EVALUATION ON THE PERFORMANCE OF A SIGNALIZED INTERSECTIONS

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NOR AIN NADIA BINTI MOHAMAD ZAID

Thesis submitted in fulfilment of the
requirements for the award of the degree of
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ABSTRACT

Intersection is where the vehicle from other direction meet. If the number of vehicle increase, this will cause a worst traffic flow when need to change the lane or direction during driving. Nowadays, traffic flow is the common problem occur not only in the urban but also in rural area due to the increases of vehicle. Therefore, this study is intended to evaluate the performance of a signalized intersection during weekdays and weekend in terms of level of service (LOS) at the intersection. In order to achieve this, the T-signalized intersection that located at Batu 10, Jalan Gambang have been chosen as study area. The data collection will be recorded in several days during peak hour morning and evening on weekdays and weekend by manual count. Determination of traffic volume and geometric characteristic will figure out the delays and level of service (LOS). Based on the analyses, the cycle length and insufficient of lane cause the condition of this study area become worst. In order to improve the future operating level of service (LOS) the improvement that have been proposed are reduce the cycle length and make some change in the geometrical design such as added the number of lanes for the critical lanes. The improvement of the level of the service for the whole intersection will improve the performance of the intersection.

ABSTRAK

Persimpangan adalah di mana kenderaan dari arah lain bertemu. Jika jumlah kenderaan meningkat, ini akan menyebabkan aliran trafik yang teruk apabila perlu menukar lorong atau arah semasa memandu. Pada masa kini, aliran trafik adalah masalah biasa yang berlaku bukan sahaja di bandar tetapi juga di kawasan luar bandar disebabkan oleh kenaikan kenderaan. Oleh itu, kajian ini bertujuan untuk menilai prestasi persimpangan berlampu isyarat pada hari bekerja dan hujung minggu dari segi tahap perkhidmatan (LOS) di persimpangan. Dalam usaha untuk mencapai matlamat ini, persimpangan T yang berlampu isyarat yang terletak di Batu 10, Jalan Gambang telah dipilih sebagai kawasan kajian. Pengumpulan data akan direkodkan dalam beberapa hari pada waktu puncak pagi dan petang pada hari bekerja dan hujung minggu dengan kiraan manual. Penentuan jumlah trafik dan ciri-ciri geometri akan menentukan kelewatan dan tahap perkhidmatan (LOS). Berdasarkan analisis, panjang kitaran dan laluan yang tidak mencukupi menyebabkan keadaan kawasan kajian ini menjadi teruk. Dalam usaha untuk meningkatkan tahap operasi masa depan perkhidmatan (LOS) peningkatan yang telah dicadangkan adalah mengurangkan panjang kitaran dan membuat beberapa perubahan dalam reka bentuk geometri seperti menambah bilangan laluan untuk laluan kritikal. Peningkatan tahap perkhidmatan untuk seluruh persimpangan akan meningkatkan prestasi persimpangan.

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CHAPTER 1

1.1 INTRODUCTION

National Statistic Department Malaysia predicted that Malaysian population will be increase to 31.5 million in 2040. (Tan Sri Dato' Soong Siew Hoong, 2013). Of course each one of them will have their own dreams to buy own vehicle. In addition, this will influences the traffic flow since the number of vehicle on the road will increase along the time. It will also give the worst effect when it comes to the intersection. Intersection is where the vehicle from other direction meet. If the number of vehicle increase, this will cause a worst traffic flow when need to change the lane or direction during driving. Besides that, the congestion and accident also can happen due to the worst traffic flow especially during peak hour.

There are various type of intersection which are signalized intersection and unsignalized intersection. At the signalized intersection, traffic light will be used to control the movement of the vehicles. The problem of traffic light system is one of the factor that contribute to the traffic congestion. By referring to Dictionary.com, traffic lights which also can be known as traffic signal is a set of electrically operated signal lights used to direct or control traffic at intersections. Traffic control started to seem necessary in the late 1890s and Earnest Sirrine from Chicago patented the first automated traffic control system in 1910 which is used the words "STOP" and "PROCEED". (Mary Bellis, 2016). Therefore, the problem of traffic light system will increase the volume of the vehicle lineup and cause the congestion and delay happen.

Besides that, traffic signal is also important to reduce the number of vehicular traffic, delay, accident, utilization of police traffic and maintain the smooth of traffic flow. There are two types of traffic signal which are fixed timed and actuated signals. Fixed-time signals follow a predetermined sequence of signal operation, always providing the same amount of time to each traffic movement, whether traffic is present or not. Actuated

signals change the lights according to the amount of traffic in each direction. They use various types of sensors to detect vehicles, and adjust the length of the green time to allow as many vehicles as possible through the intersection before responding to the presence of vehicles on another approach. (WYDOT Quick Facts Traffic Signals, 2012).

The sequences of traffic signal are green, amber (yellow) and red. The green light means the driver can proceed their driving while the amber (yellow) light warns the driver to stop at the junction because the signal is about to change to red. Meanwhile, the red signal means the driver need to stop the vehicle in order to prevent the collision between the vehicles from other direction. In designing the traffic signal, guiding principles that must be followed are minimum number of phases, short cycle lengths and the level of service of signalized intersection must same as the road system. If there are problem with the traffic signals system, it can effected the traffic flow especially during peak hours.

1.2 PROBLEM STATEMENT

Nowadays, traffic flow is the common problem occur not only in the urban but also in rural area due to the increases of vehicle. Jalan Gambang – Kuantan at batu 10 which is at the intersection is getting congested especially during AM & PM peak hours. Besides that, during festive season the road becomes more congested as it is the main road to Kuantan. This occur due the setting of signalized intersection that not suit with the volume. Most of the traffic get stuck and cannot proceed the driving. Only a few of them can proceed the driving. Therefore, the vehicle that are lineup will increase. This will affected the daily activities of the people as they wasted their time at the traffic light. This study was conducted to determine existing level of service of the signalized intersection during the peak hours. The study location of the T- signalized intersection is located at Batu 10, Jalan Gambang which is the major road to the Kuantan and near to the SMK Seri Mahkota. Figure 1.1 shown the location of the study area.

Figure 1.1: Study Area
(Sources Google Maps)

1.3 OBJECTIVE

The aim of this study is to determine whether the problem of traffic light system is the factor of the traffic flow problem at Jalan Gambang – Kuantan. The objective of this research are

i. To determine the existing level of service (LOS) of the signalized intersection during AM and PM peak hour.
ii. To propose possible mitigation measures in order improve the future operating level of service (LOS).

1.4 SCOPE OF STUDY

The scope of this research focused on the assessment of LOS in evaluating the performance of a signalized intersections. This is only limited to insolated signalized intersection. All the data will be taken during peak hour of weekdays (Monday to Friday) and weekend (Saturday and Sunday) within 7 to 10 AM & 4 to 7 PM. The data that will be collected at the study area are geometric data, signalization data and traffic volume data. The data that obtained will be inserted into the input worksheet of MHCM 2006.

From the result get from the input worksheet, the existing of level of services (LOS) will be evaluated. Hence, the solution to improve the future operating level of service will be proposed.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

All of the overall contents of this study were discussed from the problem statement, objectives and the scope in chapter 1. In order to understand this study, the literature reviews on several procedures and the discussion on the parameters are carries out in this chapter. Intersections studies were discussed in sections 2.2. Traffic flow characteristics at signalized intersection were discussed in sections 2.3. Sections 2.4 were discussed about traffic light at signalized intersection. Capacity and level of service (LOS) were discussed in sections 2.5. In this section, the definition and the criteria of the level of service at the signalized intersection were highlighted. Besides that, the factor that affect the capacity and level of service also included in this section. Sections 2.6 were discussed about traffic volume studies that also included the type of traffic count.

2.2 INTERSECTION STUDIES

According to the American Association of State Highway and Transportation Officials' (AASHTO) A Policy on Geometric Design of Highways and Streets, an intersection is defined as the general area where two or more highways join or cross, including the roadway and roadside facilities for traffic movements within the area. (Golembiewski, G.A. and Chandler, B., 2011). Intersection are an important part of a highway facility because, to a great extent, the efficiency, safety, speed, cost of operation, and capacity of the facility depend on their design. (Warne, T.R., Carlson, D., King, L. 2001). The main objective of intersection design is to reduce the severity of potential conflicts between passenger cars, buses, trucks, bicycles and pedestrians. (A Guide to the

Design of At-Grade Intersections, 2015). Nevertheless, the single mistake from them can cause the accident that will influence the capacity of the road. The increasing of the capacity of the road will lead to the traffic congestion. Sometimes, the problem of the traffic light also can encourage the problem of traffic flow. Therefore, according to the accident and traffic congestion problem, it is important to engineer to study about the intersection.

2.3 TRAFFIC FLOW CHARACTERISTICS AT SIGNALIZED INTERSECTION

Three signal indicators that displayed at signalized intersection are green, yellow, and red. The red indication may include a short period during which all indications are red, referred to as an all-red interval, which with the yellow indication forms the change and clearance interval between two green phases. (John, D.Z., Richard, D., James, B., 2000). Figure 2.1 show some fundamental attributes of flow at signalized intersections. This figure implies at typical scenario of one-way approach to a signalized intersection with cycle of two phases. This figure have three parts where a time versus space graph of vehicles has been shown in first part. The intervals for the signal cycle are indicated in the diagram. Then, for the second part, the timing interval and the labels of time interval of interest with the symbol is shown. From the diagram, an idealized plot of flow rate passing the stop line, indicating how saturation flow is defined in third part.

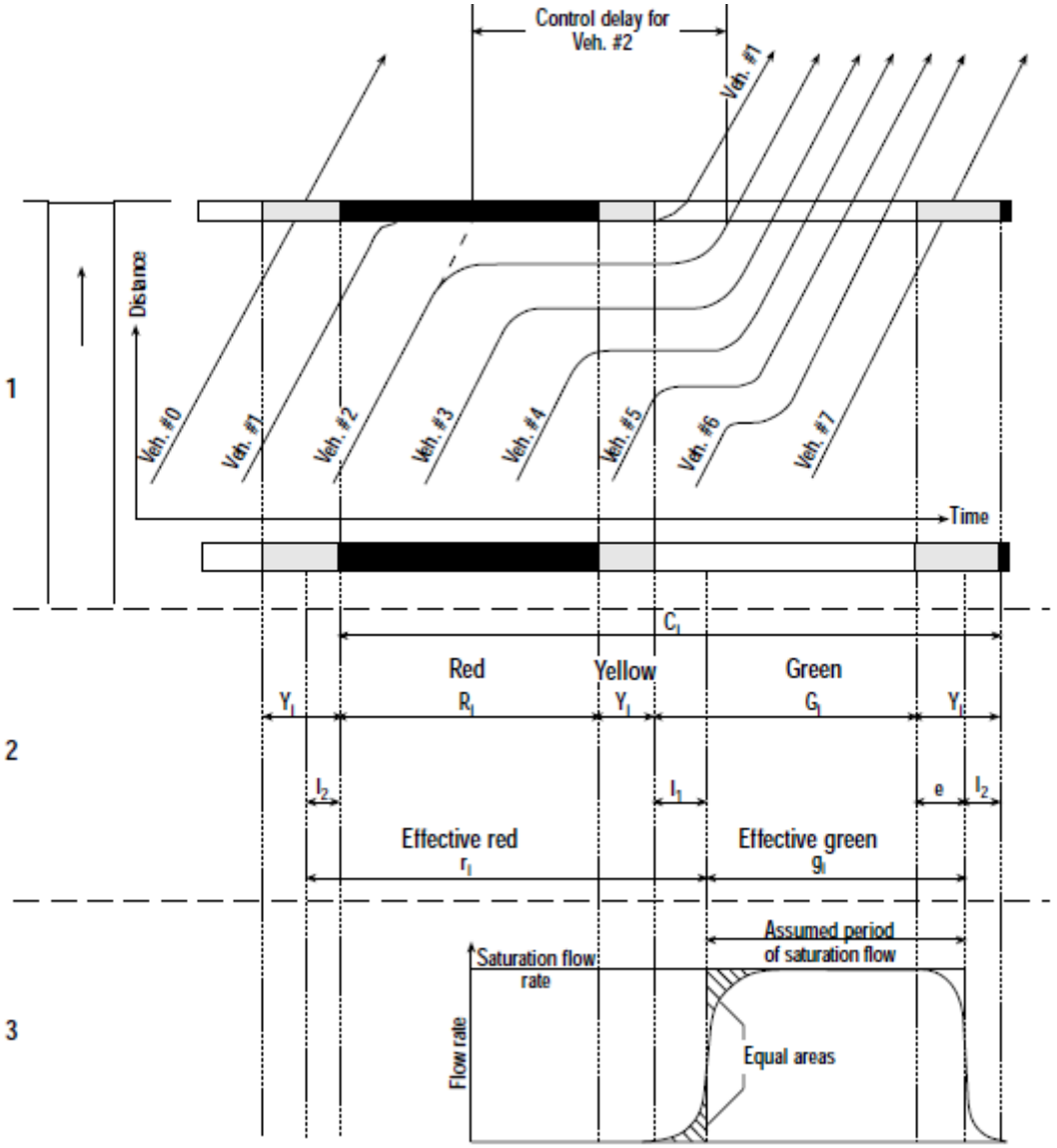


Figure 2.1: Fundamental Attributes of Flow at Signalized Intersections

(Sources HCM 2000)

2.4 TRAFFIC LIGHT AT SIGNALIZED INTERSECTION

Highway Capacity Manual, 2000 state that a traffic signal, for example, limits the times available to various movement in an intersection. Capacity is limited not only by the physical space but by the time available for movements. The overall objective of signal control is to provide for a safe and efficient traffic flow through intersections, along routes and in road networks. At individual intersections, the primary purpose is to assign

right-of-way for alternate roads or road approaches in order to maximize capacity, minimize delay and reduce conflicts. (A Guide to the Design of Traffic Signals, 1987).

2.5 CAPACITY AND LEVEL OF SERVICE CONCEPT

Capacity and Level of service are two related terms. Capacity analysis tries to give a clear understanding of how much traffic a given transportation facility can accommodate. Level of service tries to answer how good the present traffic situation on a given facility is.

2.5.1 Capacity

Capacity at intersection is defined for each lane group. The lane group capacity is the maximum hourly rate at which vehicles can reasonably be expected to pass through the intersection under prevailing traffic, roadway and signalization conditions. Capacity is considered as the maximum capability of a given transportation mode or its particular component to serve a certain volume of demand, during a specified period of time, under given conditions. (Teodorovic, D., and Janic, M., 2017). The capacity of a signalized intersection is limited by the capacities of individual approaches to the intersection.

2.5.2 Level of Service

Level of service is defined as “a quality measure describing operational conditions within a traffic stream, generally in terms of service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience.” (John, D.Z., Richard, D., James, B., 2000). Determination of L.O.S. in urban areas is very much different from the concept applied in rural areas or uninterrupted roads. (Robin Babit, Viranta Sharma, Ajay K. Duggal, 2016). When a road is carrying traffic in equal volume to its capacity, or say volume to capacity ratio near to one, under ideal traffic and roadway conditions, the operating conditions become poor. (Robin Babit, Viranta Sharma, Ajay K. Duggal, 2016). Vehicular volume affects the efficiency and the Level of Service of an intersection. High traffic volume on the major road especially during peak hours, would invariably cause considerable delay for the traffic on the minor road. (A Guide to the

Design of Traffic Signals, 1987). Robin Babit, Viranta Sharma, Ajay K. Duggal, July 2016 state that the following are the factors which might be considered in evaluating the L.O.S.:

- Traffic interruptions or restrictions, with due consideration to the number of stops per kilometer, changing of speed and delays involved are the requirement to maintain the speed in the traffic stream.
- Speed and travel time, including the operating speed and overall travel time consumed in travelling over a section of roadway.
- Driving comfort and convenience reflecting the roadway and traffic conditions in so-far as they affect driving comfort and convenience of the driver.
- Freedom to maneuver to maintain the desired operating speeds.

Highway Capacity Manual (HCM) used travel speed and volume by capacity ratio (v/c ratio) to distinguish between various levels of service. The value of v/c ratio can vary between 0 and 1.Depending upon the travel speed and v/c ratio, HCM has defined six levels of service, level A to level F based on a graph between operating speed and v/c ratio as shown in the Figure 2.2 (Tom V. Mathew and K V Krishna Rao, 2007).

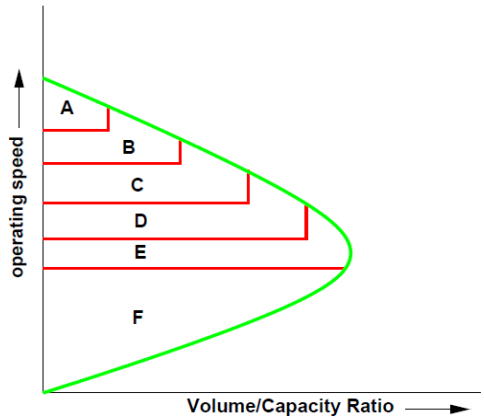


Figure 2.2: Level of Service A to F

(Sources Introduction to Transportation Engineering)

2.5.3 Types of Facilities

Since this study is conduct at the intersection, uninterrupted flow and interrupted flow are the most important classification of transportation facilities from the engineering perspective. They are determined based on the continuity of flow. Uninterrupted flow is the flow of traffic in which there is no obstructions to the movement of vehicles along the road such as traffic signals. Freeway is one example for this type of facility. Interrupted flow refers to the condition when the traffic flow on the road is obstructed due to some reasons. (Tom V. Mathew and K V Krishna Rao, 2007). Interrupted-flow facilities have controlled and uncontrolled access points that can interrupt the traffic flow. These access points included traffic signals, stop signs, yield signs, and other types of control that stop traffic periodically. HCM define level of service of freeway section as on Tables 2.1. Meanwhile Arahan Teknik (Jalan) 13/87 define level of service of signalized intersection and level of service of road as on Table 2.2 and Table 2.3. Table 2.4 show the definition of level of service for signalized intersection from A Guide to The Design of At-Grade Intersections.

Table 2.1: LOS for Freeway

LOS	K(veh /km/lane)	FFS (Km/ hr)	v/c
A	0-7	120	0.35
B	7-11	120	0.55
C	11-16	114	0.77
D	16-22	99	0.92
E	22-28	85	1.0
F	>28	<85	>1.0

(Sources Introduction to Transportation Engineering**)**

Table 2.2: LOS for an signalised Intersection

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (SEC)
A	<=10.0
B	>10.0 to 20.0
C	>20.0 to 35.0
D	>35.0 to 55.0
E	>55.0 to 80.0
F	>80.0

(Sources Arahan Teknik Jalan 13/87)

Table 2.3: Level of service of road

AREAS	CATEGORY OF ROAD	LEVEL OF SERVICES
RURAL	Expressway	C
	Highway	C
	Primary	D
	Secondary	D
	Minor	E
URBAN	Expressway	C
	Arterial	D
	Collector	D
	Local Street	E

(Source Arahan Teknik Jalan 13/87)

Table 2.4: Level of Service Definition for Signalized Intersections

Level Of Service	Intersection Conditions
A	Very short delay and most vehicle do not stop as result of favorable progressions, arrival of most vehicles during green phase, and short cycle length.
B	Short delay and many vehicles do not stop or stop for short time as a result of short cycle lengths and good progression.
C	Moderate delay, many vehicle have to stop, and occasional individual cycle failures as a result of some combination of long cycle lengths, high volume to capacity ratios, and unfavorable progressions.
D	Longer delay; many vehicle have to stop; and a noticeable number of individual cycle failures as a result of some combination of long cycle lengths, high volume to capacity ratios, and unfavorable progression.
E	Long delays and frequent individual cycle failures result from one or both of the following: long cycle lengths or high volume to capacity ratios, which, in turn, result in poor progression.
F	Delays considered unacceptable to most drivers occur when the vehicle arrival rate is greater than the capacity of the intersection for extended periods of times.

(Sources A Guide to The Design of At-Grade Intersections)

2.5.4 Factor Affecting LOS and Capacity

Highway Capacity Manual 2010 (HCM) define that the factor that affecting the level of service (LOS) and capacity consist of base condition, roadway condition and traffic condition.

2.5.4.1 Base Condition

Base condition assume good weather, good pavement conditions, users familiar with the facility, and no impediments to traffic flow. Example of base conditions for intersection approaches are given below:

- Lane widths of 3.6m,
- Level grade,
- No curb parking on the approaches,
- Only passenger cars in the traffic stream,
- No local transit buses stopping in the travel lanes,
- Intersection located in a non-central business district area, and
- No pedestrians.

In most capacity analyses, prevailing conditions differ from the base conditions, and computations of capacity, service flow rate, and level of service must include adjustment. Prevailing conditions are generally categorized as roadway, traffic, or control.

2.5.4.2 Roadway Conditions

Roadway conditions included geometric and other elements. Roadway factors included the following:

- Number of lanes,
- The types of facility and its development environment,
- Lane widths,
- Shoulder widths and lateral clearances,
- Design speed,
- Horizontal and vertical alignments, and
- Availability of exclusive turn lanes at intersections.

In general, the severity of the terrain reduces capacity and service flow rates. This is significant for two-lane rural highways, where the severity of terrain not only can affect

the operating capabilities of individual vehicles in the vehicles in the traffic stream, but also can restrict opportunities for passing slow-moving vehicles.

2.5.4.3 Traffic Conditions

Traffic conditions included the vehicle type and directional and lane distribution. The entry of heavy vehicles into the traffic stream affects the number of vehicles that can served. Heavy vehicles adversely affect traffic because they larger than passenger cars and occupy more roadway space and have poorer operating capabilities than passenger cars, particularly with respects to acceleration, deceleration, and the ability to maintain speed on upgrades. Directional distribution has a dramatic impact on two-lane rural highway operation, which achieves optimal conditions when the amount of traffic is about the same in each direction. Lane distribution also is a factor on multilane facilities. Typically, the shoulder lane carries less traffic than other lanes.

2.5.4.4 Control Conditions

For interrupted-flow facilities, the control of the time for movement of specific traffic flows is critical to capacity, service flow rates, and level of service. The most critical type of control is the traffic signal. The type of control in use, signal phasing, allocation of green time, cycle length, and the relationship with adjacent control measures affect operations. Stop signs and yield signs also affect capacity, but in a less deterministic way. In bus transit system, the buses has to stop at the bus bays and also it has to share the road with the other vehicles. Hence the capacity will be affected by the control characteristics and the traffic conditions prevailing in the road.

2.6 TRAFFIC VOLUME STUDIES

Traffic volume studies are conducted to determine the number, movements, and classifications of roadway vehicles at a given location. These data can help identify critical flow time periods, determine the influence of large vehicles or pedestrians on vehicular traffic flow, or document traffic volume trends. The length of the sampling period depends on the type of count being taken and the intended use of the data recorded.

For example, an intersection count may be conducted during the peak flow period. If so, manual count with 15-minute intervals could be used to obtain the traffic volume data. (Traffic Volume Counts, n.d.).

2.6.1 Types of Traffic Counts

Dr. Brian Slack, 2013 and Guillaume Leduc, 2008 state that traffic count is divided into intrusive and non-intrusive method. In general the intrusive methods are used most widely because of their relative ease of use and because they have been employed for decades. The only widely used non-intrusive method is manual counting, which enjoys wide application because of its ease.

2.6.1.1 Intrusive method:

i. **Pneumatic method:** rubber tubes are placed across the road lanes to detect vehicles from pressure changes that are produced when a vehicle tyre passes over the tube. The pulse of air that is created is recorded and processed by a counter located on the side of the road. The main drawback of this technology is that it has limited lane coverage and its efficiency is subject to weather, temperature and traffic conditions. This system may also not be efficient in measuring low speed flows.

ii. **Piezo-electric sensor:** a device that is placed in a groove cut into the roadbed of the lane(s) being counted. This electronic counter can be used to measure weight and speed. Cutting into the roadbed can affect the integrity of the roadbed and decrease the life of the pavement.

iii. **Inductive loop**: a wire embedded in the road in a square formation that creates a magnetic field that relays the information to a counting device at the side of the road. This has a generally short life expectancy because it can be damaged by heavy vehicles, and is also prone to installation errors.

2.6.1.2 Non-intrusive method:

i. **Manual counts:** it is the most traditional method. In this case trained observers gather traffic data that cannot be efficiently obtained through automated counts e.g. vehicle occupancy rate, pedestrians and vehicle classifications. The most common equipment used are tally sheet, mechanical count boards and electronic count board systems.

ii. **Passive and active infra-red:** the presence, speed and type of vehicles are detected based on the infrared energy radiating from the detection area. The main drawbacks are the performance during bad weather, and limited lane coverage.

iii. **Passive magnetic:** magnetic sensors are fixed under or on top of the roadbed. They count the number of vehicles, their type and speed. However, in operating conditions the sensors have difficulty differentiating between closely spaced vehicles.

iv. **Microwave radar:** this technology can detect moving vehicles and speed (Doppler radar). It records count data, speed and simple vehicle classification and is not affected by weather conditions.

v. **Ultrasonic and passive acoustic:** these devices emit sound waves to detect vehicles by measuring the time for the signal to return to the device. The ultrasonic sensors are placed over the lane and can be affected by temperature or bad weather. The passive acoustic devices are placed alongside the road and can collect vehicle counts, speed and classification data. They can also be affected by bad weather conditions (e.g. low temperatures, snow).

vi. **Video image detection:** video cameras record vehicle numbers, type and speed by means of different video techniques e.g. trip line and tracking. The system can be sensitive to meteorological conditions.

Table 2.5: The type of variables provided by different type of detectors.

Detector Type		Volume/ Count	Speed	Classification	Occupancy	Presence
I	Inductive Loop	✓	✓ (1)	✓ (2)	✓	✓
	Magnetic	✓	✓ (3)	✓ (3)	✓	✓
	Pneumatic Road Tube	✓	✓	✓	X	X
N	Active Infrared	✓	✓	✓	X	X
	Passive Infrared	✓	✓ (4)	✓	✓	✓
	Microwave Doppler	✓	✓	✓	✓	✓
	Radar True Presence	✓	✓	✓	✓	✓
	Ultrasonic	✓	X	X	X	✓
	Passive Acoustic	✓	✓	✓	✓	✓
	Video Image Processing	✓	✓	✓	✓	✓

Note: (1) Speed can be measured by dual-loops with a known distance apart, or by algorithms with a single-loop assuming the length of the detection zone and vehicle.
(2) Advanced detector cards can measure classification using “vehicle signature”.

(3) Speed and classification measurement by magnetic detectors requires two units.

(4) Passive infrared detectors with multi-detection-zone capability can measure speed.

✓ , Can provide the data type, X , cannot provide the data type

(Sources Road Traffic Data: Collection Methods and Applications)

Among various types of traffic count, for my study I have choose the manual count method in order to determine the number and movement of vehicle refer to the research paper by Ahmad Faiz Bin Nasir, 2012.

2.7 CONCLUSION

In this chapter, the discussion on the intersections studies, traffic flow characteristics at signalized intersection, traffic light at signalized intersection, capacity and level of service (LOS), traffic volume studies that also included the type of traffic count have been done. These all content were discussed based on the journal, article, books and research paper.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

In order to study the level of service of existing condition at the intersection, the analysis that need to be consider like amount and distribution of traffic movement, traffic composition and geometric characteristic and details of intersection signalization. (John, D.Z., Richard, D., James, B., 2000). The intersection study area is near to the SMK Seri Mahkota which is also the road to Jalan Sungai Panching Utara and Kuantan. The parameter that need to be collected such as geometric conditions, traffic conditions and signalization conditions. (John, D.Z., Richard, D., James, B., 2000).

3.2 DATA COLLECTION

In order to collect the data, the data collection will be recorded in several days during AM and PM peak hour on weekdays and weekend by manual count. The equipment used in data collection are paper, stopwatch and stationary. The paper and stationary is needed to record the number of vehicle manually from all direction within one hour during peak hour. The stopwatch is important in order to determine the 15 minutes time interval and to calculate the cycle time of green, amber and red. The data that need to be collect such as distribution of traffic flow and geometric characteristic.
Table 3.1 below shown the data that needed for each lane group. (John, D.Z., Richard, D., James, B., 2000).

Table 3.1: The data that needed for each lane group

Type of Condition	Parameter
Intersection	Area type
Geometric	Number of lane, N
Data	Average lane width, W (m)
	Grade, G (%)
	Existence of exclusive LT or RT lanes
	Length of storage bay, LT or RT lane, L_s (m)
	Parking
Traffic	Demand volume from movement, V (veh/h)
Survey Data	Base saturation flow rate , S_o (pc/hr/ln)
	Peak hour factor, PHF
	Percent heavy vehicle, HV (%)
	Approach Pedestrian flow rate V_{ped} (p/h)
	Local buses stopping at intersection N_B (buses/h)
	Parking activities, Nm (maneuvers/h)
	Arrival type, AT
	Proportion of vehicles arriving on green, P
	Approach speed, S_A (km/h)
Signalization	Cycle length, C (s)
Survey	Green time G (s)
Data	Yellow-plus-all-red change-and-clearance interval (intergreen), Y(s)
	Actuated or pre-timed operation
	Pedestrian push-button
	Minimum pedestrian green, G_p (s)
	Phase plan
	Analysis period, T (h)

(Sources HCM 2000)

Since all of the approach from Kuantan, Gambang and Panching have two movements, 6 person will assign in order to collect intersection geometric survey data. Figure 3.1 and 3.2 shows the intersection geometric from all approach from Google satellite.

Figure 3.1: Approach from Kuantan and Panching
(Sources Google Earth)

Figure 3.2: Approach from Gambang
(Sources Google Earth)

3.2.1 Traffic Volume Survey

Traffic volume survey is count manually at the study area during the peak hour morning and evening around 3 hours on working days to get the accurate data which is

within 7.00 to 10.00 in the morning and 4.00 to 7.00 in the evening refer to the research paper by Ahmad Faiz Bin Nasir, 2012. The large number of data may be recorded when conduct the manual counts therefore, the data forms should be carefully labeled and organized. On each tally sheet, should have the location, time and date of observation, and weather conditions. (Traffic Volume Counts, n.d.). Site characteristic of an intersection, traffic volume and vehicle classification based on Malaysian traffic characteristic should be considered in collecting the data. The vehicle classification is shown in Table 3.2. (Jamil, W.A., & Ibrahim, W.H.W., 2013).

Table 3.2: Vehicle Classification (Arahan Teknik Jalan 8/86)

Class	Vehicle Classification
1	Passenger cars, Taxi, Small vans & Utilities (Light 2 Axles)
2	Lorry, large van(Heavy vehicle with 2-axles)
3	Lorry, large van (Heavy vehicles with 3 axles or more)
4	Buses
5	Motorcycles, Scooter

(Sources An Analysis of Unsignalised Intersection Using aaSIDRA Software)

3.3 LOCATION SELECTION

T-Intersection of Jalan Kuantan – Gambang (Panching) has been chosen as a study area. It is significant intersection since this road form as a backbone of main road to Kuantan with higher traffic volume of long distance traffic generated form East Coast expressway and short distance traffic from local residents. Besides that, the traffic composition at this location is mixed as all type of vehicle such as public bus (RAPID KUANTAN) and school bus, light and heavy truck and cars from Kuala Lumpur and Johor used this road. The study area also near to the school which is contribute to the increasing traffic volume during peak hour morning and evening. In addition, this road also head to the Sungai Panching which is one of the recreation area in Pahang. Figure 3.3 below show the images of study area from satellite.

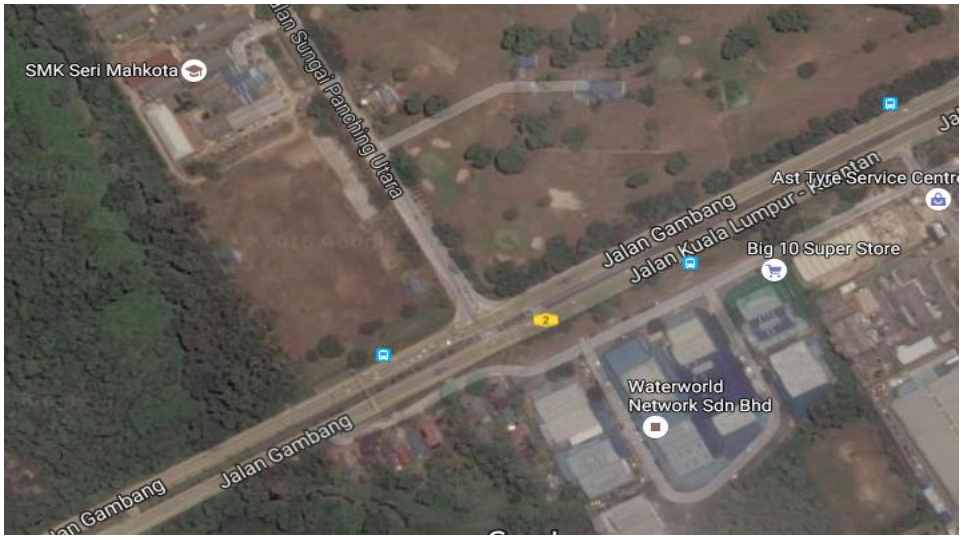


Figure 3.3: Images of study area from satellite

3.4 DATA ANALYZING

The data collection will be analyzed using MHCM 2006 that classify into observed model and proposed model. In order to analyze the data, the flow rate, saturation flow rate and capacity analysis which are included lost time, effective green time and green time ratio, lane capacity, control delay need to be determine. Lastly level of service (LOS) of intersection can be determine. (A Guide to the Design of Traffic Signals, 1987).

3.4.1 Determination of Flow Rate, Vp

The flow rate is derived from an hourly volume by dividing the movement volume by Peak Hour Factor (PHF) that computed by:

$$Vp = \frac{V}{PHF} \qquad \text{Eqn 3.1}$$

3.4.2 Determination of Saturation Flow Rate, S

The ideal saturation flow rate for Malaysian road condition is 1930 passenger cars per hour of green.

$$S = S_o \times N \times f_w \times f_g \times f_a \times f_{LT} \times f_{RT} \times (1/f_c) \qquad \text{Eqn 3.2}$$

Where

S = Saturation flow rate under prevailing conditions (vehicle per hour of effective green time)

S_o = Ideal saturation flow rate which is 1930 passenger cars per hour of green time per lane.

N = number of lanes in the lane group

f_w = adjustment factor for lane width (3.66 meter is the standard lane width)

f_g = approach grade adjustment factor

f_a = area type adjustment factor

f_{RT} = right turning in the lane group adjustment factor

f_{LT} = left turning in the lane group adjustment factor

f_c = vehicle composition correction factor ($f_{car} + f_{HV} + f_{motor}$)

f_{HV} = adjustment factor for heavy vehicle (any vehicle having more than four tires touching the pavement)

f_{car} = adjustment factor for passenger cars

f_{motor} = adjustment factor for motorcycles

3.4.2.1 Lane Width Adjustment Factor, f_w

Lane width adjustment factor is obtained through the equation below:

$$fw = 1 + \frac{w-3.66}{3.663} \qquad \text{Eqn 3.3}$$

Where w is the average lane width

3.4.2.2 Grade Adjustment Factor, f_g

Grade adjustment factor is separated into uphill and downhill which is computed by:

Downhill gradient adjustment factor,

$$fg = 1 - \frac{G}{26.34} \qquad \text{Eqn 3.4}$$

Uphill gradient adjustment factor,

$$fg = 1 - \frac{G}{14.39} \qquad \text{Eqn 3.5}$$

Where G is the gradient in percentage

Note: These formulas are only applicable for gradient from -5.24% to 3.49%.

3.4.2.3 Area Type Adjustment Factor, fa

The corresponding area type adjustment factor for CBD and non CBD areas in Malaysia is 0.8454 and 1.0000 respectively. According to US HCM 2000, CBD or Central Business District can be described if the following condition is satisfied:

a) Narrow street right-way
b) Frequent parking maneuvers
c) Vehicle blockage
d) Taxi and bus activity
e) Small radius turns
f) Limited use of exclusive turn lanes
g) High pedestrian activity
h) Dense population
i) Mid-block curb cuts

Table 3.3: Adjustment Factor for Area Type, fa

Type of area	Area type factor, fa
CBD	0.8454
NON CBD	1.000

(Sources Arahan Teknik (Jalan) 13/87)

3.4.2.4 Left Turn Adjustment Factor, f_{LT}

Left Turn Adjustment Factor is computed based on to the formula shown in Table 3.4 below:

Table 3.4: Adjustment Factor for Left (f_{LT})

Case/Lane Type	Left Turn Adjustment Factor (f_{LT})
Exclusive	0.76
Shared	$1.0 – 0.243P_{LT}$

Note: P_{LT} = Proportion of left turn in lane group

(Sources Arahan Teknik (Jalan) 13/87)

3.4.2.5 Right Turn Adjustment Factor, f_{RT}

Right turns also may be operated in either an exclusive or shared lane. Table 3.5 shows the adjustment factor for right turning at a signalized intersection.

Table 3.5: Adjustment Factor for Right (f_{RT})

Case/Lane Type	Right Turn Adjustment Factor (f_{RT})
Exclusive	0.84
Shared	$1/ 1 + 0.195P_{RT}$

Note: P_{RT} = Proportion of right turn in lane group

(Sources Arahan Teknik (Jalan) 13/87)

3.4.2.6 Vehicle Composition Correction Factor, f_c

The reflection of the composition of car, heavy vehicles and motorcycle at signalized intersection is analyzed from vehicle composition correction factor.

$$f_c = f_{car} + f_{HV} + f_{motor} \quad \text{Eqn 3.6}$$

$$f_{HV} = f_{trailer} + f_{bus} + f_{lorry} \quad \text{Eqn 3.7}$$

where fcar $= e_{car}(\frac{q\ car}{V})$

$f_{HV} = e_{motor\ (\frac{q\ motor}{V})}$

$f_{trailer} = e_{trailer\ (\frac{q\ trailer}{V})}$

$f_{bus} = e_{bus\ (\frac{q\ bus}{V})}$

$f_{lorry} = e_{lorry\ (\frac{qlorry}{V})}$

The collection data will be convert to Passenger Car Unit (PCU) following to Arahan Teknik (Jalan) 13/87. Table 3.6 below show the conversion factor to PCU.

Table 3.6: Conversion factors to pcu's

Vehicle Type	Passenger Car Equivalent (Pce)
Cars, e_{car}	1.00
Motorcycles, e_{motor}	0.22
Trailers, $e_{trailer}$	2.27
Buses, e_{bus}	2.08
Lorries, e_{lorry}	1.19

(Sources Arahan Teknik (Jalan) 13/87)

qcar = Total number of cars observed

qtrailer = Total number of trailer observed

qbus = Total number of bus observed

qlorry = Total number of lorry observed

qmotor = Total number of motor observed

V = Total vehicle flow per hour

3.4.3 Capacity Analysis

The calculation of capacity is included the calculations of Lost time, Effective Green Time and Green Time Ratio.

3.4.4 Determination of Lost time, t_L (S)

Lost time is calculated by:

$$t_L\ (s) = l1 + Y - e \qquad \text{Eqn 3.8}$$

I1 = start loss (s)

Y = Intergreen (s) = Amber + all red

e = end gain (s)

3.4.5 Determination of Effective Green time, g (s)

The formula for green time is:

$$G = G + Y - t_L \qquad \text{Eqn 3.9}$$

G = Actual green time

Y = Amber + all red time

t_L = Lost time

3.4.6 Determination of Green Ratio, g/C

$$\text{Green Ratio} = g/C \qquad \text{Eqn 3.10}$$

g = Effective green time

C = Cycle length

3.4.7 Determination of Lane Capacity, c (veh/hr)

$$C\ (veh/hr) = S\ (g/C) \qquad \text{Eqn 3.11}$$

S = saturation flow rate (veh/hr)

G = Effective green time

C = Cycle length

3.4.8 Determination of Degree of Saturation, X (Vp/c ratio)

$$X = Vp/c \qquad \text{Eqn 3.12}$$

X = Degree of Saturation

Vp = Adjusted flow rate (veh/hr)

c = Lane capacity (veh/hr)

3.4.9 Determination of Flow Ratio, y

$$\text{Flow ratio, } y = Vp/S \qquad \text{Eqn 3.13}$$

y = ratio of flow to saturation flow

Vp = Adjusted flow rate in veh/hr

S = Saturation flow rate in veh/hr

The y value for a phase is the highest y value from the approaches within that phase. For the whole junction,

$$y = \sum_{i=1}^{n} yi \qquad \text{Eqn 3.14}$$

Where n = number of phase

yi = highest y value from the approach within that phase i.

The y value should be not higher than 0.65. If the value is higher than 0.85, it is recommended that the geometrics of the intersection be upgraded to increases the capacity.

3.4.10 Determination of Level of Service (LOS)

The calculation of Level of Service is based on Intersection Delay which is a combination of Uniform Control Delay. Incremental Delay and Initial Queue Delay. Table 3.7 below used to determine the LOS at signalized intersection.

Table 3.7: Level of Service for Signalized Intersection

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (SEC)
A	<=10.0
B	>10.0 to 20.0
C	>20.0 to 35.0
D	>35.0 to 55.0
E	>55.0 to 80.0
F	>80.0

(Sources Arahan Teknik Jalan 13/87)

3.4.11 Determination of Delay, d

Average control delay is estimated for each lane group in the LOS table. The average control delay per vehicle for a given lane group is given below.

$$d = d_1PF + d_2 + d_3 \qquad \text{Eqn 3.15}$$

where: d = control delay (sec/veh)

d1 = uniform control delay (sec/veh)

d2 = incremental delay (sec/veh)

d3 = initial queue delay

PF = uniform delay progression adjustment factor which accounts for effect of signal progression

X = v/c ratio for lane group

C = cycle length (sec)

c = capacity of lane group (vph)

g = effective green time for lane group (sec)

T = duration of analysis period

k = incremental delay factor that is dependent on controller settings

l = upstream filtering/ metering adjustment factor

3.4.11.1 Uniform Control Delay, d1

The equation for calculated delay is given below:

$$d1 = \frac{0.5\,C\left(1-\frac{g}{c}\right)^2}{1-[\min(1,X)\frac{g}{C}]} \qquad \text{Eqn 3.16}$$

Where X = v/c ratio for lane group; if the value of X exceeds 1, then a value of 1 should be used instead of the value of X

C = cycle length (sec)

g = effective green time for lane group (sec)

3.4.11.2 Progression Adjustment Factor, PF

Progression Adjustment Factor, PF = $\frac{(1-P)fp}{1-(\frac{g}{c})}$ Eqn 3.17

Where P = proportion of vehicle arriving on the green

$\frac{g}{c}$ = proportion of available green time

fp = supplemental adjustment factor for when the platoon arrives during green

The default values for fp, g/c ratio and Arrival Type factor are shown in Table 3.8.

Table 3.8: Progression Adjustment Factor

Green Ratio	Arrival Type (AT)					
(g/c)	AT-1	AT-2	AT-3	AT-4	AT-5	AT-6
0.20	1.167	1.007	1.000	1.000	0.833	0.750
0.30	1.286	1.063	1.000	0.986	0.714	0.571
0.40	1.445	1.136	1.000	0.895	0.555	0.333
0.50	1.667	1.240	1.000	0.767	0.333	0.000
0.60	2.001	1.395	1.000	0.576	0.000	0.000
0.70	2.556	1.653	1.000	0.256	0.000	0.000
Default, fp	1.00	0.93	1.00	1.15	1.00	1.00
Default, Rp	0.333	0.667	1	1.333	1.667	2

Note: 1 – Tabulation based on default values of fp and Rp

2 – P = Rp g/c may not exceed 1.0

3 – PF may not evceed 1.0 for AT-3 through AT-6

(Sources Arahan Teknik Jalan 13/87)

The value of P can be measured at the site or estimated from the arrival type that are consist of 6 types shown below:

i. Arrival Type 1 (AT-1)

Dense platoon, which is contain over 80 percent of the lane group volume that arrive at the start of the red phase.

ii. Arrival Type 2 (AT-2)

Moderately dense platoon arriving in the middle of the red phase that contains 40 to 80 percent of the lane group volume.

iii. Arrival Type 3 (AT-3)

Random arrivals in which the main platoon contains less than 40 percent of the lane group volume. This AT is representative of operations at isolated and non-interconnected signalized intersection characterized by highly dispersed platoons.

iv. Arrival Type 4 (AT-4)

Moderately dense platoon that arrive in the middle of the green phase which is contains 40 to 80 percent of the lane group volume.

v. Arrival Type 5 (AT-5)

Dense to moderately dense platoon that contains over 80 percent of the lane group volume which are arrive at the start of the green phase.

vi. Arrival Type 6 (AT-6)

This arrival represent very dense platoons progressing over a number of closely spaced intersections with minimal side street entries.

3.4.11.3 Incremental Delay, d_2

Equation below describe the delay based on non-uniform arrivals and individual cycle failures. It is invalid if the value of X exceeds 1/PHF because the hourly volume exceeds the hourly capacity.

$$d2 = 900\ T\ \{(X-1) + \sqrt{[(X-1)2 + 8klX/cT]} \qquad \text{Eqn 3.18}$$

where

T = duration of analysis period

k = incremental delay factor that is dependent on controller settings

l = upstream filtering/ metering adjustment factor

X = v/c ratio for lane group

c = capacity of lane group (vph)

3.4.11.4 Incremental Delay Calibration factor, k

For pre-timed signal, k=0.50 which is based on a queuing process with random arrivals. The actuated controller can reduce incremental delay as it can modify the green time due to the traffic demand.

3.4.11.5 Initial Queue Delay, d_3

The equation for initial queue delay is shown below.

$$d3 = \frac{1800\ Qb\ (1+u)t}{cT} \qquad \text{Eqn 3.19}$$

Where:

Q_b = initial queue at the start of period T (veh)

c = adjusted lane group capacity (veh/hr)

T = analysis period (hr)

t = duration of unmet demand in T (hr)

u = delay parameter

d_3 can be assumed ad 0 if residual queue is negligible.

3.4.11.6 Approach Delay, d_A

The equation below used to compute the approach delay.

$$\text{Approach Delay, } d_A = \frac{\sum di\ vi}{\sum vi} \qquad \text{Eqn 3.20}$$

Where:

d_A = delay for approach A (sec/veh)

d_i = delay for lane group I (on approach A) (sec.veh)

v_i = adjusted flow for lane group I (veh/hr)

After all of the approach delay are determined, the intersection can be calculated using the equation below.

$$\text{Intersection Delay, dI} = \frac{\sum dA\ vA}{Va} \qquad \text{Eqn 3.21}$$

Where:

d_i = average delay per vehicle for the intersection I (sec/veh)

v_A = adjusted flow for approach A (veh/hr)

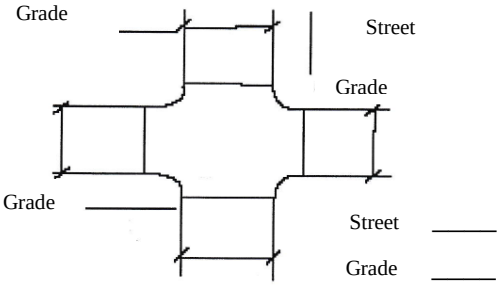
Lastly, the level of service (LOS) for intersection can be determine according to the intersection delay, d_I value against the delay segment tabulated in Table 3.7. Table 3.9, 3.10 and 3.11 below shown the worksheet from MHCM 2006 that used to analyze the data obtained.

Table 3.9: Input Worksheet

INPUT WORKSHEET

General Information		**Site Information**	
Analyst	_____	Intersection	_____
Agency or Company	_____	Area type	_____CBD_____OTHER
Date Performed	_____	Jurisdiction	_____
Analysis Time Period	_____	Analysis Year	_____

Intersection Geometry



Show North Arrow

Pedestrian button
Lane width
Through
Righ
Lef
Through + Right
Left + Right
Through + Left

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane width												
Gradient												

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)												
Lane Group												
Total Cars												
% Total Cars												
Total Motors												
% Total Motors												
Total Trailers												
% Total Trailers												
Total Lorries												
% Total Lorries												
Total Busses												
% Total Busses												
Peak Hour Factor, PHF												
Pretimed [P] or actuated [A]												
Start-up lost time,lt (s)												
Extension of effective green time, e(s)												
Arrival type, AT												
Parking (Y or N)												
Parking maneuver, Nm (maneuvers/h)												
Bus stopping, NB (buses/h)												

Signal Phasing Plan

DIAGRAM	1	2	3	4	5	6	8
							
Timing	G =	G =	G =	G =	G =	G =	G =
	I =	I =	I =	I =	I =	I =	I =

Protected turn

Permitted turn
Pedestrian

Cycle length, C = _____ s

Table 3.10: Volume Adjustment and Saturation Flow Rate Worksheet

VOLUME ADJUSTMENT AND SATURATION FLOW RATE WORKSHEET													
General Information													
Project Description													
Volume Adjustment													
		EB			WB			NB			SB		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)													
Peak-Hour factor, PHF													
Adjusted flow rate in lane group, V_p(veh/h)	Eqn 3.1												
Vehicle Composition Factor													
		EB			WB			NB			SB		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group													
F_{car}													
F_{motor}													
$F_{trailer}$													
F_{lorry}													
F_{bus}													
Proportion[1] of LT or RT (P_{LT} or P_{RT})													
Saturation Flow Rate													
Base saturation flow rate, S_o (pc/h/ln)													
Number of lanes, N													
Lane width adjustment factor, f_w	Eqn 3.3												
Vehicle composition adjustment factor, f_c	Eqn 3.6												
Grade adjustment factor, f_g	Eqn 3.4 or 3.5												
Area type adjustment factor, f_a	Table 3.3												
Left turn adjustment factor, f_{LT}	Table 3.4												
Right turn adjustment factor, f_{RT}	Table 3.5												
Adjustment saturation flow, S (veh/h),$S = S_o$, $S = S_o \times N \times f_w \times f_g \times f_a \times f_{LT} \times f_{RT} \times (1/f_c)$	Eqn 3.2												
Noted													
1. PLT = 1.000 for exclusive left turn lanes, and PRT = 1.000 for exclusive right turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group													

Table 3.11: Capacity and Los Worksheet

CAPACITY AND LOS WORKSHEET													
General Information													
Project Description													
Volume Adjustment													
Phase number													
		EB			WB			NB			SB		
Lane group		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, V_p (veh/h)													
Saturation flow rate, s (veh/h)													
Lost time, t_L (s) = l_1 + Y – e	Eqn 3.8												
Effective green time, g(s), g = G + Y - t_L	Eqn 3.9												
Green ratio, g/c	Eqn 3.10												
Lane capacity[1], c=s(g/c), (veh/h)	Eqn 3.11												
V_p/c ratio, X	Eqn 3.12												
Flow ratio, y = V_p/s	Eqn 3.13												
Lane Capacity Control Delay and LOS Determination													
		EB			WB			NB			SB		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate,[2] Vp (veh/h)													
Lane capacity[2], c=s(g/c), (veh/h)													
V_p/c ratio, [2]X = V_p/c													
Total green ratio,[2] g/c													
Uniform delay, d1 (sec/veh) $\frac{0.5\,C\left(1-\frac{g}{c}\right)^2}{1-[\min(1,X)\frac{g}{c}]}$	Eqn 3.16												
Incremental delay calibration, [3]k													
Incremental delay, d_2 = 900T{(X-1) +$\sqrt{((X-1)\text{^}2+8klX/cT)}$} (sec/veh)	Eqn 3.18												
Initial queue delay, d_3 (sec/veh)	Eqn 3.19												
Uniform delay, d_1 (s/veh)	Eqn 3.16												
Progression adjustment factor, PF	Eqn 3.17												
Delay, d = d_1(PF) + d_2 + d_3 (S/veh)	Eqn 3.15												
LOS by lane group	Table 3.7												
Delay by approach, d_A (sec/veh) $\frac{\sum di\ vi}{\sum vi}$	Eqn 3.20												
LOS by approach	Table 3.7												
Approach flow rate, V_A (veh/h)	Table 3.7												
Intersection delay, d_I (sec/veh) $\frac{\sum dA\ vA}{Va}$	Eqn 3.21	Intersection LOS (Table 3.7)											

3.5 CONCLUSION

In this chapter, the data collection which are including the method, equipment and all parameter were discussed. Besides that, location selection also were highlighted in this chapter. Lastly, this chapter also discusses on how to analyze the data collection. All the result for data collection will be discuss on next chapter.

CHAPTER 4

ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

In this chapter, analysis and results of the level of service for observed and proposed condition at the intersection will be discussed. In order to carry out this project, the data collection need to be done such as distribution of traffic flow and geometric characteristic during AM and PM peak hours. All the data will be used to figure out the delay and level of service for each lane at the signalized intersection which the evaluation of the performance of this signalized intersection will be done. All the results will be present in this chapter meanwhile more specific data collection will be present in the Appendices.

4.2 TRAFFIC FLOW DATA

Traffic flow data was collected manually at the study area during AM and PM peak hour weekdays and weekend. The data collection have been done within 7.00 to 8.00 A.M in the morning during weekdays and 8.00 to 9.00 A.M in the morning during weekend. Meanwhile, the data collection for PM peak was collected within 5.00 to 6.00 P.M in the evening for both weekdays and weekend. The data was taken in 15 minutes time interval and classified based on the vehicle classification in Malaysian traffic characteristic. According to the pilot study that have been done for a week within 3 hours in the morning and evening, traffic volume data for Wednesday and Saturday have been selected to be analyzed. Traffic volume data for Wednesday is the highest data compared to other weekdays while data collection for Saturday was higher than Sunday. In addition, only the peak hour data for morning and evening will be analyzed due to the critical condition at the intersection. The peak hour for morning on weekdays was 7.00 to 8.00 A.M meanwhile for weekend was 8.00 to 9.00 A.M in the morning. While the peak hour

for the evening on weekdays and weekend was similar which are 5.00 to 6.00 P.M in the evening. These data were shown in Table 4.1 for each approach in the AM peak on weekdays and weekend meanwhile Table 4.2 present the data for each approach in the PM peak on the weekdays and weekend.

Table 4.1: Traffic Volume for AM Peak

Time	Total Volume (Veh/hr) from North		Total Volume (Veh/hr) from South		Total Volume (Veh/hr) from West	
	Weekdays					
	NS	**NW**	**SN**	**SW**	**WN**	**WS**
7.00-7.15 am	302	159	406	321	119	109
7.15-7.30 am	388	133	469	162	160	127
7.30-7.45 am	525	119	452	97	126	82
7.45-8.00 am	352	177	416	60	100	57
Total	1567	588	1743	640	505	375
	Weekend					
	NS	**NW**	**SN**	**SW**	**WN**	**WS**
8.00-8.15 am	287	61	307	42	75	61
8.15-8.30 am	337	63	302	51	106	28
8.30-8.45 am	350	63	309	41	99	52
8.45-9.00 am	340	66	258	50	84	33
Total	1314	253	1176	184	364	174

According to the data shown in the Table 4.1, total volume (veh/hr) during weekdays morning from all approach were higher than total volume (veh/hr) during weekend morning. The total volume from north to south for weekdays morning at 7.00 to 8.00 A.M is 1567 veh/hr however for the weekend morning the volume only 1314 veh/hr which is at 8.00 to 9.00 A.M. This occur due to the activities on this road for the weekdays morning is higher than weekend. Mostly the people who live at Kuantan used this road to go work at Gambang on weekdays at 7.00 to 8.00 A.M that contribute to the higher traffic volume. Besides that, the traffic volume on weekdays morning from north to west also higher compared to the weekend which is 588 veh/hr because of the people who want send their children to the SMK Seri Mahkota.

Other than that, total traffic volume from south to north on weekdays which is 1743 veh/hr is also higher than weekend due to the people who live in the Gambang go to work at Kuantan at 7.00 to 8.00 A.M in the morning. Then, the total traffic volume from south to west on weekdays also high which is 640 veh/hr as the student want go to the school. In addition, the Kem Tentera Batu Sepuluh Kuantan also located near to this site study which is contribute to the high total traffic volume on this approach.

Besides that, the total traffic volume from west to north is higher than total traffic volume from west to south whether on weekdays or weekend. This occur due to the mostly people have their own affair at the Kuantan City as Kuantan is the state capital of Pahang. Other than that, there are a few of parents that already send their children to the school and want to back home or work used again this approach that also contribute to the high activities at this approach. Figure 4.1 shows weekdays peak hour volume (AM) meanwhile Figure 4.2 shows weekend peak hour volume (AM).

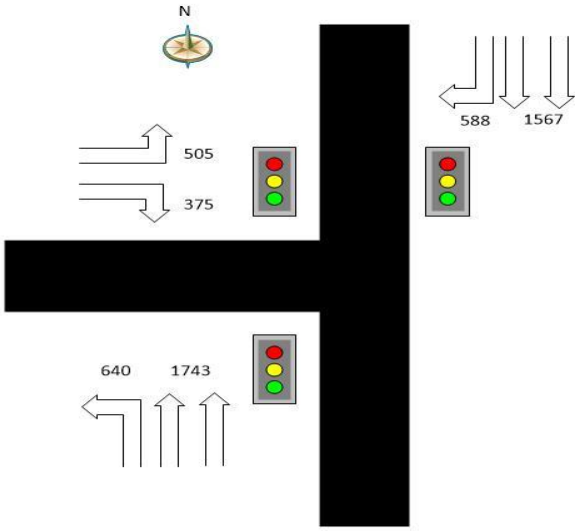


Figure 4.1: Weekdays Peak Hour Volume (AM)

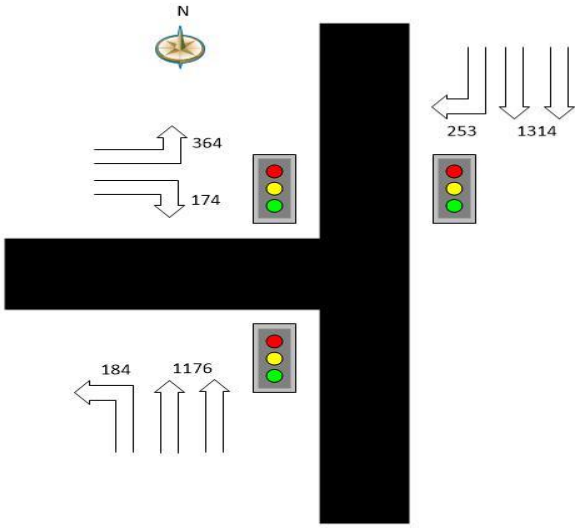


Figure 4.2: Weekend Peak Hour Volume (AM)

Based on the Figure 4.1 and Figure 4.2, weekdays peak hour volume (AM) was worst compare to the weekend. These happened due to the more activities on road on weekdays such as people went to work, school, supplies goods to the shop and others. Nevertheless on weekend, people more like to stay and rest at their home in the morning since on the weekdays they need to go out for work early in the morning. Then, the data for each approach in the PM peak on weekdays and weekend were tabulated in Table 4.2.

Table 4.2: Traffic Volume for PM Peak

Time	Total Volume (Veh/hr) from North		Total Volume (Veh/hr) from South		Total Volume (Veh/hr) from West	
	Weekdays					
	NS	**NW**	**SN**	**SW**	**WN**	**WS**
5.00-5.15 pm	439	92	458	48	99	74
5.15-5.30 pm	413	98	499	56	100	65
5.30-5.45 pm	450	123	494	76	120	74
5.45-6.00 pm	485	122	473	67	115	49
Total	1787	435	1924	247	434	262
	Weekend					
	NS	**NW**	**SN**	**SW**	**WN**	**WS**
5.00-5.15 pm	429	71	515	40	75	18

5.15-5.30 pm	468	91	486	39	88	25
5.30-5.45 pm	449	78	586	43	93	22
5.45-6.00 pm	463	69	552	34	101	20
Total	1809	309	2139	156	357	85

Table 4.2 above demonstrated that PM peak hour is similarly between weekdays and weekend which is at 5.00 to 6.00 P.M since during weekdays, mostly people back from work around that time. In contrast of the traffic volume for AM peak from north to south and south to north, the traffic volume for PM peak from both approach on weekend worse compared to weekdays. During weekend, the activities on the road in the evening was higher as the people go out for shopping, hang out with family and friends and also go out to do their hobbies such as hiking, fishing, travelling and others since during weekdays they already reached home in the evening. So they does not have time to spend with their family. Mostly the people would like go to the Kuantan city as in Kuantan, they can watch movie on cinema at East Coast Mall (ECM) and Berjaya Megamall, shopping, go to the Teluk Cempedak to see the beach and others. These will contribute to the increasing of the number of vehicle during that time.

Besides that, traffic volume for south to west during weekdays is higher than weekend since there are two school located at this area so usually student back from school on this time because of the event in their school. Then, the traffic volume for PM peak from west to north and west to south during weekdays are higher than on weekend. This might be due to the people who work at Panching were back from work to the Kuantan City and Gambang. Figure 4.3 shows weekdays peak hour volume (PM) meanwhile Figure 4.4 shows weekend peak hour volume (PM).

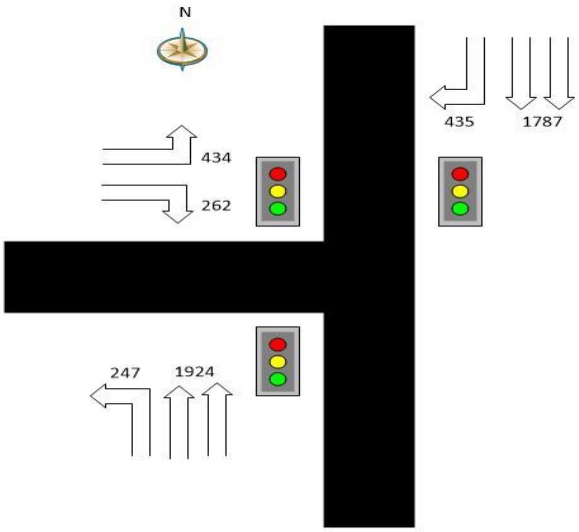


Figure 4.3: Weekdays Peak Hour Volume (PM)

Based on the Figure 4.3 above shows that traffic volume for south to north is higher than north to south because of the people from residential area in Kuantan was back home from Gambang. The total traffic volume at this area keep increasing year by year since every year the resident at this area increase. One of that is resident from Kem Tentera Batu Sepuluh Kuantan. Besides that, at the Gambang also have new housing development that also contribute the number of traffic volume keep increasing as well as the number of resident increase.

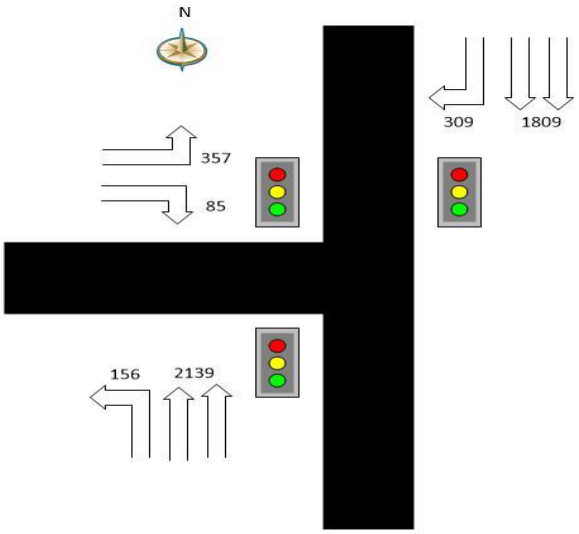


Figure 4.4: Weekend Peak Hour Volume (PM)

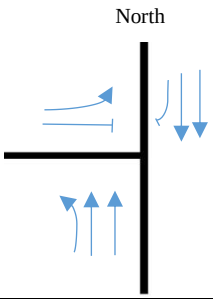
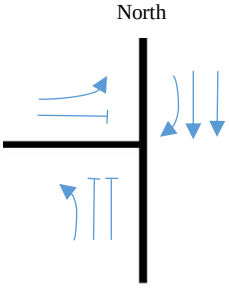
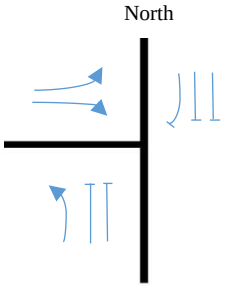
Based on the Figure 4.3 and Figure 4.4, peak hour volume during weekend (PM) more worst compared to the weekdays. These occur due to the on weekend the people like to going out with their family and friends in order to release stress. Other than that, a lot of people will travelling and going back to their hometown during weekend. Thus, the total volume during evening on weekend will increasing as there are a lot of activities on the road.

4.3 SIGNAL PHASING

A signal phase is define as the right-of-way, yellow change, and red clearance intervals in a cycle that are assigned to an independent traffic movement or combination of traffic movements by the Manual on Uniform Traffic Control Devices (MUTCD). (Signalized Intersections: Informational Guide, 2004). According to the Traffic Engineering and Management, a phase is the green interval plus the change and clearance intervals that follow it. Therefore, each phase was not assigned with the non-conflicting movements during the green interval. Besides that, the phase also allows a set of movements to flow safely before another set of movements of phase started. The phase was designed in order to make sure there are no conflict of the movement in an intersections. (Mathew, T.M., 2014). However, the minimum number of phase used will minimize the amount of lost time due to starting delays and clearance intervals.

The length of the phase should be not so long and properly design in order to avoid wasting the green time and delays occur on another approach. Since the proper design of phase length will efficiently balance the cycle time available among the several phases. (MnDOT Traffic Signal Timing and Coordination Manual, 2013). The intersection of this study have 3 phases which the phase 1 is from Gambang (South), phase 2 is from Kuantan (North) and phase 3 is from Panching (West). All phases were shown in the Table 4.3.

Table 4.3: All phases for this intersection

Phase 1		**Phase 2**		**Phase 3**	
					
Weekdays		**Weekdays**		**Weekdays**	
AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
G = 117s	G = 120s	G = 74s	G = 78s	G = 45s	G = 25s
I = 4s	I = 4s	I = 4s	I = 4s	I = 4s	I = 4s
Weekend		**Weekend**		**Weekend**	
AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
G = 84s	G = 82s	G = 35s	G = 59s	G = 32s	G = 17s
I = 4s	I = 4s	I = 4s	I = 4s	I = 4s	I = 4s

In phase 1, the vehicle from south will move while from another critical lane approach will stopped. Then, the vehicle from north will move in phase 2 and the critical lane from another approach will stopped. Lastly, the vehicle from west will move in phase 3 while other vehicle in another approach stopped.

4.4 DELAY AND LEVEL OF SERVICE (LOS) BY APPROACH

Delay is defined as the elapsed time starting when a vehicle stops at the end of a queue until the vehicle departs at the stop line. This delay is determine based on the flow rate for each approach that is directly proportional to the distribution of vehicles among the approaches. The delay will includes the time needed for the vehicle to move from the end of the queue position to the first-in-queue position and deceleration of vehicles from free-flow speed to the speed of vehicles in the queue. (Level of Service Definitions, n.d.). The Level of Service is determine by approaching each three direction at T- Intersection at the study area. The worst level of service (LOS) in the approach will affect the level of service for whole intersections.

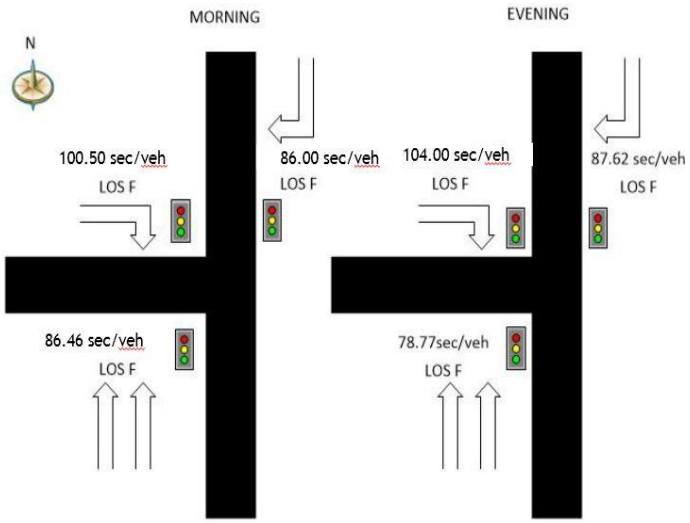


Figure 4.5: Observed condition of delay and LOS by approach during weekdays (AM and PM peak)

All the approach of the intersection during weekdays (AM and PM peak) have level of service F. LOS F means the vehicle arrival rate is greater than the capacity of the intersection. The most critical lane is from West which have the longer delay of 100.50sec/veh and 104.00 sec/veh. The traffic more congested in the AM peak compared to PM peak since during the weekdays the community were going out to work, school and also because of the transportation of goods.

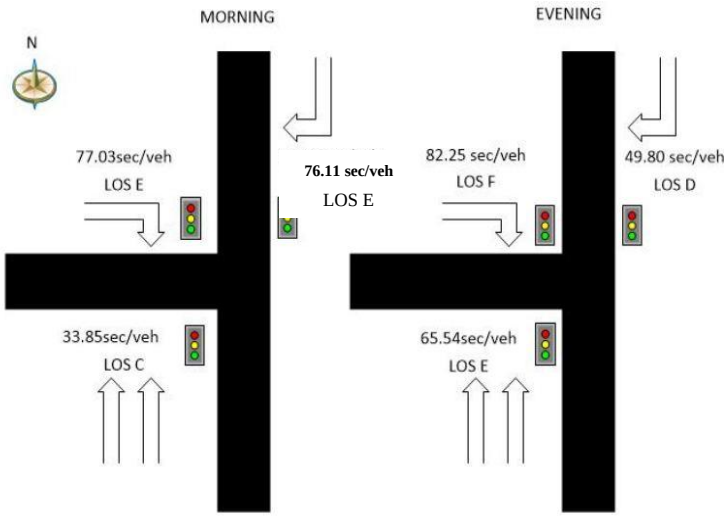


Figure 4.6: Observed condition of delay and LOS by approach during weekend (AM and PM peak)

The traffic volume for weekend more congested during PM peak as the control delay per vehicle for PM peak was higher than AM peak. The community usually spend time hang out with their family and friends during the weekend (evening) compared to morning as in the morning they would like to stay and rest at home. The longer delay during weekend (AM and PM peak) is also from West which are 77.03sec/veh and 82.25sec/veh. The level of service for both delay is also F. It shows that the West approach is in worst condition.

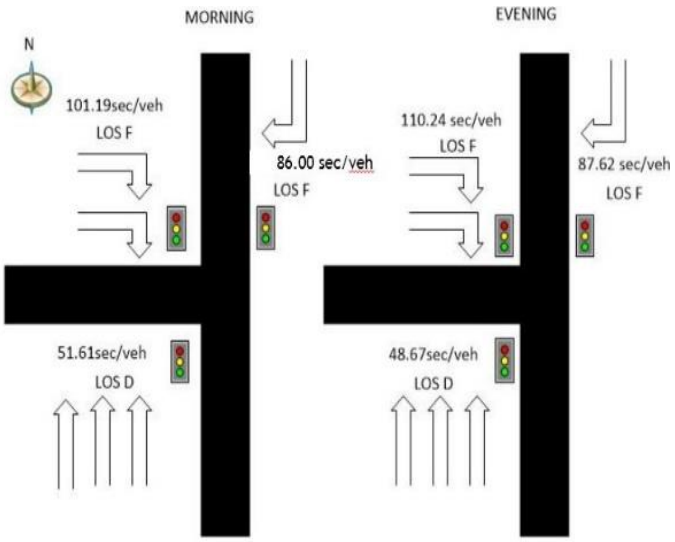


Figure 4.7: Proposed condition of delay and level of service by approach during weekdays (AM and PM peak)

After analysed the existing level of service, the proposed solution is by adding lane at West and South approach. The estimated delay by approach from South both AM and PM peak during weekdays have been improved by 51.61sec/veh and 48.67sec/veh from 86.46sec/veh and 78.77sec/veh which the LOS were improved from F to D which give better condition for this intersections.

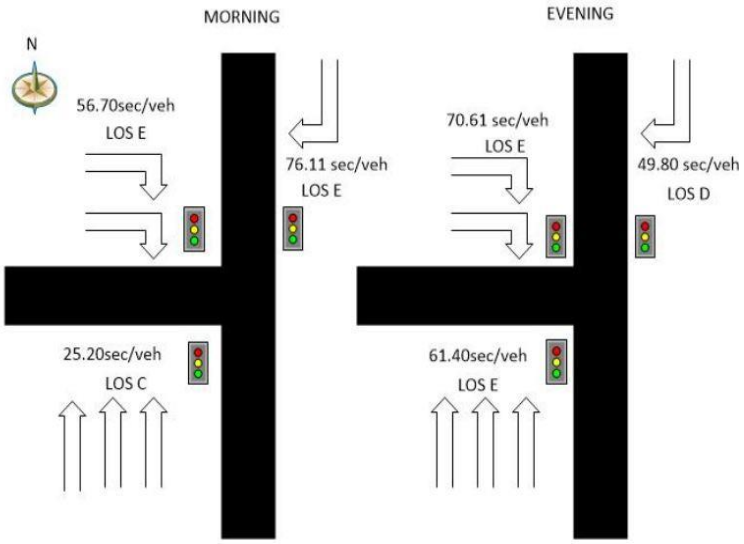


Figure 4.8: Proposed condition of delay and level of service by approach during weekend (AM and PM peak)

The control delay per vehicle for West approach during weekend (AM and PM peak) also improved from 77.03sec/veh to 56.7osec/veh and 82.25sec/veh to 70.61sec/veh. Then for the delay approach from South both AM and PM peak also have improvement from 33.85sec/hour to 25.20 sec/veh and 65.54sec/veh to 61.40sec/veh. Meanwhile the level of service of all approach during weekend (AM and PM peak) remain.

4.5 LEVEL OF SERVICE (LOS) INTERSECTION

Level of service is defined as "a quality measure describing operational conditions within a traffic stream, generally in terms of service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience."(John, D.Z., Richard, D., James, B., 2000). The existing level of service for whole intersection during weekdays (AM and PM peak were F meanwhile the existing level of service for intersection during weekend (AM and PM peak) were D and E. According to the Arahan Teknik Jalan 13/87, the level of service for the intersection at the urban which are arterial and collector road should be D. The control delay for LOS D should be between 35 sec/veh to 55.0 sec/veh. 88.66 sec/veh and 82.99 sec/veh were far away from the standard that shows the condition at this intersection is very bad. In these case, the level of service

for existing condition shows that the traffic light have the problem since this traffic light not follow the standard in Arahan Teknik Jalan 13/87. The traffic volume is very high at this area and the traffic light cannot support the increasing of the traffic volume caused the delay also increase.

In order to improve the situation, there are a lot of ways to do such as added lane, increase the green time and added the lane width. For this problem, the improvement that have been done was added one lane for Jalan Gambang to Kuantan (Thru Lane) and one lane for Jalan Panching to Gambang. Other than that the green time and cycle length also be changed. Table 4.4 represented the observed and proposed condition for AM peak meanwhile Table 4.5 tabulated the observed and proposed condition for PM peak.

4.6 OBSERVED AND PROPOSED CONDITION

Table 4.4: Observed and Proposed Condition for AM Peak

	OBSERVED (EXISTING)						**PROPOSED (MODELLED)**					
	WEEKDAYS			WEEKEND			WEEKDAYS			WEEKEND		
	N	S	W	N	S	W	N	S	W	N	S	W
DELAY (sec)	86.00	86.46	105.00	76.11	33.85	77.03	86.00	51.61	101.19	76.11	25.20	56.70
LOS BY APPROACH	F	F	F	E	C	E	F	D	F	E	C	E
LOS INTERSECTION		F			D			E			D	

Table 4.5: Observed and Proposed Condition for PM peak

	OBSERVED (EXISTING)						**PROPOSED (FUTURE)**					
	WEEKDAYS			WEEKEND			WEEKDAYS			WEEKEND		
	N	S	W	N	S	W	N	S	W	N	S	W
DELAY (sec)	87.62	78.77	104.00	49.80	65.54	82.25	87.62	48.67	110.24	49.80	61.40	70.61
LOS BY APPROACH	F	E	F	D	E	F	E	D	F	D	E	E
LOS INTERSECTION		F			E			E			E	

4.7 CONCLUSION

In this chapter, the result and analysis for all the collected data were discussed. All the result were present into the table and figure. Besides that, the suggestion to improve the level of service of this intersection also be discussed in this chapter. The recommendation for this intersection will discussed in the next chapter.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

This study was carried out to evaluate the performance of a signalized intersections based on the level of the service (LOS) at the intersection. The study location of the T- signalized intersection is located at Batu 10, Jalan Gambang which is the major road to the Kuantan and near to the SMK Seri Mahkota. Since the traffic volume increasing by year due to the increasing population predicted by National Statistic Department Malaysia, this location was congested which is occur due to the setting of signalized intersection that not suit with the volume. Most of the traffic get stuck and cannot proceed the driving.

5.2 CONCLUSION

As for the conclusion, this study was successfully conducted and achieving the objectives which are to determine the existing level of service (LOS) of the signalized intersection during AM and PM peak hour and propose possible mitigation measures in order improve the future operating level of service (LOS). Based on the analyses, the existing level of the services (LOS) for this intersection shows that the condition of the intersection was very worst since the level of service during weekdays and weekend were F and D. The performance of this intersection during weekdays was worst compared to the weekend due to the high traffic volume. This might be because of high activities of transportation of goods, the people going out and back from work and the student going out and back from school. In addition, this road is a backbone of main road to Kuantan with higher traffic volume of long distance traffic generated form East Coast expressway and short distance traffic from local residents which cause the high activities at this

intersections. Therefore, the intersection need some improvement such as adjust or re-determine the suitable cycle length and make some change in the geometrical design such as added the number of lane, increase the width of the lane and others. After adding lanes, the level of service have been improve but for more efficient in the future, the flyover also can be proposed.

5.3 RECOMMENDATION

The output from MHCM 2006 table shows the performance during morning and evening session. According to the analyses, the condition of T-intersection very worst since the level of the service of the whole T-intersection during the weekdays and weekend not followed the standard of the level of service that stated in the Arahan Teknik Jalan 13/87. Hence, some recommendation need to be consider in order to improve the future operating level of service (LOS) at this intersection. There are some recommendation for this intersection which are adjust or re-determine the suitable cycle length, change the geometrical design such as added the number of lanes, and increase the width of the lane, installed the countdown timer to reduce the lost time and design the flyover.

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APPENDIX A

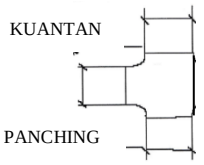
OUTPUT FROM MHCM 2006 TABLE

WEEKDAYS OBSERVED CONDITION (AM PEAK)

INPUT WORKSHEET

General Information		**Site Information**	
Analyst	_____	Intersection	_____
Agency or Company	_____	Area type	_____CBD_____OTHER
Date Performed	_____	Jurisdiction	_____
Analysis Time Period	_____	Analysis Year	_____2017_____

Intersection Geometry



Show North Arrow

Pedestrian button

Lane width

Right

Left

Through

Through + Left

Left + Right

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane width						3.25			3.50		3.50	
Gradient						0			0		0	

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						375			588		1743	
Lane Group						R			R		T	
Total Cars						182			375		1205	
% Total Cars						48.53			63.78		69.13	
Total Motors						177			181		401	
% Total Motors						47.20			30.78		23.01	
Total Trailers						5			25		70	
% Total Trailers						1.33			4.25		4.02	
Total Lorries						7			7		51	
% Total Lorries						1.87			1.19		2.93	
Total Busses						4			0		16	
% Total Busses						1.07			0		0.92	
Peak Hour Factor, PHF						0.74			0.83		0.93	
Pretimed [P] or actuated [A]						A			A		A	
Start-up lost time,lt (s)						2			2		2	
Extension of effective green time, e(s)						2			2		2	
Arrival type, AT						3			3		3	
Parking (Y or N)						N			N		N	
Parking maneuver, Nm (maneuvers/h)						0			0		0	
Bus stopping, NB (buses/h)						0			0		0	

Signal Phasing Plan

DIAGRAM	1	2	3	4	5	6	7
Timing	G =117 I = 4	G = 74 I = 4	G =45 I =4	G = I =	G = I =	G = I =	G = I =

Protected turn

Permitted turn

Pedestrian

Cycle length, C = 246 s

VOLUME ADJUSTMENT AND SATURATION FLOW RATE WORKSHEET

General Information

Project Description

Volume Adjustment

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						375			588		1743	
Peak-Hour factor, PHF						0.74			0.83		0.93	
Adjusted flow rate in lane group, V_p(veh/h) Eqn 3.1						507			708		1874	

Vehicle Composition Factor

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	T	R	L	T	R	L	T	R	L	T	R
F_{car}						0.485			0.638		0.691	
F_{motor}						0.104			0.068		0.051	
$F_{trailer}$						0.030			0.097		0.091	
F_{lorry}						0.022			0.014		0.035	
F_{bus}						0.022			0		0.019	
Proportion[1] of LT or RT (P_{LT} or P_{RT})						1			1			

Saturation Flow Rate

Base saturation flow rate, S_o (pc/h/ln)	1930	1930	1930
Number of lanes, N	1	1	2
Lane width adjustment factor, f_w Eqn 3.3	0.89	0.96	0.96
Vehicle composition adjustment factor, f_c Eqn 3.6	0.663	0.817	0.887
Grade adjustment factor, f_g Eqn 3.4 or 3.5	1	`1	1
Area type adjustment factor, f_a Table 3.3	0.8454	0.8454	0.8454
Left turn adjustment factor, f_{LT} Table 3.4	1	1	1
Right turn adjustment factor, f_{RT} Table 3.5	0.84	0.84	1
Adjustment saturation flow, S (veh/h),$S = S_o$, $S = S_o \times N \times f_w \times f_g \times f_a \times f_{LT} \times f_{RT} \times (1/f_c)$ Eqn 3.2	1840	1610	3532

Noted

1. PLT = 1.000 for exclusive left turn lanes, and PRT = 1.000 for exclusive right turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group

CAPACITY AND LOS WORKSHEET

General Information

Project Description

Volume Adjustment

Phase number

		EB			WB			NB			SB		
Lane group		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, V_p (veh/h)							507			708		1874	
Saturation flow rate, s (veh/h)							1840			1610		3532	
Lost time, t_L (s) = l_1 + Y – e	Eqn 3.8						4			4		4	
Effective green time, g(s), g = G + Y - t_L	Eqn 3.9						45			74		117	
Green ratio, g/C	Eqn 3.10						0.18			0.30		0.48	
Lane capacity[1], c=s(g/c), (veh/h)	Eqn 3.11						336.59			484.31		1679.85	
V_p/c ratio, X	Eqn 3.12						1.5			1.46		1.2	
Flow ratio, y = V_p/s	Eqn 3.13						0.28			0.44		0.53	

Lane Capacity Control Delay and LOS Determination

		EB			WB			NB			SB		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate,[2] Vp (veh/h)							507			708		1874	
Lane capacity[2], c=s(g/c), (veh/h)							336.59			484.31		1679.85	
V_p/c ratio, [2]X = V_p/c							1.5			1.46		1.2	
Total green ratio,[2] g/c							0.18			0.30		0.48	
Uniform delay, d1 (sec/veh) $\frac{0.5\,C\left(1-\frac{g}{C}\right)^2}{1-[\min(1,X)\frac{g}{C}]}$	Eqn 3.16						100.50			86.00		64.00	
Incremental delay calibration, [3]k							0.5			0.5		0.5	
Incremental delay, d_2 = 900T{(X-1)							0			0		21.96	
$+\sqrt{((X-1)\text{^}2+8klX/cT)}\}$ (sec/veh)	Eqn 3.18												
Initial queue delay, d_3 (sec/veh)	Eqn 3.19						0			0		0	
Uniform delay, d_1 (s/veh)	Eqn 3.16						100.50			86.00		64.00	
Progression adjustment factor, PF	Eqn 3.17						1			1		1	
Delay, d = d_1(PF) + d_2 + d_3 (S/veh)	Eqn 3.15						100.50			86.00		86.46	
LOS by lane group	Table 3.7						F			F		F	
Delay by approach, d_A (sec/veh) $\frac{\sum di\ vi}{\sum vi}$	Eqn 3.20					100.50			86.00			86.46	
LOS by approach	Table 3.7					F			F			F	
Approach flow rate, V_A (veh/h)	Table 3.7					507			708			1874	
Intersection delay, d_I (sec/veh) $\frac{\sum dA\ vA}{Va}$	Eqn 3.21					Intersection LOS (Table 3.7) = 88.66						F	

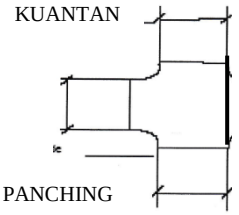
OUTPUT FROM MHCM 2006 TABLE

WEEKDAYS OBSERVED CONDITION (PM PEAK)

INPUT WORKSHEET

General Information		**Site Information**	
Analyst	_____	Intersection	_____
Agency or Company	_____	Area type	_____CBD_____OTHER
Date Performed	_____	Jurisdiction	_____
Analysis Time Period	_____	Analysis Year	_____2017_____

Intersection Geometry



Show North Arrow

Pedestrian button

Lane width

Right

Left

Through

Through + Left

Left + Right

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane width						3.25			3.50		3.50	
Gradient						0			0		0	

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						262			435		1924	
Lane Group						R			R		T	
Total Cars						131			269		1571	
% Total Cars						50.00			61.84		81.65	
Total Motors						120			143		180	
% Total Motors						45.80			32.87		9.36	
Total Trailers						6			9		68	
% Total Trailers						2.29			2.07		3.53	
Total Lorries						5			14		94	
% Total Lorries						1.91			3.22		4.89	
Total Busses						0			0		11	
% Total Busses						0			0		0.57	
Peak Hour Factor, PHF						0.89			0.88		0.96	
Pretimed [P] or actuated [A]						A			A		A	
Start-up lost time,lt (s)						2			2		2	
Extension of effective green time, e(s)						2			2		2	
Arrival type, AT						3			3		3	
Parking (Y or N)						N			N		N	
Parking maneuver, Nm (maneuvers/h)						0			0		0	
Bus stopping, NB (buses/h)						0			0		0	

Signal Phasing Plan

DIAGRAM	1	2	3	4	5	6	7
Timing	G = 120 I = 4	G = 78 I = 4	G = 25 I = 4	G = I =	G = I =	G = I =	G = I =

Protected turn

Permitted turn

Pedestrian

Cycle length, C = 233 s

VOLUME ADJUSTMENT AND SATURATION FLOW RATE WORKSHEET

General Information

Project Description

Volume Adjustment

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						262			435		1924	
Peak-Hour factor, PHF						0.89			0.88		0.96	
Adjusted flow rate in lane group, V_p(veh/h) Eqn 3.1						294			494		2004	

Vehicle Composition Factor

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	T	R	L	T	R	L	T	R	L	T	R
F_{car}						0.500			0.618		0.817	
F_{motor}						0.101			0.072		0.021	
$F_{trailer}$						0.052			0.047		0.080	
F_{lorry}						0.023			0.038		0.058	
F_{bus}						0			0		0.012	
Proportion[1] of LT or RT (P_{LT} or P_{RT})						1			1			

Saturation Flow Rate

Base saturation flow rate, S_o (pc/h/ln)						1930			1930		1930	
Number of lanes, N						1			1		2	
Lane width adjustment factor, f_w Eqn 3.3						0.89			0.96		0.96	
Vehicle composition adjustment factor, f_c Eqn 3.6						0.676			0.774		0.988	
Grade adjustment factor, f_g Eqn 3.4 or 3.5						1			1		1	
Area type adjustment factor, f_a Table 3.3						0.8454			0.8454		0.8454	
Left turn adjustment factor, f_{LT} Table 3.4						1			1		1	
Right turn adjustment factor, f_{RT} Table 3.5						0.84			0.84		1	
Adjustment saturation flow, S (veh/h), $S = S_o$, $S = S_o \times N \times f_w \times f_g \times f_a \times f_{LT} \times f_{RT} \times (1/f_c)$ Eqn 3.2						1804			1700		3171	

Noted

1. PLT = 1.000 for exclusive left turn lanes, and PRT = 1.000 for exclusive right turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group

CAPACITY AND LOS WORKSHEET

General Information

Project Description

Volume Adjustment

Phase number

		EB			WB			NB			SB		
Lane group		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, V_p (veh/h)							294			494		2004	
Saturation flow rate, s (veh/h)							1804			1700		3171	
Lost time, t_L (s) = l_1 + Y – e	Eqn 3.8						4			4		4	
Effective green time, g(s), g = G + Y - t_L	Eqn 3.9						25			78		120	
Green ratio, g/C	Eqn 3.10						0.11			0.33		0.52	
Lane capacity[1], c=s(g/c), (veh/h)	Eqn 3.11						193.56			569.10		1633.13	
V_p/c ratio, X	Eqn 3.12						1.5			0.90		1	
Flow ratio, y = V_p/s	Eqn 3.13						0.16			0.29		0.63	

Lane Capacity Control Delay and LOS Determination

		EB			WB			NB			SB		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate,[2] Vp (veh/h)							294			494		2004	
Lane capacity[2], c=s(g/c), (veh/h)							193.56			569.10		1633.13	
V_p/c ratio, [2]X = V_p/c							1.5			0.90		1	
Total green ratio,[2] g/c							0.11			0.33		0.52	
Uniform delay, d1 (sec/veh) $\frac{0.5\,C\left(1-\frac{g}{C}\right)^2}{1-[\min(1,X)\frac{g}{C}]}$	Eqn 3.16						104.00			73.79		56.50	
Incremental delay calibration, [3]k							0.5			0.41		0.5	
Incremental delay, d_2 = 900T{(X-1) +$\sqrt{((X-1)\text{^}2+8klX/cT)}$} (sec/veh)	Eqn 3.18						0			13.84		22.27	
Initial queue delay, d_3 (sec/veh)	Eqn 3.19						0			0		0	
Uniform delay, d_1 (s/veh)	Eqn 3.16						104.00			73.79		56.50	
Progression adjustment factor, PF	Eqn 3.17						1			1		1	
Delay, d = d_1(PF) + d_2 + d_3 (S/veh)	Eqn 3.15						104.00			87.62		78.77	
LOS by lane group	Table 3.7						F			F		E	
Delay by approach, d_A (sec/veh) $\frac{\sum di\ vi}{\sum vi}$	Eqn 3.20					104.00			87.62			78.77	
LOS by approach	Table 3.7					F			F			E	
Approach flow rate, V_A (veh/h)	Table 3.7					294			494			2004	
Intersection delay, d_I (sec/veh) $\frac{\sum dA\ vA}{Va}$	Eqn 3.21					Intersection LOS (Table 3.7) = 82.99						F	

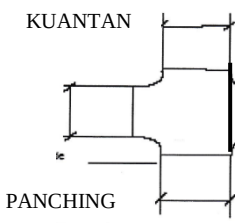
OUTPUT FROM MHCM 2006 TABLE

WEEKEND OBSERVED CONDITION (AM PEAK)

INPUT WORKSHEET

General Information		**Site Information**	
Analyst	_____	Intersection	_____
Agency or Company	_____	Area type	_____CBD_____OTHER
Date Performed	_____	Jurisdiction	_____
Analysis Time Period	_____	Analysis Year	_____2017_____

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane width						3.25			3.50		3.50	
Gradient						0			0		0	

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						174			253		1176	
Lane Group						R			R		T	
Total Cars						88			167		861	
% Total Cars						50.57			66.01		73.21	
Total Motors						64			55		147	
% Total Motors						36.78			21.74		12.50	
Total Trailers						13			14		81	
% Total Trailers						7.47			5.53		6.89	
Total Lorries						9			16		82	
% Total Lorries						5.17			6.32		6.97	
Total Busses						0			1		5	
% Total Busses						0			0.40		0.43	
Peak Hour Factor, PHF						0.71			0.96		0.95	
Pretimed [P] or actuated [A]						A			A		A	
Start-up lost time,lt (s)						2			2		2	
Extension of effective green time, e(s)						2			2		2	
Arrival type, AT						3			3		3	
Parking (Y or N)						N			N		N	
Parking maneuver, Nm (maneuvers/h)						0			0		0	
Bus stopping, NB (buses/h)						0			0		0	

Signal Phasing Plan

DIAGRAM	1	2	3	4	5	6	7
Timing	G =84 I = 4	G = 35 I = 4	G = 32 I = 4	G = I =	G = I =	G = I =	G = I =

Protected turn — Permitted turn — Pedestrian

Cycle length, C = 161 s

VOLUME ADJUSTMENT AND SATURATION FLOW RATE WORKSHEET

General Information

Project Description

Volume Adjustment

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						174			253		1176	
Peak-Hour factor, PHF						0.71			0.96		0.95	
Adjusted flow rate in lane group, V_p(veh/h) Eqn 3.1						245			264		1238	

Vehicle Composition Factor

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	T	R	L	T	R	L	T	R	L	T	R
F_{car}						0.506			0.660		0.732	
F_{motor}						0.081			0.048		0.028	
$F_{trailer}$						0.170			0.126		0.156	
F_{lorry}						0.062			0.075		0.083	
F_{bus}						0			0.008		0.009	
Proportion[1] of LT or RT (P_{LT} or P_{RT})						1			1			

Saturation Flow Rate

Base saturation flow rate, S_o (pc/h/ln)	1930	1930	1930
Number of lanes, N	1	1	2
Lane width adjustment factor, f_w Eqn 3.3	0.89	0.96	0.96
Vehicle composition adjustment factor, f_c Eqn 3.6	0.819	0.917	1.008
Grade adjustment factor, f_g Eqn 3.4 or 3.5	1	`1	1
Area type adjustment factor, f_a Table 3.3	0.8454	0.8454	0.8454
Left turn adjustment factor, f_{LT} Table 3.4	1	1	1
Right turn adjustment factor, f_{RT} Table 3.5	0.84	0.84	1
Adjustment saturation flow, S (veh/h),$S = S_o$, $S = S_o \times N \times f_w \times f_g \times f_a \times f_{LT} \times f_{RT} \times (1/f_c)$ Eqn 3.2	1489	1435	3108

Noted

1. PLT = 1.000 for exclusive left turn lanes, and PRT = 1.000 for exclusive right turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group

CAPACITY AND LOS WORKSHEET

General Information

Project Description

Volume Adjustment

Phase number

Lane group		EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Adjusted flow rate, V_p (veh/h)							245			264		1238	
Saturation flow rate, s (veh/h)							1489			1435		3108	
Lost time, t_L (s) = l_1 + Y – e	Eqn 3.8						4			4		4	
Effective green time, g(s), g = G + Y - t_L	Eqn 3.9						32			35		84	
Green ratio, g/c	Eqn 3.10						0.20			0.22		0.52	
Lane capacity[1], c=s(g/c), (veh/h)	Eqn 3.11						295.95			311.96		1621.57	
V_p/c ratio, X	Eqn 3.12						0.80			0.80		0.80	
Flow ratio, y = V_p/s	Eqn 3.13						0.16			0.18		0.40	

Lane Capacity Control Delay and LOS Determination

		EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Adjusted flow rate,[2] Vp (veh/h)							245			264		1238	
Lane capacity[2], c=s(g/c), (veh/h)							295.95			311.96		1621.57	
V_p/c ratio, [2]X = V_p/c							0.80			0.80		0.80	
Total green ratio,[2] g/c							0.20			0.22		0.52	
Uniform delay, d1 (sec/veh) $\frac{0.5\,C\left(1-\frac{g}{C}\right)^2}{1-[\min(1,X)\frac{g}{C}]}$	Eqn 3.16						61.45			59.68		31.60	
Incremental delay calibration, [3]k							0.32			0.32		0.32	
Incremental delay, d_2 = 900T{(X-1)							15.58			16.43		2.25	
$+\sqrt{((X-1)\text{^}2+8klX/cT)}\}$ (sec/veh)	Eqn 3.18												
Initial queue delay, d_3 (sec/veh)	Eqn 3.19						0			0		0	
Uniform delay, d_1 (s/veh)	Eqn 3.16						61.45			59.68		31.60	
Progression adjustment factor, PF	Eqn 3.17						1			1		1	
Delay, d = d_1(PF) + d_2 + d_3 (S/veh)	Eqn 3.15						77.03			76.11		33.85	
LOS by lane group	Table 3.7						E			E		C	
Delay by approach, d_A (sec/veh) $\frac{\sum di\ vi}{\sum vi}$	Eqn 3.20					77.03			77.43			33.85	
LOS by approach	Table 3.7					E			E			C	
Approach flow rate, V_A (veh/h)	Table 3.7					245			264			1238	
Intersection delay, d_I (sec/veh) $\frac{\sum dA\ vA}{Va}$	Eqn 3.21					Intersection LOS (Table 3.7) = 46.29						D	

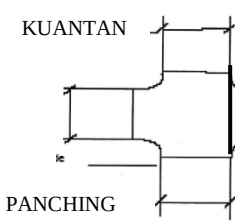
OUTPUT FROM MHCM 2006 TABLE

WEEKEND OBSERVED CONDITION (PM PEAK)

INPUT WORKSHEET

General Information		**Site Information**	
Analyst	_____	Intersection	_____
Agency or Company	_____	Area type	_____CBD_____OTHER
Date Performed	_____	Jurisdiction	_____
Analysis Time Period	_____	Analysis Year	_____2017_____

Intersection Geometry



Show North Arrow

GAMBANG

Pedestrian button

Lane width

Left + Right

Right

Through + Left

Left

Through

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane width						3.25			3.50		3.50	
Gradient						0			0		0	

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						85			309		2139	
Lane Group						R			R		T	
Total Cars						55			233		1940	
% Total Cars						64.71			75.40		90.70	
Total Motors						25			66		154	
% Total Motors						29.41			21.36		7.20	
Total Trailers						2			4		12	
% Total Trailers						2.35			1.29		0.56	
Total Lorries						3			6		23	
% Total Lorries						3.53			1.94		1.08	
Total Busses						0			0		10	
% Total Busses						0			0		0.47	
Peak Hour Factor, PHF						0.85			0.85		0.91	
Pretimed [P] or actuated [A]						A			A		A	
Start-up lost time,lt (s)						2			2		2	
Extension of effective green time, e(s)						2			2		2	
Arrival type, AT						3			3		3	
Parking (Y or N)						N			N		N	
Parking maneuver, Nm (maneuvers/h)						0			0		0	
Bus stopping, NB (buses/h)						0			0		0	

Signal Phasing Plan

DIAGRAM	1	2	3	4	5	6	7
Timing	G =82 I = 4	G = 59 I = 4	G = 17 I = 4	G = I =	G = I =	G = I =	G = I =

Protected turn Permitted turn Pedestrian Cycle length, C = 168 s

VOLUME ADJUSTMENT AND SATURATION FLOW RATE WORKSHEET

General Information

Project Description

Volume Adjustment

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						85			309		2139	
Peak-Hour factor, PHF						0.85			0.85		0.91	
Adjusted flow rate in lane group, V_p(veh/h) Eqn 3.1						100			364		2351	

Vehicle Composition Factor

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	T	R	L	T	R	L	T	R	L	T	R
F_{car}						0.647			0.754		0.907	
F_{motor}						0.065			0.045		0.016	
$F_{trailer}$						0.053			0.029		0.013	
F_{lorry}						0.042			0.023		0.013	
F_{bus}						0			0		0.010	
Proportion[1] of LT or RT (P_{LT} or P_{RT})						1			1			

Saturation Flow Rate

Base saturation flow rate, S_o (pc/h/ln)						1930			1930		1930	
Number of lanes, N						1			1		2	
Lane width adjustment factor, f_w Eqn 3.3						0.89			0.96		0.96	
Vehicle composition adjustment factor, f_c Eqn 3.6						0.807			0.851		0.959	
Grade adjustment factor, f_g Eqn 3.4 or 3.5						1			`1		1	
Area type adjustment factor, f_a Table 3.3						0.8454			0.8454		0.8454	
Left turn adjustment factor, f_{LT} Table 3.4						1			1		1	
Right turn adjustment factor, f_{RT} Table 3.5						0.84			0.84		1	
Adjustment saturation flow, S (veh/h),$S = S_o$,						1512			1546		3267	
$S = S_o \times N \times f_w \times f_g \times f_a \times f_{LT} \times f_{RT} \times (1/f_c)$ Eqn 3.2												

Noted

1. PLT = 1.000 for exclusive left turn lanes, and PRT = 1.000 for exclusive right turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group

CAPACITY AND LOS WORKSHEET													
General Information													
Project Description													
Volume Adjustment													
Phase number													
		EB			WB			NB			SB		
Lane group		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, V_p (veh/h)							100			364		2351	
Saturation flow rate, s (veh/h)							1512			1546		3267	
Lost time, t_L (s) = l_1 + Y – e	Eqn 3.8						4			4		4	
Effective green time, g(s), g = G + Y - t_L	Eqn 3.9						17			59		82	
Green ratio, g/c	Eqn 3.10						0.101			0.35		0.49	
Lane capacity[1], c=s(g/c), (veh/h)	Eqn 3.11						153			542.94		1594.61	
V_p/c ratio, X	Eqn 3.12						0.70			0.70		1	
Flow ratio, y = V_p/s	Eqn 3.13						0.07			0.24		0.72	
Lane Capacity Control Delay and LOS Determination													
		EB			WB			NB			SB		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate,[2] Vp (veh/h)							100			364		2351	
Lane capacity[2], c=s(g/c), (veh/h)							153			542.94		1594.61	
V_p/c ratio, [2]X = V_p/c							0.65			0.70		1	
Total green ratio,[2] g/c							0.101			0.35		0.49	
Uniform delay, d1 (sec/veh) $\frac{0.5\,c\left(1-\frac{g}{c}\right)^2}{1-[\min(1,X)\frac{g}{c}]}$	Eqn 3.16						73.03			46.89		43.00	
Incremental delay calibration, [3]k							0.22			0.22		0.5	
Incremental delay, d_2 = 900T{(X-1)							9.22			2.91		22.54	
$+\sqrt{((X-1)\text{^}2+8klX/cT)}\}$ (sec/veh)	Eqn 3.18												
Initial queue delay, d_3 (sec/veh)	Eqn 3.19						0			0		0	
Uniform delay, d_1 (s/veh)	Eqn 3.16						73.03			46.89		43.00	
Progression adjustment factor, PF	Eqn 3.17						1			1		1	
Delay, d = d_1(PF) + d_2 + d_3 (S/veh)	Eqn 3.15						82.25			49.80		65.54	
LOS by lane group	Table 3.7						F			D		D	
Delay by approach, d_A (sec/veh) $\frac{\sum di\ vi}{\sum vi}$	Eqn 3.20					82.25			49.80			65.54	
LOS by approach	Table 3.7					F			D			D	
Approach flow rate, V_A (veh/h)	Table 3.7					100			364			2351	
Intersection delay, d_I (sec/veh) $\frac{\sum dA\ vA}{Va}$	Eqn 3.21					Intersection LOS (Table 3.7) = 63.33						E	

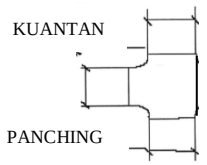
OUTPUT FROM MHCM 2006 TABLE

WEEKDAYS PROPOSED CONDITION (AM PEAK)

INPUT WORKSHEET

General Information		**Site Information**	
Analyst	_____	Intersection	_____
Agency or Company	_____	Area type	_____CBD_____OTHER
Date Performed	_____	Jurisdiction	_____
Analysis Time Period	_____	Analysis Year	_____2017_____

Intersection Geometry



Show North Arrow

Pedestrian button
Lane width

 Right

 Left

 Through

 Through + Left

 Left + Right

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane width						3.25			3.50		3.50	
Gradient						0			0		0	

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						375			588		1743	
Lane Group						R			R		T	
Total Cars						182			375		1205	
% Total Cars						48.53			63.78		69.13	
Total Motors						177			181		401	
% Total Motors						47.20			30.78		23.01	
Total Trailers						5			25		70	
% Total Trailers						1.33			4.25		4.02	
Total Lorries						7			7		51	
% Total Lorries						1.87			1.19		2.93	
Total Busses						4			0		16	
% Total Busses						1.07			0		0.92	
Peak Hour Factor, PHF						0.74			0.83		0.93	
Pretimed [P] or actuated [A]						A			A		A	
Start-up lost time,lt (s)						2			2		2	
Extension of effective green time, e(s)						2			2		2	
Arrival type, AT						3			3		3	
Parking (Y or N)						N			N		N	
Parking maneuver, Nm (maneuvers/h)						0			0		0	
Bus stopping, NB (buses/h)						0			0		0	

Signal Phasing Plan

DIAGRAM	1	2	3	4	5	6	7
Timing	G =117 I = 4	G = 74 I = 4	G = 45 I = 4	G = I =	G = I =	G = I =	G = I =

 Protected turn

 Permitted turn

 Pedestrian

Cycle length, C = 246 s

VOLUME ADJUSTMENT AND SATURATION FLOW RATE WORKSHEET

General Information

Project Description

Volume Adjustment

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						375			588		1743	
Peak-Hour factor, PHF						0.74			0.83		0.93	
Adjusted flow rate in lane group, V_p(veh/h) Eqn 3.1						507			708		1874	

Vehicle Composition Factor

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	T	R	L	T	R	L	T	R	L	T	R
F_{car}						0.485			0.638		0.691	
F_{motor}						0.104			0.068		0.051	
$F_{trailer}$						0.030			0.097		0.091	
F_{lorry}						0.022			0.014		0.035	
F_{bus}						0.022			0		0.019	
Proportion[1] of LT or RT (P_{LT} or P_{RT})						1			1			

Saturation Flow Rate

Base saturation flow rate, S_o (pc/h/ln)						1930			1930		1930	
Number of lanes, N						2			1		3	
Lane width adjustment factor, f_w Eqn 3.3						0.89			0.96		0.96	
Vehicle composition adjustment factor, f_c Eqn 3.6						0.663			0.817		0.887	
Grade adjustment factor, f_g Eqn 3.4 or 3.5						1			`1		1	
Area type adjustment factor, f_a Table 3.3						0.8454			0.8454		0.8454	
Left turn adjustment factor, f_{LT} Table 3.4						1			1		1	
Right turn adjustment factor, f_{RT} Table 3.5						0.84			0.84		1	
Adjustment saturation flow, S (veh/h),$S = S_o$, $S = S_o \times N \times f_w \times f_g \times f_a \times f_{LT} \times f_{RT} \times (1/f_c)$ Eqn 3.2						3680			1610		5298	

Noted

1. PLT = 1.000 for exclusive left turn lanes, and PRT = 1.000 for exclusive right turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group

CAPACITY AND LOS WORKSHEET

General Information

Project Description

Volume Adjustment

Phase number

		EB			WB			NB			SB		
Lane group		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, V_p (veh/h)							507			708		1874	
Saturation flow rate, s (veh/h)							3680			1610		5298	
Lost time, t_L (s) = l_1 + Y – e	Eqn 3.8						4			4		4	
Effective green time, g(s), g = G + Y - t_L	Eqn 3.9						45			74		117	
Green ratio, g/C	Eqn 3.10						0.18			0.30		0.48	
Lane capacity[1], c=s(g/c), (veh/h)	Eqn 3.11						673.17			484.31		2519.78	
V_p/c ratio, X	Eqn 3.12						0.8			1.46		0.7	
Flow ratio, y = V_p/s	Eqn 3.13						0.14			0.44		0.35	

Lane Capacity Control Delay and LOS Determination

		EB			WB			NB			SB		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate,[2] Vp (veh/h)							507			708		1874	
Lane capacity[2], c=s(g/c), (veh/h)							673.17			484.31		2519.78	
V_p/c ratio, [2]X = V_p/c							0.8			1.46		0.7	
Total green ratio,[2] g/c							0.18			0.30		0.48	
Uniform delay, d1 (sec/veh) $\frac{0.5\,C\left(1-\frac{g}{C}\right)^2}{1-[\min(1,X)\frac{g}{C}]}$	Eqn 3.16						96.19			86.00		50.70	
Incremental delay calibration, [3]k							0.32			0.5		0.22	
Incremental delay, d_2 = 900T{(X-1)							5.00			0		0.91	
$+\sqrt{((X-1)\text{^}2+8klX/cT)}\}$ (sec/veh)	Eqn 3.18												
Initial queue delay, d_3 (sec/veh)	Eqn 3.19						0			0		0	
Uniform delay, d_1 (s/veh)	Eqn 3.16						96.19			86.00		50.70	
Progression adjustment factor, PF	Eqn 3.17						1			1		1	
Delay, d = d_1(PF) + d_2 + d_3 (S/veh)	Eqn 3.15						101.19			86.00		51.61	
LOS by lane group	Table 3.7						F			F		D	
Delay by approach, d_A (sec/veh) $\frac{\sum di\ vi}{\sum vi}$	Eqn 3.20					101.19			86.00			51.61	
LOS by approach	Table 3.7					F			F			D	
Approach flow rate, V_A (veh/h)	Table 3.7					507			708			1874	
Intersection delay, d_I (sec/veh) $\frac{\sum dA\ vA}{Va}$	Eqn 3.21					Intersection LOS (Table 3.7) = 67.63						E	

OUTPUT FROM MHCM 2006 TABLE

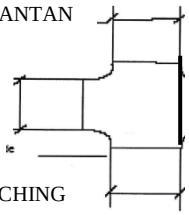
WEEKDAYS PROPOSED CONDITION (PM PEAK)

INPUT WORKSHEET

General Information		**Site Information**	
Analyst	_____	Intersection	_____
Agency or Company	_____	Area type	_____CBD_____OTHER
Date Performed	_____	Jurisdiction	_____
Analysis Time Period	_____	Analysis Year	_____2017_____

Intersection Geometry

KUANTAN



PANCHING

GAMBANG

Show North Arrow

Pedestrian button

Lane width

Right

Through + Left

Left

Left + Right

Through

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane width						3.25			3.50		3.50	
Gradient						0			0		0	

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						262			435		1924	
Lane Group						R			R		T	
Total Cars						131			269		1571	
% Total Cars						50.00			61.84		81.65	
Total Motors						120			143		180	
% Total Motors						45.80			32.87		9.36	
Total Trailers						6			9		68	
% Total Trailers						2.29			2.07		3.53	
Total Lorries						5			14		94	
% Total Lorries						1.91			3.22		4.89	
Total Busses						0			0		11	
% Total Busses						0			0		0.57	
Peak Hour Factor, PHF						0.89			0.88		0.96	
Pretimed [P] or actuated [A]						A			A		A	
Start-up lost time,lt (s)						2			2		2	
Extension of effective green time, e(s)						2			2		2	
Arrival type, AT						3			3		3	
Parking (Y or N)						N			N		N	
Parking maneuver, Nm (maneuvers/h)						0			0		0	
Bus stopping, NB (buses/h)						0			0		0	

Signal Phasing Plan

DIAGRAM	1	2	3	4	5	6	7
Timing	G = 120 I = 4	G = 78 I = 4	G = 25 I = 4	G = I =	G = I =	G = I =	G = I =

Protected turn

Permitted turn

Pedestrian

Cycle length, C = 233 s

VOLUME ADJUSTMENT AND SATURATION FLOW RATE WORKSHEET

General Information

Project Description

Volume Adjustment

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						262			435		1924	
Peak-Hour factor, PHF						0.89			0.88		0.96	
Adjusted flow rate in lane group, V_p(veh/h) Eqn 3.1						294			494		2004	

Vehicle Composition Factor

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	T	R	L	T	R	L	T	R	L	T	R
F_{car}						0.500			0.618		0.817	
F_{motor}						0.101			0.072		0.021	
$F_{trailer}$						0.052			0.047		0.080	
F_{lorry}						0.023			0.038		0.058	
F_{bus}						0			0		0.012	
Proportion[1] of LT or RT (P_{LT} or P_{RT})						1			1			

Saturation Flow Rate

Base saturation flow rate, S_o (pc/h/ln)	1930	1930	1930
Number of lanes, N	2	1	3
Lane width adjustment factor, f_w Eqn 3.3	0.89	0.96	0.96
Vehicle composition adjustment factor, f_c Eqn 3.6	0.676	0.774	0.988
Grade adjustment factor, f_g Eqn 3.4 or 3.5	1	`1	1
Area type adjustment factor, f_a Table 3.3	0.8454	0.8454	0.8454
Left turn adjustment factor, f_{LT} Table 3.4	1	1	1
Right turn adjustment factor, f_{RT} Table 3.5	0.84	0.84	1
Adjustment saturation flow, S (veh/h),$S = S_o$, $S = S_o \times N \times f_w \times f_g \times f_a \times f_{LT} \times f_{RT} \times (1/f_c)$ Eqn 3.2	3609	1700	4756

Noted

1. PLT = 1.000 for exclusive left turn lanes, and PRT = 1.000 for exclusive right turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group

CAPACITY AND LOS WORKSHEET

General Information

Project Description

Volume Adjustment

Phase number

		EB			WB			NB			SB		
Lane group		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, V_p (veh/h)							294			494		2004	
Saturation flow rate, s (veh/h)							3609			1700		4756	
Lost time, t_L (s) = l_1 + Y – e	Eqn 3.8						4			4		4	
Effective green time, g(s), g = G + Y - t_L	Eqn 3.9						25			78		120	
Green ratio, g/c	Eqn 3.10						0.11			0.33		0.52	
Lane capacity[1], c=s(g/c), (veh/h)	Eqn 3.11						387.23			569.10		2449.44	
V_p/c ratio, X	Eqn 3.12						0.8			0.90		0.8	
Flow ratio, y = V_p/s	Eqn 3.13						0.08			0.29		0.42	

Lane Capacity Control Delay and LOS Determination

		EB			WB			NB			SB		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate,[2] Vp (veh/h)							294			494		2004	
Lane capacity[2], c=s(g/c), (veh/h)							387.23			569.10		2449.44	
V_p/c ratio, [2]X = V_p/c							0.8			0.90		0.8	
Total green ratio,[2] g/c							0.11			0.33		0.52	
Uniform delay, d1 (sec/veh) $\frac{0.5\,C\left(1-\frac{g}{c}\right)^2}{1-[\min(1,X)\frac{g}{c}]}$	Eqn 3.16						101.56			73.79		46.60	
Incremental delay calibration, [3]k							0.32			0.41		0.32	
Incremental delay, d_2 = 900T{(X-1)							8.69			13.84		2.06	
$+\sqrt{((X-1)\text{^}2+8klX/cT)}\}$ (sec/veh)	Eqn 3.18												
Initial queue delay, d_3 (sec/veh)	Eqn 3.19						0			0		0	
Uniform delay, d_1 (s/veh)	Eqn 3.16						101.56			73.79		46.60	
Progression adjustment factor, PF	Eqn 3.17						1			1		1	
Delay, d = d_1(PF) + d_2 + d_3 (S/veh)	Eqn 3.15						110.24			87.62		48.67	
LOS by lane group	Table 3.7						F			E		D	
Delay by approach, d_A (sec/veh) $\frac{\sum di\ vi}{\sum vi}$	Eqn 3.20					110.24			87.62			48.67	
LOS by approach	Table 3.7					F			F			D	
Approach flow rate, V_A (veh/h)	Table 3.7					294			494			2004	
Intersection delay, d_I (sec/veh) $\frac{\sum dA\ vA}{Va}$	Eqn 3.21					Intersection LOS (Table 3.7) = 62.04						E	

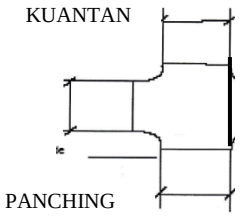
OUTPUT FROM MHCM 2006 TABLE

WEEKEND PROPOSED CONDITION (AM PEAK)

INPUT WORKSHEET

General Information		**Site Information**	
Analyst	_____	Intersection	_____
Agency or Company	_____	Area type	
Date Performed	_____	_____CBD_____OTHER	
Analysis Time Period	_____	Jurisdiction	_____
		Analysis Year	_____2017_____

Intersection Geometry



GAMBANG

Show North Arrow

Pedestrian button
Lane width
Right
Left
Through
Left + Right
Through + Left

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane width						3.25			3.50		3.50	
Gradient						0			0		0	

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						174			253		1176	
Lane Group						R			R		T	
Total Cars						88			167		861	
% Total Cars						50.57			66.01		73.21	
Total Motors						64			55		147	
% Total Motors						36.78			21.74		12.50	
Total Trailers						13			14		81	
% Total Trailers						7.47			5.53		6.89	
Total Lorries						9			16		82	
% Total Lorries						5.17			6.32		6.97	
Total Busses						0			1		5	
% Total Busses						0			0.40		0.43	
Peak Hour Factor, PHF						0.71			0.96		0.95	
Pretimed [P] or actuated [A]						A			A		A	
Start-up lost time,lt (s)						2			2		2	
Extension of effective green time, e(s)						2			2		2	
Arrival type, AT						3			3		3	
Parking (Y or N)						N			N		N	
Parking maneuver, Nm (maneuvers/h)						0			0		0	
Bus stopping, NB (buses/h)						0			0		0	

Signal Phasing Plan

DIAGRAM	1	2	3	4	5	6	7
Timing	G =84 I = 4	G = 35 I = 4	G = 32 I = 4	G = I =	G = I =	G = I =	G = I =

Protected turn — Permitted turn — Pedestrian

Cycle length, C = 161 s

VOLUME ADJUSTMENT AND SATURATION FLOW RATE WORKSHEET

General Information

Project Description

Volume Adjustment

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						174			253		1176	
Peak-Hour factor, PHF						0.71			0.96		0.95	
Adjusted flow rate in lane group, V_p(veh/h) Eqn 3.1						245			264		1238	

Vehicle Composition Factor

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	T	R	L	T	R	L	T	R	L	T	R
F_{car}						0.506			0.660		0.732	
F_{motor}						0.081			0.048		0.028	
$F_{trailer}$						0.170			0.126		0.156	
F_{lorry}						0.062			0.075		0.083	
F_{bus}						0			0.008		0.009	
Proportion[1] of LT or RT (P_{LT} or P_{RT})						1			1			

Saturation Flow Rate

Base saturation flow rate, S_o (pc/h/ln)	1930	1930	1930
Number of lanes, N	2	1	3
Lane width adjustment factor, f_w Eqn 3.3	0.89	0.96	0.96
Vehicle composition adjustment factor, f_c Eqn 3.6	0.819	0.917	1.008
Grade adjustment factor, f_g Eqn 3.4 or 3.5	1	`1	1
Area type adjustment factor, f_a Table 3.3	0.8454	0.8454	0.8454
Left turn adjustment factor, f_{LT} Table 3.4	1	1	1
Right turn adjustment factor, f_{RT} Table 3.5	0.84	0.84	1
Adjustment saturation flow, S (veh/h),$S = S_o$, $S = S_o \times N \times f_w \times f_g \times f_a \times f_{LT} \times f_{RT} \times (1/f_c)$ Eqn 3.2	2979	1435	4662

Noted

1. PLT = 1.000 for exclusive left turn lanes, and PRT = 1.000 for exclusive right turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group

CAPACITY AND LOS WORKSHEET													
General Information													
Project Description													
Volume Adjustment													
Phase number													
		EB			WB			NB			SB		
Lane group		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, V_p (veh/h)							245			264		1238	
Saturation flow rate, s (veh/h)							2979			1435		4662	
Lost time, t_L (s) = l_1 + Y – e	Eqn 3.8						4			4		4	
Effective green time, g(s), g = G + Y - t_L	Eqn 3.9						32			35		84	
Green ratio, g/c	Eqn 3.10						0.20			0.22		0.52	
Lane capacity[1], c=s(g/c), (veh/h)	Eqn 3.11						592.10			311.96		2432.35	
V_p/c ratio, X	Eqn 3.12						0.40			0.80		0.50	
Flow ratio, y = V_p/s	Eqn 3.13						0.08			0.18		0.27	
Lane Capacity Control Delay and LOS Determination													
		EB			WB			NB			SB		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate,[2] Vp (veh/h)							245			264		1238	
Lane capacity[2], c=s(g/c), (veh/h)							592.10			311.96		2432.35	
V_p/c ratio, [2]X = V_p/c							0.40			0.80		0.50	
Total green ratio,[2] g/c							0.20			0.22		0.52	
Uniform delay, d1 (sec/veh) $\frac{0.5\,C\left(1-\frac{g}{C}\right)^2}{1-[\min(1,X)\frac{g}{C}]}$	Eqn 3.16						56.14			59.68		24.91	
Incremental delay calibration, [3]k							0.13			0.32		0.19	
Incremental delay, d_2 = 900T{(X-1)							0.56			16.43		0.29	
$+\sqrt{((X-1)\text{^}2+8klX/cT)}\}$ (sec/veh)	Eqn 3.18												
Initial queue delay, d_3 (sec/veh)	Eqn 3.19						0			0		0	
Uniform delay, d_1 (s/veh)	Eqn 3.16						56.14			59.68		24.91	
Progression adjustment factor, PF	Eqn 3.17						1			1		1	
Delay, d = d_1(PF) + d_2 + d_3 (S/veh)	Eqn 3.15						56.70			76.11		25.20	
LOS by lane group	Table 3.7						E			E		C	
Delay by approach, d_A (sec/veh) $\frac{\sum di\ vi}{\sum vi}$	Eqn 3.20					56.70			76.11			25.20	
LOS by approach	Table 3.7					E			E			C	
Approach flow rate, V_A (veh/h)	Table 3.7					245			264			1238	
Intersection delay, d_I (sec/veh) $\frac{\sum dA\ vA}{Va}$	Eqn 3.21						Intersection LOS (Table 3.7) = 37.31					D	

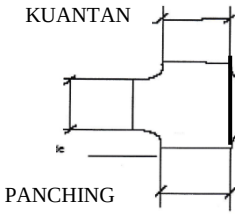
OUTPUT FROM MHCM 2006 TABLE

WEEKEND PROPOSED CONDITION (PM PEAK)

INPUT WORKSHEET

General Information		**Site Information**	
Analyst	_____	Intersection	_____
Agency or Company	_____	Area type	_____CBD_____OTHER
Date Performed	_____	Jurisdiction	_____
Analysis Time Period	_____	Analysis Year	_____2017_____

Intersection Geometry



Show North Arrow

Pedestrian button

Lane width

Right

Left

Through

Through + Left

Left + Right

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane width						3.25			3.50		3.50	
Gradient						0			0		0	

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						85			309		2139	
Lane Group						R			R		T	
Total Cars						55			233		1940	
% Total Cars						64.71			75.40		90.70	
Total Motors						25			66		154	
% Total Motors						29.41			21.36		7.20	
Total Trailers						2			4		12	
% Total Trailers						2.35			1.29		0.56	
Total Lorries						3			6		23	
% Total Lorries						3.53			1.94		1.08	
Total Busses						0			0		10	
% Total Busses						0			0		0.47	
Peak Hour Factor, PHF						0.85			0.85		0.91	
Pretimed [P] or actuated [A]						A			A		A	
Start-up lost time,lt (s)						2			2		2	
Extension of effective green time, e(s)						2			2		2	
Arrival type, AT						3			3		3	
Parking (Y or N)						N			N		N	
Parking maneuver, Nm (maneuvers/h)						0			0		0	
Bus stopping, NB (buses/h)						0			0		0	

Signal Phasing Plan

DIAGRAM	1	2	3	4	5	6	7
Timing	G =82 I = 4	G = 59 I = 4	G = 17 I = 4	G = I =	G = I =	G = I =	G = I =

Protected turn

Permitted turn

Pedestrian

Cycle length, C = 168 s

VOLUME ADJUSTMENT AND SATURATION FLOW RATE WORKSHEET

General Information

Project Description

Volume Adjustment

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume, V (veh/h)						85			309		2139	
Peak-Hour factor, PHF						0.85			0.85		0.91	
Adjusted flow rate in lane group, V_p(veh/h) Eqn 3.1						100			364		2351	

Vehicle Composition Factor

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	T	R	L	T	R	L	T	R	L	T	R
F_{car}						0.647			0.754		0.907	
F_{motor}						0.065			0.045		0.016	
$F_{trailer}$						0.053			0.029		0.013	
F_{lorry}						0.042			0.023		0.013	
F_{bus}						0			0		0.010	
Proportion[1] of LT or RT (P_{LT} or P_{RT})						1			1			

Saturation Flow Rate

Base saturation flow rate, S_o (pc/h/ln)						1930			1930		1930	
Number of lanes, N						2			1		3	
Lane width adjustment factor, f_w Eqn 3.3						0.89			0.96		0.96	
Vehicle composition adjustment factor, f_c Eqn 3.6						0.807			0.851		0.959	
Grade adjustment factor, f_g Eqn 3.4 or 3.5						1			`1		1	
Area type adjustment factor, f_a Table 3.3						0.8454			0.8454		0.8454	
Left turn adjustment factor, f_{LT} Table 3.4						1			1		1	
Right turn adjustment factor, f_{RT} Table 3.5						0.84			0.84		1	
Adjustment saturation flow, S (veh/h),$S = S_o$,						3023			1546		4900	
$S = S_o \times N \times f_w \times f_g \times f_a \times f_{LT} \times f_{RT} \times (1/f_c)$ Eqn 3.2												

Noted

1. PLT = 1.000 for exclusive left turn lanes, and PRT = 1.000 for exclusive right turn lanes. Otherwise, they are equal to the proportions of turning volumes in the lane group

CAPACITY AND LOS WORKSHEET

General Information

Project Description

Volume Adjustment

Phase number

Lane group		EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Adjusted flow rate, V_p (veh/h)							100			364		2351	
Saturation flow rate, s (veh/h)							3023			1546		4900	
Lost time, t_L (s) = l_1 + Y – e	Eqn 3.8						4			4		4	
Effective green time, g(s), g = G + Y - t_L	Eqn 3.9						17			59		82	
Green ratio, g/c	Eqn 3.10						0.10			0.35		0.49	
Lane capacity[1], c=s(g/c), (veh/h)	Eqn 3.11						305.90			542.94		2391.67	
V_p/c ratio, X	Eqn 3.12						0.30			0.70		1	
Flow ratio, y = V_p/s	Eqn 3.13						0.03			0.24		0.48	

Lane Capacity Control Delay and LOS Determination

		EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Adjusted flow rate,[2] Vp (veh/h)							100			364		2351	
Lane capacity[2], c=s(g/c), (veh/h)							305.90			542.94		2391.67	
V_p/c ratio, [2]X = V_p/c							0.30			0.70		1	
Total green ratio,[2] g/c							0.10			0.35		0.49	
Uniform delay, d1 (sec/veh) $\frac{0.5\,C\left(1-\frac{g}{C}\right)^2}{1-[\min(1,X)\frac{g}{C}]}$	Eqn 3.16						69.98			46.89		43.00	
Incremental delay calibration, [3]k							0.11			0.22		0.5	
Incremental delay, d_2 = 900T{(X-1) +$\sqrt{((X-1)\text{^}2+8klX/cT)}$} (sec/veh)	Eqn 3.18						0.63			2.91		18.40	
Initial queue delay, d_3 (sec/veh)	Eqn 3.19						0			0		0	
Uniform delay, d_1 (s/veh)	Eqn 3.16						69.98			46.89		43.00	
Progression adjustment factor, PF	Eqn 3.17						1			1		1	
Delay, d = d_1(PF) + d_2 + d_3 (S/veh)	Eqn 3.15						70.61			49.80		61.40	
LOS by lane group	Table 3.7						E			D		E	
Delay by approach, d_A (sec/veh) $\frac{\sum di\ vi}{\sum vi}$	Eqn 3.20					70.61			49.80			61.40	
LOS by approach	Table 3.7					E			D			E	
Approach flow rate, V_A (veh/h)	Table 3.7					100			364			2351	
Intersection delay, d_I (sec/veh) $\frac{\sum dA\ vA}{Va}$	Eqn 3.21					Intersection LOS (Table 3.7) = 60.23						E	

APPENDIX B

PEAK HOUR TRAFFIC VOLUME

Traffic Volume for AM Peak

Time (am)	Total Volume (Veh/hr) from North		Total Volume (Veh/hr) from South		Total Volume (Veh/hr) from West	
	Weekdays					
	NS	NW	SN	SW	WN	WS
7.00-8.00	1567	588	1743	640	505	375
	Weekend					
	NS	NW	SN	SW	WN	WS
8.00-9.00	1314	253	1176	184	364	174

Traffic Volume for PM Peak

Time (pm)	Total Volume (Veh/hr) from North		Total Volume (Veh/hr) from South		Total Volume (Veh/hr) from West	
	Weekdays					
	NS	NW	SN	SW	WN	WS
5.00-6.00	1787	435	1924	247	434	262
	Weekend					
	NS	NW	SN	SW	WN	WS
5.00-6.00	1809	309	2139	156	357	85

APPENDIX C

TRAFFIC VOLUME DATA (AM)

From : SOUTH TO WEST

MONDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	168	0	3	2	149	322
7.15-7.30	61	1	2	0	92	156
7.30-7.45	48	0	1	0	40	89
7.45-8.00	35	1	3	0	29	68
Total	312	2	9	2	310	635
8.00-8.15	31	0	3	0	21	55
8.15-8.30	29	1	4	1	17	52
8.30-8.45	24	1	1	0	14	40
8.45-9.00	18	0	2	0	12	32
Total	102	2	10	1	64	179
9.00-9.15	17	1	3	0	13	34
9.15-9.30	15	1	2	0	13	31
9.30-9.45	12	0	3	1	12	28
9.45-10.00	11	2	4	0	15	32
Total	55	4	12	1	53	125

TUESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	169	0	2	1	145	317
7.15-7.30	78	1	2	1	89	171
7.30-7.45	31	1	4	0	36	72
7.45-8.00	29	0	3	0	32	64
Total	284	2	11	2	302	624
8.00-8.15	29	1	4	0	13	47
8.15-8.30	29	1	3	0	14	47
8.30-8.45	24	0	2	0	16	42
8.45-9.00	21	2	2	1	11	37
Total	103	4	11	1	54	173
9.00-9.15	19	2	3	0	12	36
9.15-9.30	15	1	4	0	13	33
9.30-9.45	14	0	2	0	15	31
9.45-10.00	11	1	2	1	14	29
Total	59	4	11	1	54	129

WEDNESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	173	1	4	3	140	321
7.15-7.30	59	1	3	0	99	162
7.30-7.45	48	1	1	0	47	97
7.45-8.00	29	0	4	0	27	60
Total	309	3	12	3	313	640
8.00-8.15	27	1	5	0	22	55
8.15-8.30	25	1	3	0	17	46
8.30-8.45	22	1	1	1	14	39
8.45-9.00	21	0	2	1	13	37
Total	95	3	11	2	66	177
9.00-9.15	20	1	3	0	15	39
9.15-9.30	15	0	3	1	12	31
9.30-9.45	17	2	2	0	10	31
9.45-10.00	12	1	0	0	11	24
Total	64	4	8	1	48	125

THURSDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	170	1	3	2	138	314
7.15-7.30	60	0	4	1	100	165
7.30-7.45	44	0	2	0	56	102
7.45-8.00	31	3	2	0	29	65
Total	305	4	11	3	323	646
8.00-8.15	30	1	3	0	23	57
8.15-8.30	28	0	4	1	18	51
8.30-8.45	22	1	2	0	14	39
8.45-9.00	19	2	2	1	10	34
Total	99	4	11	2	65	181
9.00-9.15	18	2	2	0	13	35
9.15-9.30	14	0	3	0	12	29
9.30-9.45	10	1	3	0	17	31
9.45-10.00	11	1	5	0	12	29
Total	53	4	13	0	54	124

FRIDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	177	0	3	2	136	318
7.15-7.30	62	1	3	0	87	153
7.30-7.45	51	2	1	0	50	104
7.45-8.00	33	0	2	1	28	64
Total	323	3	9	3	301	639
8.00-8.15	28	1	2	0	20	51
8.15-8.30	25	1	4	0	16	46
8.30-8.45	22	2	1	0	14	39
8.45-9.00	20	1	3	1	13	38
Total	95	5	10	1	63	174
9.00-9.15	18	1	4	0	13	36
9.15-9.30	17	0	3	0	15	35
9.30-9.45	14	2	0	0	12	28
9.45-10.00	13	2	1	0	11	27
Total	62	5	8	0	51	126

SATURDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	10	0	3	1	8	22
7.15-7.30	8	0	0	0	5	13
7.30-7.45	15	2	1	0	11	29
7.45-8.00	29	2	3	0	24	58
Total	62	4	7	1	48	122
8.00-8.15	25	1	2	0	14	42
8.15-8.30	24	3	3	0	21	51
8.30-8.45	22	1	1	0	17	41
8.45-9.00	31	3	3	0	13	50
Total	102	8	9	0	65	184
9.00-9.15	12	1	3	0	11	27
9.15-9.30	12	3	2	0	7	24
9.30-9.45	16	2	4	0	10	32
9.45-10.00	14	1	3	0	8	26
Total	54	7	12	0	36	109

SUNDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	6	0	1	0	4	11
7.15-7.30	10	1	2	0	8	21
7.30-7.45	12	1	0	0	11	24
7.45-8.00	19	0	0	0	19	38
Total	47	2	3	0	42	94
8.00-8.15	11	1	0	0	4	16
8.15-8.30	11	0	0	0	7	18
8.30-8.45	12	1	0	0	12	25
8.45-9.00	12	0	0	0	6	18
Total	46	2	0	0	29	77
9.00-9.15	11	4	0	0	9	24
9.15-9.30	20	0	0	0	10	30
9.30-9.45	18	1	0	0	12	31
9.45-10.00	17	3	1	0	13	34
Total	66	8	1	0	44	119

From : SOUTH TO NORTH

MONDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	312	9	11	4	65	401
7.15-7.30	305	9	14	7	121	456
7.30-7.45	367	14	20	1	107	509
7.45-8.00	262	12	18	1	87	380
Total	1246	44	63	13	380	1746
8.00-8.15	281	21	23	3	68	396
8.15-8.30	231	12	27	0	34	304
8.30-8.45	240	18	28	2	40	328
8.45-9.00	225	11	20	1	27	284
Total	977	62	98	6	169	1312
9.00-9.15	215	17	23	3	31	289
9.15-9.30	200	23	33	0	26	282
9.30-9.45	217	15	21	2	25	280
9.45-10.00	215	13	18	1	16	263
Total	847	68	95	6	98	1114

TUESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	305	12	14	3	85	419
7.15-7.30	325	10	13	9	110	467
7.30-7.45	330	15	19	1	131	496
7.45-8.00	254	25	32	1	64	376
Total	1214	62	78	14	390	1758
8.00-8.15	273	22	24	2	71	392
8.15-8.30	246	14	24	0	38	322
8.30-8.45	237	17	26	1	30	311
8.45-9.00	240	14	22	1	29	306
Total	996	67	96	4	168	1331
9.00-9.15	215	17	23	3	31	289
9.15-9.30	214	23	31	1	28	297
9.30-9.45	217	15	17	2	28	279
9.45-10.00	210	12	16	1	16	255
Total	856	67	87	7	103	1120

WEDNESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	311	11	11	2	71	406
7.15-7.30	314	10	15	8	122	469
7.30-7.45	301	16	23	2	110	452
7.45-8.00	279	14	21	4	98	416
Total	1205	51	70	16	401	1743
8.00-8.15	267	24	22	1	65	379
8.15-8.30	237	11	24	2	37	311
8.30-8.45	254	16	21	0	28	319
8.45-9.00	231	12	23	3	28	297
Total	989	63	90	6	158	1306
9.00-9.15	220	16	23	2	31	292
9.15-9.30	211	23	28	1	29	292
9.30-9.45	217	11	16	3	27	274
9.45-10.00	213	15	13	0	17	258
Total	861	65	80	6	104	1116

THURSDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	309	13	12	1	63	398
7.15-7.30	312	9	17	7	112	457
7.30-7.45	315	17	22	1	115	470
7.45-8.00	256	14	21	2	87	380
Total	1192	53	72	11	377	1705
8.00-8.15	251	24	25	0	67	367
8.15-8.30	245	15	26	2	45	333
8.30-8.45	231	16	21	1	36	305
8.45-9.00	254	11	19	1	31	316
Total	981	66	91	4	179	1321
9.00-9.15	218	15	25	2	32	292
9.15-9.30	205	20	30	1	27	283
9.30-9.45	216	12	19	3	29	279
9.45-10.00	211	11	17	0	18	257
Total	850	58	91	6	106	1111

FRIDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	298	12	14	3	78	405
7.15-7.30	310	9	15	7	127	468
7.30-7.45	315	17	25	3	109	469
7.45-8.00	275	13	22	2	89	401
Total	1198	51	76	15	403	1743
8.00-8.15	289	23	27	3	75	417
8.15-8.30	251	15	24	1	31	322
8.30-8.45	243	13	23	1	35	315
8.45-9.00	234	12	22	2	27	297
Total	1017	63	96	7	168	1351
9.00-9.15	216	13	26	1	31	287
9.15-9.30	214	18	28	1	28	289
9.30-9.45	207	13	16	1	27	264
9.45-10.00	210	11	17	0	20	258
Total	847	55	87	3	106	1098

SATURDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	91	11	8	6	27	143
7.15-7.30	143	13	12	2	36	206
7.30-7.45	199	12	13	2	70	296
7.45-8.00	195	16	15	1	56	283
Total	628	52	48	11	189	928
8.00-8.15	213	27	22	2	43	307
8.15-8.30	217	15	21	1	48	302
8.30-8.45	239	21	18	1	30	309
8.45-9.00	192	19	20	1	26	258
Total	861	82	81	5	147	1176
9.00-9.15	206	17	23	1	25	272
9.15-9.30	233	22	21	1	14	291
9.30-9.45	226	18	19	1	22	286
9.45-10.00	220	20	16	0	17	273
Total	885	77	79	3	78	1122

SUNDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	72	4	3	0	12	91
7.15-7.30	97	6	4	0	19	126
7.30-7.45	133	6	6	5	20	170
7.45-8.00	122	3	11	1	23	160
Total	424	19	24	6	74	547
8.00-8.15	132	4	8	3	18	165
8.15-8.30	152	4	11	0	16	183
8.30-8.45	199	7	4	2	24	236
8.45-9.00	163	7	4	2	21	197
Total	646	22	27	7	79	781
9.00-9.15	144	6	2	1	17	170
9.15-9.30	170	8	6	1	29	214
9.30-9.45	200	8	6	3	19	236
9.45-10.00	210	5	5	1	22	243
Total	724	27	19	6	87	863

From : NORTH TO WEST

MONDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	111	3	6	0	39	159
7.15-7.30	86	1	8	1	42	138
7.30-7.45	70	3	3	2	48	126
7.45-8.00	97	2	6	0	62	167
Total	364	9	23	3	191	590
8.00-8.15	56	1	3	0	36	96
8.15-8.30	51	2	2	0	35	90
8.30-8.45	58	0	5	0	29	92
8.45-9.00	49	2	2	0	33	86
Total	214	5	12	0	133	364
9.00-9.15	50	4	3	0	21	78
9.15-9.30	45	5	4	0	18	72
9.30-9.45	48	4	3	0	19	74
9.45-10.00	42	6	5	0	15	68
Total	185	19	15	0	73	292

TUESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	126	2	5	0	40	173
7.15-7.30	95	3	7	1	56	162
7.30-7.45	89	1	4	0	41	135
7.45-8.00	69	1	4	0	39	113
Total	379	7	20	1	176	583
8.00-8.15	50	2	4	0	36	92
8.15-8.30	48	0	5	0	24	77
8.30-8.45	55	3	3	0	28	89
8.45-9.00	51	2	4	0	31	88
Total	204	7	16	0	119	346
9.00-9.15	47	5	4	0	22	78
9.15-9.30	43	4	3	0	19	69
9.30-9.45	50	6	4	0	15	75
9.45-10.00	41	3	5	0	17	66
Total	181	18	16	0	73	288

WEDNESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	119	1	8	0	31	159
7.15-7.30	82	3	7	0	41	133
7.30-7.45	73	2	4	0	40	119
7.45-8.00	101	1	6	0	69	177
Total	375	7	25	0	181	588
8.00-8.15	55	2	6	0	25	88
8.15-8.30	42	2	2	0	32	78
8.30-8.45	53	1	4	1	26	85
8.45-9.00	44	3	2	0	35	84
Total	194	8	14	1	118	335
9.00-9.15	41	3	5	0	21	70
9.15-9.30	48	5	6	0	18	77
9.30-9.45	50	4	3	0	16	73
9.45-10.00	43	2	4	0	17	66
Total	182	14	18	0	72	286

THURSDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	110	2	4	0	29	145
7.15-7.30	87	1	8	2	39	137
7.30-7.45	76	3	5	1	42	127
7.45-8.00	98	1	3	0	61	163
Total	371	7	20	3	171	572
8.00-8.15	47	3	4	0	33	87
8.15-8.30	52	2	3	0	35	92
8.30-8.45	50	2	3	0	29	84
8.45-9.00	46	3	1	0	27	77
Total	195	10	11	0	124	340
9.00-9.15	50	4	6	0	14	74
9.15-9.30	42	5	6	0	20	73
9.30-9.45	50	8	2	0	19	79
9.45-10.00	42	7	5	0	15	69
Total	184	24	19	0	68	295

FRIDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	123	3	5	0	35	166
7.15-7.30	76	1	7	0	48	132
7.30-7.45	85	2	4	2	42	135
7.45-8.00	95	1	8	1	55	160
Total	379	7	24	3	180	593
8.00-8.15	53	3	2	0	31	89
8.15-8.30	49	1	5	0	36	91
8.30-8.45	51	2	2	0	28	83
8.45-9.00	44	0	3	0	24	71
Total	197	6	12	0	119	334
9.00-9.15	48	5	5	0	20	78
9.15-9.30	44	4	3	0	16	67
9.30-9.45	46	7	4	0	19	76
9.45-10.00	43	5	4	0	13	65
Total	181	21	16	0	68	286

SATURDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	17	0	3	1	8	29
7.15-7.30	24	4	7	0	11	46
7.30-7.45	32	2	5	0	20	59
7.45-8.00	41	1	7	0	19	68
Total	114	7	22	1	58	202
8.00-8.15	39	3	7	0	12	61
8.15-8.30	40	5	1	1	16	63
8.30-8.45	42	3	4	0	14	63
8.45-9.00	46	5	2	0	13	66
Total	167	16	14	1	55	253
9.00-9.15	39	3	5	0	14	61
9.15-9.30	50	1	2	0	19	72
9.30-9.45	40	5	3	0	12	60
9.45-10.00	42	2	1	0	13	58
Total	171	11	11	0	58	251

SUNDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	14	1	1	0	8	24
7.15-7.30	19	2	1	0	11	33
7.30-7.45	16	0	0	0	9	25
7.45-8.00	40	1	1	0	15	57
Total	89	4	3	0	43	139
8.00-8.15	35	2	2	0	11	50
8.15-8.30	29	2	1	0	12	44
8.30-8.45	24	1	0	0	16	41
8.45-9.00	34	2	0	0	16	52
Total	122	7	3	0	55	187
9.00-9.15	27	0	0	0	24	51
9.15-9.30	29	0	0	0	8	37
9.30-9.45	38	1	0	0	12	51
9.45-10.00	29	1	1	0	9	40
Total	123	2	1	0	53	179

From : NORTH TO SOUTH

MONDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	242	13	16	4	31	306
7.15-7.30	301	15	19	3	65	403
7.30-7.45	421	12	14	1	60	508
7.45-8.00	286	20	11	1	39	357
Total	1250	60	60	9	195	1574
8.00-8.15	280	20	15	4	35	354
8.15-8.30	255	18	12	2	24	311
8.30-8.45	241	22	14	2	29	308
8.45-9.00	228	19	11	1	30	289
Total	1004	79	52	9	118	1262
9.00-9.15	217	25	10	2	29	283
9.15-9.30	204	30	14	3	33	284
9.30-9.45	200	23	16	3	35	277
9.45-10.00	197	27	11	1	28	264
Total	818	105	51	9	125	1108

TUESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	240	17	11	3	34	305
7.15-7.30	294	13	14	4	65	390
7.30-7.45	423	21	13	1	68	526
7.45-8.00	280	13	12	1	43	349
Total	1237	64	50	9	210	1570
8.00-8.15	286	19	14	4	37	360
8.15-8.30	249	21	13	3	26	312
8.30-8.45	238	23	15	1	29	306
8.45-9.00	226	22	12	2	31	293
Total	999	85	54	10	123	1271
9.00-9.15	207	26	17	2	31	283
9.15-9.30	201	30	13	4	28	276
9.30-9.45	192	24	18	1	29	264
9.45-10.00	187	31	15	3	26	262
Total	787	111	63	10	114	1085

WEDNESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	246	16	8	3	29	302
7.15-7.30	297	11	15	4	61	388
7.30-7.45	424	19	8	1	73	525
7.45-8.00	270	23	8	2	49	352
Total	1237	69	39	10	212	1567
8.00-8.15	277	18	13	3	40	351
8.15-8.30	251	21	16	3	35	326
8.30-8.45	234	24	12	2	33	305
8.45-9.00	228	21	11	2	33	295
Total	990	84	52	10	141	1277
9.00-9.15	220	24	18	1	31	294
9.15-9.30	214	28	13	3	29	287
9.30-9.45	205	25	17	2	37	286
9.45-10.00	196	30	19	4	26	275
Total	835	107	67	10	123	1142

THURDAYS

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	239	18	10	4	31	302
7.15-7.30	305	14	8	3	60	390
7.30-7.45	419	20	11	1	77	528
7.45-8.00	277	17	12	0	47	353
Total	1240	69	41	8	215	1573
8.00-8.15	282	15	13	3	41	354
8.15-8.30	253	17	15	2	33	320
8.30-8.45	241	22	11	3	29	306
8.45-9.00	224	23	14	1	30	292
Total	1000	77	53	9	133	1272
9.00-9.15	210	30	11	1	28	280
9.15-9.30	206	20	16	4	15	261
9.30-9.45	194	31	10	3	36	274
9.45-10.00	193	38	18	4	20	273
Total	803	119	55	12	99	1088

FRIDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	240	17	10	2	30	299
7.15-7.30	295	13	11	5	62	386
7.30-7.45	427	16	8	1	71	523
7.45-8.00	275	21	12	1	45	354
Total	1237	67	41	9	208	1562
8.00-8.15	285	15	13	3	42	358
8.15-8.30	244	13	18	2	39	316
8.30-8.45	231	17	14	3	37	302
8.45-9.00	229	20	13	1	31	294
Total	989	65	58	9	149	1270
9.00-9.15	215	26	16	2	30	289
9.15-9.30	200	25	14	4	28	271
9.30-9.45	198	33	13	1	35	280
9.45-10.00	190	36	19	4	25	274
Total	803	120	62	11	118	1114

SATURDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	106	13	12	1	20	152
7.15-7.30	151	15	16	4	36	222
7.30-7.45	179	12	10	0	43	244
7.45-8.00	202	17	13	1	33	266
Total	638	57	51	6	132	884
8.00-8.15	228	18	3	4	34	287
8.15-8.30	266	19	6	3	43	337
8.30-8.45	279	20	11	5	35	350
8.45-9.00	282	18	14	2	24	340
Total	1055	75	34	14	136	1314
9.00-9.15	279	16	11	2	34	342
9.15-9.30	292	25	12	7	33	369
9.30-9.45	304	28	18	4	28	382
9.45-10.00	301	24	14	0	26	365
Total	1176	93	55	13	121	1458

SUNDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	80	5	3	0	23	111
7.15-7.30	95	9	5	2	26	137
7.30-7.45	137	6	5	3	21	172
7.45-8.00	155	8	6	4	27	200
Total	467	28	19	9	97	620
8.00-8.15	164	6	4	2	24	200
8.15-8.30	123	4	6	3	25	161
8.30-8.45	181	15	2	1	27	226
8.45-9.00	229	8	2	6	48	293
Total	697	33	14	12	124	880
9.00-9.15	225	9	5	1	36	276
9.15-9.30	209	9	8	7	35	268
9.30-9.45	212	7	10	1	23	253
9.45-10.00	210	5	7	3	29	254
Total	856	30	30	12	123	1051

From : WEST TO SOUTH

MONDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	50	1	2	0	52	105
7.15-7.30	65	2	2	3	59	131
7.30-7.45	30	2	1	0	37	70
7.45-8.00	26	3	5	0	25	59
Total	171	8	10	3	173	365
8.00-8.15	15	1	3	1	25	45
8.15-8.30	16	2	2	0	18	38
8.30-8.45	13	2	4	0	21	40
8.45-9.00	11	1	2	0	20	34
Total	55	6	11	1	84	157
9.00-9.15	11	3	9	0	13	36
9.15-9.30	11	4	7	0	15	37
9.30-9.45	9	3	6	0	13	31
9.45-10.00	10	1	4	0	10	25
Total	41	11	26	0	51	129

TUESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	51	2	2	0	51	106
7.15-7.30	60	2	1	2	59	124
7.30-7.45	29	1	3	1	30	64
7.45-8.00	26	4	6	0	28	64
Total	166	9	12	3	168	358
8.00-8.15	13	2	4	1	13	33
8.15-8.30	15	1	3	0	25	44
8.30-8.45	11	3	3	0	21	38
8.45-9.00	10	2	2	0	18	32
Total	49	8	12	1	77	147
9.00-9.15	8	4	7	0	15	34
9.15-9.30	10	2	5	0	14	31
9.30-9.45	14	3	9	0	11	37
9.45-10.00	12	2	4	0	12	30
Total	44	11	25	0	52	132

WEDNESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	57	2	0	0	50	109
7.15-7.30	64	1	1	3	58	127
7.30-7.45	43	2	1	0	36	82
7.45-8.00	18	2	3	1	33	57
Total	182	7	5	4	177	375
8.00-8.15	11	3	3	2	20	39
8.15-8.30	14	2	2	0	25	43
8.30-8.45	13	1	4	0	17	35
8.45-9.00	11	3	1	0	20	35
Total	49	9	10	2	82	152
9.00-9.15	15	4	4	0	13	36
9.15-9.30	10	2	7	0	15	34
9.30-9.45	13	3	5	0	13	34
9.45-10.00	9	4	3	0	12	28
Total	47	13	19	0	53	132

THURSDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	52	1	0	0	49	102
7.15-7.30	69	2	1	3	57	132
7.30-7.45	44	1	2	1	38	86
7.45-8.00	20	0	2	0	35	57
Total	185	4	5	4	179	377
8.00-8.15	15	2	4	1	22	44
8.15-8.30	14	4	2	1	18	39
8.30-8.45	17	3	1	0	21	42
8.45-9.00	13	1	3	0	19	36
Total	59	10	10	2	80	161
9.00-9.15	10	2	6	0	11	29
9.15-9.30	6	4	9	0	11	30
9.30-9.45	18	5	4	0	14	41
9.45-10.00	10	3	4	0	16	33
Total	44	14	23	0	52	133

FRIDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	51	1	1	0	45	98
7.15-7.30	68	1	2	2	58	131
7.30-7.45	41	2	3	1	33	80
7.45-8.00	24	1	2	0	32	59
Total	184	5	8	3	168	368
8.00-8.15	15	2	3	1	21	42
8.15-8.30	16	2	4	0	22	44
8.30-8.45	18	1	2	0	22	43
8.45-9.00	13	4	2	0	19	38
Total	62	9	11	1	84	167
9.00-9.15	16	2	4	0	13	35
9.15-9.30	18	1	6	0	11	36
9.30-9.45	13	3	4	0	15	35
9.45-10.00	10	5	4	0	10	29
Total	57	11	18	0	49	135

SATURDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	9	0	0	0	8	17
7.15-7.30	13	0	1	0	9	23
7.30-7.45	7	0	1	0	10	18
7.45-8.00	17	2	2	0	14	35
Total	46	2	4	0	41	93
8.00-8.15	32	4	5	0	20	61
8.15-8.30	10	3	2	0	13	28
8.30-8.45	26	2	1	0	23	52
8.45-9.00	20	0	5	0	8	33
Total	88	9	13	0	64	174
9.00-9.15	14	1	8	0	15	38
9.15-9.30	21	2	12	0	10	45
9.30-9.45	22	2	6	0	14	44
9.45-10.00	11	1	3	0	22	37
Total	68	6	29	0	61	164

SUNDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	8	0	0	0	5	13
7.15-7.30	7	0	0	0	8	15
7.30-7.45	4	0	0	0	4	8
7.45-8.00	10	0	1	0	10	21
Total	29	0	1	0	27	57
8.00-8.15	11	1	0	0	6	18
8.15-8.30	11	0	0	0	5	16
8.30-8.45	10	2	0	0	8	20
8.45-9.00	16	1	3	0	12	32
Total	48	4	3	0	31	86
9.00-9.15	12	2	0	0	16	30
9.15-9.30	20	2	0	0	7	29
9.30-9.45	17	2	0	0	10	29
9.45-10.00	14	1	1	0	12	28
Total	63	7	1	0	45	116

From : WEST TO NORTH

MONDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	101	0	0	0	19	120
7.15-7.30	118	3	0	0	44	165
7.30-7.45	80	5	2	0	46	133
7.45-8.00	59	2	4	0	24	89
Total	358	10	6	0	133	507
8.00-8.15	69	3	8	0	36	116
8.15-8.30	80	1	6	0	31	118
8.30-8.45	64	4	8	0	29	105
8.45-9.00	53	2	4	0	25	84
Total	266	10	26	0	121	423
9.00-9.15	39	2	14	0	19	74
9.15-9.30	55	5	16	0	17	93
9.30-9.45	61	4	11	0	23	99
9.45-10.00	52	3	9	0	24	88
Total	207	14	50	0	83	354

TUESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	105	0	0	0	21	126
7.15-7.30	110	2	0	0	40	152
7.30-7.45	73	6	0	0	43	122
7.45-8.00	61	3	7	0	21	92
Total	349	11	7	0	125	492
8.00-8.15	60	1	7	0	42	110
8.15-8.30	77	2	9	0	24	112
8.30-8.45	68	3	4	0	30	105
8.45-9.00	61	2	3	0	22	88
Total	266	8	23	0	118	415
9.00-9.15	53	2	10	0	17	82
9.15-9.30	49	5	19	0	20	93
9.30-9.45	58	5	13	0	16	92
9.45-10.00	51	3	7	0	23	84
Total	211	15	49	0	76	351

WEDNESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	100	0	0	0	19	119
7.15-7.30	116	2	0	0	42	160
7.30-7.45	89	4	2	0	31	126
7.45-8.00	58	3	0	0	39	100
Total	363	9	2	0	131	505
8.00-8.15	63	2	5	0	44	114
8.15-8.30	70	3	4	0	27	104
8.30-8.45	64	2	7	0	33	106
8.45-9.00	55	4	4	0	25	88
Total	252	11	20	0	129	412
9.00-9.15	40	1	11	0	20	72
9.15-9.30	51	5	17	0	15	88
9.30-9.45	66	7	14	0	17	104
9.45-10.00	49	2	7	0	23	81
Total	206	15	49	0	75	345

THURSDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	98	0	0	0	19	117
7.15-7.30	115	2	0	0	40	157
7.30-7.45	77	6	3	0	48	134
7.45-8.00	53	3	5	0	21	82
Total	343	11	8	0	128	490
8.00-8.15	57	3	6	0	38	104
8.15-8.30	73	1	8	0	30	112
8.30-8.45	66	4	2	0	33	105
8.45-9.00	58	2	4	0	25	89
Total	254	10	20	0	126	410
9.00-9.15	44	3	8	0	16	71
9.15-9.30	56	7	20	0	17	100
9.30-9.45	60	6	10	0	19	95
9.45-10.00	54	1	5	0	21	81
Total	214	17	43	0	73	347

FRIDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	99	0	0	0	23	122
7.15-7.30	109	3	0	0	43	155
7.30-7.45	79	5	3	0	49	136
7.45-8.00	65	3	4	0	22	94
Total	352	11	7	0	137	507
8.00-8.15	66	4	8	0	33	111
8.15-8.30	75	2	5	0	40	122
8.30-8.45	62	4	5	0	29	100
8.45-9.00	52	3	4	0	28	87
Total	255	13	22	0	130	420
9.00-9.15	40	2	10	0	20	72
9.15-9.30	53	4	18	0	19	94
9.30-9.45	64	3	12	0	21	100
9.45-10.00	52	3	7	0	24	86
Total	209	12	47	0	84	352

SATURDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	20	0	0	0	14	34
7.15-7.30	28	1	1	0	14	44
7.30-7.45	38	1	0	0	22	61
7.45-8.00	46	2	1	0	21	70
Total	132	4	2	0	71	209
8.00-8.15	51	3	3	0	18	75
8.15-8.30	66	0	8	0	32	106
8.30-8.45	59	2	3	0	21	99
8.45-9.00	53	5	8	0	18	84
Total	229	10	22	0	89	364
9.00-9.15	51	6	7	0	15	79
9.15-9.30	59	5	9	0	18	91
9.30-9.45	56	6	6	0	10	78
9.45-10.00	53	3	5	0	13	74
Total	219	20	27	0	56	322

SUNDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	15	0	1	0	7	23
7.15-7.30	20	1	1	0	10	32
7.30-7.45	35	0	0	0	9	44
7.45-8.00	37	1	1	0	11	50
Total	107	2	3	0	37	149
8.00-8.15	46	4	1	0	7	58
8.15-8.30	56	1	3	0	13	73
8.30-8.45	56	2	2	0	20	80
8.45-9.00	44	2	2	0	13	61
Total	202	9	8	0	53	272
9.00-9.15	48	1	0	0	12	61
9.15-9.30	40	0	0	0	13	53
9.30-9.45	56	0	0	0	15	71
9.45-10.00	50	1	1	0	9	61
Total	194	2	1	0	49	246

TRAFFIC VOLUME DATA (PM)

From : SOUTH TO WEST

MONDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	13	3	0	0	13	29
7.15-7.30	22	1	0	0	17	40
7.30-7.45	10	4	2	0	9	25
7.45-8.00	17	1	2	1	15	36
Total	62	9	4	1	54	130
8.00-8.15	16	0	1	1	18	36
8.15-8.30	27	0	1	1	16	45
8.30-8.45	40	3	1	0	33	77
8.45-9.00	38	3	2	0	31	74
Total	121	6	5	2	98	232
9.00-9.15	42	2	2	1	35	82
9.15-9.30	38	0	1	0	33	72
9.30-9.45	32	2	0	1	36	71
9.45-10.00	20	1	0	0	21	42
Total	132	5	3	2	125	267

TUESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	16	0	1	0	17	34
7.15-7.30	20	2	0	0	15	37
7.30-7.45	18	1	1	1	18	39
7.45-8.00	19	0	1	0	10	30
Total	73	3	3	1	60	140
8.00-8.15	26	3	1	1	24	55
8.15-8.30	25	0	1	1	26	53
8.30-8.45	37	3	0	0	34	74
8.45-9.00	34	0	0	2	21	57
Total	122	6	2	4	105	239
9.00-9.15	40	2	1	0	38	81
9.15-9.30	37	0	0	0	32	69
9.30-9.45	35	1	0	0	38	74
9.45-10.00	17	0	0	0	17	34
Total	129	3	1	0	125	258

WEDNESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	15	2	1	0	14	32
7.15-7.30	19	1	0	0	16	36
7.30-7.45	18	0	2	0	15	35
7.45-8.00	15	2	1	1	11	30
Total	67	5	4	1	56	133
8.00-8.15	22	2	0	1	23	48
8.15-8.30	28	0	0	1	27	56
8.30-8.45	40	3	2	0	31	76
8.45-9.00	38	2	1	1	25	67
Total	128	7	3	3	106	247
9.00-9.15	39	3	0	1	27	70
9.15-9.30	33	2	2	0	31	68
9.30-9.45	37	3	1	1	34	76
9.45-10.00	25	0	1	0	22	48
Total	134	8	4	2	114	262

THURSDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	12	3	2	0	16	33
7.15-7.30	24	0	0	0	14	38
7.30-7.45	17	2	0	0	17	36
7.45-8.00	17	1	1	0	8	27
Total	70	6	3	0	55	134
8.00-8.15	22	2	3	0	25	52
8.15-8.30	30	0	0	2	26	58
8.30-8.45	36	3	1	0	35	75
8.45-9.00	33	0	0	1	23	57
Total	121	5	4	3	109	242
9.00-9.15	38	2	1	1	28	70
9.15-9.30	39	1	0	1	30	71
9.30-9.45	33	0	1	0	32	66
9.45-10.00	28	1	0	0	25	54
Total	138	4	2	2	115	261

FRIDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	28	1	1	0	40	70
7.15-7.30	35	0	1	0	29	65
7.30-7.45	23	1	0	0	13	37
7.45-8.00	23	0	0	0	12	35
Total	109	2	2	0	94	207
8.00-8.15	21	2	1	0	12	36
8.15-8.30	25	1	0	1	10	37
8.30-8.45	44	2	1	1	21	69
8.45-9.00	46	1	0	3	44	94
Total	136	6	2	5	87	236
9.00-9.15	37	2	0	0	26	65
9.15-9.30	32	1	0	1	31	65
9.30-9.45	40	1	1	1	38	81
9.45-10.00	36	1	1	0	29	67
Total	145	5	2	2	124	278

SATURDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	19	0	0	0	7	26
7.15-7.30	18	0	0	0	10	28
7.30-7.45	16	0	0	0	8	24
7.45-8.00	21	0	0	1	8	30
Total	74	0	0	1	33	108
8.00-8.15	24	1	0	0	15	40
8.15-8.30	22	1	1	0	15	39
8.30-8.45	25	0	1	0	17	43
8.45-9.00	15	1	0	0	18	34
Total	86	3	2	0	65	156
9.00-9.15	30	1	0	0	14	45
9.15-9.30	25	1	1	0	12	39
9.30-9.45	28	0	0	0	14	42
9.45-10.00	23	1	1	0	11	36
Total	106	3	2	0	51	162

SUNDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	14	0	0	0	5	19
7.15-7.30	14	0	0	0	9	23
7.30-7.45	15	0	0	1	6	22
7.45-8.00	24	0	0	0	7	31
Total	67	0	0	1	27	95
8.00-8.15	22	2	1	0	11	36
8.15-8.30	23	1	0	0	19	43
8.30-8.45	21	0	0	0	8	29
8.45-9.00	18	0	1	0	13	32
Total	84	3	2	0	51	140
9.00-9.15	28	0	0	0	11	39
9.15-9.30	27	1	0	0	14	42
9.30-9.45	30	0	0	0	16	46
9.45-10.00	27	2	1	0	13	43
Total	112	3	1	0	54	170

From : SOUTH TO NORTH

MONDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	265	19	15	4	15	318
7.15-7.30	285	17	20	2	22	346
7.30-7.45	305	21	13	3	30	372
7.45-8.00	270	25	22	1	21	339
Total	1125	82	70	10	88	1375
8.00-8.15	350	21	10	3	42	426
8.15-8.30	420	21	16	3	34	494
8.30-8.45	425	26	12	1	45	509
8.45-9.00	399	27	11	2	40	479
Total	1594	95	49	9	161	1908
9.00-9.15	301	12	10	3	26	352
9.15-9.30	298	14	7	2	29	350
9.30-9.45	310	17	9	4	30	370
9.45-10.00	245	11	8	2	23	289
Total	1154	54	34	11	108	1361

TUESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	255	20	15	3	19	312
7.15-7.30	260	27	20	3	24	334
7.30-7.45	315	15	19	2	32	383
7.45-8.00	320	23	15	1	25	384
Total	1150	85	69	9	100	1413
8.00-8.15	359	23	28	5	39	454
8.15-8.30	408	21	14	2	59	504
8.30-8.45	415	28	13	2	49	507
8.45-9.00	390	27	10	2	41	470
Total	1572	99	65	11	188	1935
9.00-9.15	310	14	11	4	27	366
9.15-9.30	266	13	8	1	27	315
9.30-9.45	315	22	6	5	29	377
9.45-10.00	240	12	7	2	25	286
Total	1131	61	32	12	108	1344

WEDNESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	258	21	19	3	20	321
7.15-7.30	271	28	20	3	24	346
7.30-7.45	316	15	17	2	31	381
7.45-8.00	319	22	15	0	27	383
Total	1164	86	71	8	102	1431
8.00-8.15	370	21	25	4	38	458
8.15-8.30	401	22	17	2	57	499
8.30-8.45	405	26	15	3	45	494
8.45-9.00	395	25	11	2	40	473
Total	1571	94	68	11	180	1924
9.00-9.15	315	12	8	3	30	368
9.15-9.30	310	13	10	1	31	365
9.30-9.45	313	19	7	4	35	378
9.45-10.00	258	11	9	2	28	308
Total	1196	55	34	10	124	1419

THURSDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	248	22	18	4	17	309
7.15-7.30	269	29	21	3	21	343
7.30-7.45	315	12	12	3	30	372
7.45-8.00	317	24	17	0	26	384
Total	1149	87	68	10	94	1408
8.00-8.15	352	20	17	4	31	424
8.15-8.30	360	22	6	1	56	445
8.30-8.45	410	25	10	2	48	495
8.45-9.00	385	23	11	1	43	463
Total	1507	90	44	8	178	1827
9.00-9.15	309	14	9	4	25	361
9.15-9.30	278	16	10	2	25	331
9.30-9.45	308	20	6	3	30	367
9.45-10.00	269	14	8	2	27	320
Total	1164	64	33	11	107	1379

FRIDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	308	18	17	3	27	373
7.15-7.30	320	25	28	3	22	398
7.30-7.45	326	16	17	5	33	397
7.45-8.00	352	27	16	3	23	421
Total	1306	86	78	14	105	1589
8.00-8.15	350	21	10	3	42	426
8.15-8.30	420	21	16	3	34	494
8.30-8.45	418	25	12	2	49	506
8.45-9.00	418	26	11	2	44	501
Total	1606	93	49	10	169	1927
9.00-9.15	443	21	11	5	35	515
9.15-9.30	384	25	7	3	33	452
9.30-9.45	354	19	11	2	58	444
9.45-10.00	335	26	14	4	39	418
Total	1516	91	43	14	165	1829

SATURDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	410	10	8	3	25	456
7.15-7.30	436	7	5	2	19	469
7.30-7.45	428	6	5	3	30	472
7.45-8.00	444	9	6	4	27	490
Total	1718	32	24	12	101	1887
8.00-8.15	469	5	4	3	34	515
8.15-8.30	437	7	1	1	40	486
8.30-8.45	535	5	4	3	39	586
8.45-9.00	499	6	3	3	41	552
Total	1940	23	12	10	154	2139
9.00-9.15	477	7	4	2	44	534
9.15-9.30	489	5	3	3	46	546
9.30-9.45	470	10	3	5	49	537
9.45-10.00	446	9	4	3	43	505
Total	1882	31	14	13	182	2122

SUNDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	402	9	5	4	21	441
7.15-7.30	446	11	10	3	15	485
7.30-7.45	431	4	7	2	34	478
7.45-8.00	455	8	2	5	30	500
Total	1734	32	24	14	100	1904
8.00-8.15	461	7	3	2	36	509
8.15-8.30	444	6	2	2	39	493
8.30-8.45	562	7	5	4	43	621
8.45-9.00	482	7	2	3	43	537
Total	1949	27	12	11	161	2160
9.00-9.15	481	4	5	1	49	540
9.15-9.30	490	8	3	4	48	553
9.30-9.45	465	12	2	6	49	534
9.45-10.00	441	8	2	1	46	498
Total	1877	32	12	12	192	2125

From : NORTH TO WEST

MONDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	50	2	2	0	15	69
7.15-7.30	49	3	3	0	20	75
7.30-7.45	37	0	1	0	18	56
7.45-8.00	56	4	10	0	14	84
Total	192	9	16	0	67	284
8.00-8.15	54	1	2	0	29	86
8.15-8.30	66	2	2	0	39	109
8.30-8.45	68	2	3	0	42	115
8.45-9.00	76	0	1	0	35	112
Total	264	5	8	0	145	422
9.00-9.15	98	3	0	0	33	134
9.15-9.30	85	1	2	0	35	123
9.30-9.45	71	0	1	0	27	99
9.45-10.00	73	2	0	0	25	100
Total	327	6	3	0	120	456

TUESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	48	3	2	0	13	66
7.15-7.30	51	2	4	0	18	75
7.30-7.45	57	4	5	0	17	83
7.45-8.00	55	1	2	0	19	77
Total	211	10	13	0	67	301
8.00-8.15	59	7	3	0	24	93
8.15-8.30	60	2	3	0	36	101
8.30-8.45	61	0	3	0	43	107
8.45-9.00	81	6	1	0	39	127
Total	261	15	10	0	142	428
9.00-9.15	104	1	1	0	38	144
9.15-9.30	66	2	0	0	22	90
9.30-9.45	72	2	2	0	27	103
9.45-10.00	73	6	0	0	24	103
Total	315	11	3	0	111	440

WEDNESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	42	3	3	0	16	64
7.15-7.30	53	5	3	0	21	82
7.30-7.45	48	4	4	0	18	74
7.45-8.00	54	2	2	0	19	77
Total	197	14	12	0	74	297
8.00-8.15	58	5	3	0	26	92
8.15-8.30	60	2	1	0	35	98
8.30-8.45	71	4	3	0	45	123
8.45-9.00	80	3	2	0	37	122
Total	269	14	9	0	143	435
9.00-9.15	99	3	2	0	33	137
9.15-9.30	83	2	1	0	28	114
9.30-9.45	77	2	0	0	30	109
9.45-10.00	72	0	2	0	24	98
Total	331	7	5	0	115	458

THURSDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	41	2	4	0	13	60
7.15-7.30	56	5	5	0	21	87
7.30-7.45	50	4	1	0	18	73
7.45-8.00	55	3	2	0	18	78
Total	202	14	12	0	70	298
8.00-8.15	55	4	1	0	27	87
8.15-8.30	55	2	3	0	36	96
8.30-8.45	69	3	0	0	45	117
8.45-9.00	78	2	2	0	34	116
Total	257	11	6	0	142	416
9.00-9.15	101	2	1	0	38	142
9.15-9.30	70	0	2	0	31	103
9.30-9.45	74	3	0	0	25	102
9.45-10.00	69	4	2	0	27	102
Total	314	9	5	0	121	449

FRIDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	79	5	9	0	39	132
7.15-7.30	87	4	1	0	35	127
7.30-7.45	86	1	0	0	32	119
7.45-8.00	60	4	0	0	19	83
Total	312	14	10	0	125	461
8.00-8.15	58	3	0	0	14	75
8.15-8.30	81	0	5	0	20	106
8.30-8.45	64	0	2	0	23	89
8.45-9.00	74	0	1	0	36	111
Total	277	3	8	0	93	381
9.00-9.15	85	1	0	0	27	113
9.15-9.30	97	3	2	0	39	141
9.30-9.45	88	1	1	0	35	125
9.45-10.00	97	3	3	0	31	134
Total	367	8	6	0	132	513

SATURDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	30	0	0	0	11	41
7.15-7.30	46	1	0	0	15	62
7.30-7.45	31	1	1	0	13	46
7.45-8.00	42	1	0	0	16	59
Total	149	3	1	0	55	208
8.00-8.15	55	2	0	0	14	71
8.15-8.30	70	2	1	0	18	91
8.30-8.45	58	0	1	0	19	78
8.45-9.00	50	2	2	0	15	69
Total	233	6	4	0	66	309
9.00-9.15	54	1	0	1	18	74
9.15-9.30	64	0	1	0	13	78
9.30-9.45	51	1	0	0	16	68
9.45-10.00	48	0	2	0	15	65
Total	217	2	3	1	62	285

SUNDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	35	1	0	0	14	50
7.15-7.30	44	0	0	0	14	58
7.30-7.45	34	0	0	0	11	45
7.45-8.00	45	1	0	0	18	64
Total	158	2	0	0	57	217
8.00-8.15	60	1	1	0	17	79
8.15-8.30	67	3	0	0	15	85
8.30-8.45	53	1	0	0	15	69
8.45-9.00	48	0	2	0	17	67
Total	228	5	3	0	64	300
9.00-9.15	59	0	0	1	11	71
9.15-9.30	65	0	0	0	16	81
9.30-9.45	54	2	1	0	10	67
9.45-10.00	44	1	1	1	13	60
Total	222	3	2	2	50	279

From : NORTH TO SOUTH

MONDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	267	25	19	2	30	343
7.15-7.30	255	26	20	2	44	347
7.30-7.45	290	23	17	3	34	367
7.45-8.00	277	15	18	3	37	350
Total	1089	89	74	10	145	1407
8.00-8.15	355	12	19	5	88	479
8.15-8.30	321	10	16	0	55	402
8.30-8.45	330	15	14	1	78	438
8.45-9.00	351	14	13	1	100	479
Total	1357	51	62	7	321	1798
9.00-9.15	315	12	13	1	85	426
9.15-9.30	310	9	11	4	77	411
9.30-9.45	326	13	14	2	40	395
9.45-10.00	294	10	14	2	62	382
Total	1245	44	52	9	264	1614

TUESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	264	25	13	3	31	336
7.15-7.30	253	24	25	2	42	346
7.30-7.45	295	26	18	4	35	378
7.45-8.00	301	16	24	2	48	391
Total	1113	91	80	11	156	1451
8.00-8.15	306	18	17	1	68	410
8.15-8.30	281	8	18	4	93	404
8.30-8.45	327	10	16	0	85	438
8.45-9.00	357	16	11	2	102	488
Total	1271	52	62	7	348	1740
9.00-9.15	319	14	16	2	79	430
9.15-9.30	301	6	5	5	74	391
9.30-9.45	329	14	12	1	42	398
9.45-10.00	290	8	10	2	64	374
Total	1239	42	43	10	259	1593

WEDNESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	269	27	17	4	33	350
7.15-7.30	255	24	25	2	41	347
7.30-7.45	289	25	15	2	36	367
7.45-8.00	310	17	24	3	49	403
Total	1123	93	81	11	159	1467
8.00-8.15	336	15	15	3	70	439
8.15-8.30	298	13	18	2	82	413
8.30-8.45	328	17	13	1	91	450
8.45-9.00	351	16	14	0	104	485
Total	1313	61	60	6	347	1787
9.00-9.15	324	11	13	2	89	439
9.15-9.30	311	13	11	4	65	404
9.30-9.45	301	12	15	2	53	383
9.45-10.00	287	7	11	1	68	374
Total	1223	43	50	9	275	1600

THURSDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	273	26	14	2	32	347
7.15-7.30	247	28	26	4	42	347
7.30-7.45	297	22	16	1	31	367
7.45-8.00	306	12	23	5	56	402
Total	1123	88	79	12	161	1463
8.00-8.15	329	22	14	2	64	431
8.15-8.30	349	17	14	5	80	465
8.30-8.45	336	16	19	1	77	449
8.45-9.00	350	14	20	3	101	488
Total	1364	69	67	11	322	1833
9.00-9.15	325	11	13	3	89	441
9.15-9.30	311	14	9	2	71	407
9.30-9.45	302	12	11	1	59	385
9.45-10.00	278	8	10	2	63	361
Total	1216	45	43	8	282	1594

FRIDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	385	23	16	1	41	466
7.15-7.30	337	15	22	3	39	416
7.30-7.45	284	22	12	2	40	360
7.45-8.00	338	11	16	6	55	426
Total	1344	71	66	12	175	1668
8.00-8.15	342	22	14	2	58	438
8.15-8.30	382	19	10	5	78	494
8.30-8.45	343	12	11	0	72	438
8.45-9.00	391	7	13	3	101	515
Total	1458	60	48	10	309	1885
9.00-9.15	371	12	13	0	102	498
9.15-9.30	472	13	15	2	86	588
9.30-9.45	395	10	15	6	70	496
9.45-10.00	398	11	16	5	68	498
Total	1636	46	59	13	326	2080

SATURDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	432	7	5	2	69	515
7.15-7.30	418	8	5	1	40	472
7.30-7.45	411	12	15	2	30	470
7.45-8.00	378	9	8	5	26	426
Total	1639	36	33	10	165	1883
8.00-8.15	388	6	5	3	27	429
8.15-8.30	420	9	3	1	35	468
8.30-8.45	409	10	4	3	23	449
8.45-9.00	417	8	8	2	28	463
Total	1634	33	20	9	113	1809
9.00-9.15	433	7	5	1	36	482
9.15-9.30	449	9	6	3	33	500
9.30-9.45	430	5	3	4	31	473
9.45-10.00	400	7	6	2	27	442
Total	1712	28	20	10	127	1897

SUNDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	423	10	6	1	76	516
7.15-7.30	410	5	8	2	33	458
7.30-7.45	407	15	16	1	31	470
7.45-8.00	385	7	4	6	28	430
Total	1625	37	34	10	168	1874
8.00-8.15	396	10	3	2	30	441
8.15-8.30	415	14	5	3	31	468
8.30-8.45	412	6	3	4	27	452
8.45-9.00	425	4	7	3	26	465
Total	1648	34	18	12	114	1826
9.00-9.15	442	10	7	0	38	497
9.15-9.30	441	6	5	5	38	495
9.30-9.45	420	6	6	2	28	462
9.45-10.00	405	5	4	1	24	439
Total	1708	27	22	8	128	1893

From : WEST TO SOUTH

MONDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	15	1	2	0	25	43
7.15-7.30	19	3	1	0	23	46
7.30-7.45	16	2	0	0	11	29
7.45-8.00	10	1	0	1	21	33
Total	60	7	3	1	80	151
8.00-8.15	34	1	2	0	19	56
8.15-8.30	25	1	2	0	24	52
8.30-8.45	40	4	3	0	30	77
8.45-9.00	39	3	3	0	28	73
Total	138	9	10	0	101	258
9.00-9.15	41	1	0	1	30	73
9.15-9.30	47	2	1	2	31	83
9.30-9.45	61	1	1	1	48	112
9.45-10.00	33	3	0	0	26	62
Total	182	7	2	4	135	330

TUESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	12	2	1	0	22	37
7.15-7.30	18	1	2	0	20	41
7.30-7.45	22	3	2	0	18	45
7.45-8.00	24	3	1	0	23	51
Total	76	9	6	0	83	174
8.00-8.15	34	2	5	0	37	78
8.15-8.30	34	1	0	0	28	63
8.30-8.45	41	1	0	0	38	80
8.45-9.00	21	1	0	0	21	43
Total	130	5	5	0	124	264
9.00-9.15	22	0	0	0	20	42
9.15-9.30	49	3	1	0	36	89
9.30-9.45	68	0	0	2	57	127
9.45-10.00	43	2	1	3	19	68
Total	182	5	2	5	132	326

WEDNESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	17	3	2	0	15	37
7.15-7.30	20	0	1	0	11	32
7.30-7.45	23	2	2	0	22	49
7.45-8.00	21	4	2	0	21	48
Total	81	9	7	0	69	166
8.00-8.15	34	2	3	0	35	74
8.15-8.30	35	2	0	0	28	65
8.30-8.45	39	0	2	0	33	74
8.45-9.00	23	1	1	0	24	49
Total	131	5	6	0	120	262
9.00-9.15	44	0	0	2	33	79
9.15-9.30	35	1	1	2	39	78
9.30-9.45	50	2	1	0	30	83
9.45-10.00	45	2	2	1	19	69
Total	174	5	4	5	121	309

THURSDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	17	3	2	0	25	47
7.15-7.30	20	0	1	0	11	32
7.30-7.45	23	1	1	0	25	50
7.45-8.00	36	6	3	0	20	65
Total	96	10	7	0	81	194
8.00-8.15	32	2	1	0	41	76
8.15-8.30	33	0	1	0	28	62
8.30-8.45	39	1	0	0	30	70
8.45-9.00	19	2	0	0	26	47
Total	123	5	2	0	125	255
9.00-9.15	50	0	0	2	36	88
9.15-9.30	34	0	1	1	37	73
9.30-9.45	52	3	0	0	28	83
9.45-10.00	41	2	2	2	22	69
Total	177	5	3	5	123	313

FRIDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	16	0	1	0	16	33
7.15-7.30	15	1	3	0	20	39
7.30-7.45	24	1	2	0	7	34
7.45-8.00	17	3	0	0	11	31
Total	72	5	6	0	54	137
8.00-8.15	22	2	0	0	8	32
8.15-8.30	38	1	0	0	30	69
8.30-8.45	18	2	0	0	23	43
8.45-9.00	21	1	0	0	18	40
Total	99	6	0	0	79	184
9.00-9.15	65	0	0	1	37	103
9.15-9.30	23	0	1	1	23	48
9.30-9.45	45	0	0	0	23	68
9.45-10.00	46	3	0	4	37	90
Total	179	3	1	6	120	309

SATURDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	16	0	1	0	3	20
7.15-7.30	13	1	0	1	2	17
7.30-7.45	17	0	0	0	3	20
7.45-8.00	13	1	0	0	5	19
Total	59	2	1	1	13	76
8.00-8.15	10	2	1	0	5	18
8.15-8.30	17	0	1	0	7	25
8.30-8.45	12	1	0	0	9	22
8.45-9.00	16	0	0	0	4	20
Total	55	3	2	0	25	85
9.00-9.15	16	1	0	0	7	24
9.15-9.30	22	0	1	0	5	28
9.30-9.45	15	1	0	1	10	27
9.45-10.00	23	0	1	0	14	38
Total	76	2	2	1	36	117

SUNDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	15	1	0	0	2	18
7.15-7.30	14	0	0	0	4	18
7.30-7.45	16	0	0	1	4	21
7.45-8.00	9	0	0	0	6	15
Total	54	1	0	1	16	72
8.00-8.15	11	0	1	0	7	19
8.15-8.30	15	1	0	0	8	24
8.30-8.45	14	0	0	0	8	22
8.45-9.00	15	1	0	0	9	25
Total	55	2	1	0	32	90
9.00-9.15	12	0	0	1	9	22
9.15-9.30	25	0	1	0	7	33
9.30-9.45	19	0	0	0	16	35
9.45-10.00	21	1	0	0	11	33
Total	77	1	1	1	43	123

From : WEST TO NORTH

MONDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	40	3	2	0	12	57
7.15-7.30	43	2	3	0	18	66
7.30-7.45	55	3	3	0	22	83
7.45-8.00	61	1	2	0	21	85
Total	199	9	10	0	73	291
8.00-8.15	81	4	2	0	40	127
8.15-8.30	83	1	2	0	34	120
8.30-8.45	78	3	1	0	31	113
8.45-9.00	73	3	0	0	20	96
Total	315	11	5	0	125	456
9.00-9.15	60	3	0	0	19	82
9.15-9.30	58	2	1	0	24	85
9.30-9.45	86	1	1	1	16	105
9.45-10.00	79	1	0	0	12	92
Total	283	7	2	1	71	364

TUESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	33	4	3	0	16	56
7.15-7.30	41	1	2	0	15	59
7.30-7.45	53	2	2	0	25	82
7.45-8.00	59	2	3	0	23	87
Total	186	9	10	0	79	284
8.00-8.15	89	3	0	0	35	127
8.15-8.30	67	5	1	0	26	99
8.30-8.45	77	5	0	0	36	118
8.45-9.00	89	2	1	0	18	110
Total	322	15	2	0	115	454
9.00-9.15	51	1	0	0	22	74
9.15-9.30	64	1	0	0	22	87
9.30-9.45	99	2	0	0	18	119
9.45-10.00	87	2	0	0	15	104
Total	301	6	0	0	77	384

WEDNESDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	37	3	2	0	15	57
7.15-7.30	43	2	3	0	13	61
7.30-7.45	55	4	5	0	15	79
7.45-8.00	52	1	4	0	23	80
Total	187	10	14	0	66	277
8.00-8.15	66	2	0	0	31	99
8.15-8.30	70	5	2	0	23	100
8.30-8.45	75	4	2	0	39	120
8.45-9.00	85	3	3	0	24	115
Total	296	14	7	0	117	434
9.00-9.15	57	1	1	1	23	83
9.15-9.30	61	3	0	0	20	84
9.30-9.45	90	1	2	1	14	108
9.45-10.00	82	2	0	0	17	101
Total	290	7	3	2	74	376

THURSDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	51	4	1	0	13	69
7.15-7.30	46	1	3	0	17	67
7.30-7.45	52	4	6	0	11	73
7.45-8.00	43	1	1	0	16	61
Total	192	10	11	0	57	270
8.00-8.15	63	3	2	0	29	97
8.15-8.30	72	5	0	0	30	107
8.30-8.45	80	2	3	0	33	118
8.45-9.00	78	4	1	0	27	110
Total	293	14	6	0	119	432
9.00-9.15	59	2	2	1	21	85
9.15-9.30	67	2	0	0	18	87
9.30-9.45	86	1	0	2	16	105
9.45-10.00	85	1	1	0	17	104
Total	297	6	3	3	72	381

FRIDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	37	2	4	0	21	64
7.15-7.30	36	4	6	0	18	64
7.30-7.45	41	5	2	0	5	53
7.45-8.00	40	2	1	0	6	49
Total	154	13	13	0	50	230
8.00-8.15	58	1	1	0	21	81
8.15-8.30	74	5	1	0	11	91
8.30-8.45	68	1	0	0	16	85
8.45-9.00	58	1	0	0	24	83
Total	258	8	2	0	72	340
9.00-9.15	75	0	1	0	9	85
9.15-9.30	63	1	0	0	13	77
9.30-9.45	63	3	1	2	25	94
9.45-10.00	84	1	0	0	13	98
Total	285	5	2	2	60	354

SATURDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	55	1	0	0	12	68
7.15-7.30	63	0	0	0	14	77
7.30-7.45	58	1	0	0	15	74
7.45-8.00	57	1	0	0	12	70
Total	233	3	0	0	53	289
8.00-8.15	61	1	0	0	13	75
8.15-8.30	72	0	0	0	16	88
8.30-8.45	78	1	0	0	14	93
8.45-9.00	80	1	0	0	20	101
Total	291	3	0	0	63	357
9.00-9.15	71	0	0	0	13	84
9.15-9.30	67	1	0	0	20	88
9.30-9.45	62	2	0	0	19	83
9.45-10.00	76	0	0	0	14	90
Total	276	3	0	0	66	345

SUNDAY

Time (am)	Class 1 (Cars, taxi, small van)	Class 2 Lorry (Heavy vehicle with 2 - axles	Class 3 Lorry (Heavy vehicles with 3 axles or more)	Class 4 (Buses)	Class 5 (Motorcycles)	Total
7.00-7.15	59	2	0	0	15	76
7.15-7.30	68	0	0	0	16	84
7.30-7.45	59	0	0	0	13	72
7.45-8.00	51	2	0	0	14	67
Total	237	4	0	0	58	299
8.00-8.15	58	1	0	0	16	75
8.15-8.30	66	2	0	0	13	81
8.30-8.45	83	2	0	0	17	102
8.45-9.00	81	1	0	0	23	105
Total	288	6	0	0	69	363
9.00-9.15	67	1	0	0	16	84
9.15-9.30	73	1	0	0	22	96
9.30-9.45	66	0	0	0	17	83
9.45-10.00	71	0	0	0	19	90
Total	277	2	0	0	74	353