each road may have contributed to the increase of the total capacity of the CPA. Above all, Jalan Ampang, Jalan Tun Peak, Jalan Bukit Bintang, Jalan Maharajalela and Jalan Sultan Hishamuddin especially seem to have gained in traffic capacity.

In fact, according to the demand forecast, the true traffic demand in the CPA between 7:30 and 8:30 a.m. is predicted to be even higher than those predicted values; therefore, a significant number of vehicles will remain in the CPA and its vicinity without reaching their destinations yet. In order to see when those vehicles reach their goals, the computation time has been extended in the dynamic simulation. Based on this observation, the time to finish clearing off the whole peak-hour traffic demand is estimated for both cases in Table 9.2.10.

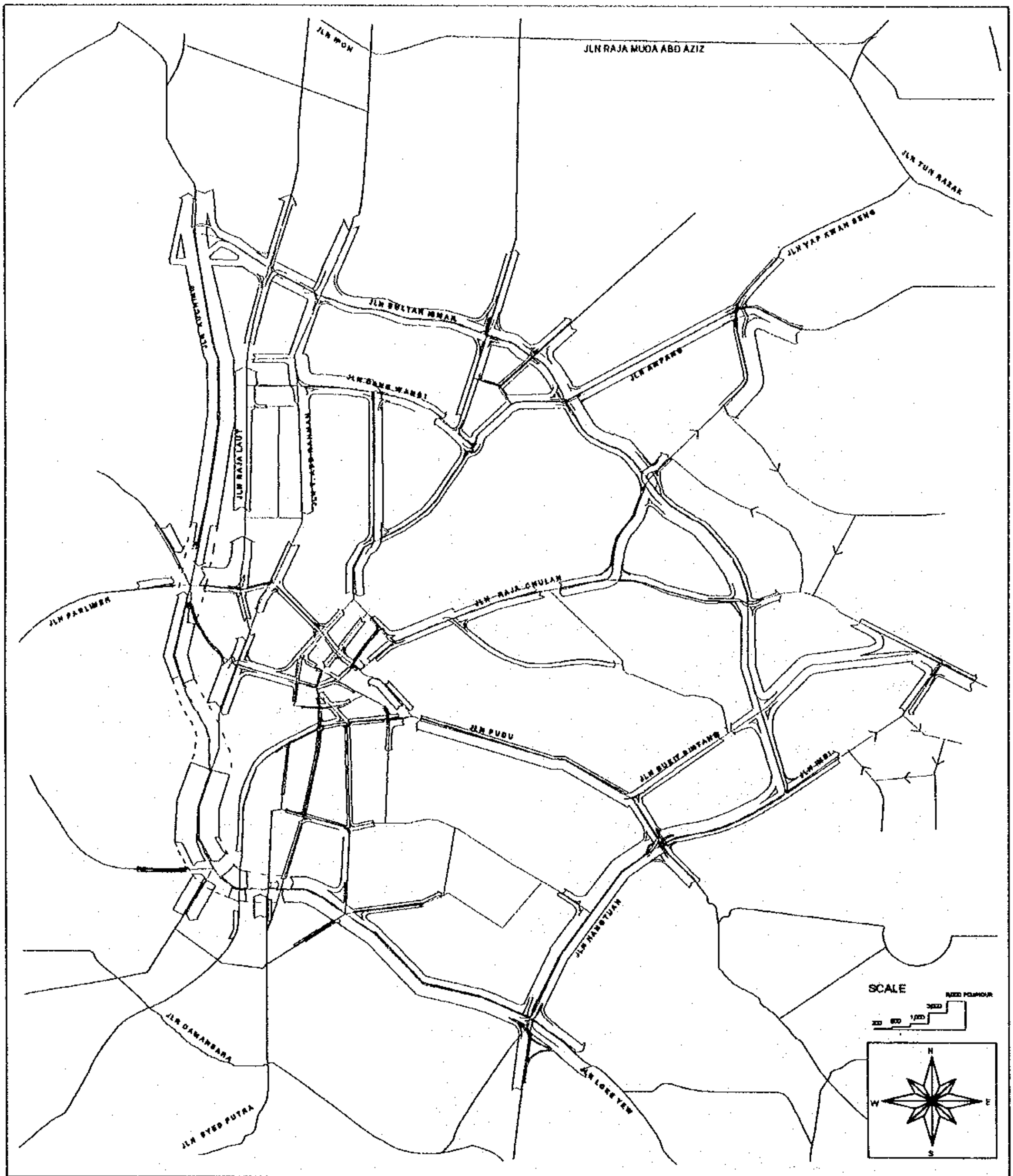
**Table 9.2.10 Estimated Time to Clear Off the Whole Peak-Hour Demand**

(Morning Peak 7:30-8:30 a.m. in 2000)

| | Without Any Plans | With Package Plan | % Change |
|---|---|---|---|
| Necessary Time to Clear Off Demand | 141 min. | 125 min. | -12% |
| Demand Will Be Cleared at: | 9:51 a.m. | 9:35 a.m. | — |

Note: In the dynamic simulation settings, the peak-hour traffic demand is the same in both cases.

Actually there are so many uncertain factors that it is very difficult to estimate the clear-off time. However, according to the simulation results, as the traffic capacity of the CPA increases from the case without any plans to the case with the package plan, time necessary to clear off the whole peak-hour (7:30- 8:30 a.m.) traffic demand is estimated to become around 12 percent shorter. As a result, some vehicles from the peak-hour demand will linger in and around the CPA until nearly 10 o'clock in the case without any plans, while all the demand is expected to be cleared off around 9:30 a.m. in the case with the package plan.




LEGEND

SCALE

200 600 1,000 3,000 6,000 PCU/HOUR

0 1 2 3

Kilometers

**Figure 9.2.29**

**Predicted Traffic Flow in CPA: Without Any Plans (Morning Peak, year 2000)**

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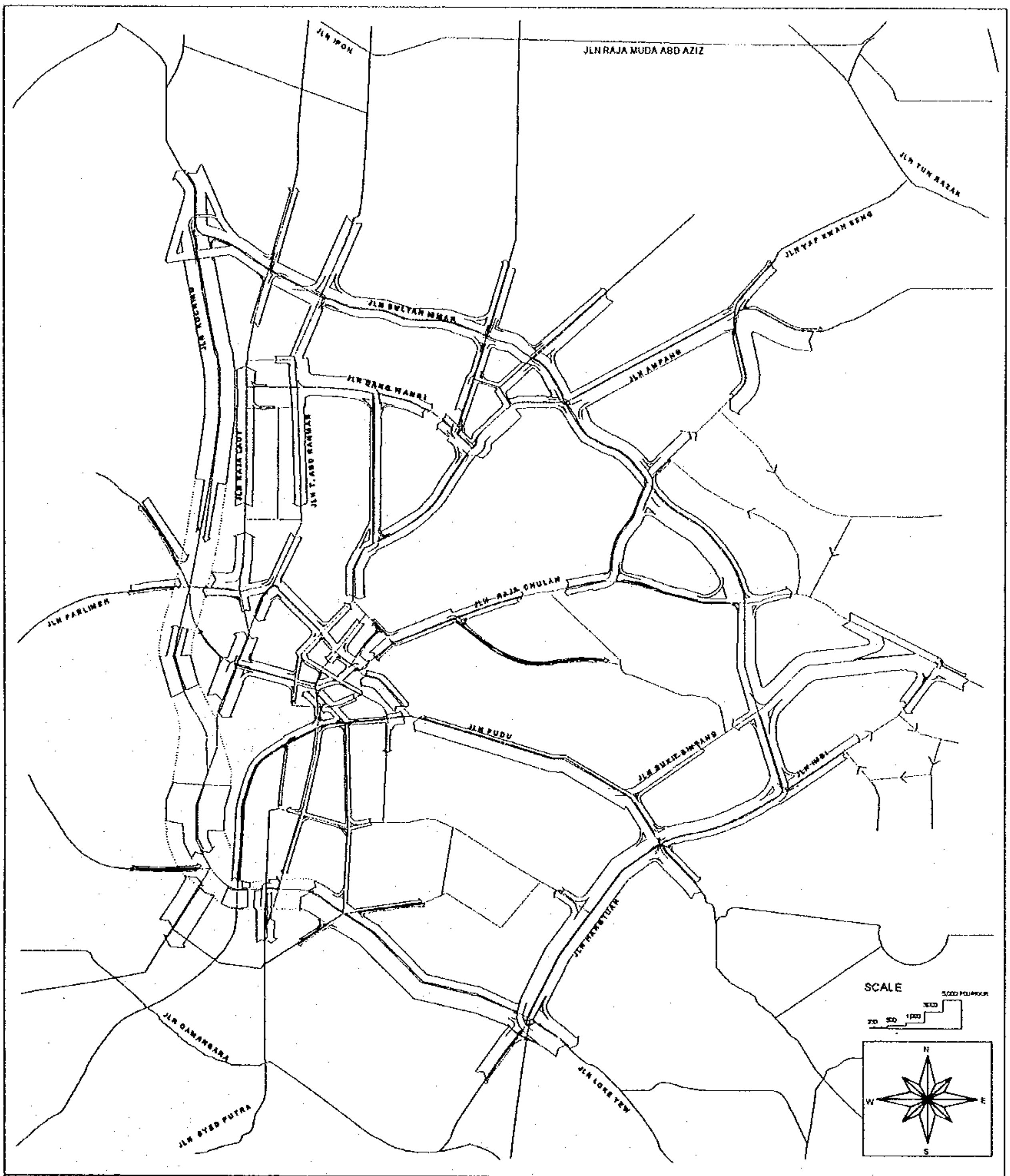


LEGEND

SCALE
200 500 1,000 3,000 5,000 PCU/HOUR

0 1 2 3
Kilometers

**Figure 9.2.30**

**Predicted Traffic Flow in CPA: With Package Plan (Morning Peak, year 2000)**

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b. Effects on the Whole Peak-Hour Demand

In order to give an overall appraisal for the whole CPA, it is necessary to make as fair a comparison as possible between the two cases, each of which can handle different traffic volume per hour. For this purpose, the simulation time was extended until the whole peak-hour (7:30 – 8:30 a.m.) demand had been cleared off in each case. In this way, the average vehicle speed and the total stopping delay for the entire CPA were dynamically computed. The predicted effect of the package plan on the whole CPA is shown in Table 9.2.11.

**Table 9.2.11 Predicted Effects on the Whole-Peak Hour Demand in CPA**
(Morning Peak 7:30-8:30 a.m. in 2000)

| | Without Any Plans | | With Package Plan | | % Change | |
|---|---|---|---|---|---|---|
| | Cars | Buses | Cars | Buses | Cars | Buses |
| Average Vehicle Speed [km/h] | 14.2 | 12.5 | 16.2 | 15.6 | 14% | 25% |
| Total Stopping Delay [hour] | 9,240 | 291 | 7,510 | 195 | -19% | -33% |
| Average Travel Time per Trip [min.] | 19 | 39 | 16 | 33 | -16% | -15% |

The average speed of cars is predicted to increase by 14 percent in the case with the package plan, while that for buses is predicted to significantly increase by 25 percent. It is very important for the evaluation of the package plan that passenger car traffic will also improve notwithstanding the adoption of reversible flow lanes and bus priority lanes.

Total stopping delay is an accumulation of the time fragments when a vehicle is at a full stop. It is sometimes utilised for the calculation of the total emission of carbon dioxide, nitrogen oxides, and other gases caused by engine idling. Improvement of traffic signal control system may surpass the negative impact caused by the reversible flow lanes and bus priority lanes, so that the total stopping delay for cars will be reduced by 19 percent in the case with the package plan. On the other hand, total stopping delay for buses will be even more remarkably reduced, by as much as 33 percent.

The average travel time per trip for cars is predicted to become shorter by 16 percent in the case with the package plan. Travel time for buses is, of course, predicted to be shorter; however, the reduction ratio is just 15 percent and it is not as remarkable as other indices which showed more dramatic changes. This is because, as previously explained, the current bus routes normally consist of not only inbound directions but also outbound directions in which all vehicles including buses sometimes suffer from a negative impact. Therefore, when the reversible flow lane and bus priority lane system is introduced into the CPA, individual bus routes may just as well be reconsidered so that the buses can receive the maximum benefits and minimum negative impact from the new system.

3) Conclusion

The improvement package plan was originally intended for a better and smoother flow of public buses with a minimum negative impact on the private car users. For this objective, most of those dynamic simulation outputs tally with the prior expectations, and the short-tem CPA traffic control/management plans may be feasible on most of the routes.

Prioritising the public transport and allocating a lane exclusively for buses were the main ideas of the CPA plans; therefore, the traffic flow of cars did not greatly improve. However, if it had not been for the bus priority lanes, the traffic flow of cars would have more dramatically improved on account of the reversible flow lanes.

In any case, inasmuch as the case with the package plan entails very stringent, drastic traffic control and management, a more detailed traffic survey and its analysis along with discussion on bus re-routing are essential before the adoption of any of these package plans.

# Chapter 10

# Development Plan of Model Area

# Chapter 10 Development Plan of Model Area

## 10.1 Immediate Action Plan

### 10.1.1 General

(1) Objectives

The objectives of the immediate action plan in the Model Area are;

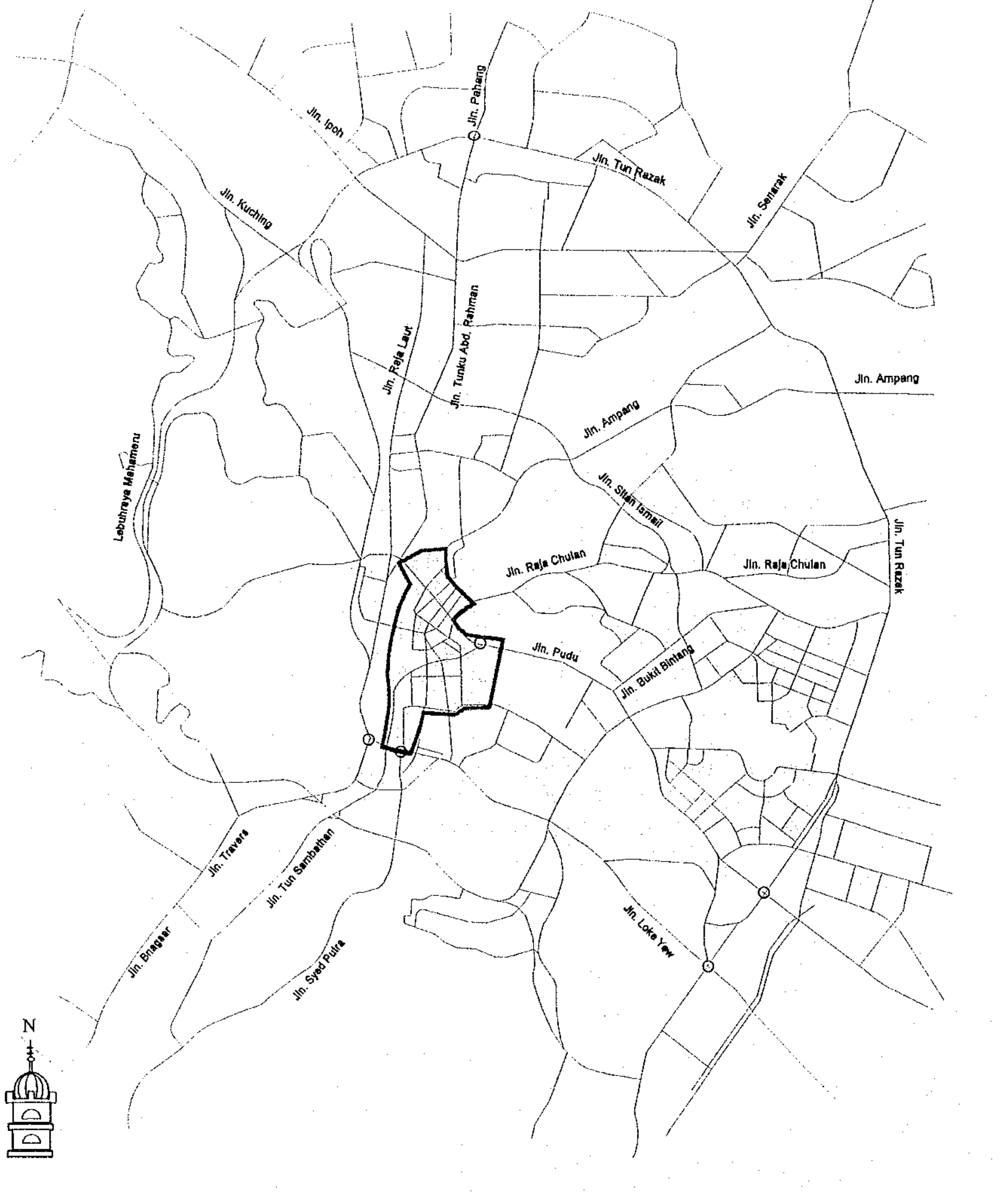
(i) to formulate urban transportation strategies to mitigate traffic congestion by promoting the usage of public transportation in the Model Area.

(ii) to formulate this plan by using the following strategies for the short-term period.

-Re-organisation of bus operation routes and formulation of required facilities.
-Effective traffic circulation system.
-Creation of "Pedestrian-friendly" facilities.

(2) Model Area

The Model Area, as shown in Figure 10.1.1, covers the area bordered by the Jln. Gereja in the north, Jln. Kinabalu in the south, the renewed area of Puduraya bus terminal in the east, and Sungai Klang in the west.




**LEGEND**

Model Area

**Figure 10.1.1**
**Location of Model Area**

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FOR
ENVIRONMENTAL IMPROVEMENT
IN
KUALA LUMPUR
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)