4.2 SELECTION OF PRELIMINARY DESIGN SECTIONS

The selection of the ten Study Sections, from the fifty-nine Study Sections put forward for the preliminary design, was carried out through discussions with the DOH. In the selection of the Study Sections the results of the data analysis and the site investigations were reviewed and sites exhibiting the following points were chosen:

A. Sections which would experience effective improvement of congested hazardous conditions from the improvement plan;

B. Sections which revealed typical traffic problems, and whose improvement plans were applicable to other sections;

C. Sections which required detailed plans for the explanation of the countermeasures put forward by the improvement plans.

Figure 4.2 indicates the selected locations. The outline of each location and the proposed traffic controls and safety measures are summarized in Table 4.1.

The preliminary design sections have been classified into five categories, by traffic safety and control measures, as follows:

A.	Improvement of roadway section	: S-44
B.	Improvement of signalized intersection	: S-18, S-22
C.	Grade separation	: S-19, S-48
D.	Improvement of intersection and median openings	: S-10, S-15, S-24
E.	Signalization and channelization	: S-43, S-52 (S-48)

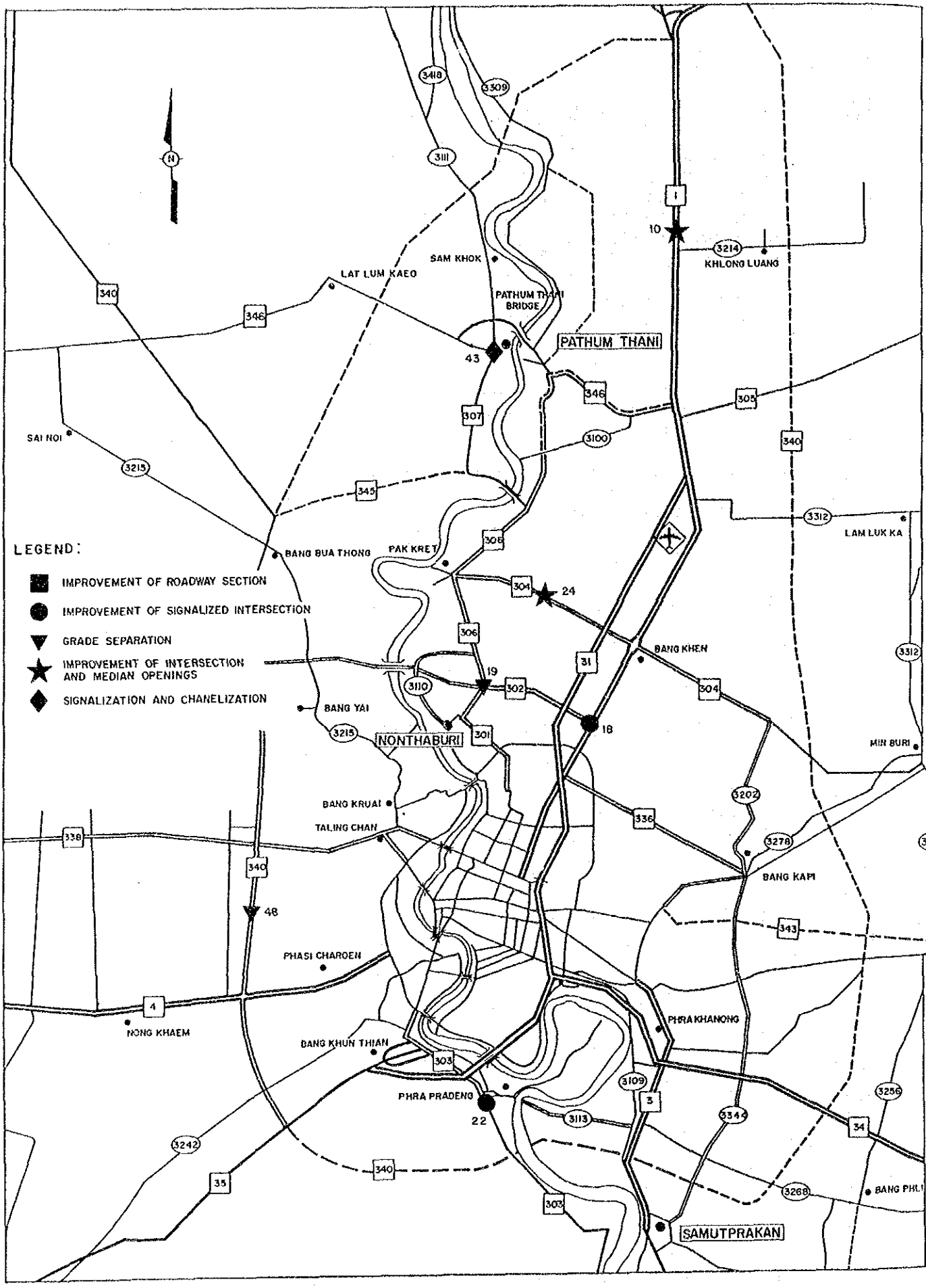
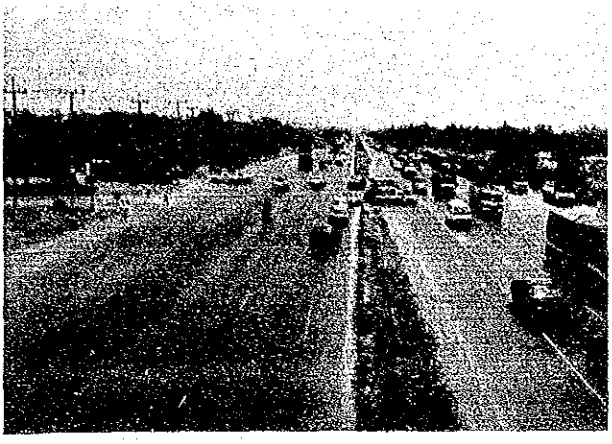


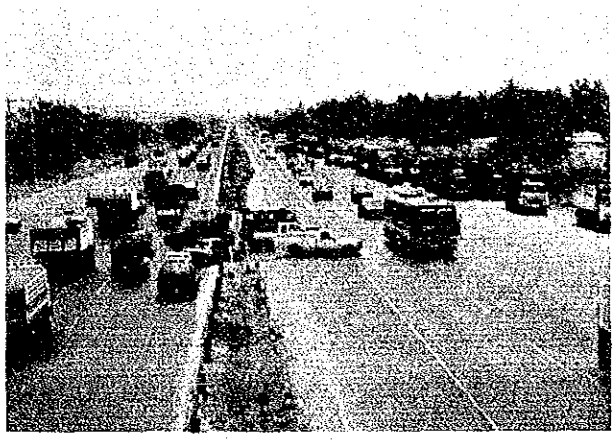
Figure 4.2 LOCATION OF PRELIMINARY DESIGN SECTIONS

Table 4.1 Outline of Preliminary Design Section

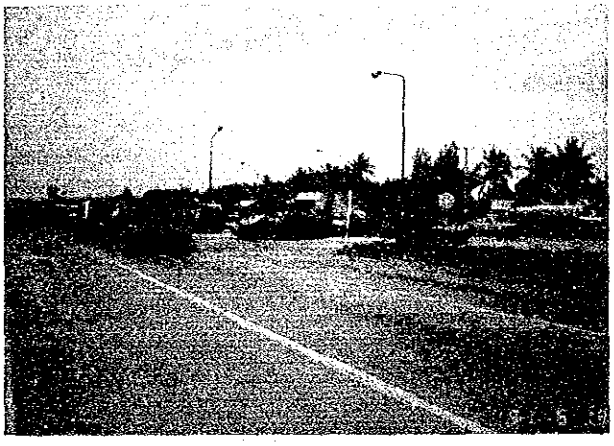
No.	Route No.	Location Name	Kilopost Cont.Sec.No.	Type of Road	Lane No.	Strategies and Measures
10.	1	Ent. AIT	41+500 201	Roadway section with entrance and median openings	4	- Channelization to minimize the size of the intersection. - Provision of U-turn facility to deal with the U-turn traffic.
15.	4	Sanamchan Palace	58+580 203	four-leg intersection with median opening	4x2	- Signalization and/or U-turn facility to ensure smooth traffic flow at the intersection and median openings.
18.	302 (1)	Kaset Sat	0+000 100	three-leg signalized intersection	4x4(8)	- Channelization and modification of the signal phasing to increase the capacity of the intersection.
19.	302 (306)	Khae Rai	6+333 100	four-leg signalized intersection	4x4(8)	- Grade separation to deal with the heavy traffic volume.
22.	303 (3104)	Prapadaeng	11+198 100	three-leg signalized intersection	4x2(4)	- Channelization and modification of the signal phasing to increase the capacity of the intersection. - Improvement of the road-side to ensure smooth traffic flow.
24.	304 (BMA)	Khlong Prapa	4+800-5+600 101	four-leg intersection with median openings	4x2(4)	- Signalization to ensure smooth traffic flow at the intersection and median openings.
43.	307 (3035) (3111)	Pathum Wilai	10+813 100	four-leg intersection	2x2	- Signalization and channelization to solve the confusion at the intersection.
44.	325	Damnoen Saduak	33+705-38+215 200	Roadway section	2	- Installation of motorcycle lanes to avoid mixing traffic. - Improvement of curvature section.
48.	340 (BMA)	Bang Waek	3+725 100	four-leg intersection	4x2	- Signalization to deal with turning traffic at the intersection as a short-term plan. - Grade separation as a long-term plan.
52.	3119 (BMA)	Onn Nuch-R.3119	11+003 100	three-leg intersection	2x2	- Signalization and channelization to ensure the smooth traffic flow at the intersection.

No. of Lane
( ) : Improvement Plan

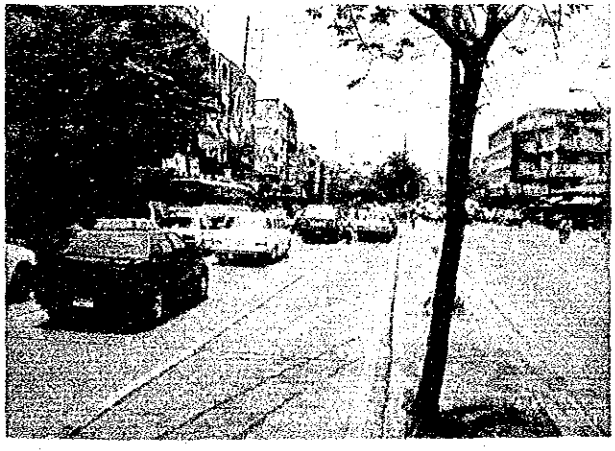


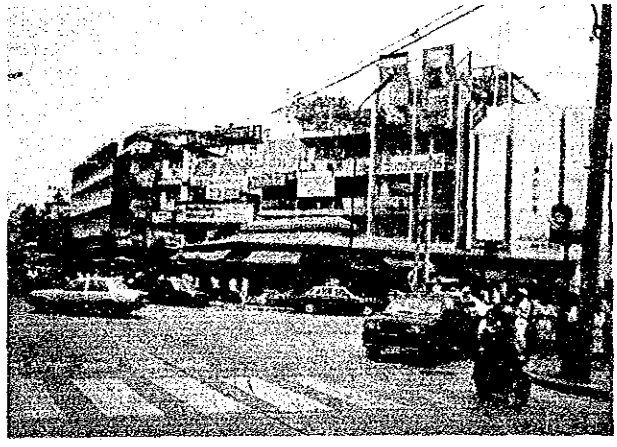


Study Section S-10: Ent. AIT (R1)



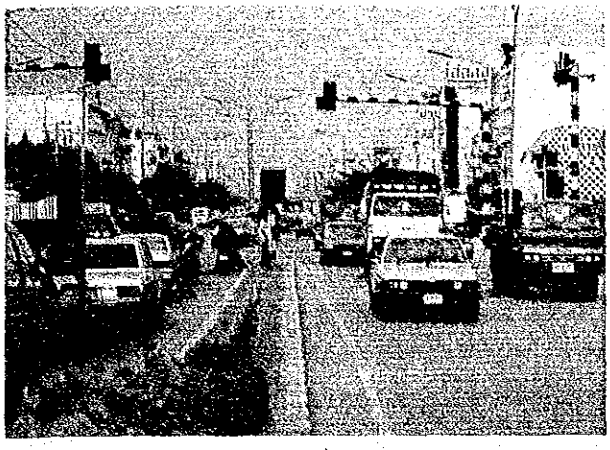
Study Section S-15: Sanamchan Palace (R4)

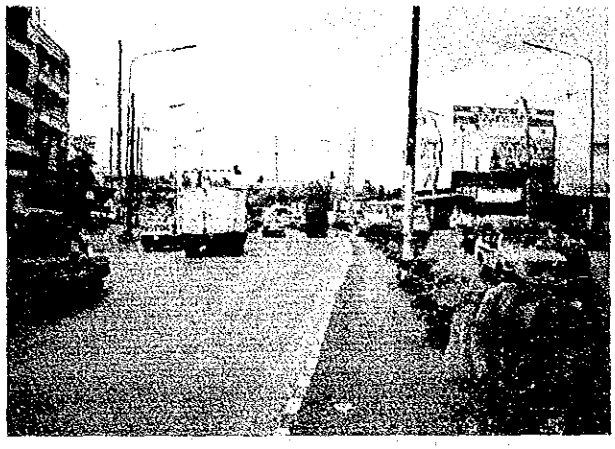




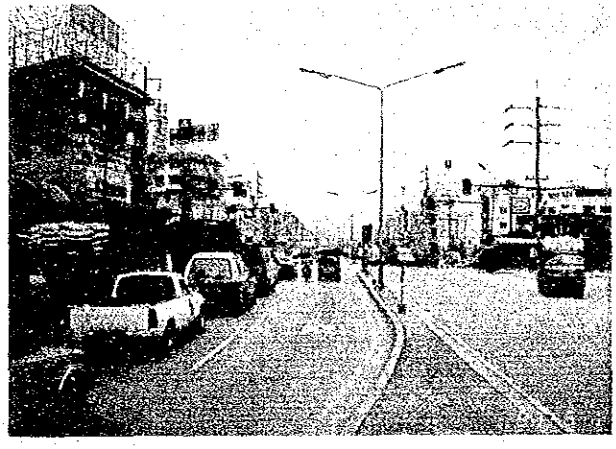
Study Section S-18: Kaset Sat (R302)

PHOTOGRAPH OF PRELIMINARY DESIGN SECTIONS(1)

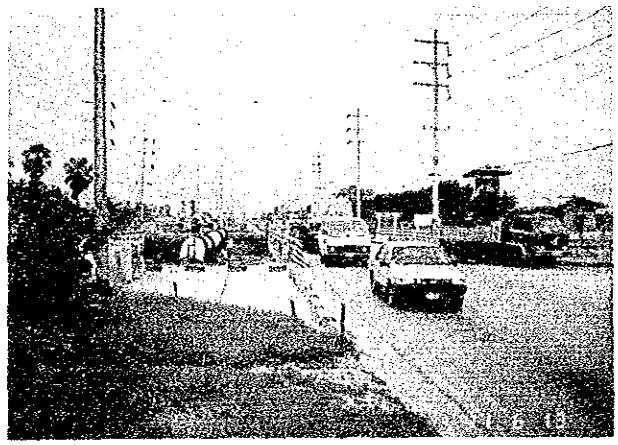




Study Section S-19: Khae Rai (R302,R306)

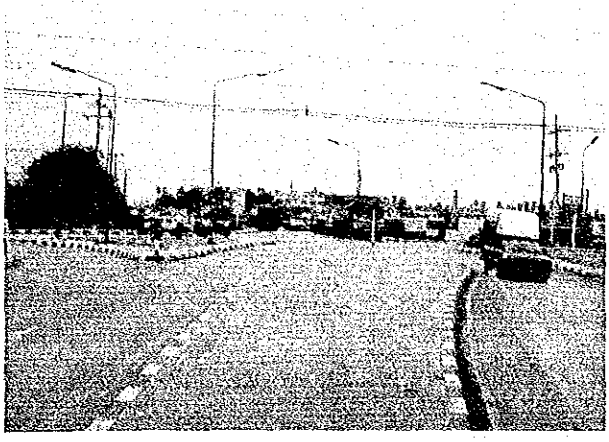


Study Section S-22: Prapadaeng (R303)



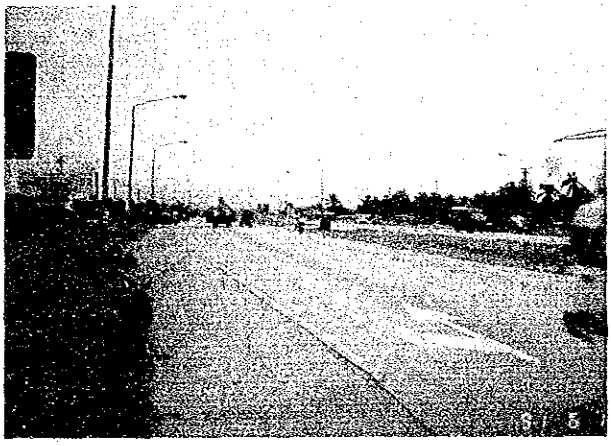
Study Section S-24: Khlong Prapa (R304)

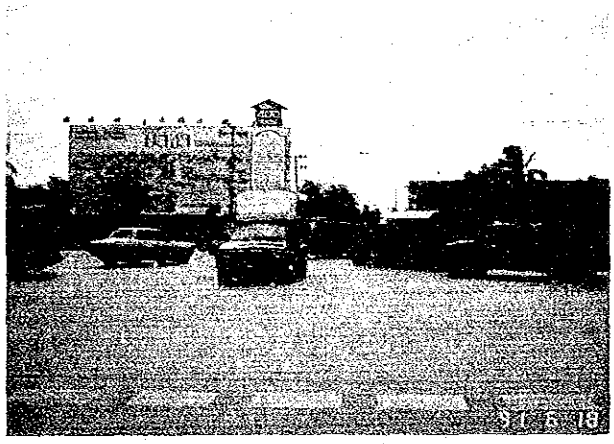
PHOTOGRAPH OF PRELIMINARY DESIGN SECTIONS(2)



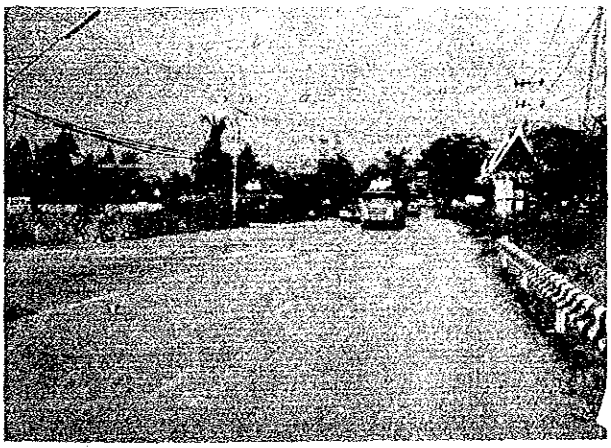
Study Section S-43: Pathum Wilai (R307)

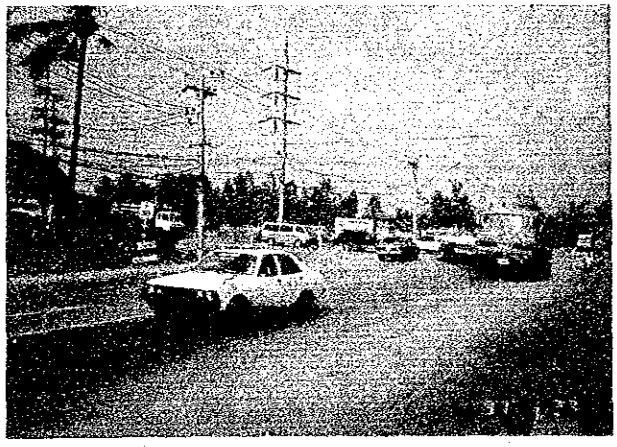
Study Section S-44: Damnoen Saduak (R325)





Study Section S-48: Bang Waek (R340)





Study Section S-52: Onn Nuch-3119 (R3119)

PHOTOGRAPH OF PRELIMINARY DESIGN SECTIONS(3)

4.3 SUPPLEMENTAL TOPOGRAPHIC SURVEY

Topographic maps were used for the preliminary design of the improvement plans of each Section. The maps had to be of a sufficiently small scale to reveal the existing conditions at the sites and to enable traffic control and safety measures to be devised to deal with these.

In the Study, the topographic maps are at a scale of 1:500. These maps were prepared for the preliminary design sections based on the results of the topographic survey.

Table 4.2 is a summary of the survey locations and the types of topographic surveys. Except for Study Section S-19, all surveys were conducted by the Study Team.

Table 4.2 Survey Locations and Type of Topographic Surveys

Study Section	Route No.	Survey Type	Remarks
S10 Ent.AIT	R1	Plane table survey cross-section survey	
S15 Sanamchan Palace	R4	Plane table survey cross-section survey	
S18 Kaset Sat	R302/R1	Plane table survey cross-section survey	
S19 Khae Rai	R302/R306	Plane table survey cross-section survey	by DOH
S22 Prapadaeng	R303/R3104	Plane table survey cross-section survey	
S24 Khlong Prapa	R304/BMA Rd.	Plane table survey cross-section survey	
S43 Pathum Wilai	R307,R3035/ R3111	Plane table survey cross-section survey	
S44 Damnoen Saduak	R325	Plane table survey cross-section survey profile survey	
S48 Bang Waek	R340/BMA Rd.	Plane table survey cross-section survey profile survey	
S52 Onn Nuch- Rt.3119	R3119/BMA Rd.	Plane table survey cross-section survey profile survey	

4.4 PRELIMINARY DESIGN

Details of the results of the preliminary designs for ten selected Study Sections, carried out by the Study Team, are described in this section. Preliminary designs were conducted primarily based on topographic maps with a scale of 1:500.

Through a series of site investigations and supplementary surveys, as well as by data analysis, existing conditions and major problems were identified for each planning site. Traffic control and safety measures were then planned to cope with the major traffic problems.

The geometric details for channelizing traffic, such as the dimensions of islands and turning paths and the methods of determining the signal phases and signal timing adopted in the preliminary design, have already been explained in the Technical Guidelines of the TOPR Study.

The following sub-sections describe the details of the improvement plans. Each Study Section is looked at in turn and the existing conditions and the main problems at the site are discussed. Several alternative countermeasures are presented and the main proposed countermeasure is outlined.

The detailed plans for each preliminary design are combined in the Drawings.

4.4.1 Study Section S-10: Ent. AIT (R1)

(1) Existing Conditions

A. This is a small suburban intersection connecting R1 with a minor road leading to the AIT and to Tamasart University.

B. In this section R1 was partially expanded from four lanes to ten lanes, when the pedestrian overpass was constructed, with a view to the future requirements of R1.

C. A right-turn lane, which uses the wide median on R1, exists.

D. Figure 4.3 shows the turning movement at this intersection. R1 carries heavy traffic volume at high speed, whilst the traffic volume exiting from the minor road is small.

E. At this intersection, the U-turn traffic volume from Bangkok is high because there is no median opening for a long distance before this intersection.

F. Accidents in this section mainly occur whilst turning.

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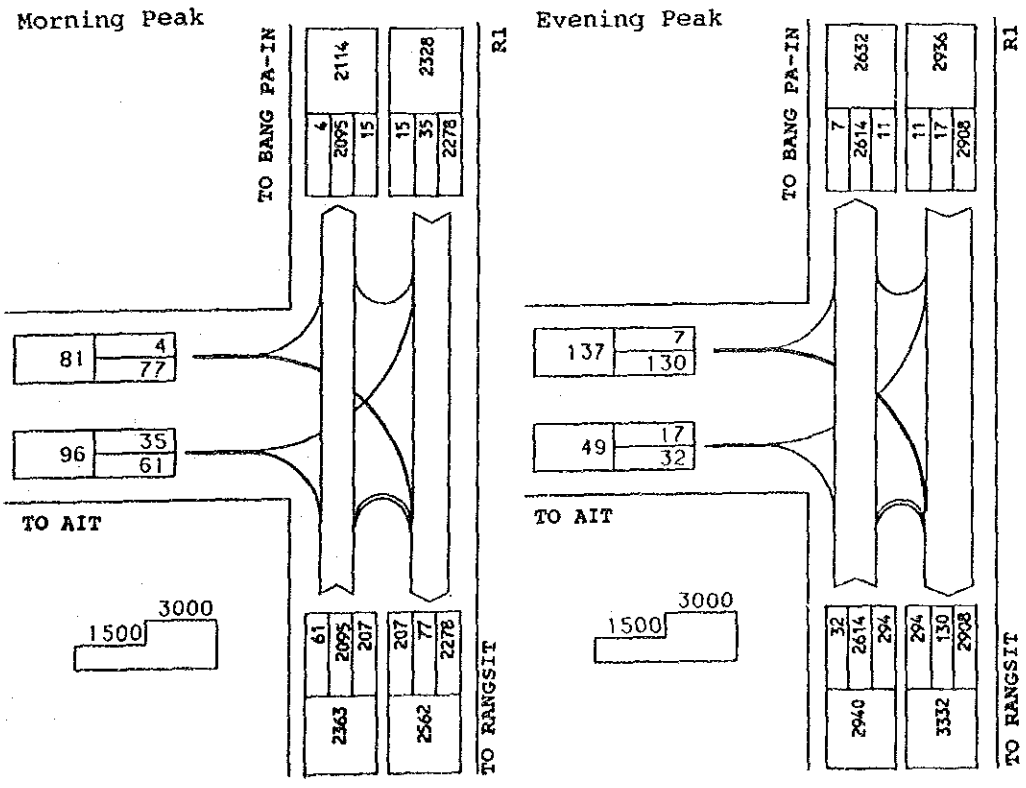

Figure 4.3 TURNING MOVEMENT AT THE INTERSECTION OF S-10

(2) Main Problems

A. The difficulty and the degree of danger facing right-turns and U-turns is a result of the lane expansion and the heavy traffic volume on R1.

B. This situation becomes more critical when overtaking vehicles run into the expanded lanes.

C. Obstructions are caused on the through-lanes by vehicles waiting to turn at the median openings and on the right-hand side shoulder. These obstructions are responsible for the sudden stoppages and the lane changes of the through-traffic.

(3) Main Countermeasures

The following countermeasures were chosen for the improvement plan:

A. Reducing the number of lanes in this intersection so that it matches the number of lanes in the ordinary section of R1. This will shorten the number of lanes to be crossed when turning right onto R1 and it will lead to a smoother and more orderly traffic flow on R1;

B. Widening of the median to 14 m and creating storage and accelerating lanes inside the median to be used exclusively for U-turning. Light vehicles, which make up a large portion of the U-turn traffic, can make U-turns using this U-turn facility and thus avoid obstructing the through-traffic. Widening of the median also provides the refuge-space for right-turn vehicles;

C. Providing an individual turning facility for right-turn vehicles in order to avoid confusion at the median openings.

Alternative countermeasure

Traffic signal control is an alternative which ensures traffic safety. This alternative was not chosen because of the low volumes of traffic on the minor road entering the intersection and the delays this measure would create on R1.

4.4.2 Study Section S-15: Sanamchan Palace (R4)

(1) Existing Conditions

A. This intersection is a stop-controlled four-leg intersection between R4 and a minor rural road.

B. R4 has a four-lane carriageway with a wide median and shoulders, while the intersecting road has two lanes. The south-side section is an unpaved narrow road.

C. Lighting and right-turn lanes on R4 have been installed at this intersection.

D. Median openings are about 600 m away from the intersection on both sides. At these locations lighting and U-turn lanes have not been installed.

E. Figure 4.4 shows the directional traffic volume at the intersection, as well as at the median opening in the upper diagrams. Traffic volume on R4 is high and includes a lot of heavy vehicles which comprise more than 40% of the total volume, excluding the motorcycles.

F. Traversing and turning right from the minor road are prohibited at the intersection and this leads to heavy U-turn traffic at the median openings.

G. Traffic accidents occur mainly at the intersection and median openings. The most common accidents are rear-end collisions and accidents caused by improper turnings.

(2) Main Problems

A. U-turns and right-turns are difficult to make at the intersection and median openings due to the heavy high-speed traffic volume. Often there are not enough gaps in the traffic flow on R4 to successfully complete a turn. This situation frequently leads to serious accidents, such as rear-end collisions and side collisions caused by improper turns. This forces the through-traffic to stop and change lanes suddenly.

B. Obstruction and conflicts at the section adjacent to the median openings on R4 are caused by vehicles waiting to turn. These vehicles occupy the through-lane because there is not enough space for deceleration and storage on the median due to the poor paved shoulder. This is also a major cause of accidents.

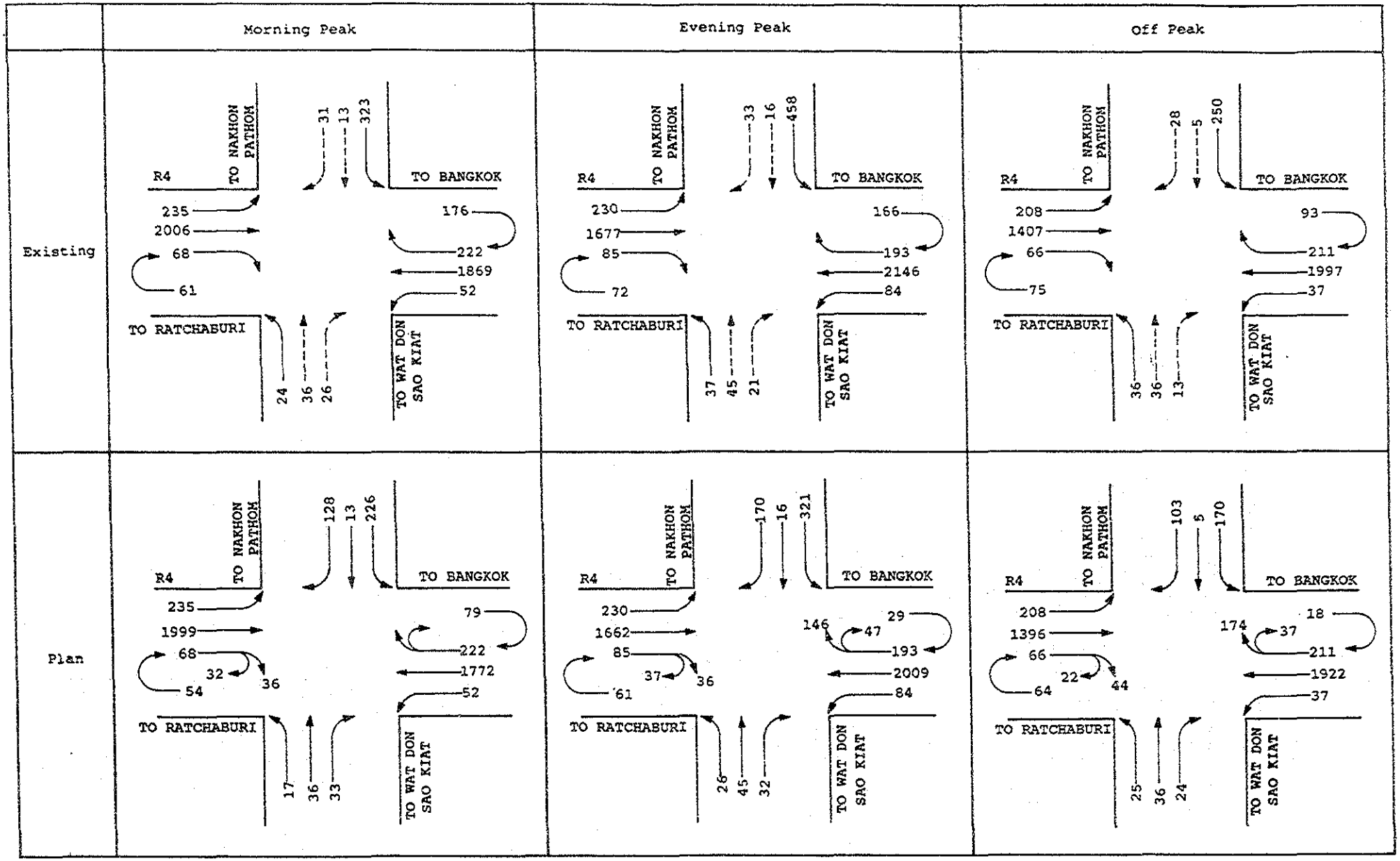

Figure 4.4 TURNING MOVEMENT AT THE INTERSECTION OF S-15

C. Illegal traversing of R4, turning right from the minor road to take short-cuts by avoiding the detour, and ignoring the traffic regulations, are problems encountered in this section.

(3) Main Countermeasures

In order to deal with turning vehicles crossing R4, four alternatives were considered. Figure 4.5 shows these alternatives and Table 4.3 summarizes the strategies and measures and the advantages and disadvantages of the alternatives.

After careful consideration alternative 2 was chosen for this section for the following reasons:

A. Traffic control by signals is an effective way of ensuring traffic safety;

B. Signalization at the intersection can solve the problems at the median opening since it reduces the volume of U-turn traffic. Vehicles which have either their point of origin or destination between the intersection and the median openings will still be allowed to make U-turns;

C. The effects of the signal control of alternative 2 on the through-traffic will be minor, since the queue length is estimated at 80 m/cycle;

D. The addition of a through-lane to increase the capacity of the intersection, proposed in alternative 3, is desirable, however, it requires the widening of R4 for about 1 km. and this is not economically feasible.

This intersection exhibits typical problems encountered on DOH trunk roads. This is because most DOH roads are constructed with low embankments resulting in at grade intersections.

In other sections, depending upon the site conditions, grade separations and special U-turn facilities should be considered besides these alternatives.

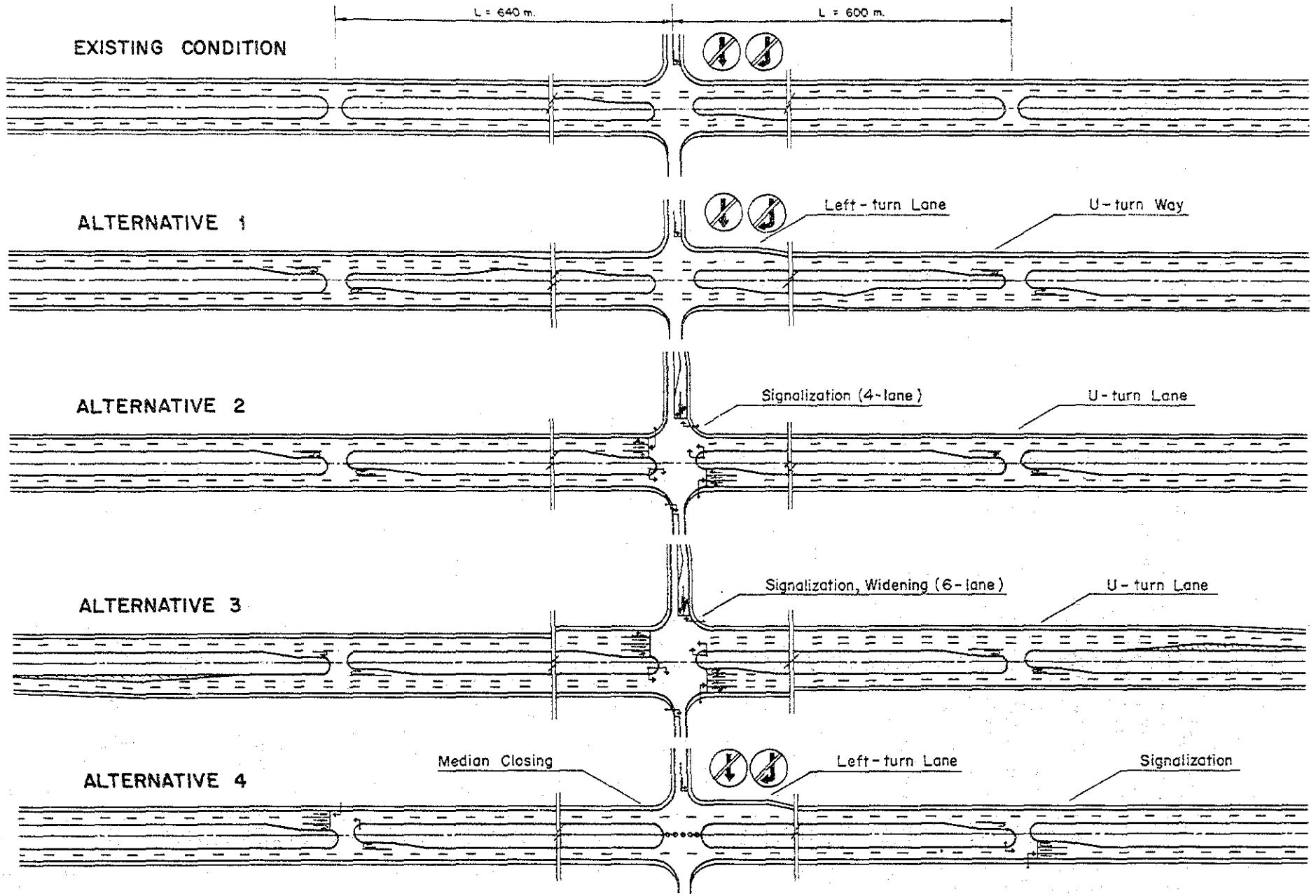

Figure 4.5 ALTERNATIVES OF IMPROVEMENT PLAN FOR S-15

Table 4.3 Comparison of Alternatives of Improvement Plan for Section 15

	Improvement Plan		Advantage	Disadvantages
	at Intersection	at Median Openings		
Alternative 1	- Channelization to ensure the restriction of traversing and turning right from minor road onto R4. Left-turn lane will also be provided.	- Provision of a U-turn opening to enable small-sized vehicles to U-turn freely.	- U-turn traffic can be dealt with in the traffic gaps on R4.	- Difficulty for heavy vehicles to complete U-turns at median openings. - Difficulty in turning right at the intersection.
Alternative 2	- Signalization at the intersection.	- Provision of a U-turn lane to avoid the obstruction of through-traffic.	- Reduction of U-turn traffic volume. - Safety for turning and crossing is ensured. - Convenience for users since they are now able to avoid the detour.	- Traffic delays on R4 are caused by signalization.
Alternative 3	- Signalization and channelization at the intersection. - Addition of a through-lane to reduce the delay caused by signal control.	- Provision of a U-turn lane.	- Safety for turning is ensured. - Traffic delays on R4 are lower than for alternative 3. - U-turn queues are shortened.	- Traffic delays on R4 are caused by signalization. - The widening of long sections of the road is required to provide smooth merging for the traffic and to avoid the median openings.
Alternative 4	- Closing the median.	- Installation of traffic signal for U-turn on one direction. - Provision of a U-turn lane.	- This method is useful to treat one-sided U-turn traffic.	- Long delays for traffic on R4 are caused by lower saturation flow rates for U-turns than those proposed in alternative 2 and 3. - Longer detour distance.

4.4.3 Study Section S-18: Kaset Sat (R302/R1)

(1) Existing Conditions

A. This is the T-shaped signalized intersection between R302 and R1 (Phahon Yothin road). Most of the roadside has been commercialized, except for the area around the Kaset Sat university on the north corner.

B. The plan to widen R302 from four lanes to eight lanes has already been prepared by the DOH.

C. Figures 4.6 and 4.7 show the hourly traffic volume entering the intersection, and the volume of traffic turning during peak hours, respectively. Both roads have heavy traffic volumes.

D. R1 is very congested and long queues and tail-backs occur during peak hours.

E. The number of accidents occurring in the R302 section of this intersection was recorded as 11 cases in 1988. Collisions between vehicles were the main cause of accidents.

(2) Main Problems

A. This intersection has been over-saturated by a high volume of incoming traffic.

B. The reduced capacity of the through-lane on R1 has been caused by right-turning vehicles filling the short storage lane and spilling over onto the through-lane and blocking the right-turn-and-through lane whilst they wait for the lights to change.

C. The corners have an inadequate radius on the R1 left-turn lane. This also reduces the intersection's capacity.

(3) Main Countermeasures

The traffic congestion problems at this intersection are related to the back-up of traffic in the adjacent section. Comprehensive traffic operational plans, which include plans for the improvement of the intersections and the mid-block section as well as road network considerations, are required.

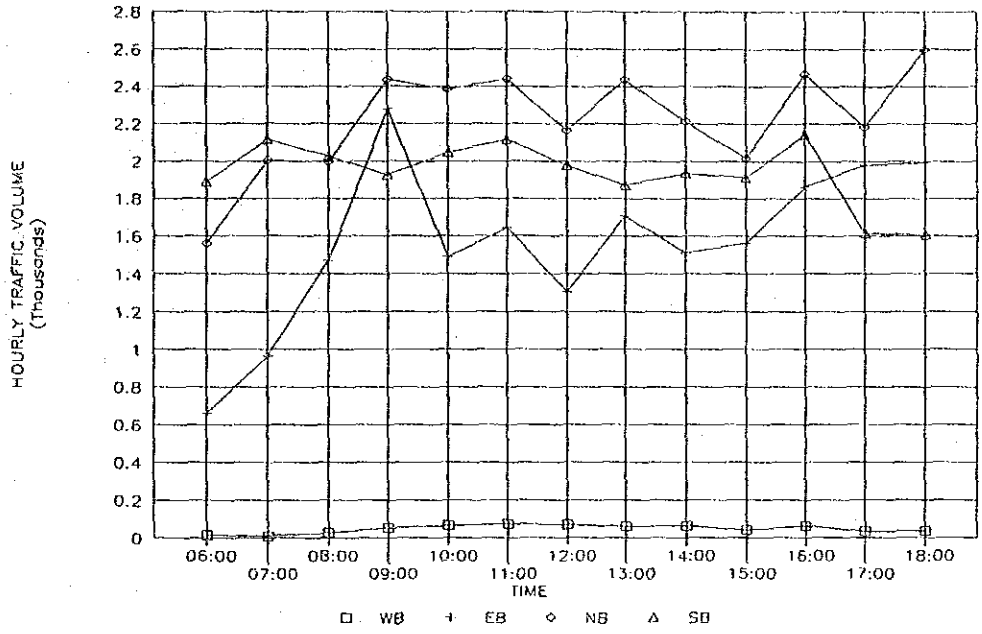

Figure 4.6 HOURLY FLUCTUATION OF TRAFFIC VOLUME ON S-18

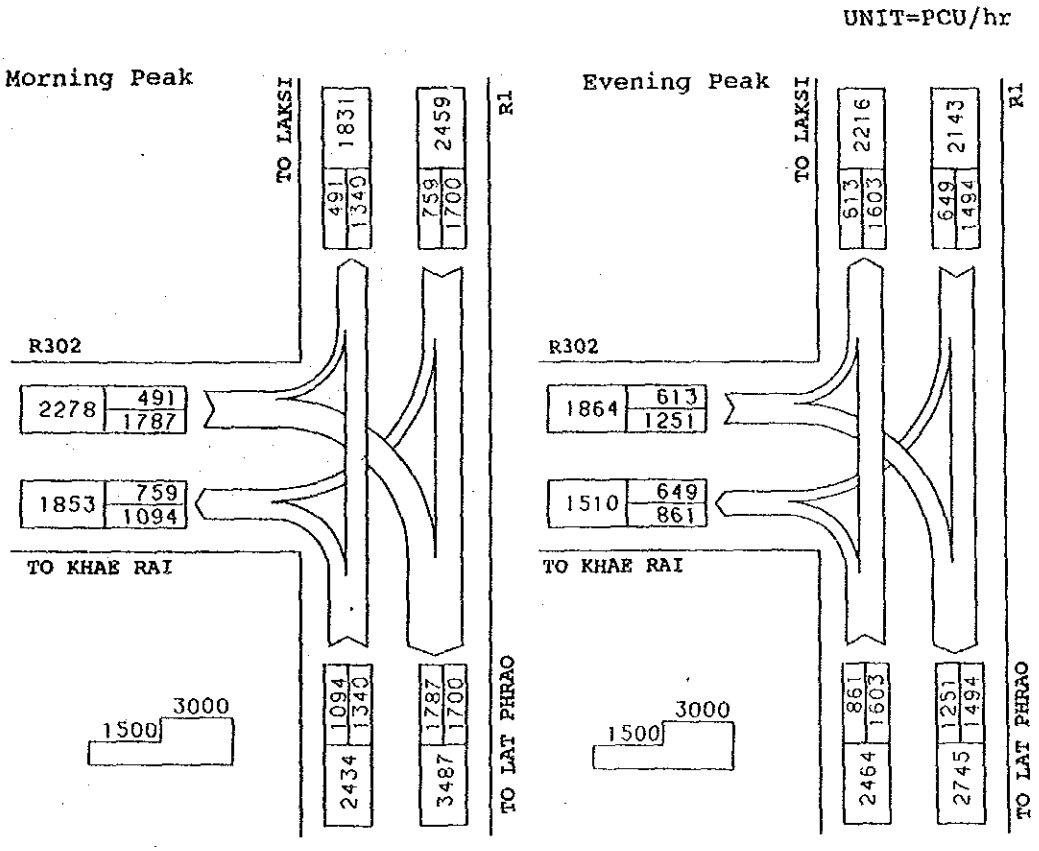

Figure 4.7 TURNING MOVEMENT AT THE INTERSECTION OF S-18

The supplemental traffic survey recorded the peak-hour traffic volume which passed through the intersection under over-saturated conditions. If it were not for the over-saturated conditions the volume of traffic would have been higher for the same period of time.

The improvement plan was based upon an estimate of the traffic volume which was calculated by adding the storage traffic count on R1 to the traffic volume count measured by the survey.

The following countermeasures were chosen:

A. Widening of R302. However, the widening of R302 from four lanes to eight lanes is insufficient to tackle the traffic problem;

B. A right-turn lane will be provided to support the existing right-turn lane in the following ways:

   - by creating a minimum width of 2.5 m. for the right-turn lane, and by reducing the width of the lane, the median and side-walk within the right-of-way;

   - shifting of the through-lanes on the northern section by 0.5-1.0 m. to accommodate the new right-turn lane. However, in order to avoid shifting the lanes on the southern section of the intersection as well, the through-traffic has to deviate by 0.5 to 1 m. when it crosses the intersection;

C. The rearrangement of the left-turn lane on R1 to ensure a minimum radius at the corner for heavy vehicles which are turning;

D. The re-arrangement of traffic signals to suitable locations after channelization. Over-hanging signals should be used to ensure improved visibility.

4.4.4 Study Section S-19: Khae Rai (R302/R306)

(1) Existing Conditions

A. This is a signalized intersection in an urban area, situated between two four-lane roads.

B. Both roads have right-and left-turn lanes, but the left-turn lane from the south is narrow.

C. R302 has a wide right-of-way 40 m. in width, and there are plans to widen it to eight lanes. The right-of-way on R306 is approximately 28 m..

D. Figure 4.8 and 4.9 describe the hourly volume of traffic entering the intersection and the peak-hour turning movement, respectively. Both roads have heavy traffic volumes. Through-traffic makes up the bulk of the traffic volume, however, right-and left-turning traffic is also significant.

(2) Main Problems

A. This intersection is over-saturated during peak hours and long queues and tail-backs occur. Under the present conditions, the degree of saturation of this intersection is estimated at 1.14 in the evening peak hours.

B. Obstruction of the left-turn lanes by overflowing through-traffic queues, especially on the left-turn lane from the south, has become increasingly worse because of narrower lane widths.

C. Short storage lane lengths for right-turn traffic results in right-turn vehicles occupying the through-lane and reducing the capacity of the through-lanes.

D. Poor lane alignment, which uses shorter taper section lengths and sharp curvatures, causes disorderly traffic flows and obstructs the adjacent lanes.

(3) Main Countermeasures

To cope with the problem of congestion at this intersection, the following alternatives were considered:

Alternative 1	Widening of R302 at grade intersection;
Alternative 2	Grade separation by viaduct crossing over R302 after widening of R302;
Alternative 3	Grade separation by viaduct crossing over R306.

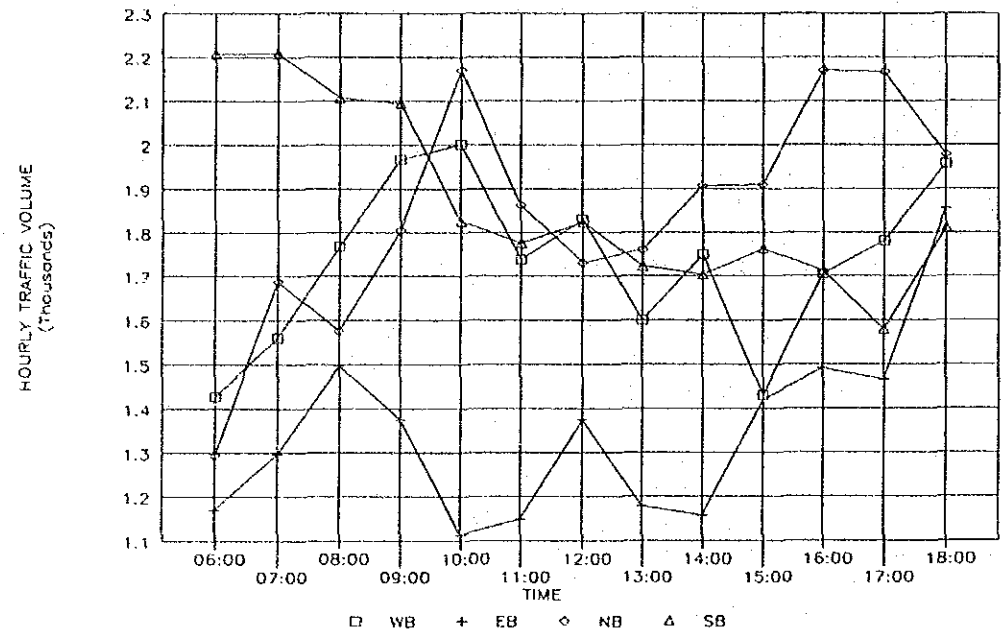

Figure 4.8 HOURLY FLUCTUATION OF TRAFFIC VOLUME ON S-19

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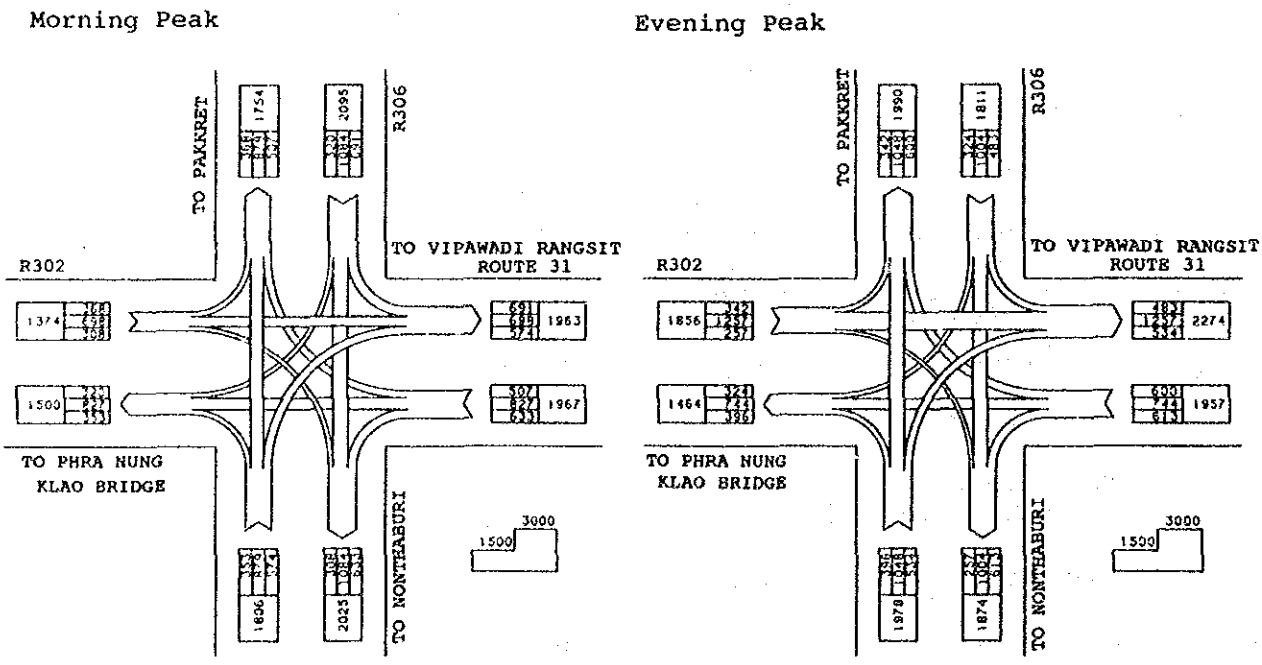


Figure 4.9 TURNING MOVEMENT AT THE INTERSECTION OF S-19

Figure 4.10 shows the signal phasing plan and the degree of saturation of the intersection. The various alternatives as well as the existing condition are looked at. The cross-sectional element of each alternative plan is described in Figure 4.11.

After consideration, alternative 3 was proposed for the following reasons:

A. The widening of R302 to eight lanes is not in itself sufficient to reduce the congestion. In order to deal with the heavy traffic volume entering the road, a widening of R306 is also required. However, land acquisition will be a problem;

B. The degree of saturation of the intersection will be reduced by grade separation. The saturation degree of the intersection for alternative 2 is estimated to be lower than that of alternative 3 because of the widening of R302 to eight lanes;

C. The construction of the R302 viaduct and the widening of the road will be implemented at the same time due to the wide right-of-way of the road (40 m.). In this way, workability of construction will be increased;

D. A four-lane viaduct is recommended to deal with the future traffic demands. Through-traffic on both roads is about 2,000 pcu/hr. (as revealed by the traffic survey). This volume represents 80% of the total capacity of a two-lane road. A four-lane viaduct in both directions is proposed. This takes into account the daily variations of traffic volume and the future increase in traffic volume created by the grade separation on another R302 section and new road construction, such as the ETA road. The four-lane viaduct of R306, will require land acquisition .

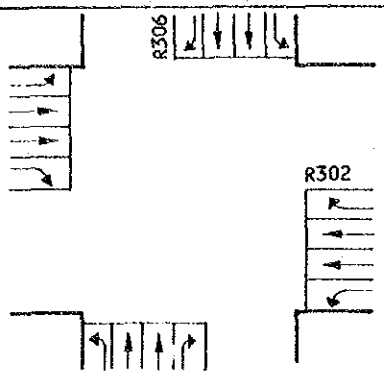
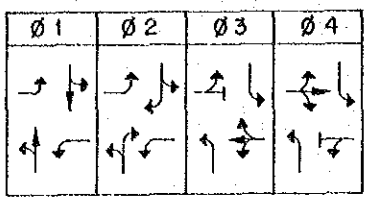
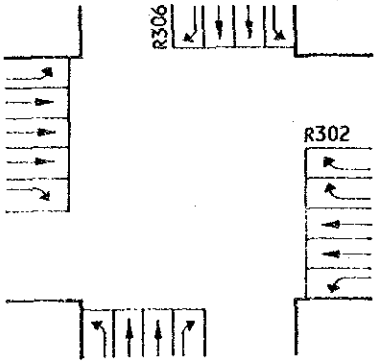
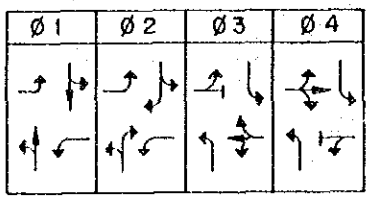
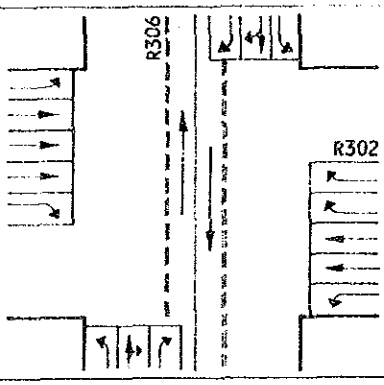
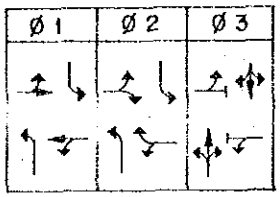
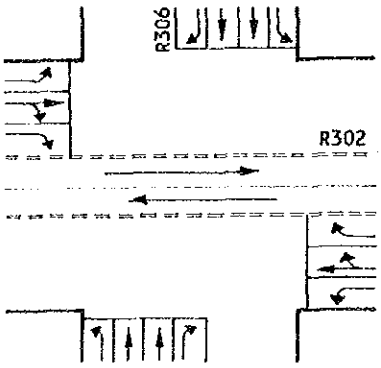
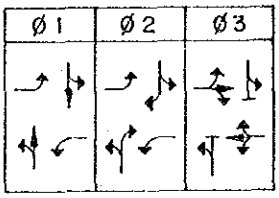
ALTERNATIVES	NUMBER OF LANES	SINGNAL PHASING	SATURATION DEGREE OF INTERSECTION	
			MORNING PEAK	EVENING PEAK
EXISTING CONDITION			0.980	1.139
ALTERNATIVE 1 WIDENING OF ROUTE 302			0.902	0.921
ALTERNATIVE 2 ROUTE 306 : VIADUCT			0.475	0.469
ALTERNATIVE 3 ROUTE 302 : VIADUCT			0.684	0.677

Figure 4.10 SATURATION DEGREE OF THE INTERSECTION IN ALTERNATIVE PLAN

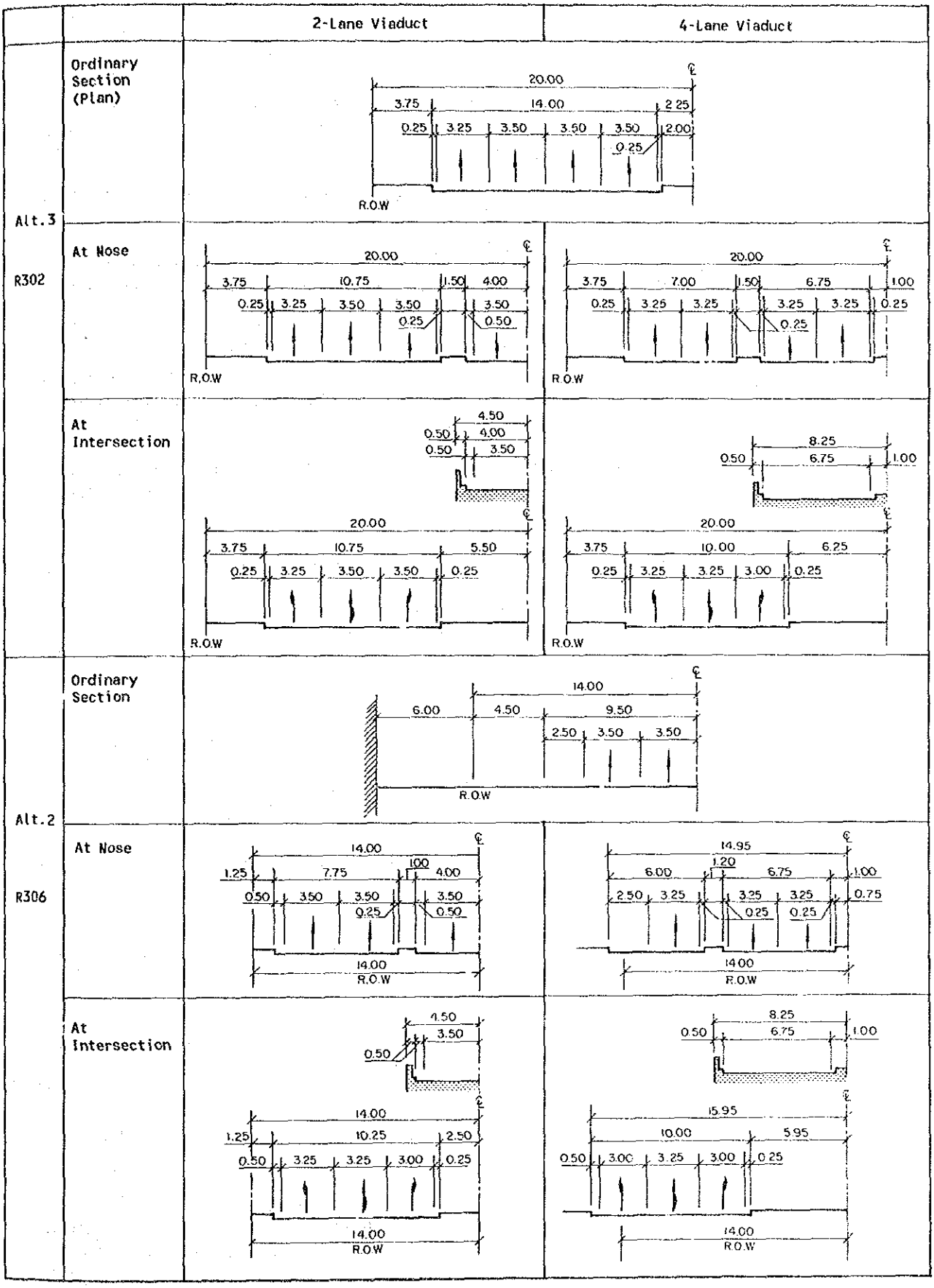


Figure 4.11 CROSS SECTION ELEMENT OF ALTERNATIVE PLAN

4.4.5 Study Section S-22: Prapadaeng (R303/R3104)

(1) Existing Conditions

A. This is a signalized T-shaped intersection in an urban area.

B. R303 is a four-lane road and R3104 is connected to R3113 by ferry at the Chaophaya river. There are plans to widen this road to four lanes.

C. Figure 4.12 shows hourly traffic volumes in each direction and Figure 4.13 shows turning movement during peak hours. The major form of traffic flow is through-traffic on R303.

D. Accident rates at this section are two times higher than at the other sections. Motorcycle accidents occurred frequently.

(2) Main Problems

At less than 0.8 the estimated saturation degree of this intersection is not very high, however, long queues occur during peak hours. This is a direct result of obstructions causing a reduction in the capacity of the lanes.

Obstructions result in reductions of traffic capacity and traffic safety caused by the need to change lanes or stop suddenly to avoid the obstructions. Obstructions on through-lanes are found at the following sections:

A. In the north side beyond the intersection, through-lane traffic is often reduced to one lane because of parked vehicle;

B. In the south side beyond the intersection, through-lane traffic is obstructed by buses avoiding the deteriorated paved shoulder;

C. The short storage lane length for right-turn traffic may be responsible for the obstruction of the through-lane on R303;

D. At the merging sections from two lanes to one lane on R3104;

E. Throughout the section, shoulder pavement has been deteriorating and pavement markings are fading. This has resulted in ambiguous carriageway and shoulder boundaries which has lead to traffic conflicts and a reduction of road capacity.

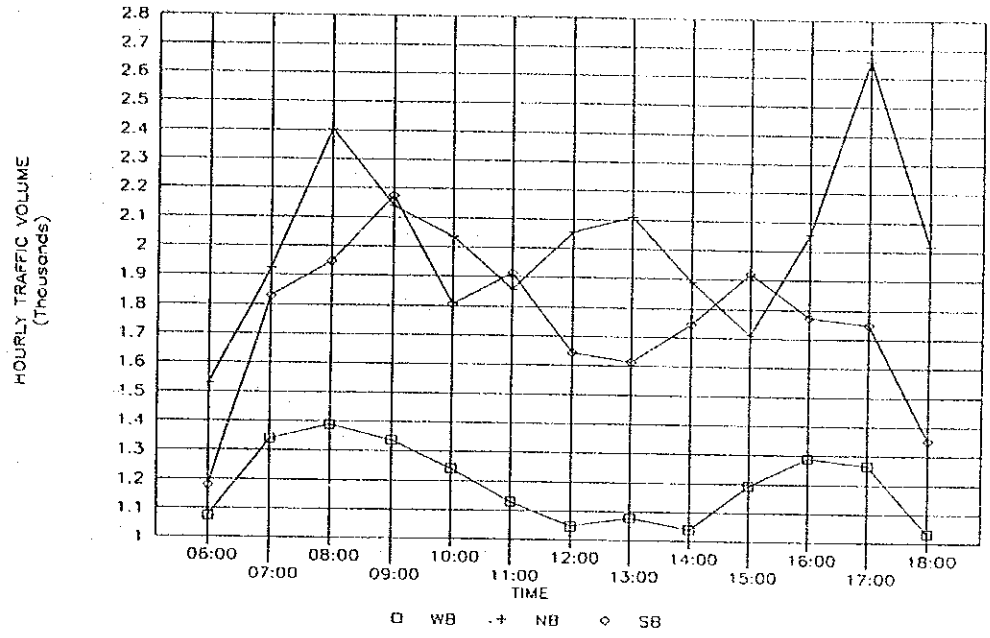


Figure 4.12 HOURLY FLUCTUATION OF TRAFFIC VOLUME ON S-22

UNIT=PCU/hr

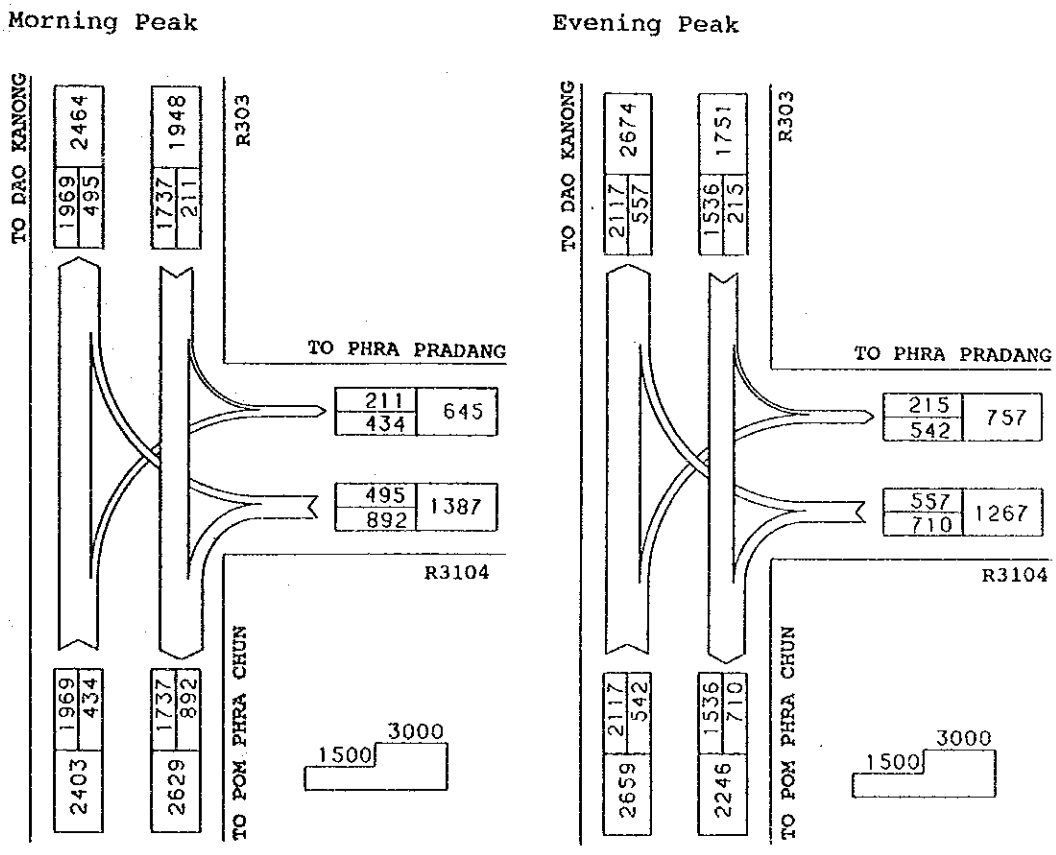


Figure 4.13 TURNING MOVEMENT AT THE INTERSECTION OF S-22

(3) Main Countermeasures

In order to improve the road capacity and to ensure the orderly and smooth flow of traffic, the following traffic control measures were proposed:

A. Repair of the shoulders and installation of pavement markings;

B. Provision of bus bay on R303;

C. Restriction of parking on the adjacent sections to the intersection;

D. Extension of storage lane length for right-turn traffic on R303;

E. Improvement of signal phasing.

The problems of the merging section on R3104 will be solved by widening R3104.

4.4.6 Study Section S-24: Khlong Prapa (R304/BMA Rd.)

(1) Existing Conditions

A. This is the intersection of R304 and the BMA road. At present the median of R304 has been closed and turned into a T-shaped intersection.

B. R304 is a four-lane road with a wide median, whilst the BMA road is a two-lane road. The north section is not for public use. Widening of the BMA road to four lanes has been considered for the south section.

C. Figure 4.14 and 4.15 show the hourly traffic volume entering the intersection and the turning movement at peak hours, respectively. The upper diagrams in Figure 4.15 show the existing situation and the lower diagrams show directional traffic volumes after opening the median. In the morning peak-hours east-bound traffic predominates, whilst in the evening peak-hours west-bound traffic flows predominate. Traffic volumes between R304 and the BMA road are high and this leads to many U-turns being made at the median openings which are situated 300 m. and 500 m. away from the intersection.

D. In terms of accidents, rear-end collisions occur frequently.

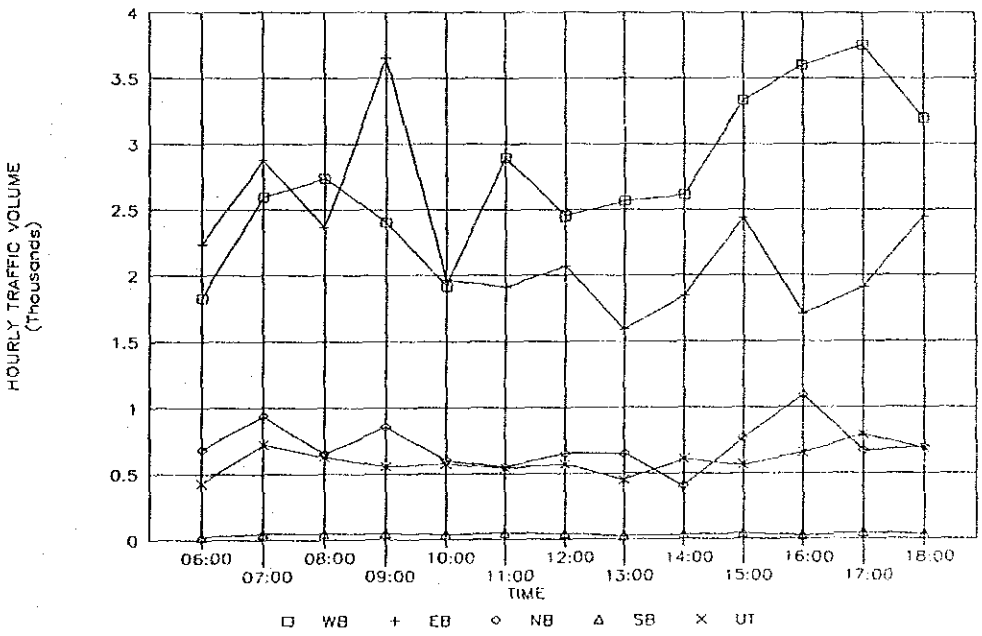


Figure 4.14 HOURLY FLUCTUATION OF TRAFFIC VOLUME ON S-24

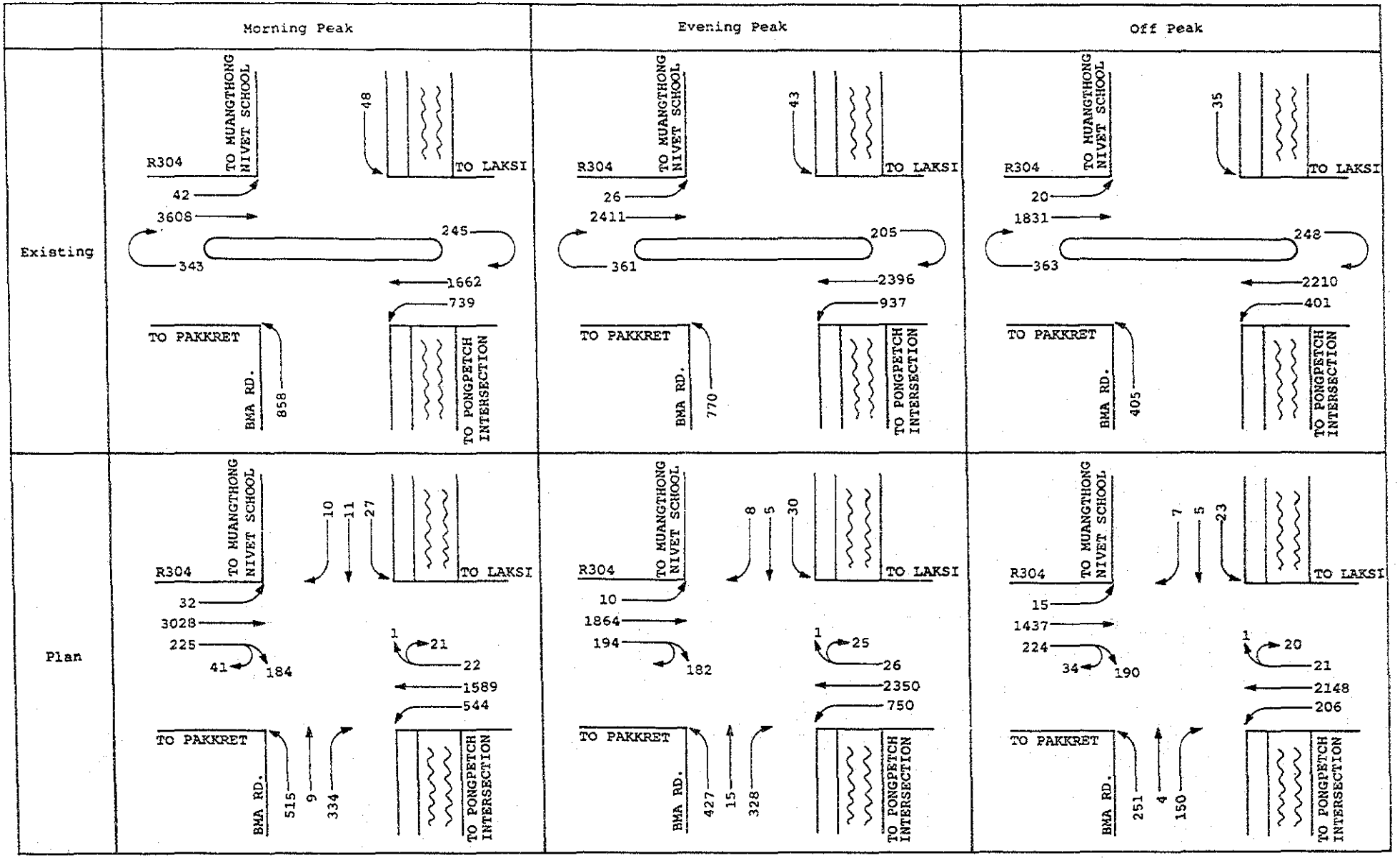


Figure 4.15 TURNING MOVEMENT AT THE INTERSECTION OF S-24

(2) Main Problems

A. U-turn traffic has difficulty in turning at the median openings due to heavy traffic flows on R304 and this poses a danger to the through-traffic by improper turnings being made.

B. Obstructions on the through-lane, created by stopping vehicles waiting to make U-turns, cause conflicts between through-traffic and U-turn vehicles.

C. Traffic weaving occurs as vehicles from the BMA road move across the through-lanes to make U-turns on R304.

D. A sharp curve at the left-turn corner from east R304 affects the smoothness of turning left. This causes long queues as vehicles, wanting to turn left on to the BMA road, obstruct the through-lane traffic on R304.

(3) Main Countermeasures

In order to deal with high U-turn traffic volumes and to ensure traffic safety, traffic control by traffic signals is recommended.

a) Signalization of the Intersection

The improvement plan was prepared on the assumption that the widening of the BMA road will be carried out. The details of these measures are described below:

A. Installation of traffic signals at the intersection. A large proportion of the U-turn traffic volume will be reduced and problems caused by U-turn traffic at the median opening will be relieved;

B. Left-and right-turn lanes on each approach (except in the northerly direction) are required in order to deal with the heavy traffic volume. A widening of the bridge section is required to provide the left-turn lane from the easterly direction.

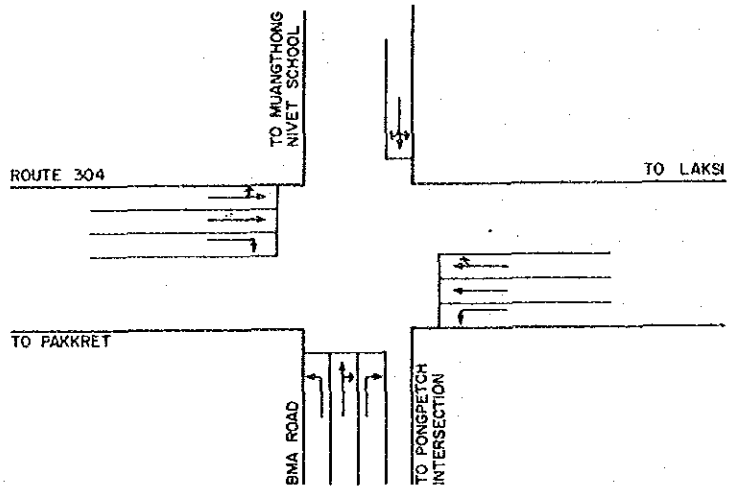
For the north section of the BMA road, light vehicles were adopted as the design vehicles, because of the low traffic volumes there, and also to avoid widening the north-side bridge;

C. Proposed signal phasing is shown in Figure 4.16.

b) Signal Control at the Median Opening

Alternatives to signal control plans at the median opening, which do not require the widening of the BMA road, will be considered. Figure 4.17 shows the outline of this alternative plan.

An additional through-lane is required due to heavy traffic volume on R304, high volumes of U-turn traffic and lower saturation flow rates for the U-turn traffic. The additional lane should be continued for some distance after the intersection to facilitate the merging from three lanes back to two lanes. A widening of the bridge section is also required.



	1 ø	2 ø	3 ø	Saturation Degree
Morning Peak				0.81
	55 %	35 %	10 %	
Evening Peak				0.82
	70 %	6 %	29 %	

Figure 4.16 LANE NUMBER AND SIGNAL PHASING

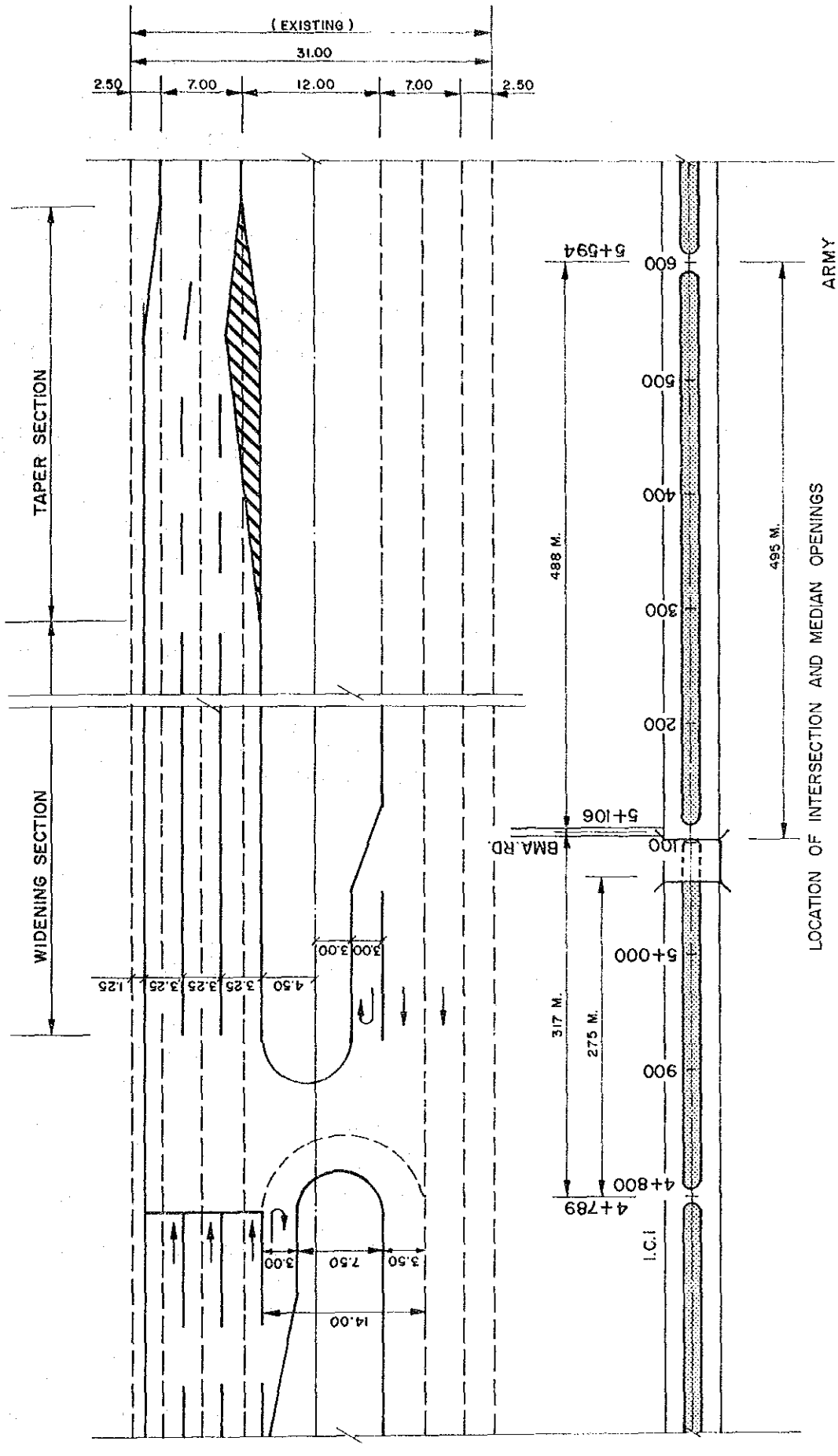


Figure 4.17 SIGNALIZATION AT MEDIAN OPENINGS

4.4.7 Study Section S-43: Pathum Wilai (R307, R3111/R3035)

(1) Existing Conditions

A. This is a stop-controlled 4-leg intersection between two two-lane roads situated in an urban area.

B. R307 and R3035 have left-turn lanes. R3111, which is connected to R307 at this intersection, has a bridge section with a narrow width on the approach to the intersection.

C. Figure 4.18 and 4.19 shows the hourly traffic volume entering the intersection and the turning movement during peak hours, respectively. Both roads have similar traffic volumes. The left- and right-turn traffic volumes make up a high proportion of the total traffic volume (except left-turning traffic toward R3111 and right-turning traffic from R3111).

D. High heavy vehicle rates, which made up more than 30% of the traffic volume, were observed, except on the section between R3035 and R3111.

E. In terms of accidents, rear-end collisions and collisions with opposed vehicles occur frequently. Motorcycle accidents are also common.

(2) Main Problems

A. Traffic volume exceeds the capacity of the stop-controlled intersection.

B. There is no clear traffic priority in the intersection because of similarities in traffic volume and in the configuration of the roads.

C. Adding to the above mentioned conditions, traffic confusion and conflicts are also caused by following:

- a high proportion of right-turning traffic;
- difficulty in turning right for heavy vehicles, due to the poor location of the median;
- poor lane alignment for vehicles travelling between R307 and R3111;
- the shared use of the lane for both through-traffic and right-turn traffic.

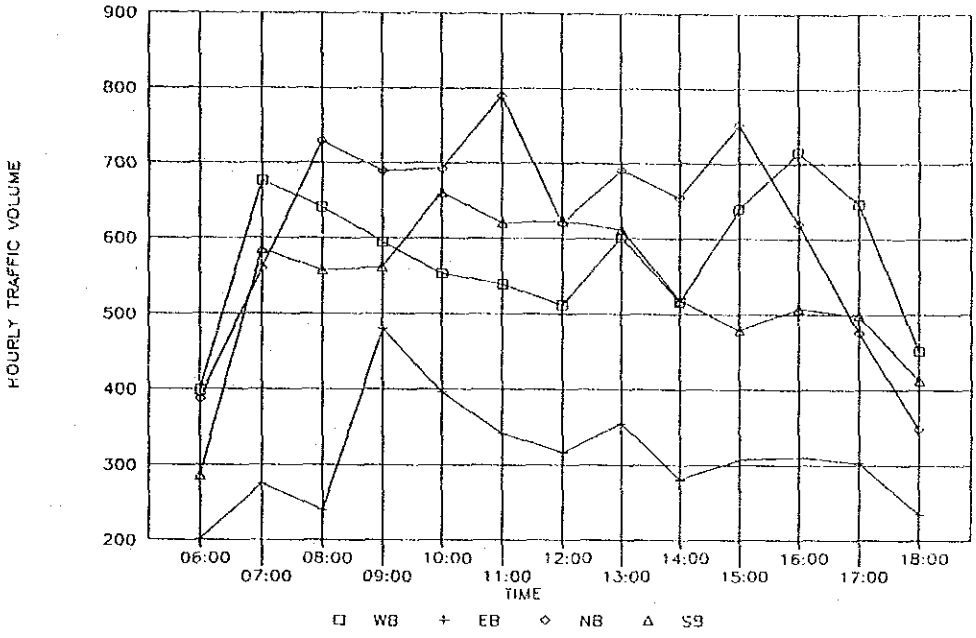
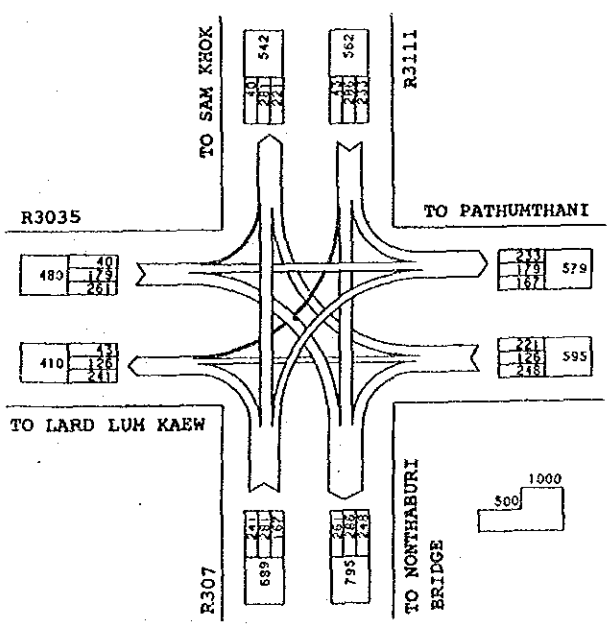


Figure 4.18 HOURLY FLUCTUATION OF TRAFFIC VOLUME ON S-43

UNIT=PCU/hr

Morning Peak



Evening Peak

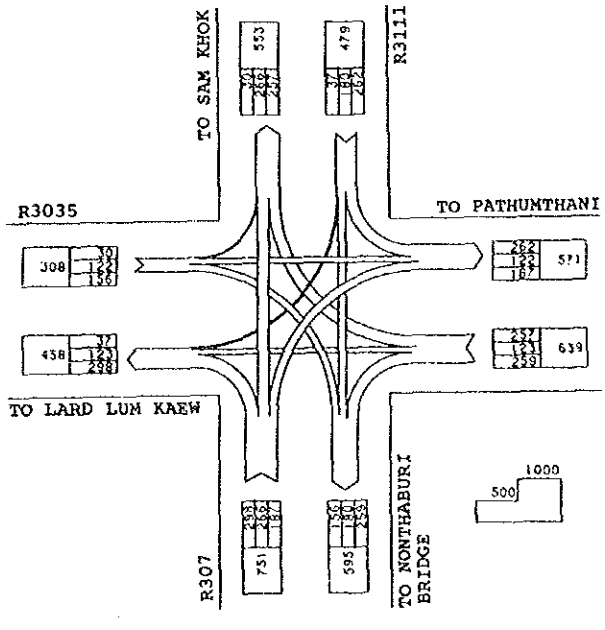


Figure 4.19 TURNING MOVEMENT AT THE INTERSECTION OF S-43

(3) Main Countermeasures

A. Installation of traffic signals.

B. Provision of right-turn lanes on each approach except on R3111:

- a right-turn lane is effective for ensuring smooth traffic flow and traffic safety;

- a right-turn lane on R3111 has not been proposed because of low traffic volumes and the desire to avoid widening the bridge section;

- the right-turn lane on R3035 is planned to be widened only on the left side in order to minimize the construction work required. The left-turn lane from the west on R3035 has been rejected because of low traffic volumes.

4.4.8 Study Section S-44: Damnoen Saduak (R325)

(1) Existing Conditions

A. R325 is a two-lane road with 2.5 m. width soft shoulders. This section is located near an urban area.

B. This Study Section has a bridge section and a sharp curvature 200 m. in radius.

C. Figure 4.20 shows the hourly traffic volume of ordinary vehicles and motorcycles. Traffic volume is not heavy in each direction. More than 50% of the traffic volume is made up of motorcycles during peak hours.

D. Most of the accidents in this section involved motorcycles. These accidents showed a higher percentage of fatalities caused by collisions with opposed vehicles and rear-end collisions.

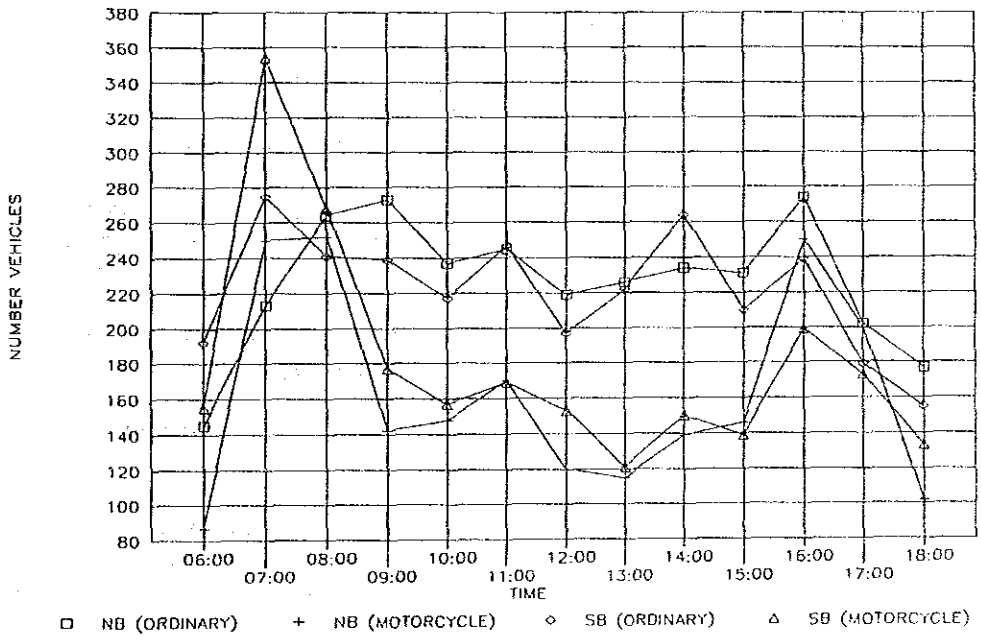


Figure 4.20 HOURLY FLUCTUATION OF TRAFFIC VOLUME ON S-44

(2) Main Problems

A. The mixture of motorcycles and ordinary vehicles on the roads is dangerous and interrupts to the smooth traffic flow.

B. Most of the motorcycles use the carriageway and not the soft shoulders and they travel at lower speeds than ordinary vehicles.

C. Ordinary vehicles frequently encroach on the opposing lane to overtake and to avoid motorcycles. These situations may cause serious accidents, especially in the sharp curvature section and in the narrow carriageway section. The carriageway width has been narrowed by a covering of soil from the shoulders.

D. Steep super-elevations of more than 6% are dangerous for motorcycles.

E. There is insufficient visual guidance for the sharp curve section.

(3) Main Countermeasures

a) Provision of a motorcycle lane which utilizes the existing shoulder in the following ways:

A. The cross-section element was decided following the conception of the motorcycle lane in Khon Kaen constructed as experimental work in the TOPR Study;

B. In the bridge section the alternatives shown in Figure 4.21 were considered. Alternative 1 was proposed for the following reasons:

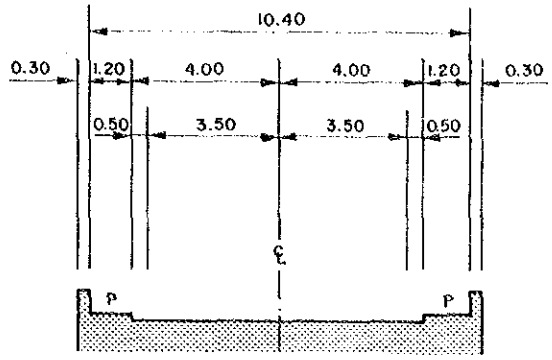
- a continuous motorcycle lane is desirable to avoid confusion at the bridge section;

- a width of 1.20 m. for the motorcycle lane is acceptable;

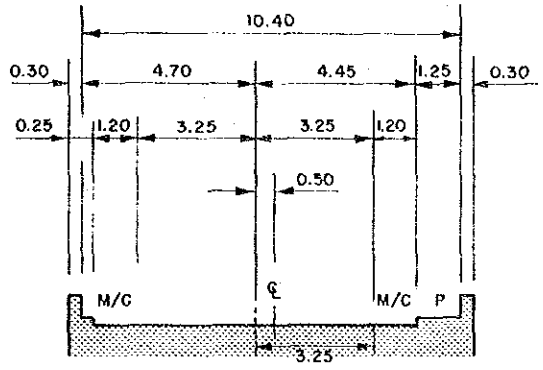
- the width of the lanes can be reduced depending on the traffic volume and the proportion of heavy vehicles;

- the side-walk provision on the right side seems to be sufficient, considering the low pedestrian numbers and the land-use;

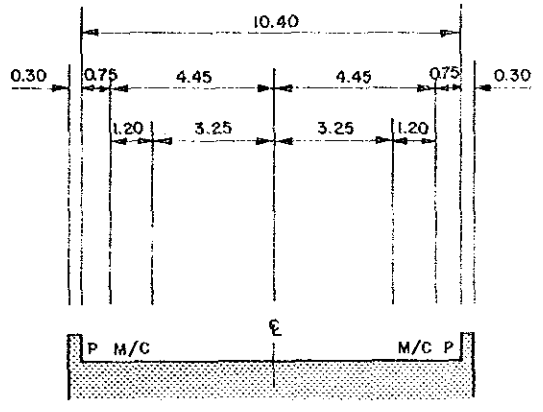
EXISTING



ALTERNATIVE 1
SIDEWALK – ON ONE SIDE



ALTERNATIVE 2
SIDEWALK – ON BOTH SIDE



ALTERNATIVE 3
SIDEWALK – SEPERATE

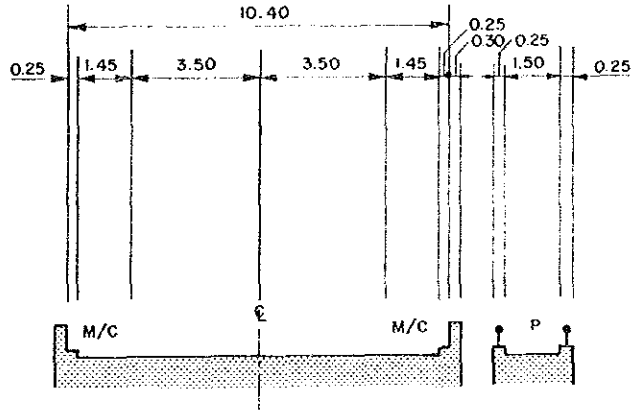


Figure 4.21 ALTERNATIVE PLAN ON THE BRIDGE SECTION

- in the alternative 2 plan, conflicts between pedestrians and motorcycles may be caused due to narrow spaces for pedestrian;

- alternative 3 is desirable, but new bridge construction for pedestrians is required.

For this improvement plan the left-hand side-walk is needed for the motorcycle lane. From the site observations it seems possible to adopt this plan, however, further studies of the structural requirements should be carried out.

b) Improvement of curvature section

A. Visual guides will be provided by the installation of delineators, road studs and pavement markings.

B. Improvement of super elevation to below 6%.

4.4.9 Study Section S-48: Bang Waek (R340/BMA Rd.)

(1) Existing Conditions

A. This is a four-leg stop-controlled intersection between R340 and the BMA road, within a suburban area.

B. R340 is made up of part of the Outer Ring Road and was designed to a high standard. At present it is partially operated.

C. The other trunk road intersections on R340 were planned as grade separations, however, this section is an at grade intersection.

D. Figure 4.22 shows the turning movement during peak periods. Traffic volume on R340 will be increased after the completion of the whole of the Outer Ring Road. The BMA road also carries high traffic volumes.

(2) Main Problems

A. Stop-control is difficult due to the heavy traffic volume on both intersecting roads. This leads to improper turnings and crossings.

B. Traffic approaching the intersection at speed along the access-controlled sections of R340 is given little warning of the at grade intersection. Poor visibility of the intersection is also dangerous.

C. Confusion arises at the median opening on R340 caused by traffic from all directions congregating here whilst waiting to turn or traverse the road.

(3) Main Countermeasures

a) Long-Term Plan

Grade separation at this intersection should be considered, to keep the uniformity of access control on road R340, as well as to ensure the smoothness and safety of the traffic flow.

Before choosing the plan for the grade separation, several alternatives were considered which are outlined below. After careful consideration alternative 2 was chosen.

Alternative 1	Crossing over the BMA road by viaduct of R340;
Alternative 2	Crossing under R340 by culvert box of the BMA road;
Alternative 3	Crossing over R340 by viaduct of the BMA road.

UNIT=PCU/hr

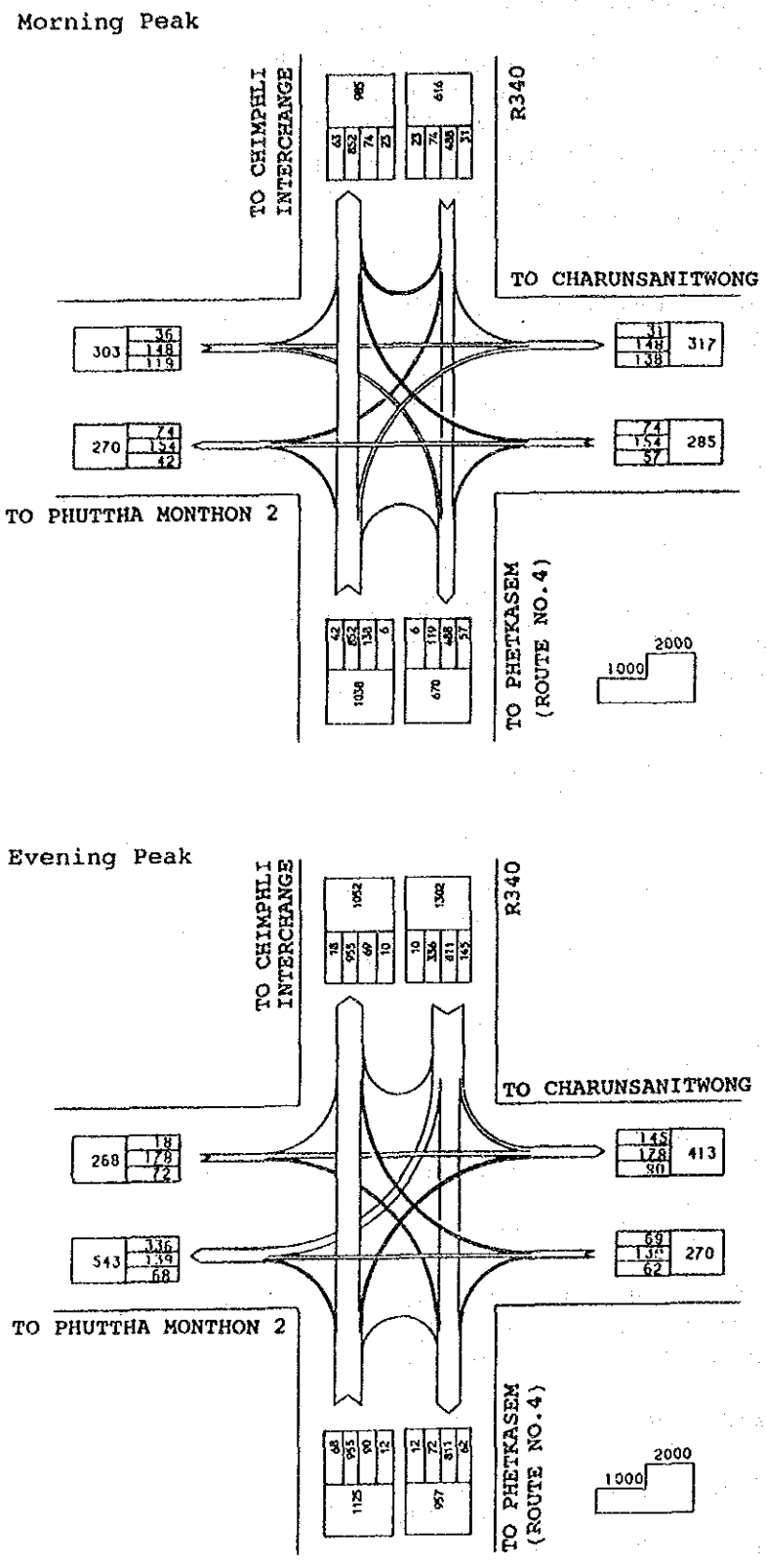


Figure 4.22 TURNING MOVEMENT AT THE INTERSECTION OF S-48

The reasons for the selection of alternative 2 are as follows:

A. This alternative has the shortest approach section length as a result of its low structural height;

B. The short approach length avoids the need to widen the bridge section located approximately 320 m. away from the intersection;

C. The construction cost of this alternative is lower than that of the other alternatives;

D. Alternative 1 is the most costly, and it requires the widening of the existing bridge;

E. Alternative 3 is also costly, and requires complicated structural and traffic operational systems, as shown in Figure 4.23 below.

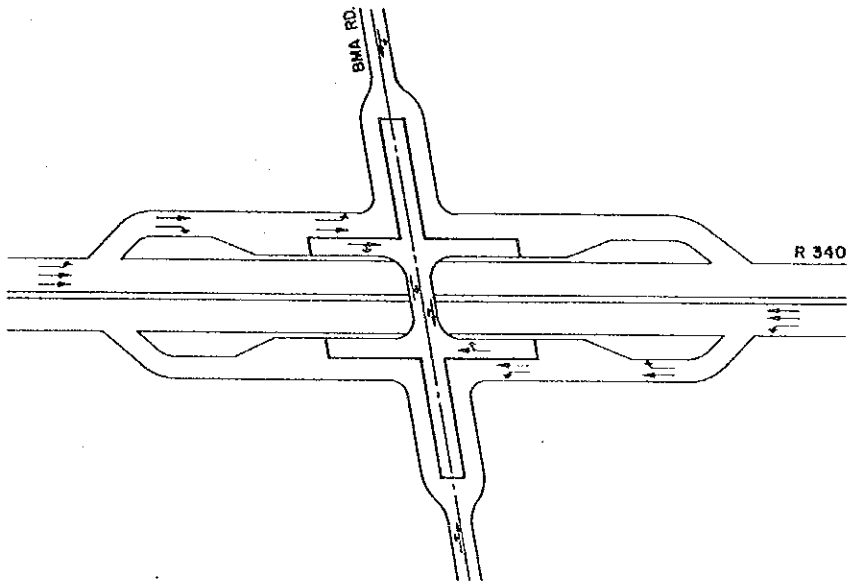


Figure 4.23 CONCEPTION OF ALTERNATIVE 3

For alternative 2 the following actions were required:

- land acquisition at the corner of the intersection;
- signal control at the intersection between the BMA road and the ramps to deal with the insufficient sight distance at the intersection, despite low traffic volumes;
- further studies of soil conditions for the embankments.

b) Short-Term Plan

Construction of the grade separation may take a long time, in the mean time the following measures are proposed:

A. Signalization at the Intersection

To warn drivers approaching at speed towards the intersection, over hanging signal displays and advanced warning signs are required.

B. Provision of right-turn lanes.

4.4.10 Study Section S-52: Onn Nuch-R3119 (R3119/BMA Rd.)

(1) Existing Conditions

A. R3119 is connected to R3256 by a T-shaped intersection on the BMA road.

B. This is an at grade stop-controlled intersection.

C. R3119 and the BMA road have two-lane carriageways and wide shoulders.

D. Hourly traffic fluctuation volumes and turning movement volumes during peak hours, are shown in Figure 4.24 and 4.25 respectively. Traffic volume between the north and the west predominates. Heavy vehicles make up more than 35% of the traffic volume. The hourly incoming traffic volume varies slightly throughout the day.

E. Accidents were recorded which were caused by failure to yield to traffic having the right-of-way.

(2) Main Problems

A. Traffic volume has exceeded the limit of the stop-controlled intersection.

B. Priority of traffic movement should be given to traffic in the north and west direction, however, traffic on the BMA road currently has priority due to the good alignment of the road.

C. The difficulty of turning right on R3119 causes long queues and results in improper turnings.

D. The right-turning lane on the BMA road is used by both through-traffic and traffic turning right and this causes confusion at the intersection.

(3) Main Countermeasures.

A. Signalization at the intersections will control the flow of traffic in proportion to the volume and ensure traffic safety by avoiding traffic conflicts. Congestion of R3119 will be minimize by this measures.

B. Channelization in order to ensure the smooth turning of traffic in the northerly and westerly direction as well as to clarify the right-turn lane on the BMA road.

C. Installation of lights at the intersection is proposed.

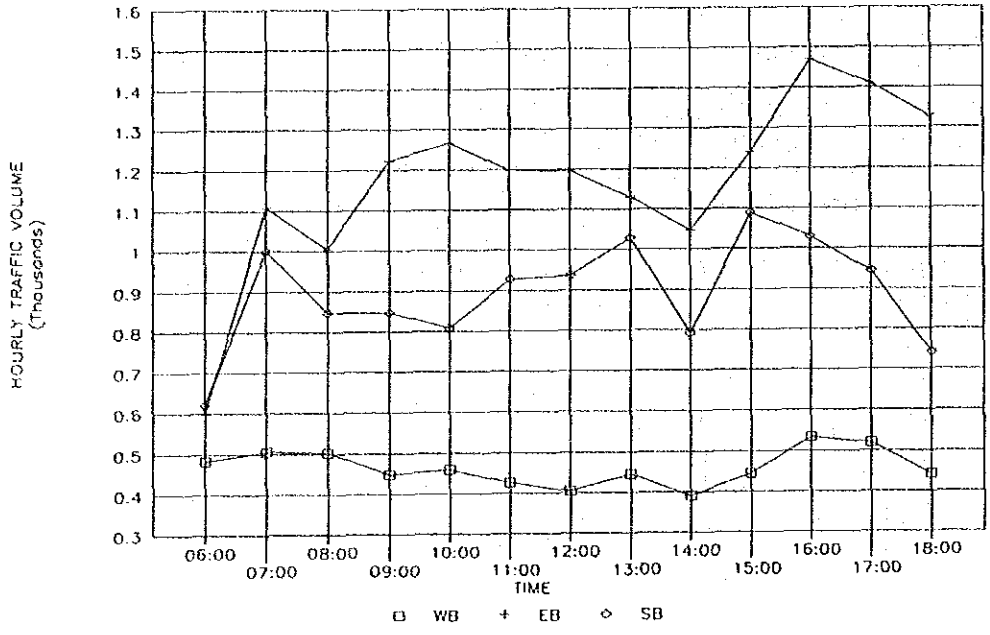


Figure 4.24 HOURLY FLUCTUATION OF TRAFFIC VOLUME ON S-52

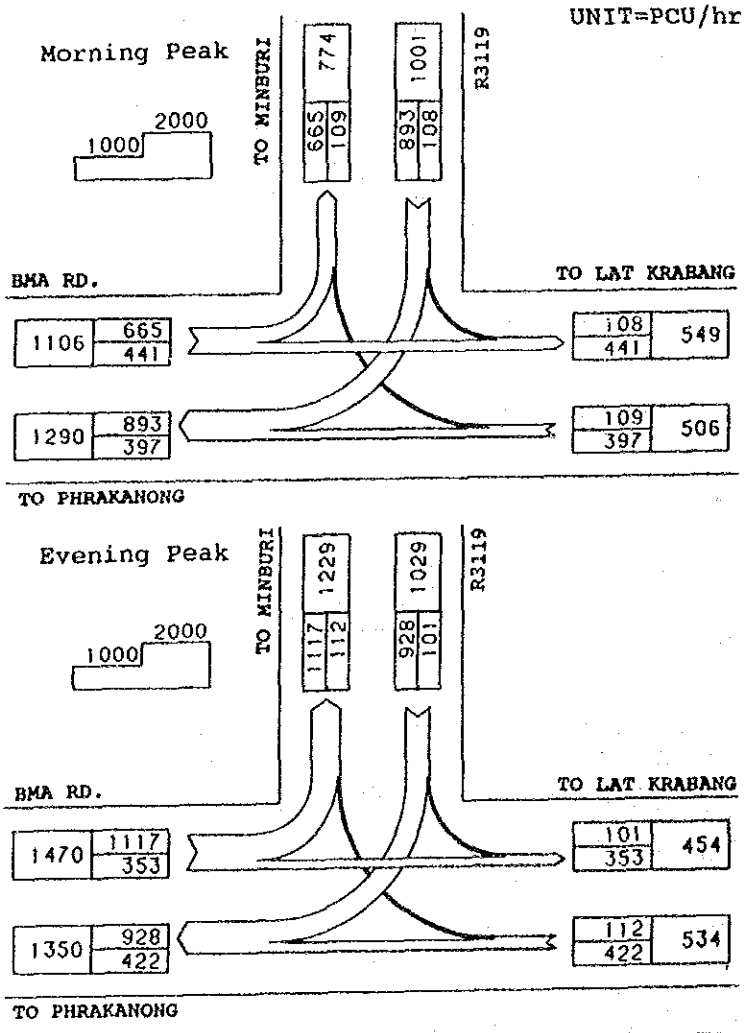


Figure 4.25 TURNING MOVEMENT AT THE INTERSECTION OF S-52

4.5 COST ESTIMATION

Based on the results of the preliminary designs, the work quantities and improvement cost were estimated. The results are useful for the selection of the traffic control/safety measures and for preparing the future improvement plans. The unit cost for the cost estimation was determined through discussions with the DOH officials based on the recent improvement projects implemented by the DOH.

The results of the cost estimations for the ten Study Sections are summarized in Table 4.4. The table of the unit cost and quantities of the measures at each Study Section is contained in Appendix 4.1 and 4.2. The construction cost for widening plans prepared by the DOH were not included in this estimation except for the grade separation plan in Study Section S-19. Concerning the long term plan in Study Section S-48, cost for the foundation was not included because there was no data of soil conditions at this site.

Table 4.4 Summary of Construction Cost

(Unit : Baht)

Item	SECTION NO.	S-10	S-15	S-18	S-19	S-22	S-24	S-43	S-44	S-48.1 1)	S-48.2 2)	S-52
	ROUTE NO.	1	4	302 (1)	302 (306)	303 (3104)	304 (BMA)	307 (3035) (3111)	325	340 (BMA)	340 (BMA)	(3119) (BMA)
	KILOPOST	41+500	58+580	0+000	6+333	11+198	4+800 to 5+600	10+813	41+465 to 42+150	8+725	3+725	11+003
	LENGTH (m)	750	375	140	890	375	800	170	685	692	375	390
GENERAL AND EARTHWORKS		0	9,400	21,900	1,545,140	10,080	79,200	52,200	40,000	10,748,000	101,600	38,800
PAVEMENT		33,890	743,720	208,670	9,176,490	365,210	265,610	170,220	1,056,080	5,015,710	0	424,450
FACILITY FOR TRAFFIC CONTROL	Traffic signal	0	648,500	486,000	296,000	191,000	598,500	648,500	0	728,500	598,500	578,500
	Traffic sign	4,040	6,640	0	0	11,940	0	0	26,380	0	6,640	0
	Pavement marking	661,550	170,100	166,500	461,850	157,400	141,100	124,800	133,650	202,650	103,300	92,450
	Guard Fence	0	0	0	0	0	0	0	0	372,000	0	0
	Lighting	0	81,000	162,000	0	0	81,000	0	0	0	0	162,000
	Delineator	0	0	0	0	0	0	0	12,000	0	0	0
	Road Stud	32,200	0	0	0	0	0	0	9,800	0	0	0
	Island	0	0	135,450	685,080	39,010	11,000	162,260	0	172,000	9,540	8,520
STRUCTURE		0	0	0	89,950,000	0	1,730,000	0	0	3,600,000	0	0
LAND ACQUISITION		0	0	0	0	0	0	0	0	750,000	0	0
AMOUNT		731,680	1,659,360	1,180,520	102,114,560	774,640	2,906,410	1,157,980	1,277,910	21,588,860	819,580	1,304,720

Note : 1) S-48.1 means Long-term plan and foundation cost is not estimated.
2) S-48.2 means Short-term plan

CHAPTER 5 RECOMMENDATION

CHAPTER 5 RECOMMENDATIONS

5.1 SYSTEM AND ORGANIZATION OF THE TRAFFIC OPERATION PLAN

5.1.1 System for Implementation of the Traffic Operation Plan

To implement traffic operation projects, the long- and short-term plans of the DOH must be established. In the DOH Seventh Plan, the traffic safety project puts forward an investment framework which should be widened to cover traffic operations. In order to implement traffic safety projects systematically, the diagnostic sheet (an example of which is shown in Table 3.1) is a useful tool for the collection and analysis of traffic data.

5.1.2 Organization of the Traffic Operation Plan

Within the DOH, the Traffic Engineering Division (TED), which is responsible for the implementation of the traffic operation plans for the whole of Thailand, is stretched to cope with this volume of work. Therefore, for the implementation of the traffic operation plan, the organizational structure of the TED has got to be tightened, to perform its assigned and enlarged duties. Table 5.1 is a list of recommended sections within the TED and a summary of the main duties and activities to be carried out in order to implement the traffic operation plans.

Alongside these sections within the DOH a traffic control section, to deal with traffic operation, should be established within each district office.

Table 5.1 Main Duties for Sections of Traffic Engineering Division

TRAFFIC CONTROL SECTION	**DUTY**	Control of Road Traffic
	ACTIVITIES	- to control the road traffic; - to approve the special vehicle types (heavy vehicle, caterpillar, etc.); - to improve railway crossings; - to install signals and signs; - to establish the new traffic systems.
TRAFFIC SAFETY SECTION	**DUTY**	Safety of Road Traffic
	ACTIVITIES	- to set-up long- and short-term traffic safety measures; - to carry out statistical analysis of traffic accidents; - to set-up the standards for traffic safety technology, traffic safety measures, etc.; - to monitor traffic safety program.
TRAFFIC CENSUS SECTION	**DUTY**	Survey and Analysis of Road Traffic, Collection of Traffic Information, Analysis and Forecast of Traffic and Transportation from an Economic viewpoint
	ACTIVITIES	- to conduct: (1) permanent traffic surveys; (2) general traffic surveys; (3) vehicle OD surveys; (4) person-trip surveys; (5) vehicle travel speed surveys; (6) intersection traffic volume surveys; (7) vehicle weight surveys; (8) commodity flow surveys.
TRAFFIC MEASURE STANDARDS SECTION	**DUTY**	Determination of Standards, Guidelines and specifications for Traffic Measures
	ACTIVITIES	- to formulate specific geometric road designs; - to set-up traffic information facilities; - to set-up traffic control and safety facilities; - to set-up the standards for parking lots, traffic terminals, bus bays, etc.
TRAFFIC ENVIRONMENT SECTION	**DUTY**	Improvement and Preservation of the Road Environment, Roadside Landscape, Parks, and Green Areas
	ACTIVITIES	- to study noise levels, gas emissions, and vibration levels; - to examine the effectiveness of countermeasures to air pollution noise and vibration; - to encourage information campaign aware motorists to be responsible for air pollution and noise; - to preserve green areas; - to improve the roadside environment; - to enforce environmental assessments.
ROAD ADMINISTRATION SECTION	**DUTY**	Standardization of Access Roads and Public Utility in the Right of Ways.
	ACTIVITIES	- to formulate policy for right of way utilization; - to permit road access to highway; - to coordinate with public utility authorities.

5.2 RECOMMENDATIONS FOR FUTURE TRAFFIC OPERATION PLANNING POLICIES

5.2.1 Signal Control on High-standard Highways

DOH roads only have traffic signals in Bangkok, its outskirts and major local cities. High-standard highways, such as R1 and R340, have no signals, except in the central part of Bangkok, because of the DOH policy.

Recent years have seen an upsurge in housing and factory construction in the suburban areas of Bangkok, and this has resulted in a marked increase in traffic volume on small streets that have hitherto been disregarded in formulating traffic operation plans. Consequently problems have arisen in the intersections of these small streets and high-standard highways.

In the coming years, therefore, it is proposed to install traffic signals on any sector of the high-standard highways where signal-controlled traffic operation is desirable. If the installation of traffic signals is not accepted, large-scale construction of grade separations will be needed at these problem intersections. It is necessary to conduct studies conducive to the installation of traffic signals of such sites. An examination of signal installation should be made without delay, especially for those parts of Bangkok's environs where urbanization is going on at a rapid pace.

In making this examination, due consideration should be given to the possible hindrance to the smooth traffic flow on high-standard highways that may be caused by signal installation, and the influences on traffic safety that may result from interruptions to the high-speed traffic stream. In the Study, signal installation, in some problem Sections along high-standard highways, was suggested, the hindrance to the smooth traffic flow being very small. It is necessary to conduct studies on the delays and traffic stresses that may be caused by signal installation and on the method of presenting advanced-signal signs to ensure traffic safety.

5.2.2 U-Turn Traffic Operation

Intersection traffic operation on DOH highways has been based on the following principle: when a minor road has a small traffic volume, the through- and right-turning traffic from the minor road is required to make a left-

turn first, then a U-turn in the U-turn zone beyond, in order to avoid directly intersecting the major road traffic.

This is highly effective if the U-turn traffic is properly regulated. The installation of a U-turn facility is also effective in regulating high volumes of traffic emerging from connecting sois by avoiding signal installation. However, in recent years with increasing traffic from minor roads, it is often noted that the U-turn traffic cannot be smoothly operated because of the large main road traffic in the U-turn zone.

Some new, workable means of traffic operation should be introduced in sections where the smooth flow, or where the safety of traffic, is impeded owing to the difficulty in U-turn traffic operation resulting from the increases in main road traffic and U-turn traffic.

In this Study, the definition of the maximum traffic volume that can be coped with by U-turn traffic operation is given, and the installation of U-turn signals, or suitable U-turn lanes, is proposed for the cases where traffic exceeds the said maximum.

If both U-turn traffic volumes on either side of an intersection median exceed the maximum then it is recommended that the median be opened at the intersection. However, if only one U-turn traffic volume dominates, then it is preferable to install traffic signals at this point and not open the median.

Considering the anticipated rapid increase of motor vehicle traffic in the coming years, it will be necessary to introduce such new measures following to the evaluation on the basis of the installation standards defined in this Study.

5.2.3 Arrangement of Pedestrian Overpasses

Judging from the existing traffic condition in the Bangkok region, what is most anxiously expected from traffic operation is the assurance of a smooth, safe flow of motor-vehicle traffic. Accordingly, little or no consideration is given, at the moment, to improving pedestrian crossing facilities which interrupt motor-vehicle traffic.

Given this point of view, it can be said that the construction of pedestrian overpasses is an important

measure for ensuring the safety of pedestrians, and the DOH should conduct studies on the proper method of their construction and spacing. In the Bangkok suburbans areas, where urbanization is proceeding at a rapid pace, pedestrian overpasses should be built at suitable intervals under a careful construction plan, taking into account the budget of the DOH, the desires of local inhabitants, changes in the construction of roadside facilities, and the development of hinterland areas.

The pedestrian overpasses on major highways in central Bangkok are spaced at an average of approximately 500 m in 1987. This average spacing will be used as a guideline for pedestrian overpass construction plans.

APPENDICES

Appendix 3.1 (1)

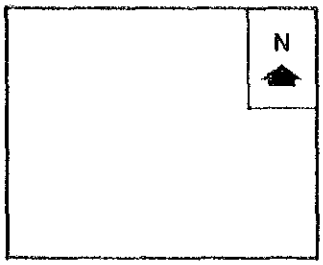
SURVEY SHEET FOR TRAFFIC VOLUME COUNTING SURVEY (AT INTERSECTION)

SURVEY STATION

DIRECTION
NO.

SUPERVISOR

DAY	
MONTH	
YEAR	
SURVEYER	
WEATHER	



Hours	1 4-wheel vehicle	2 Motorcycle	3 More than 6-wheel vehicle	Remarks
06:00 - 06:15				
06:15 - 06:30				
06:30 - 06:45				
06:45 - 07:00				
07:00 - 07:15				
07:15 - 07:30				
07:30 - 07:45				
07:45 - 08:00				
08:00 - 08:15				
08:15 - 08:30				
08:30 - 08:45				
08:45 - 09:00				
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17:00 - 17:15				
17:15 - 17:30				
17:30 - 17:45				
17:45 - 18:00				
18:00 - 18:15				
18:15 - 18:30				
18:30 - 18:45				
18:45 - 19:00				

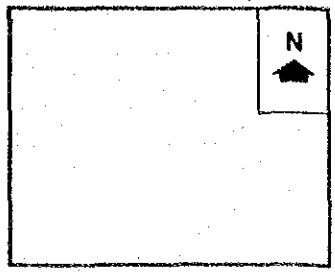
SURVEY SHEET FOR TRAFFIC VOLUME COUNTING SURVEY (AT ROADSIDE)

SURVEY STATION

DIRECTION
NO.

SUPERVISOR

DAY	
MONTH	
YEAR	
SURVEYER	
WEATHER	



Hours	1 4-wheel vehicle	2 Motorcycle	3 More than 6-wheel vehicle	Remarks
06:00 - 06:30				
06:30 - 07:00				
07:00 - 07:30				
07:30 - 08:00				
08:00 - 08:30				
08:30 - 09:00				
09:00 - 09:30				
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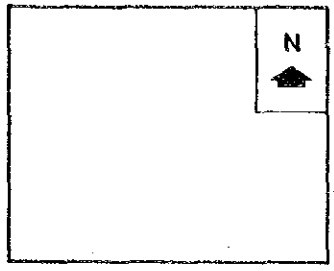
16:00 - 16:30				
16:30 - 17:00				
17:00 - 17:30				
17:30 - 18:00				
18:00 - 18:30				
18:30 - 19:00				

SURVEY SHEET FOR CROSSING PEDESTRIAN COUNTING SURVEY

SURVEY STATION

SUPERVISOR

DAY	
MONTH	
YEAR	
SURVEYER	
WEATHER	

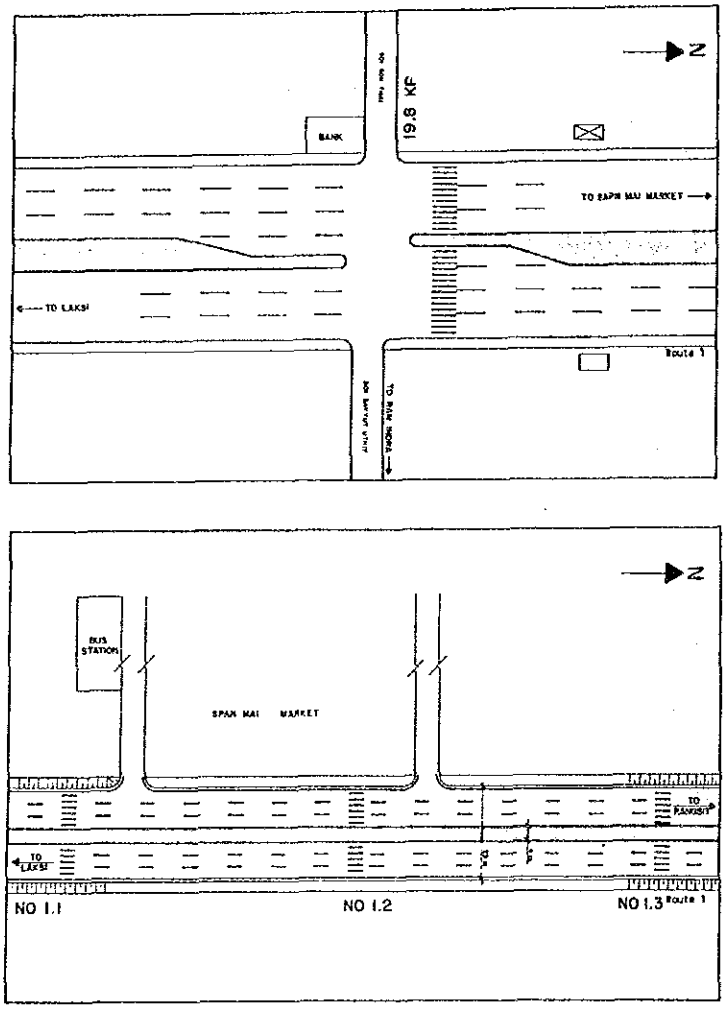


Hours	Numbers		Remarks
	Direction-1	Direction-2	
07:00 - 07:30			
07:30 - 08:00			
08:00 - 08:30			
08:30 - 09:00			
09:00 - 09:30			
09:30 - 10:00			
10:00 - 10:30			
10:30 - 11:00			
11:00 - 11:30			
11:30 - 12:00			
12:00 - 12:30			
12:30 - 13:00			

1 DIAGNOSTIC SHEET OF PROBLEM LOCATIONS (Form - 1)

LOCATION NO.			LOCATION NAME	Sapan Mai Market			
ROUTE NO.	1	CONTROL SECTION NO.	100	K.P. OF PROBLEM LOCATION	K.P. 20.500 – K.P. 21.500	ROAD CONDITION	Roadway Section
K.P. OF CONTROL SECT.	K.P. 16.441 – K.P. 29.000					DISTRICT CODE	411
DIVISION NAME	BANGKOK			DISTRICT NAME	BANGKOK		
TRAFFIC VOLUME (VEHICLES) (P.C.U.)	(WHOLE DAY) MAJOR ROAD 53,153 MINOR ROAD (PEAK HOUR) MAJOR ROAD 4,260 MINOR ROAD			PERCENT OF HEAVY VEHICLES (%)	(WHOLE DAY) MAJOR ROAD 21.8 MINOR ROAD (PEAK HOUR) MAJOR ROAD 29.4 MINOR ROAD	PEDESTRIAN VOLUME (PERSONS/ PEAK HOUR)	1,354
						ACCIDENT RATE (PERSONS / 100 MIL. VEH. KM.)	112.3
NO. OF ACCIDENTS(CASES)	67			CASUALITIES (PERSONS)	(FATALITIES) 2 (INJURIES) 17	WHOLE CONTROL SECTION	32.1

EXISTING ROAD CONDITION DIAGRAM



COMMENTS ON EXISTING ROAD CONDITION

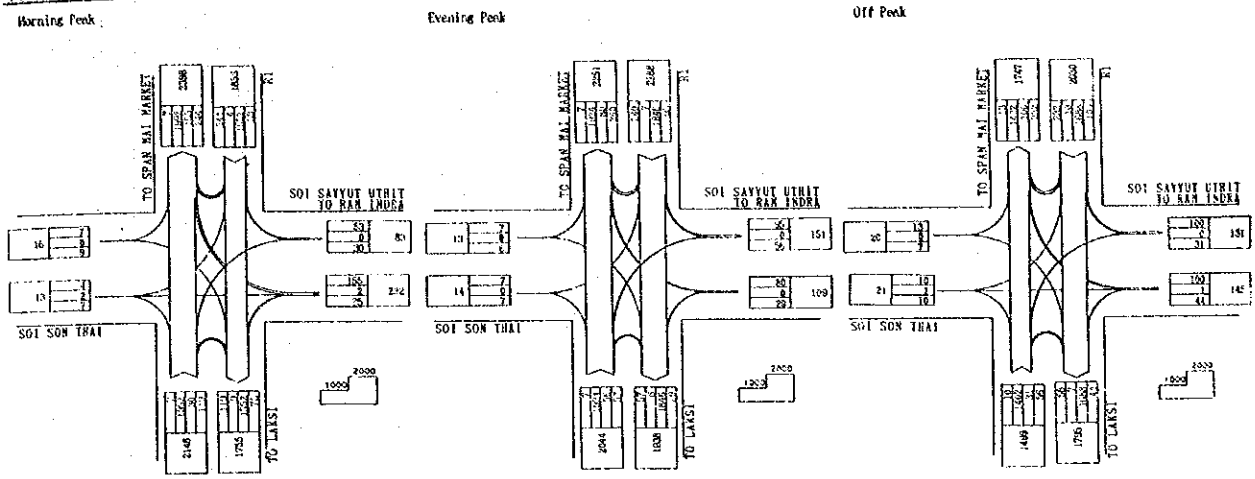
R1 is a straight four-lane section with a wide median (4-5 m) and wide shoulders (4 m). There are many service facilities along the section, such as a department store and supermarkets located in front of Sapan Mai market.

TRAFFIC SAFETY / CONTROL DEVICES INSTALLED

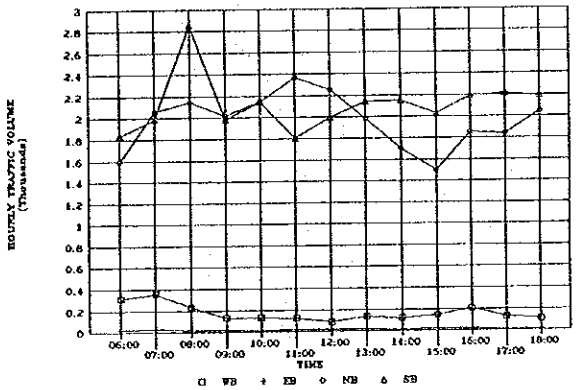
TRAFFIC SIGNAL	
PEDESTRIAN CROSSING	0
PEDESTRIAN OVERPASS	
STREET LIGHTING	0
GUARD FENCE	
CHANELIZATION	

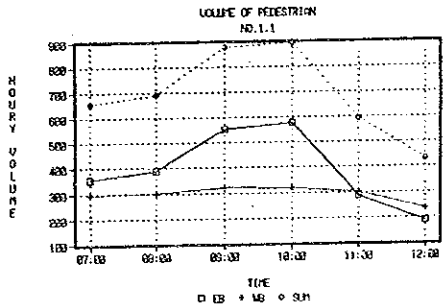
TRAFFIC DATA ANALYSIS

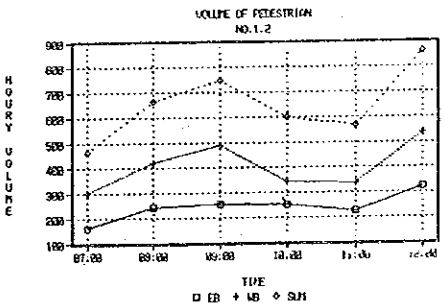
Traffic Data Analysis

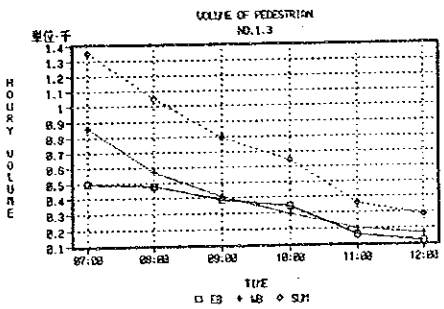


VARIATION IN TRAFFIC VOLUME









Accident Data Analysis

Number of Accident and Casualties

ROUTE NO.	CONTROL SECTION NO.	TRAFFIC VOLUME	NUMBER OF ACCIDENTS	CASUALTIES	ACCIDENT RATE	REMARKS
1	100	66,341	67	2 / 17 / 19	112.3	

Number of Accident by type

ROUTE NO.	CONTROL SECTION NO.	NUMBER OF ACCIDENTS BY TYPE OF ACCIDENT (CASES)												
		#11 PEDES-TRIANS	#12 BICYCLE	#13 PARKING PASSING	#14 OPPOSITE VEHICLE	REAR END COLLI-SION	HEAD ON COLLI-SION	#16 AT INTER-SECTION	SIDE COLLI-SION	OVERTAKING PARKING	OUT OF CONTROL	#17 HIT FIXED OBJECT	#18 TRAIN	OTHERS	SUM
1	100	16	8	12	1	29	0	2	2	2	0	0	0	0	67

Number of Accident by cause

ROUTE NO.	CONTROL SECTION NO.	NUMBER OF ACCIDENTS BY CLASS OF ACCIDENT								REMARKS
		OVER SPEED LIMIT	FAILURE TO YIELD TO R/W	IMPROPER PASSING	VEHICLE DEFECTS	DRUNKEN DRIVER	SLEEPY	DISEASE	SUM	
1	100	52	8	3	0	0	2	2	67	

COMMENTS ON TRAFFIC CONDITION

R1 is a primary highway and has large traffic volumes. The flow of traffic at the intersection on 19.8 Kp is impeded by cars taking U-turns and by the large amount of traffic entering R1 from soi Son Thai in the morning and evening peak hours. There are many pedestrians crossing R1 from shops on both sides of the road in the section between 20.3 Kp and 21.8 Kp.

COMMENTS ON ACCIDENT CONDITION

Rear-end collisions are the most frequent (29 cases, which represents 43% of all accident types), followed by pedestrian accidents (16 cases, 24% of total), and overtaking accidents (12 cases, 18% of total). Most accidents are caused by speeding. The accident rate is as high as 112.3 casualties/100 mil. vehicle kilometers.

POSIBLE COUNTERMEASURES AND THEIR GROUNDS

PROBLEMS

Traffic volume exceededs the capacity of the stop-controlled intersection and there is much confusion caused by U-turning vehicles at 19.8 Kp. Therefore, smoothness of traffic flow between 19.0 Kp and 21.5 Kp, is not possible. The pedestrian crossing, in front of Sapan Hai Market, is very dangerous.

MEASURES

In order to secure traffic smoothness, the installation of pre-timed signals with coordinated signal controls in control segment 19.8 Kp to 21.8 Kp, is suggested.

The following measures for pedestrians are proposed:

Alternative-1: Installation of a pedestrian overpass;

Alternative-2: Installation of pedestrian signals to be coordinated with the traffic signals.

EVALUATION

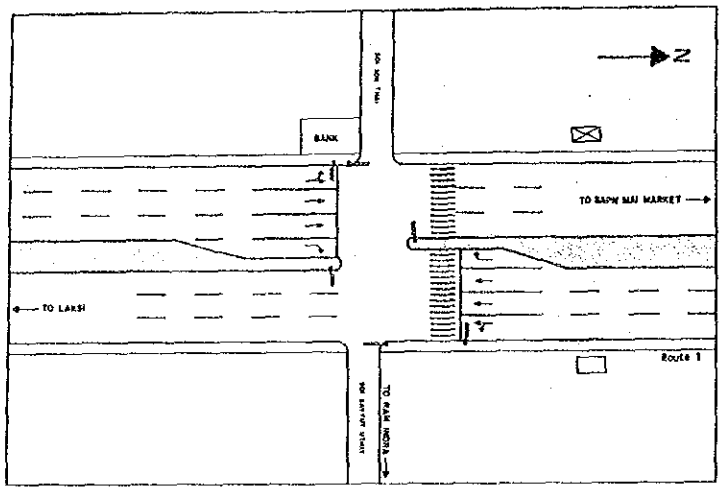
Installation of pre-timed signals: Satisfies criteria for improvement.

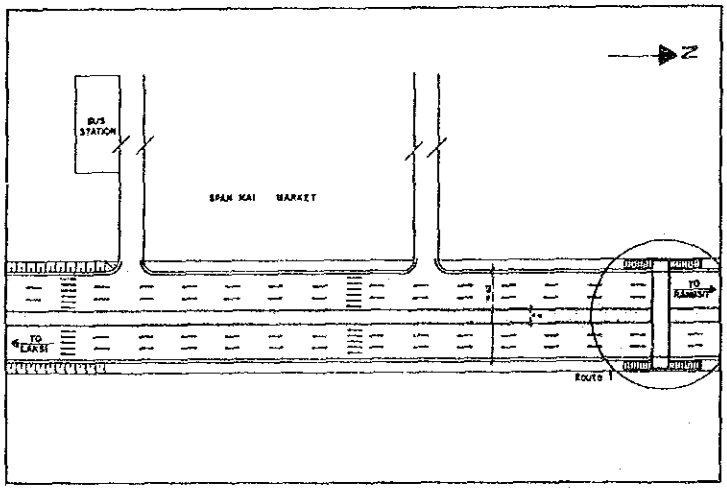
Installation of a pedestrian overpass: Satisfies criteria for improvement.

Installation of pedestrian signal coordinated with adjacent signals: Pedestrian signals coordinated with adjacent signals are not feasible because of the heavy pedestrian volume.

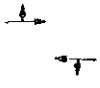
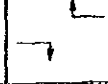
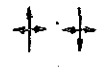
Coordinated signal control in control segment: Satisfies criteria for improvement.

ILLUSTRATION OF TRAFFIC SAFETY / OPERATION PLAN





Morning Peak

1Ø	2Ø	3Ø
		
58.2	24.1	17.7

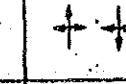
Cycle Length	141	Saturate Degree	0.551

Evening Peak

1Ø	2Ø	3Ø
		
60.6	25.6	13.8

Cycle Length	180	Saturate Degree	0.490

Off Peak

1Ø	2Ø	3Ø
		
59.4	26.7	13.9

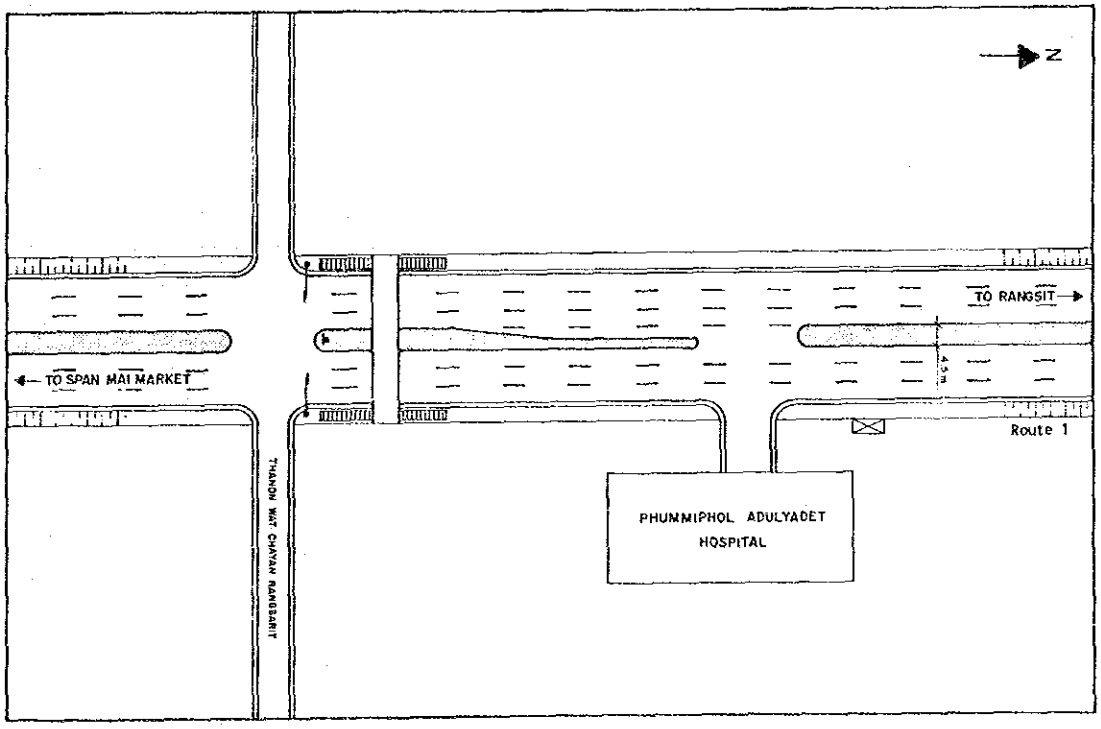
Cycle Length	180	Saturate Degree	0.480

DIAGNOSTIC SHEET OF PROBLEM LOCATIONS

(Form - 1)

LOCATION NO.	2		LOCATION NAME	Phumiphol Adulyadet Hospital			
ROUTE NO.	1	CONTROL SECTION NO. 100	K.P. OF PROBLEM LOCATION	K.P 22.500 — K.P 23.500		ROAD CONDITION	Inter-section
K.P OF CONTROL SECT.	K.P 16.441 — K.P. 29.000						
DIVISION NAME	BANGKOK		DISTRICT NAME	BANGKOK		DISTRICT CODE	411
TRAFFIC VOLUME (VEHICLES) (P.C.U.)	(WHOLE DAY) MAJOR ROAD 40,500 MINOR ROAD (PEAK HOUR) MAJOR ROAD 3,122 MINOR ROAD		PERCENT OF HEAVY VEHICLES (%)	(WHOLE DAY) MAJOR ROAD 27.0 MINOR ROAD (PEAK HOUR) MAJOR ROAD 32.0 MINOR ROAD		PEDESTRIAN VOLUME (PERSONS/PEAK HOUR)	35
						ACCIDENT RATE (PERSONS/100 MIL. VEH. KM)	7.5
NO. OF ACCIDENTS(CASES)	22		CASUALITIES (PERSONS)	(FATALITIES) 0 (INJURIES) 1		WHOLE CONTROL SECTION	32.1

EXISTING ROAD CONDITION DIAGRAM



COMMENTS ON EXISTING ROAD CONDITION

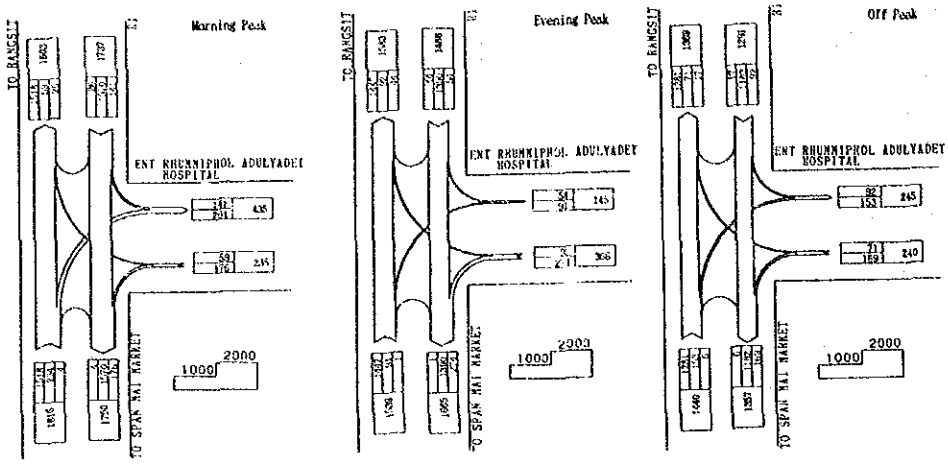
This is a small T-shaped intersection on R1 and a feeder road leading to Phumiphol Adulyadat Hospital. The R1 section is a straight four-lane section with a wide median (4.5 m).

TRAFFIC SAFETY/CONTROL DEVICES INSTALLED

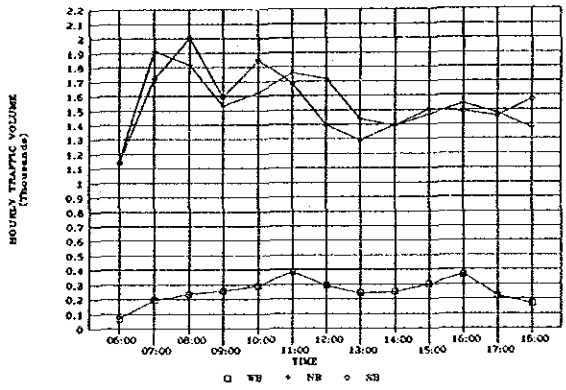
TRAFFIC SIGNAL	
PEDESTRIAN CROSSING	
PEDESTRIAN OVERPASS	
STREET LIGHTING	0
GUARD FENCE	
CHANELIZATION	

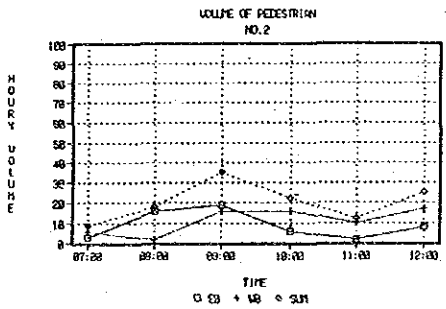
TRAFFIC DATA ANALYSIS

Traffic Data Analysis



VARIATION IN TRAFFIC VOLUME





Accident Data Analysis

Number of Accident and Casualties

STUDY SECTION NO.	ROUTE NO.	CONTROL SECTION NO.	K.P.-K.P.	LENGTH (KM)	TRAFFIC VOLUME ADT (PCU/DAY)	TRAFFIC VOLUME VEHICLE KILOMETER	NUMBER OF ACCIDENTS (CASES)	CASUALTIES DEATH (CASES)	CASUALTIES INJURY (CASES)	CASUALTIES DEATH AND INJURY (CASES)	ACCIDENT RATE ACCIDENT DENSITY (CASES/KM)	ACCIDENT RATE ALL ACCIDENTS (CASES/100 MIL. VEH.KM.)	ACCIDENT RATE DEATH (CASUALTIES/100 MIL.VEH. KM.)	ACCIDENT RATE INJURY (CASUALTIES/100 MIL.VEH. KM.)	ACCIDENT RATE DEATH AND INJURY (CASUALTIES/100 MIL.VEH. KM.)	ACCIDENT RATE OF CONTROL SECTION (CASUALTIES/100 MIL.VEH. KM.)	REMARKS
2	1	100	22+500 - 23+500	1.000	36,589	36,589	22	0	1	1	22.0	164.7	0.0	7.5	7.5	32.1	

Number of Accident by type

NO.	ROUTE NO.	CONTROL SECTION NO.	NUMBER OF ACCIDENTS BY TYPE OF ACCIDENT (CASES) HIT PEDESTRIANS	HIT BICYCLE	HIT DURING PASSING	HIT OPPOSED VEHICLE	REAR END COLLISION	READ ON COLLISION	HIT AT INTERSECTION	SIDE COLLISION	IMPROPER TURNING	LOST OF CONTROL	HIT FIXED OBJECT	HIT TRAIN	OTHERS	SUM
2	1	100	1	0	4	6	3	0	2	0	0	0	1	0	5	22

Number of Accident by cause

NO.	ROUTE NO.	CONTROL SECTION NO.	NUMBER OF ACCIDENTS BY CAUSE OF ACCIDENT OVER SPEED LIMIT	FAILURE TO YIELD TO ROW	IMPROPER PASSING	VEHICLE DEFECTS	DRUNKEN DRIVER	SLEEPY	OTHERS	SUM	REMARKS
2	1	100	16	0	0	0	0	6	6	22	

COMMENTS ON TRAFFIC CONDITION

Traffic conditions are the same as at S-1 and traffic signals are situated approximately 100 m to the south.

COMMENTS ON ACCIDENT CONDITION

Collisions with cars running in the opposite direction are the most frequent (6 cases, 27% of all accident types). These accidents are most probably caused by U-turning and right-turning vehicles.

POSIBLE COUNTERMEASURES AND THEIR GROUNDS

PROBLEMS

Confusion is caused by vehicles entering, existing and taking U-turns in front of the hospital.

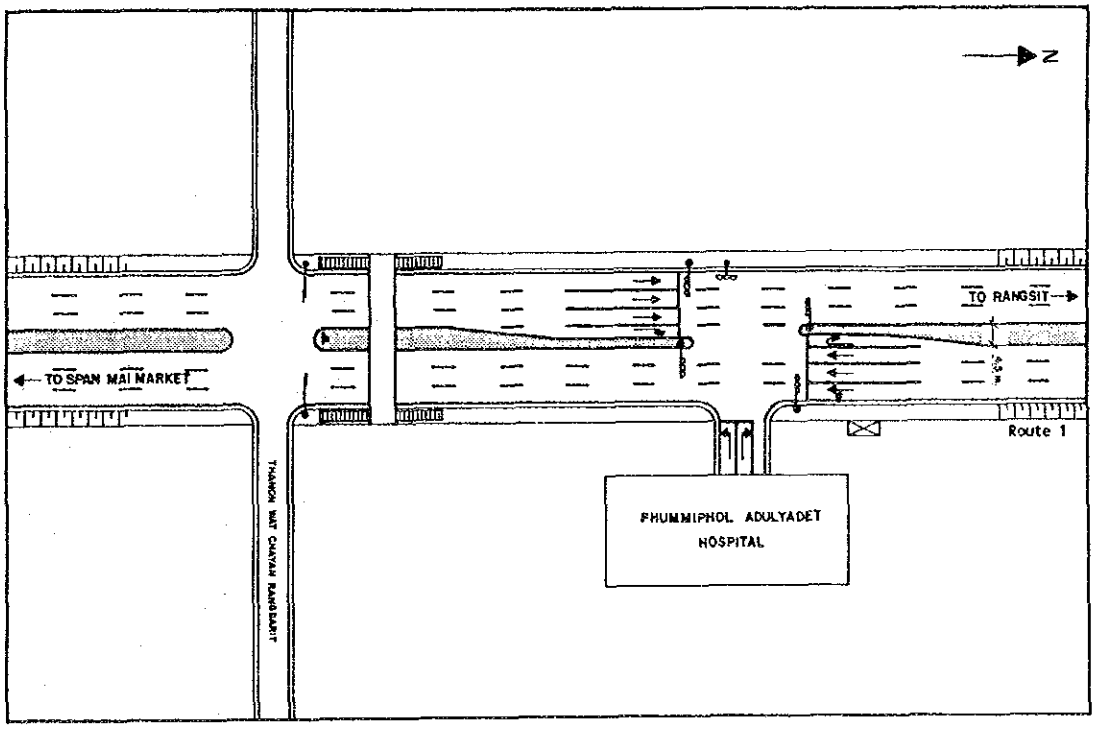
MEASURES

The installation of a pre-timed signal, set to offset simultaneous with nearby signals, is suggested.

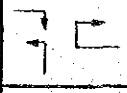
EVALUATION

Installation of pre-timed signals set to be simultaneously offset with nearby signals (this signal is operated only during hospital opening hours and it is left flashing during closing hours: Satisfies criteria for improvement.

ILLUSTRATION OF TRAFFIC SAFETY / OPERATION PLAN



Morning Peak

1Ø	2Ø	3Ø
		
50.8	28.3	20.9

Cycle Length	120	Saturate Degree	0.490

Evening Peak

1Ø	2Ø	3Ø
		
57.7	12.9	29.4

Cycle Length	85	Saturate Degree	0.395

Off Peak

1Ø	2Ø	3Ø
		
55.8	23.3	20.9

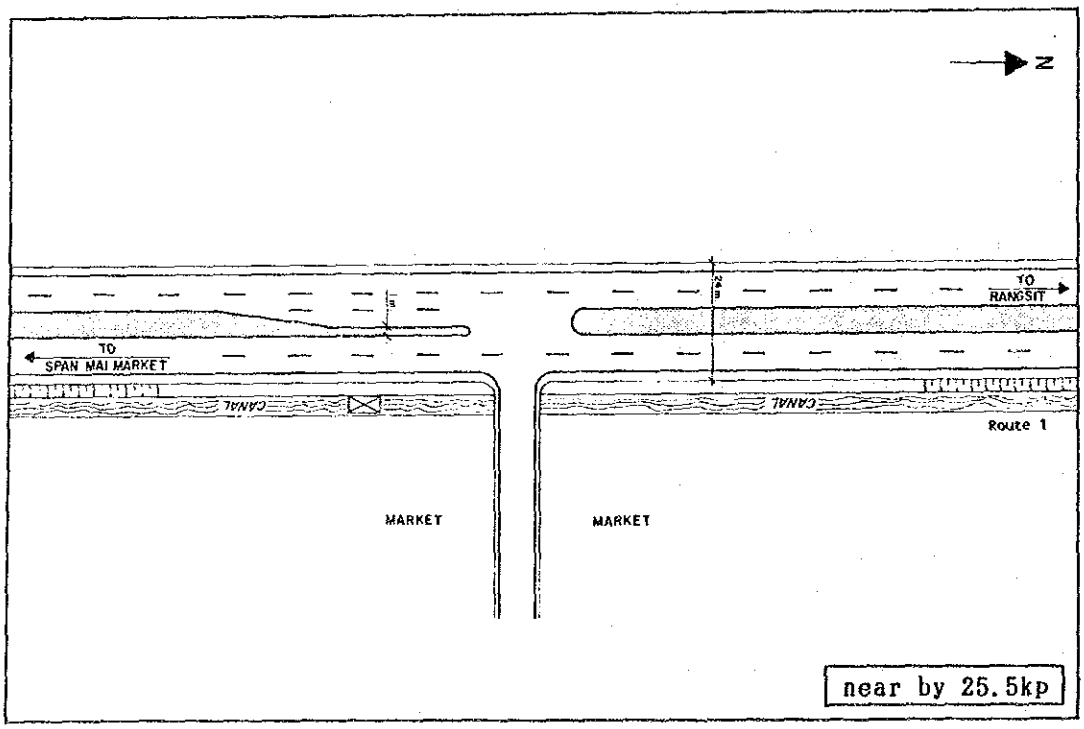
Cycle Length	120	Saturate Degree	0.344

DIAGNOSTIC SHEET OF PROBLEM LOCATIONS

(Form - 1)

LOCATION NO.	3		LOCATION NAME	Ko Mo 25			
ROUTE NO.	1	CONTROL SECTION NO. 100	K.P. OF PROBLEM LOCATION	K.P. 25.000 – K.P. 26.000		ROAD CONDITION	Roadway Section
K.P OF CONTROL SECT.	K.P. 16.441 – K.P. 29.000					DISTRICT CODE	411
DIVISION NAME	BANGKOK		DISTRICT NAME	BANGKOK		PEDESTRIAN VOLUME (PERSONS/ PEAK HOUR)	213
TRAFFIC VOLUME (VEHICLES) (P.C.U.)	(WHOLE DAY) MAJOR ROAD 40,500 MINOR ROAD (PEAK HOUR) MAJOR ROAD 3,122 MINOR ROAD		PERCENT OF HEAVY VEHICLES (%)	(WHOLE DAY) MAJOR ROAD 27.0 MINOR ROAD (PEAK HOUR) MAJOR ROAD 32.0 MINOR ROAD		ACCIDENT RATE (PERSONS / 100 MIL. VEH. KM.)	30.0
NO. OF ACCIDENTS(CASES)	18		CASUALITIES (PERSONS)	(FATALITIES) 0 (INJURIES) 4		WHOLE CONTROL SECTION	32.1

EXISTING ROAD CONDITION DIAGRAM



COMMENTS ON EXISTING ROAD CONDITION

The R1 section here is a straight four-lane section with a wide median (4 m). These locations are T-intersections between R1 and several sois.

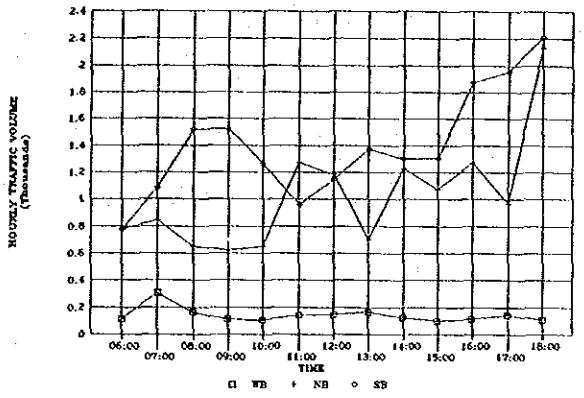
TRAFFIC SAFETY/CONTROL DEVICES INSTALLED

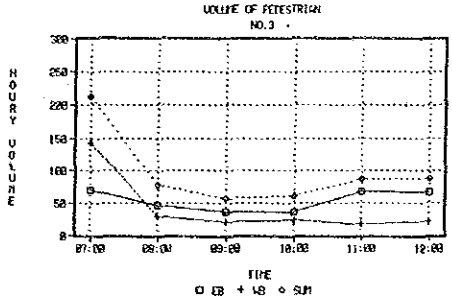
TRAFFIC SIGNAL	
PEDESTRIAN CROSSING	
PEDESTRIAN OVERPASS	
STREET LIGHTING	0
GUARD FENCE	
CHANELIZATION	

TRAFFIC DATA ANALYSIS

Traffic Data Analysis

VARIATION IN TRAFFIC VOLUME





Accident Data Analysis

Number of Accident and Casualties

STUDY SECTION NO.	ROUTE NO.	CONTROL SECTION NO.	K.P.-K.P.	LENGTH (KM)	TRAFFIC VOLUME ADT (PCU/DAY)	TRAFFIC VOLUME VEHICLE KILOMETER	NUMBER OF ACCIDENTS (CASES)	CASUALTIES DEATH (CASES)	CASUALTIES INJURY (CASES)	CASUALTIES DEATH AND INJURY (CASES)	ACCIDENT RATE ACCIDENT DENSITY (CASES/KM)	ACCIDENT RATE ALL ACCIDENTS (CASES/100 MIL. VEH.KM.)	ACCIDENT RATE DEATH (CASUALTIES/100 MIL.VEH. KM.)	ACCIDENT RATE INJURY (CASUALTIES/100 MIL.VEH. KM.)	ACCIDENT RATE DEATH AND INJURY (CASUALTIES/100 MIL.VEH. KM.)	ACCIDENT RATE OF CONTROL SECTION (CASUALTIES/100 MIL.VEH. KM.)	REMARKS
3	1	100	25+000 - 26+000	1.000	36,589	36,589	18	0	4	4	18.0	134.8	0.0	30.0	30.0	32.1	

Number of Accident by type

NO.	ROUTE NO.	CONTROL SECTION NO.	NUMBER OF ACCIDENTS BY TYPE OF ACCIDENT (CASES) HIT PEDESTRIANS	HIT BICYCLE	HIT DURING PASSING	HIT OPPOSED VEHICLE	REAR END COLLISION	HEAD ON COLLISION	HIT AT INTERSECTION	SIDE COLLISION	IMPROPER TURNING	LOST OF CONTROL	HIT FIXED OBJECT	HIT TRAIN	OTHERS	SUM
3	1	100	1	0	5	1	2	0	0	1	1	1	0	0	6	18

Number of Accident by cause

NO.	ROUTE NO.	CONTROL SECTION NO.	NUMBER OF ACCIDENTS BY CAUSE OF ACCIDENT OVER SPEED LIMIT	FAILURE TO YIELD TO ROW	IMPROPER PASSING	VEHICLE DEFECTS	DRUNKEN DRIVER	SLEEPY	OTHERS	SUM	REMARKS
3	1	100	10	1	0	0	0	0	7	18	

COMMENTS ON TRAFFIC CONDITION

Traffic Conditions are the same as at S-1 and S-2.

COMMENTS ON ACCIDENT CONDITION

Each location recorded between one and three pedestrian accidents.

POSIBLE COUNTERMEASURES AND THEIR GROUNDS

PROBLEMS

The pedestrian crossings are in a dangerous condition.

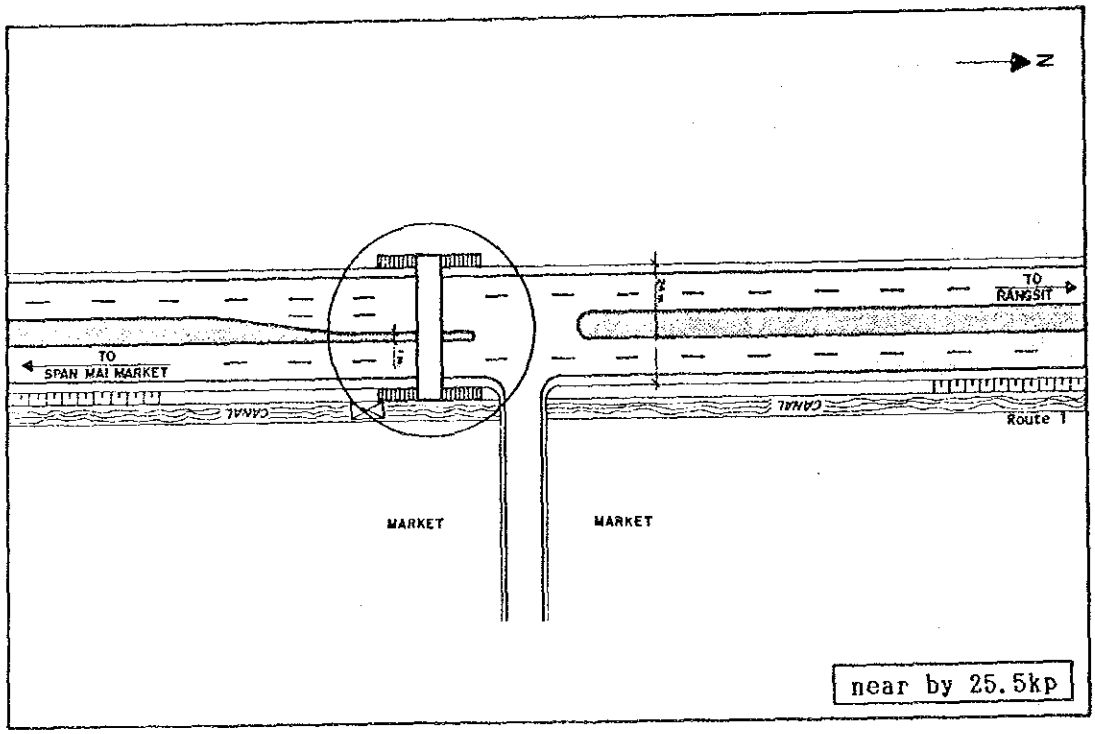
MEASURES

The installation of a pedestrian overpass is suggested.

EVALUATION

Installation of pedestrian overpass: Satisfies criteria for improvement.

ILLUSTRATION OF TRAFFIC SAFETY / OPERATION PLAN

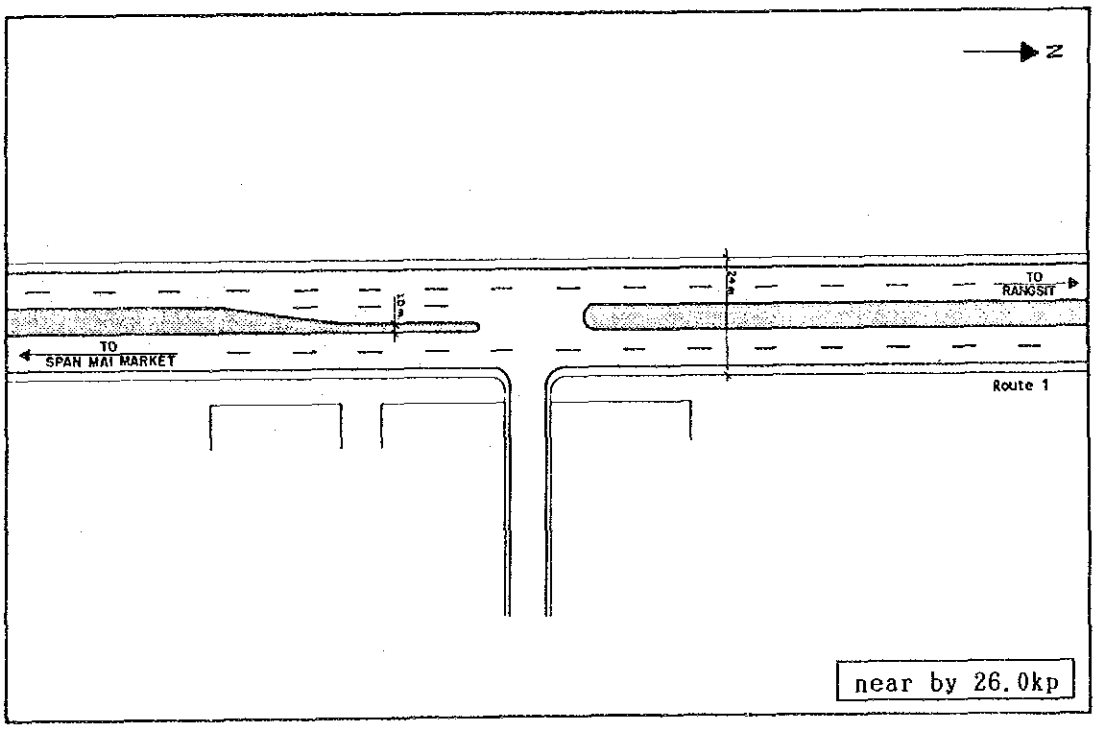


DIAGNOSTIC SHEET OF PROBLEM LOCATIONS

(Form - 1)

LOCATION NO.	4		LOCATION NAME	Sora Kan Rithiron School			
ROUTE NO.	1	CONTROL SECTION NO.	100	K.P. OF PROBLEM LOCATION	K.P. 25.500 — K.P. 26.500	ROAD CONDITION	Roadway Section
K.P. OF CONTROL SECT.	K.P. 16.441 — K.P. 29.000					DISTRICT CODE	411
DIVISION NAME	BANGKOK			DISTRICT NAME	BANGKOK	PEDESTRIAN VOLUME (PERSONS/PEAK HOUR)	100
TRAFFIC VOLUME (VEHICLES) (P.C.U.)	(WHOLE DAY) MAJOR ROAD 40,500 MINOR ROAD (PEAK HOUR) MAJOR ROAD 3,122 MINOR ROAD			PERCENT OF HEAVY VEHICLES (%)	(WHOLE DAY) MAJOR ROAD 27.0 MINOR ROAD (PEAK HOUR) MAJOR ROAD 32.0 MINOR ROAD	ACCIDENT RATE (PERSONS / 100 MIL. VEH. KM.)	44.9
NO. OF ACCIDENTS(CASES)	29			CASUALITIES (PERSONS)	(FATALITIES) 2 (INJURIES) 4	WHOLE CONTROL SECTION	32.1

EXISTING ROAD CONDITION DIAGRAM



COMMENTS ON EXISTING ROAD CONDITION

The R1 section here is a straight four-lane section with a wide median (4 m). These locations are T-intersections between R1 and several sois.

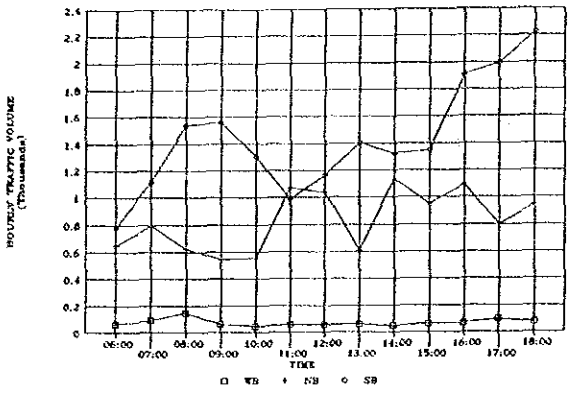
TRAFFIC SAFETY/CONTROL DEVICES INSTALLED

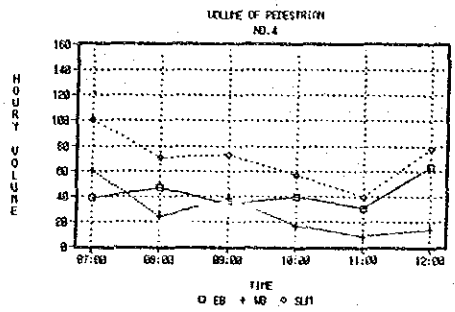
TRAFFIC SIGNAL	
PEDESTRIAN CROSSING	
PEDESTRIAN OVERPASS	
STREET LIGHTING	0
GUARD FENCE	
CHANELIZATION	

TRAFFIC DATA ANALYSIS

Traffic Data Analysis

VARIATION IN TRAFFIC VOLUME





Accident Data Analysis

Number of Accident and Casualties

STUDY SECTION NO.	ROUTE NO.	CONTROL SECTION NO.	K.P.-K.P.	LENGTH (KM)	TRAFFIC VOLUME ADT (PCU/DAY)	TRAFFIC VOLUME VEHICLE KILOMETER	NUMBER OF ACCIDENTS (CASES)	CASUALTIES DEATH (CASES)	CASUALTIES INJURY (CASES)	CASUALTIES DEATH AND INJURY (CASES)	ACCIDENT RATE ACCIDENT DENSITY (CASES/KM)	ACCIDENT RATE ALL ACCIDENTS (CASES/100 MIL. VEH.KM.)	ACCIDENT RATE DEATH (CASUALTIES/100 MIL.VEH. KM.)	ACCIDENT RATE INJURY (CASUALTIES/100 MIL.VEH. KM.)	ACCIDENT RATE DEATH AND INJURY (CASUALTIES/100 MIL.VEH. KM.)	ACCIDENT RATE OF CONTROL SECTION (CASUALTIES/100 MIL.VEH.KM.)	REMARKS
4	1	100	25+500 - 26+500	1.000	36,589	36,589	29	2	4	6	29.0	217.1	15.0	30.0	44.9	32.1	

Number of Accident by type

NO.	ROUTE NO.	CONTROL SECTION NO.	NUMBER OF ACCIDENTS BY TYPE OF ACCIDENT (CASES) HIT PEDESTRIANS	HIT BICYCLE	HIT DURING PASSING	HIT OPPOSED VEHICLE	REAR END COLLISION	HEAD ON COLLISION	HIT AT INTERSECTION	SIDE COLLISION	IMPROPER TURNING	LOST OF CONTROL	HIT FIXED OBJECT	HIT TRAIN	OTHERS	SUM
4	1	100	2	0	7	4	3	0	0	1	1	1	1	0	9	29

Number of Accident by cause

NO.	ROUTE NO.	CONTROL SECTION NO.	NUMBER OF ACCIDENTS BY CAUSE OF ACCIDENT OVER SPEED LIMIT	FAILURE TO YIELD TO ROW	IMPROPER PASSING	VEHICLE DEFECTS	DRUNKEN DRIVER	SLEEPY	OTHERS	SUM	REMARKS
4	1	100	17	1	0	0	0	0	11	29	

COMMENTS ON TRAFFIC CONDITION

Traffic Conditions are the same as at S-1 and S-2.

COMMENTS ON ACCIDENT CONDITION

Each location recorded between one and three pedestrian accidents.

POSIBLE COUNTERMEASURES AND THEIR GROUNDS

PROBLEMS

The pedestrian crossings are in a dangerous condition.

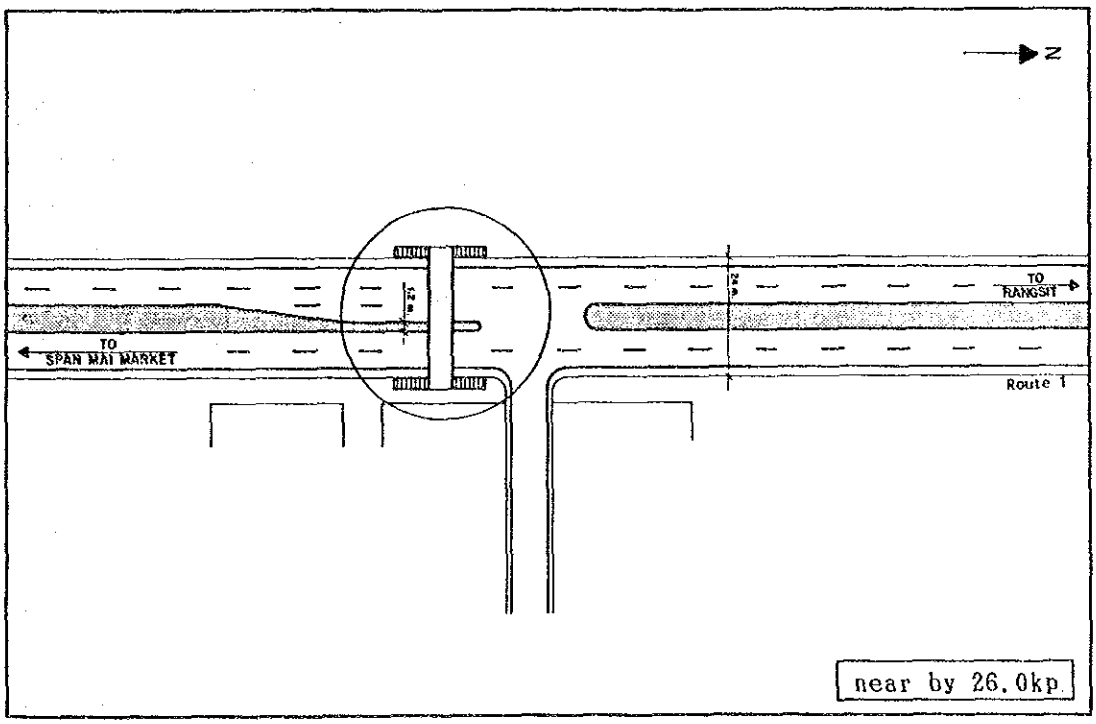
MEASURES

The installation of a pedestrian overpass is suggested.

EVALUATION

Installation of pedestrian overpass: Satisfies criteria for improvement.

ILLUSTRATION OF TRAFFIC SAFETY / OPERATION PLAN

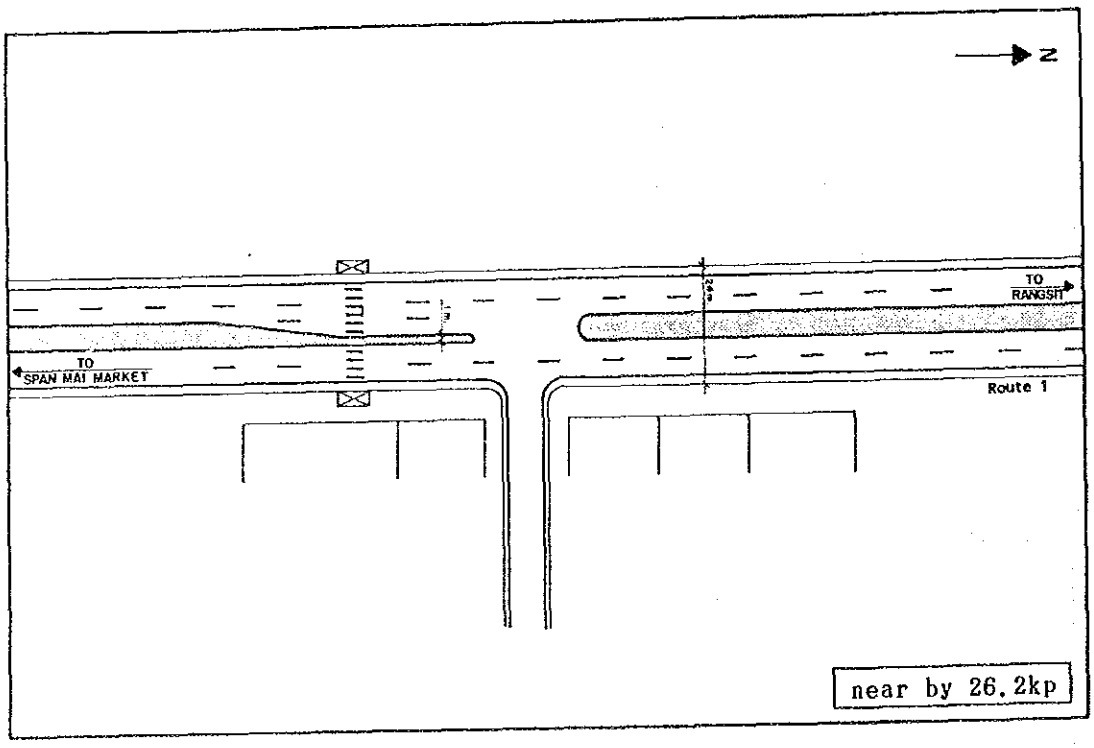


DIAGNOSTIC SHEET OF PROBLEM LOCATIONS

(Form - 1)

LOCATION NO.	5		LOCATION NAME	Annex			
ROUTE NO.	1	CONTROL SECTION NO. 100	K.P. OF PROBLEM LOCATION	K.P. 25.500 – K.P. 26.500		ROAD CONDITION	Roadway Section
K.P. OF CONTROL SECT.	K.P. 16.441 – K.P. 29.000					DISTRICT CODE	411
DIVISION NAME	BANGKOK		DISTRICT NAME	BANGKOK		PEDESTRIAN VOLUME (PERSONS/ PEAK HOUR)	614
TRAFFIC VOLUME (VEHICLES) (P.C.U.)	(WHOLE DAY) MAJOR ROAD 40,500 MINOR ROAD (PEAK HOUR) MAJOR ROAD 3,122 MINOR ROAD		PERCENT OF HEAVY VEHICLES (%)	(WHOLE DAY) MAJOR ROAD 27.0 MINOR ROAD (PEAK HOUR) MAJOR ROAD 32.0 MINOR ROAD		ACCIDENT RATE (PERSONS / 100 MIL. VEH. KM.)	44.9
NO. OF ACCIDENTS(CASES)	29		CASUALITIES (PERSONS)	(FATALITIES) 2 (INJURIES) 4		WHOLE CONTROL SECTION	32.1

EXISTING ROAD CONDITION DIAGRAM



COMMENTS ON EXISTING ROAD CONDITION

The R1 section here is a straight four-lane section with a wide median (4 m). These locations are T-intersections between R1 and several sois.

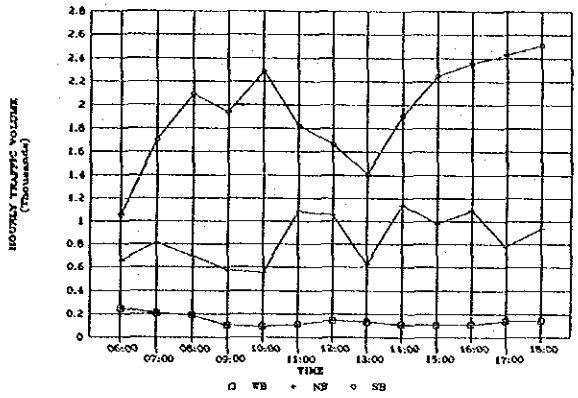
TRAFFIC SAFETY / CONTROL DEVICES INSTALLED

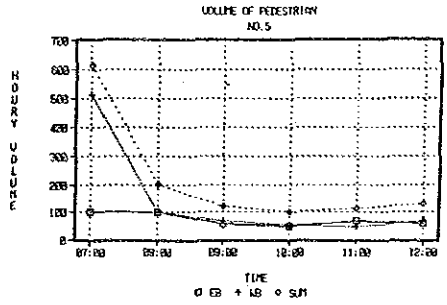
TRAFFIC SIGNAL	
PEDESTRIAN CROSSING	0
PEDESTRIAN OVERPASS	
STREET LIGHTING	0
GUARD FENCE	
CHANELIZATION	

TRAFFIC DATA ANALYSIS

Traffic Data Analysis

VARIATION IN TRAFFIC VOLUME





Accident Data Analysis

Number of Accident and Casualties

STUDY SECTION NO.	ROUTE NO.	CONTROL SECTION NO.	K.P.-K.P.	LENGTH (KM)	TRAFFIC VOLUME ADT (PCU/DAY)	TRAFFIC VOLUME VEHICLE KILOMETER	NUMBER OF ACCIDENTS (CASES)	CASUALTIES DEATH (CASES)	CASUALTIES INJURY (CASES)	CASUALTIES DEATH AND INJURY (CASES)	ACCIDENT RATE ACCIDENT DENSITY (CASES/KM)	ACCIDENT RATE ALL ACCIDENTS (CASES/100 MIL. VEH.KM.)	ACCIDENT RATE DEATH (CASUALTIES/100 MIL.VEH. KM.)	ACCIDENT RATE INJURY (CASUALTIES/100 MIL.VEH. KM.)	ACCIDENT RATE DEATH AND INJURY (CASUALTIES/100 MIL.VEH. KM.)	ACCIDENT RATE OF CONTROL SECTION (CASUALTIES/100 MIL.VEH. KM.)	REMARKS
5	1	100	25+500 - 26+500	1.000	36,589	36,589	29	2	4	6	29.0	217.1	15.0	30.0	44.9	32.1	

Number of Accident by type

NO.	ROUTE NO.	CONTROL SECTION NO.	NUMBER OF ACCIDENTS BY TYPE OF ACCIDENT (CASES) HIT PEDESTRIANS	HIT BICYCLE	HIT DURING PASSING	HIT OPPOSED VEHICLE	REAR END COLLISION	HEAD ON COLLISION	HIT AT INTERSECTION	SIDE COLLISION	IMPROPER TURNING	LOST OF CONTROL	HIT FIXED OBJECT	HIT TRAIN	OTHERS	SUM
5	1	100	2	0	7	4	3	0	0	1	1	1	1	0	9	29

Number of Accident by cause

NO.	ROUTE NO.	CONTROL SECTION NO.	NUMBER OF ACCIDENTS BY CAUSE OF ACCIDENT OVER SPEED LIMIT	FAILURE TO YIELD TO ROW	IMPROPER PASSING	VEHICLE DEFECTS	DRUNKEN DRIVER	SLEEPY	OTHERS	SUM	REMARKS
5	1	100	17	1	0	0	0	0	11	29	

COMMENTS ON TRAFFIC CONDITION

Traffic Conditions are the same as at S-1 and S-2.

COMMENTS ON ACCIDENT CONDITION

Each location recorded between one and three pedestrian accidents.

POSIBLE COUNTERMEASURES AND THEIR GROUNDS

PROBLEMS

The pedestrian crossings are in a dangerous condition.

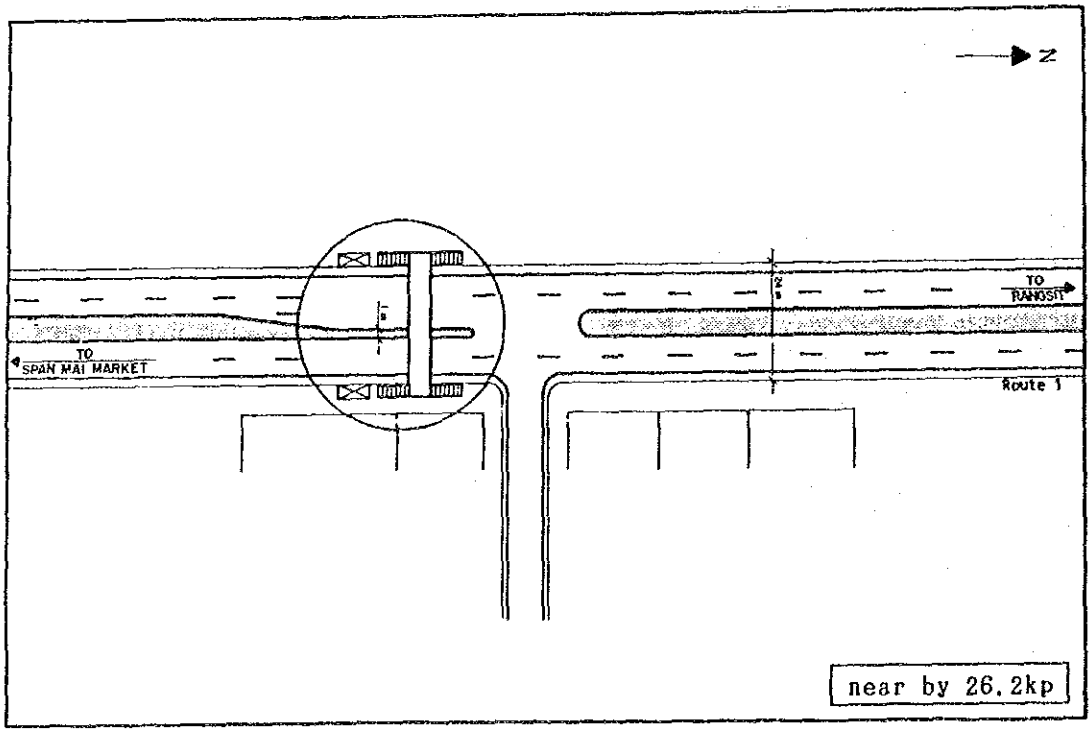
MEASURES

The installation of a pedestrian overpass is suggested.

EVALUATION

Installation of pedestrian overpass: Satisfies criteria for improvement.

ILLUSTRATION OF TRAFFIC SAFETY / OPERATION PLAN

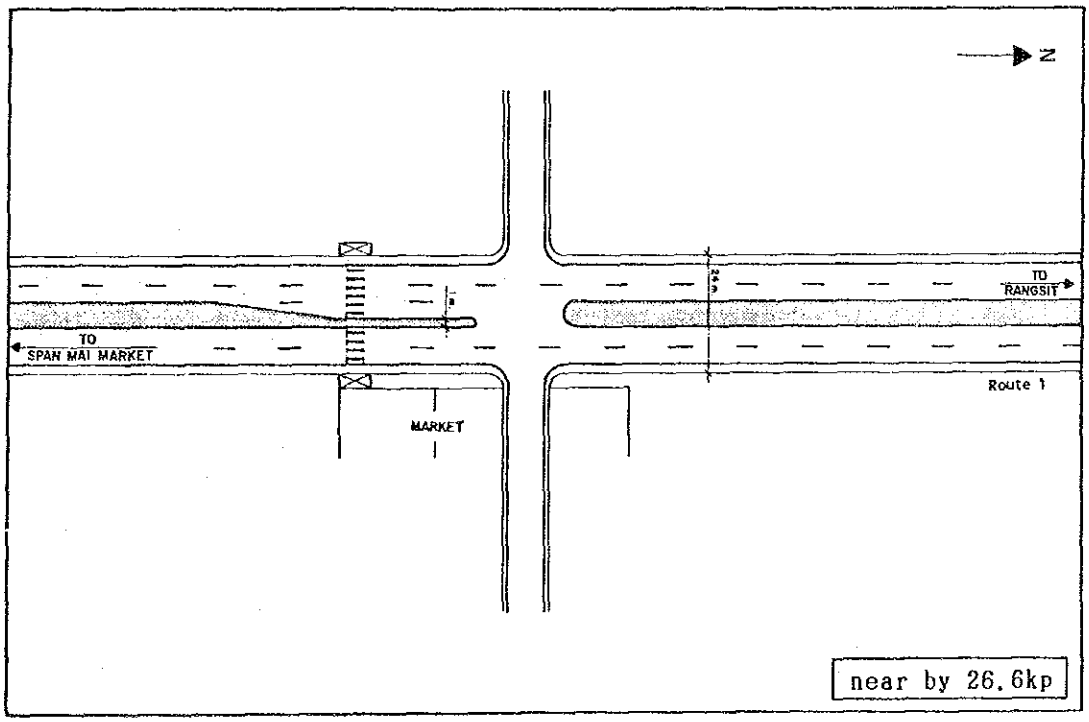


DIAGNOSTIC SHEET OF PROBLEM LOCATIONS

(Form - 1)

LOCATION NO.	6		LOCATION NAME	Chan Sin			
ROUTE NO.	1	CONTROL SECTION NO. 100	K.P. OF PROBLEM LOCATION	K.P 26.000 – K.P 27.000		ROAD CONDITION	Roadway Section
K.P OF CONTROL SECT.	K.P. 16.441 – K.P. 29.000					DISTRICT CODE	411
DIVISION NAME	BANGKOK		DISTRICT NAME	BANGKOK		PEDESTRIAN VOLUME (PERSONS / PEAK HOUR)	559
TRAFFIC VOLUME (VEHICLES) (P.C.U.)	(WHOLE DAY) MAJOR ROAD 40,500 MINOR ROAD (PEAK HOUR) MAJOR ROAD 3,122 MINOR ROAD		PERCENT OF HEAVY VEHICLES (%)	(WHOLE DAY) MAJOR ROAD 27.0 MINOR ROAD (PEAK HOUR) MAJOR ROAD 32.0 MINOR ROAD		ACCIDENT RATE (PERSONS / 100 MIL. VEH. KM.)	59.9
NO. OF ACCIDENTS(CASES)	31		CASUALITIES (PERSONS)	(FATALITIES) 2 (INJURIES) 6		WHOLE CONTROL SECTION	32.1

EXISTING ROAD CONDITION DIAGRAM



COMMENTS ON EXISTING ROAD CONDITION

The R1 section here is a straight four-lane section with a wide median (4 m). These locations are T-intersections between R1 and several sois.

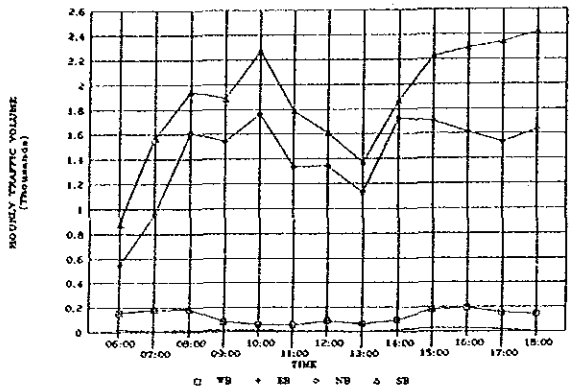
TRAFFIC SAFETY / CONTROL DEVICES INSTALLED

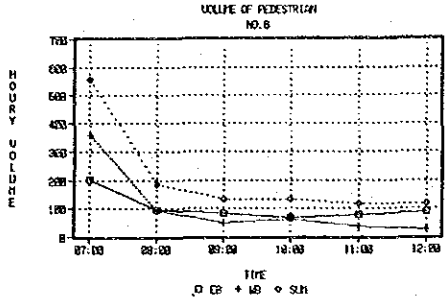
TRAFFIC SIGNAL	
PEDESTRIAN CROSSING	0
PEDESTRIAN OVERPASS	
STREET LIGHTING	0
GUARD FENCE	
CHANELIZATION	

TRAFFIC DATA ANALYSIS

Traffic Data Analysis

VARIATION IN TRAFFIC VOLUME





Accident Data Analysis

Number of Accident and Casualties

STUDY SECTION NO.	ROUTE NO.	CONTROL SECTION NO.	K.P.-K.P.	LENGTH (KM)	TRAFFIC VOLUME ADT (PCU/DAY)	TRAFFIC VOLUME VEHICLE KILOMETER	NUMBER OF ACCIDENTS (CASES)	CASUALTIES DEATH (CASES)	CASUALTIES INJURY (CASES)	CASUALTIES DEATH AND INJURY (CASES)	ACCIDENT RATE ACCIDENT DENSITY (CASES/KM)	ACCIDENT RATE ALL ACCIDENTS (CASES/100 MIL.VEH.KM.)	ACCIDENT RATE DEATH (CASUALTIES/100 MIL.VEH.KM.)	ACCIDENT RATE INJURY (CASUALTIES/100 MIL.VEH.KM.)	ACCIDENT RATE DEATH AND INJURY (CASUALTIES/100 MIL.VEH.KM.)	ACCIDENT RATE OF CONTROL SECTION (CASUALTIES/100 MIL.VEH.KM.)	REMARKS
6	1	100	26+000 - 27+000	1.000	36,589	36,589	31	2	6	8	31.0	232.1	15.0	44.9	59.9	32.1	

Number of Accident by type

NO.	ROUTE NO.	CONTROL SECTION NO.	NUMBER OF ACCIDENTS BY TYPE OF ACCIDENT (CASES) HIT PEDESTRIANS	HIT BICYCLE	HIT DURING PASSING	HIT OPPOSED VEHICLE	REAR END COLLISION	HEAD ON COLLISION	HIT AT INTERSECTION	SIDE COLLISION	IMPROPER TURNING	LOST OF CONTROL	HIT FIXED OBJECT	HIT TRAIN	OTHERS	SUM
6	1	100	3	0	10	6	3	0	0	1	1	0	1	0	6	31

Number of Accident by cause

NO.	ROUTE NO.	CONTROL SECTION NO.	NUMBER OF ACCIDENTS BY CAUSE OF ACCIDENT OVER SPEED LIMIT	FAILURE TO YIELD TO ROW	IMPROPER PASSING	VEHICLE DEFECTS	DRUNKEN DRIVER	SLEEPY	OTHERS	SUM	REMARKS
6	1	100	22	2	0	0	0	0	7	31	

COMMENTS ON TRAFFIC CONDITION

Traffic Conditions are the same as at S-1 and S-2.

COMMENTS ON ACCIDENT CONDITION

Each location recorded between one and three pedestrian accidents.

POSIBLE COUNTERMEASURES AND THEIR GROUNDS

PROBLEMS

The pedestrian crossings are in a dangerous condition.

MEASURES

The installation of a pedestrian overpass is suggested.

EVALUATION

Installation of pedestrian overpass: Satisfies criteria for improvement.

ILLUSTRATION OF TRAFFIC SAFETY / OPERATION PLAN