THE EFFECT OF OVERSIZED LANE WIDTH AND LANE SHOULDER ON HEAVY VEHICLE PARKING ON RESIDENTIAL STREETS

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requirements for the award of the degree of
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Alhamdulillah..

A special thanks to my beloved ayah and mak for giving me infinite love, care and blessing

.

For my family, thanks for giving me some inspiration and strengthen on finishing this research

For my love one and friends, big thanks to all of you for helping me directly and indirectly

Thank you, everyone...

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ABSTRACT

Heavy vehicle are wider than passenger car, hence, it requires a wider space to operate and to park. When heavy vehicle drivers are unable to locate parking they often park on the road lane or shoulder. These vehicles should not be allowed to park on road lane or shoulder as it obstructs the vision of other drivers, the road lane or shoulder may require constant maintenance and repair; and pedestrian and motorists may be forced onto the streets or onto the wrong side of the streets in order to pass the heavy vehicles. This research was conducted to establish if width of road lane and road shoulders in neighbourhood streets will encourage heavy vehicle parking. Five residential areas in MPJBT were selected as the case study. Selected local and minor collector streets with heavy vehicle parked on it were measured for their actual lane width (ALW) and actual road shoulder width (ASW). The *t*-test was used to compare the means of ALW and ASW with the recommended JKR and JPBD standard. The *t-test* rejected the null hypothesis as the *sig- value p* is less than alpha level (α = 0.20) at 80% confidence level. The analysis indicates that almost all (80%) of ALW and ASW do not follow the recommended JKR and JPBD standard. The mean of ALW for both local and minor collector roads are oversized (p = 0.000). Comparisons of ALW for minor collector road also show a lower *p value* than the alpha level (p = 0.0002). The results further suggest that oversized lane will encourage heavy vehicles to be parked on it. The *t-test* also proved that the mean of ASW for both local (p = 0.000) and minor collector (p = 0.001) streets do not follow the recommended JKR standard. It is concluded that oversized lane and road shoulders widths provides an opportunity for heavy vehicle drivers to misuse the space.

ABSTRAK

Kenderaan berat adalah lebih luas daripada kereta penumpang, dengan itu, memerlukan ruang yang lebih luas untuk beroperasi dan untuk meletak.Apabila pemandu kenderaan berat tidak dapat untuk mencari tempat meletak mereka sering meletakkan di lorong atau bahu jalan. Kenderaan ini tidak harus dibenarkan untuk meletakkan di lorong atau bahu jalan kerana menghalang penglihatan pemandu yang lain, lorong atau bahu jalan mungkin memerlukan penyelenggaraan yang berterusan dan pembaikan; dan pejalan kaki dan pemandu kenderaan mungkin terpaksa ke jalan-jalan atau sisi yang salah bagi melepasi kenderaan berat. Kajian ini telah dijalankan untuk menentukan sama ada lebar lorong dan bahu jalan di jalan-jalan kejiranan akan menggalakkan letak kenderaan berat. Lima kawasan perumahan di MPJBT telah dipilih sebagai kawasan kajian kes. Jalan dipilih merupakan jalan pengumpul minor dan tempatan dengan kenderaan berat yang diletakkan di atasnya diukur bagi mendapatkan ukuran sebenar lorong (ALW) dan ukuran sebenar bahu jalan (ASW). Ujian *t*-test digunakan bagi membandingkan purata ALW dan ASW dengan piawaian yang disyorkan JKR dan JPBD. *T*-test menolak hipotesis nol apabila nilai *sig- value p* kurang dari paras alfa (α = 0.20) pada 80% tahap keyakinan. Analisis menujukkan hampir semua (80%) ALW dan ASW tidak mengikut piawaian yang disyorkan JKR dan JPBD. Min ALW bagi kedua-dua jalan tempatan dan pengumpul adalah lebar (p = 0.000). Perbandingan ALW untuk jalan pengumpul kecil juga menunjukkan nilai p lebih rendah daripada tahap alfa (p =0.0002). Keputusan seterusnya mencadangkan bahawa lorong besar akan menggalakkan kenderaan berat diletakkan di atasnya. *T-test* juga membuktikan bahawa min ASW untuk kedua-dua jalan tempatan (p = 0.000) dan pengumpul minor (p = 0.001) tidak mengikut standard JKR yang disyorkan. Disimpulkan lorong dan bahu jalan yang lebar memberi peluang kepada pemandu-pemandu kenderaan berat menyalahgunakan ruang.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

μ	-	The mean of the study population
$\bar{x}$	-	Sample mean
α	-	Probability of Type I error
T	-	Tons
m	-	Meter
t_{obs}	-	The t- statistic
s	-	The sample standard deviation
n	-	The number of observation units in the sample
$n_{\circ}$	-	Infinite sample size
$Z^2\alpha_2$	-	Z values on significant level
p	-	Proportion of residential area that face a problem of heavy vehicle parking
$(1-p)$	-	q, which is the proportion of residential area that do not face the a problem of heavy vehicle parking
e	-	margin of error
N	-	Total of actual population
H_0.	-	Null Hypothesis
H_1	-	Alternative Hypothesis
$\bar{x}$	-	the sample mean

GLOSSARY OF TERMS

AASHTO	-	American Association of State Highway and Transportation Officials
ADT	-	Annual Daily Traffic
ALW	-	Actual Lane Width
ASW	-	Actual Road Shoulder Width
FHWA		Federal Highway administration
GVM	-	Gross Vehicle Mass
ITE	-	Institute Transport Engineering
JKR	-	Jabatan Kerja Raya
JPJ	-	Road Transport Department
JPBD	-	Jabatan Perancang Bandar dan Desa
MDOT	-	The Maryland Department of Transportation
MPJBT	-	Majlis Perbandaran Johor Bahru Tengah
NZ	-	New Zealand
ROW	-	Right of ways
RORO	-	Roll on roll offs
SPSS	-	Statistical Package for the Social Sciences
SLW	-	Standard Lane Width
SSW	-	Standard Road Shoulder Width
t-test	-	Student's *t*-test
z- test	-	Normal Deviate (z) Test
Sig value	-	Significant Value

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

The speedy growth in the industrial and trade sector has increased the demand of heavy vehicle transport. It is widely applied as one of the primary methods of moving and distributing goods from inside and outside the state. The Road Transport Department Malaysia (JPJ) reported that the registration numbers of new heavy vehicles (lorries) are steadily increasing since the year 2000 until 2009. Therefore, this situation has led to the existence of issues and problems related to the inadequacy and insufficiency of the available parking spaces for those vehicles (JPBD, 2012). There are four areas most frequently occupied by heavy vehicle drivers to park their vehicles. These areas are public rest areas, privately owned truck stops, other private locations (e.g., loading docks) and along the roadway (ROW) (Smith *et. al*, 2005). Yet, ROW which includes road lane and shoulder is considered as dangerous and illegal area for heavy vehicle to park.

Heavy vehicle drivers have difficulty in finding space to park their vehicles in the parking lot. When heavy vehicle drivers are unable to locate their vehicle in the parking lot, they often unsafely park on the road lane or shoulder of neighbourhood streets. Parking on road lane and shoulder are not safe and may even create potential safety hazards for themselves as well as other drivers. Charlton *et.al* (2002) found that general road users often have negative perceptions towards heavy vehicles as heavy vehicle drivers park on neighbourhood streets. In addition, the result of the

study by Luther *et al* (2002) showed that heavy vehicles are a significant community issue on main arterial roads and state highways for residents

Consequently, to create a safe environment for residents and other drivers, this research examined to w extent to which the width of the lane and road shoulders that greater than the recommended standard contribute to heavy vehicle parking problem in residential areas.

1.1 Background of Problem

The road lane and shoulder are important features of the road pertaining to the safety and comfort driving. In general, road lane is defined as a lane for the movement of vehicles travelling from one destination to another. In addition, Jabatan Kerja Raya (JKR, 1986) described the road shoulder as the portion of the roadway continuous with travelled way for accommodation of stopped vehicle, for emergency use and for lateral support of pavement.

However, when a road lane and shoulders are abused for the purpose of heavy vehicle parking, it creates traffic hazard for residents and drivers including pedestrian and motorists. According to the study done by the Baltimore Regional Transportation Board (2006), truck parking in unsuitable locations such as on road shoulder may cause safety risk to motorists. Besides, the study showed by Maryland Department of Transportation (MDOT, 2005) also show that on whatever given day, approximately 55 to 70 trucks have ample room to park on the wide road shoulders which affect the safety of motorist and truck driver.

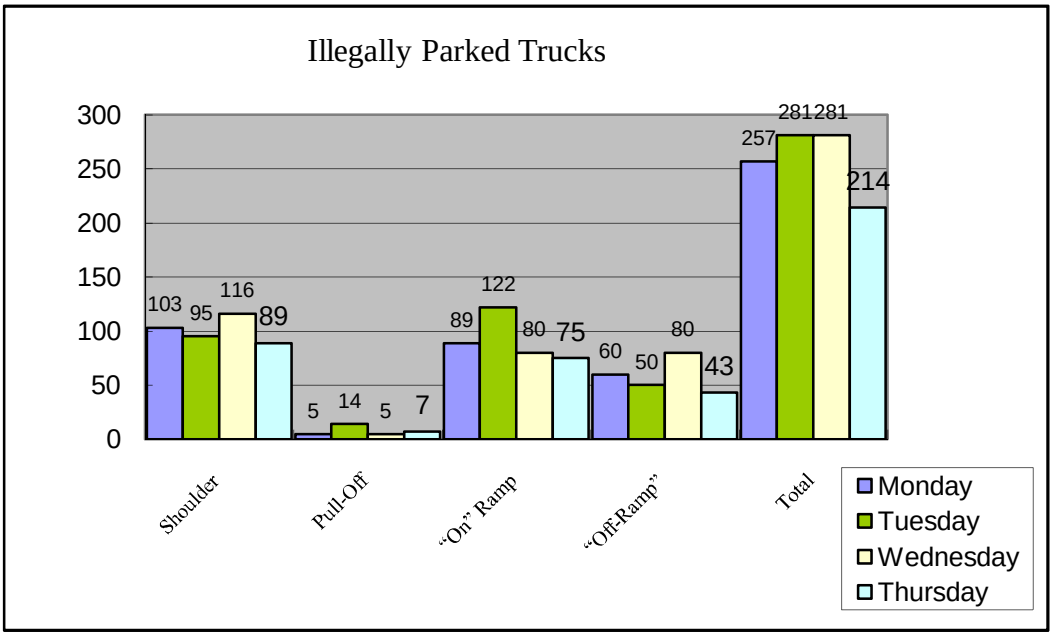

Figure 1-1: Result of Truck Parking study conducted by The Maryland Department of Transportation (MDOT) on year 2005

Other than that, parking the heavy vehicles on road lane and shoulder will also restrict the width of travel lanes for other road users especially for emergency vehicles such as fire engines. Reducing a street to certain width prevents fire engines to arrive on the scene of fire (Arizona Board of Regents, 2006). In Blain Avenue Fire at Galesburg in United States, the street narrowness was claimed as the factor which obstructs the setup of fire equipment (Kroll, 1999).

In Great Baltimore Fire of 1904 (Enoch Pratt Free Library, 2004), insufficient road width is defined as the major problem in fire fighting. Consequently, the fire spreads faster to the entire block and the next building. Besides, the heavy vehicle, pedestrian and motorists may be forced onto roads and may even need to make wrong turns on the road. Therefore, this may most likely lead to traffic accidents involving pedestrian. Figure 1-2 show how parked heavy vehicles on road lane and shoulders narrowing the width of the road.

Figure 1-2: Heavy vehicle parking on lane and road shoulder has reduced the access width particularly for fire engines.

There is no doubt that the growing number of heavy vehicles such as trucks can be a sign of economic expansion towards our industry. However, this growing number can also be a sign of constant investment which is necessary for roadway improvement and damages if the uncontrolled heavy vehicle parking problem in neighbourhood street constantly happens. Every year, millions of Ringgit has been expended to restore the road damages caused by trucks. Minister of Works Datuk Seri Shaziman Abu Mansor stated that RM 747 million was spent on the maintenance of federal roads throughout the country between January and October 2012. Heavy vehicles can severely damage roads more as compared to other automobile traffic. Research from South Africa Department of Transport and Council has shown that light vehicles such as cars and light lorries make a relatively minor contribution to road damage compared to heavy vehicles

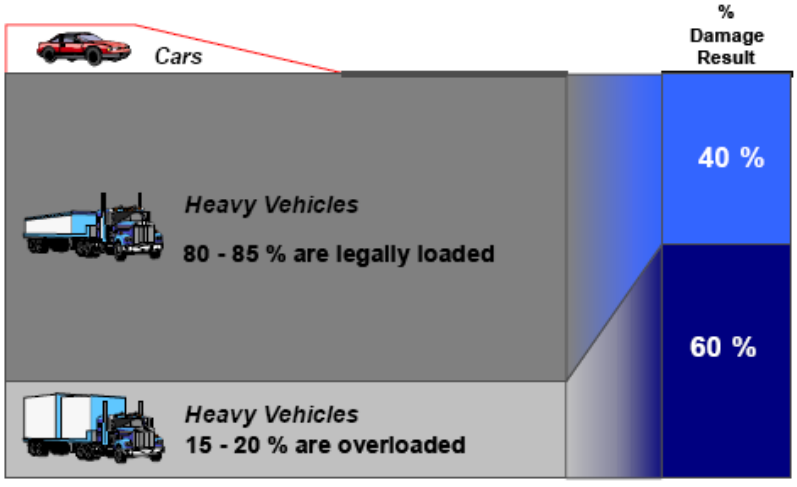

Figure 1-3: Impact of vehicle weight toward road pavement damages.

In summary, the problem poses danger to pedestrian and motorist, an obstruction or impending vision for residents to drive in and out of their house, road damage and late arrival of fire engines may result when heavy vehicles regularly are parked in road lane and road shoulder.

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1.2 Problem Statement

Heavy vehicle parking on residential streets may contribute to unsafe environment for residents and other road users. The two main unsafe locations most often occupied by heavy vehicle drivers are lane and road shoulder of neighbourhood streets. The study by Luther *et al* (2002) showed that heavy vehicles parking are a significant community issue for residents and other road users on main arterial roads and state highways.

Nevertheless, not all road lane and shoulder are employed as parking areas for heavy vehicle. This is because heavy vehicle drivers require special operating characteristic and more generous space to park their vehicle. Guideline of Heavy Vehicle Terminal by JPBD pointed that heavy vehicle drivers need at least minimum 3.06m width to be able to park their vehicles. AASHTO (2011) also stated that a 3.00m road lane and shoulder widths are insufficient where trucks may exhibit a substantial risk to passing motorist.

Nowadays, neighbourhood streets are often made more spacious than usual to give the impression that the developers are generous to the automobile users and to facilitate the movement of vehicles (Shah, 2007). The wider than usual road width which exceeding the recommended standard creates the illusion of a luxurious development. Nevertheless, these extra road spaces are misused for heavy vehicle parking which subsequently create traffic hazard for residents and other road users including pedestrians and cyclists.

In future, the problem of heavy vehicle parking on road lane and shoulders may get worse when more neighbourhood streets are expected to provide extra road spaces with the increasing of heavy vehicle car ownership. Therefore, this study will focus on examine to what extent the width of lane and road shoulders that are oversized or greater than the recommended standard contributes to heavy vehicle parking problem on residential streets.

Study focused on oversized streets and not the narrow streets because there are several heavy vehicles such as emergency vehicle, garbage truck and school bus are needed to access the neighbouring areas for certain purpose. Besides, it is not appropriate to reduce the width of residential street less than recommended standard as the standard recommended by JKR are recommend after considering the function of the proposed streets and the area it transverse and it also restrict the access of heavy vehicles

1.3 Research Question

This research attempts to answer the following questions:

i. Does the Actual Lane Width (ALW) greater than the Recommended Standard Lane width (SLW) contributes to the problem of the heavy vehicle parking in residential streets?

ii. Does the Actual Shoulder Width (ASW) greater than the Recommended Standard Shoulder width (SSW) contributes to the problem of the heavy vehicle parking in residential streets?

1.4 Research Aims and Objectives

This research aims to investigate to what extent the width of lane and road shoulders that greater than recommended standard contributes to heavy vehicle parking problem in residential. The following objectives are developed in line with the aim of the research:-

i. To assess the effect of Actual Lane Width (ALW) that greater than Standard Lane Width (SLW) on the problem of heavy vehicle parking on residential streets.

ii. To assess the effect of Actual Shoulder Width (ASW) that greater than Shoulder Standard Width (SSW) on the problem of heavy vehicle parking on residential streets.

1.5 Research Hypotheses

The research questions (Section 1.3) help to understand to what extent the lane and road shoulders width that greater than recommended standard contributes to heavy vehicle parking problem in residential areas. In order to answer the question and achieve the objectives, the research hypotheses were developed. Below are the null hypothesis (H_o) and alternative hypothesis (H_1) developed for each research question according to the types of neighbourhood street.

Research Question 1

Does the Actual Lane Width (ALW) greater than the Recommended Standard Lane width (SLW) contributes to the problem of the heavy vehicle parking in residential area?

a. Local road using recommended SLW required by JKR and JPBD

H_o: The mean of ALW for local road is equal to the recommended $SLW_{JKR\ \&\ JPBD}$ of 2.75, ($\mu = 2.75$)

H_1: The mean of ALW for local road is greater than recommended $SLW_{JKR\ \&\ JPBD}$ of 2.75, ($\mu > 2.75$)

b. Minor collector road using recommended SLW required by JKR

H_o: The mean of ALW for minor collector road is equal to the recommended SLW_{JKR} of 3.00, ($\mu = 3.00$)

H_1: The mean of ALW for minor collector road is greater than recommended SLW_{JKR} of 3.00, ($\mu > 3.00$)

c. Minor collector road using recommended SLW required by JPBD

H_o: The mean of ALW for minor collector road is equal to the recommended SLW_{JPBD} of 3.25, ($\mu = 3.25$)

H_1: The mean of ALW for minor collector road is greater than recommended SLW_{JPBD} of 3.25, ($\mu > 3.25$)

Research Question 2

Does the Actual Shoulder Width (ASW) greater than the Recommended Standard Shoulder width (SSW) contributes to the problem of the heavy vehicle parking in residential area?

a. Local road using recommended SSW required by JKR

H_o: The mean of ASW for local road is equal to the recommended SSW_{JKR} of 2.00, ($\mu = 2.00$)

H_1: The mean of ASW for local road is greater than recommended SSW_{JKR} of 2.00, ($\mu > 2.00$)

b. Minor collector road using recommended SLW required by JKR

H_o: The mean of ASW for minor collector road is equal to the recommended SSW_{JKR} of 2.5, ($\mu = 2.00$)

H_1: The mean of ASW for minor collector road is greater than recommended SSW_{JKR} of 2.5, ($\mu > 2.50$)

1.6 Theoretical and Conceptual Framework

Sufficient road lane and shoulder width are a key consideration for heavy vehicle to park on the road lane and road shoulders. This is because heavy vehicles are significantly wider than passenger car and require special operating characteristic and more generous spaces in finding a parking area. The total heavy vehicle width including mirrors is nearly 3.0 meters (Land Transport NZ, Guide to Heavy Vehicle Management, 2006).

As for neighbourhood street design, JKR requires the recommended standard as a common approach in providing the lane and road shoulder width. The lane width fit for neighbourhood streets is recommended to be 2.75m for local road and 3.00m for minor collector road. However, JPBD recommends wider width for minor collector road which is 3.25m wide. On the other hand, the standard shoulder width recommended by JKR for local road and minor collector road are 2.00m and 2.50m respectively.

Lane and road shoulder width greater than 3.00m is considered one of the criteria to enable heavy vehicle drivers to park their vehicles. However, by taking consideration of road lane and shoulders width standard, the width that is more than recommended standard is considered as extra road space.

This study examines to what extent the lane and road shoulders width that greater than the recommended standard contributes to heavy vehicle parking problem in residential areas. The actual road lane and shoulder width measured on sites are used to compare with the recommended standards required by JKR and JPBD. The findings are expected to help the transportation planner, road designer and developer to update their current practice on the provision of lane and road shoulder width in residential area. Figure 1-6 shows the conceptualized relationship between the independent and dependent variables.

INDEPENDENT VARIABLE			**DEPENDENT VARIABLE**
1. Types of lane width for neighborhood street.	• Actual Lane width of Local Street. • Actual Lane width of minor collector road	→	Recommended Standard required by JKR and JPBD
2. Types of road shoulder width for neighborhood street	• Actual Road shoulder width of Local Street. • Actual Road Shoulder width of minor collector. road	→	Recommended Standard required by JKR

Figure 1-4: The Conceptualize relationship between the variables in this study

1.7 Scope of Research

To fulfil the aims and objectives that have been set up, the following scopes are formulated.

1.7.1 Study Object

Heavy vehicle drivers need a sufficient road lane and shoulder width to enable them to park on the road lane and road shoulders. In this study, actual ALW and ASW are selected as the factors that influence heavy vehicles to park on road lane and shoulder. ALW and ASW obtained will later be used to compare with the SLW and SSW by JKR and JPBD.

The road lanes and road shoulder width taken for measurement must have a heavy vehicle park along it since not all road lanes and shoulder are suitable to use as parking space for heavy vehicle. The road lane of ALW must be paved. Meanwhile, road shoulders do not have to be paved as unpaved shoulder is also seen as a type of road shoulder. The study has put a limit in measuring the road shoulder width which only covers white line at the edge of the carriageway till the drain and fencing (Section 3.4.2).

1.7.2 Study Area

The site survey will be conducted in residential areas located in MPJBT area. Selection of residential areas will be based on the residential areas that facing a problem of heavy vehicle parking in their neighbourhood area. Information concerning location of heavy vehicle parking in the neighbourhood area was obtained on the number of heavy vehicle parking compounds issued by

neighbourhood areas in MPJBT. Five neighbourhood areas in MPJBT were selected for this research (see section 3.3.3).

Road lane and shoulder to be measured are residential areas from one, two and three storey such as bungalow, semi-detached, town house and terraced houses. Housing areas at higher density are also not included in the study such as shop house, town house, flat and apartment. All these high density neighbourhoods utilize a different SLW and SSW and mostly are classified as the confidential document. Besides, neighbourhood situated in a gated and guarded community is also not included as heavy vehicle are no allowed to access the area. The reason is to select terrace residential area is that the recommended standards used are standardized.

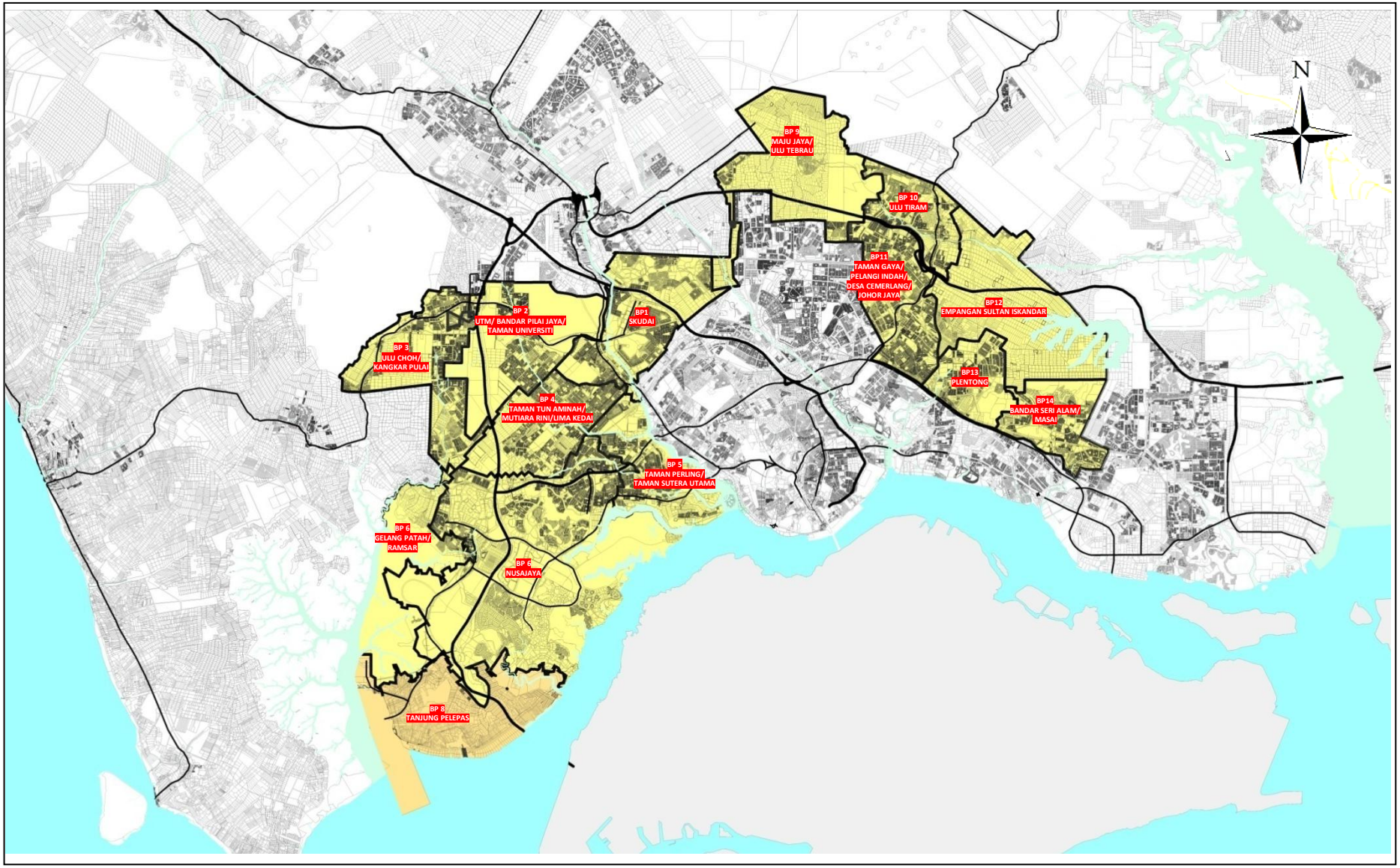


Figure 1-5: Study Area

1.7.3 Time for ALW and ASW measurement

The surveys were carried out to measure the ALW and ASW during two time periods which are daytime during weekend and night time during weekdays. During weekend, most of the working group especially heavy vehicles drivers do not work and reveal how they park their heavy vehicles more accurately. For weekdays, starting from 7 p.m to 7 a.m, the time is ideal to measure the lane and road shoulder that have heavy vehicle park on it as most heavy vehicle drivers will be back from work and park their heavy vehicles.

This site surveys were conducted three times a week which are on Friday, Saturday and Sunday. Thus, within a month there are twelve times in total and the survey were carried out for two consecutive months in all selected residential area that have been choose through sampling method.

1.7.4 Road Lane and Shoulder width Standard

This study examines to what extent the lane and road shoulders width that greater than recommended standard contributes to heavy vehicle parking problems in residential. The recommended standards of road lane and shoulder width used in this study are from JKR and JPBD. Other standards are not considered in this research analysis.

1.8 Research Assumptions

In this study, two assumptions were made during the investigation for ALW and ASW survey:

i. All selected survey road lane and shoulder width remain unchanged during the survey period. There is no consideration for road lane shoulder width widening or narrowing in future.

ii. The study only considered recommended standards which are required by JKR and JPBD for the study area. Therefore, the result of the study may not be appropriate for other areas using different standard.

1.9 Limitations of Research

The information concerning the location of heavy vehicle parking in the neighbourhood area was obtained through the number of heavy vehicle parking compounds issued by neighbourhood areas in MPJBT. However, these numbers of compound obtained do not reflect the actual number of the residential areas that face heavy vehicle parking problem in MPJBT area. This is because there might be other residential areas that have the same problem but not listed as there is no compound released in their area. Consequently, the study will need to determine the actual number of the residential areas that face heavy vehicle parking problem in their area. Then, the result obtained from this study will reflect all the residential areas that face the problem of illegal heavy vehicle parking in MPJBT area.

1.10 Expected Contributions

The outcome of this study should provide answer whether the width of lane and road shoulders greater than recommended standard contributes to heavy vehicle parking problem in residential areas. This research will provide the fundamental references for selection of an appropriate of road lane and road shoulder width to prevent a problem of heavy vehicle parking in residential and to enhance the safety for the residents and other road users. The finding of this study is also expected to raise an attention and awareness on current planning practice since it is important to follow the recommended standard in provision and designing the neighbourhood street.

1.11 Significance of Research

This research will benefit the local authority, transport planner, developer and residents living in that area. Some of the benefits are as follows:-

i. The study will confirm whether the width of lane and road shoulders that greater than recommended standard contributes to heavy vehicle parking problem in residential or not.

ii. Will help to create a safe environment for residents and other road users like pedestrian and motorist by improving the safety and effectiveness of vehicle movement.

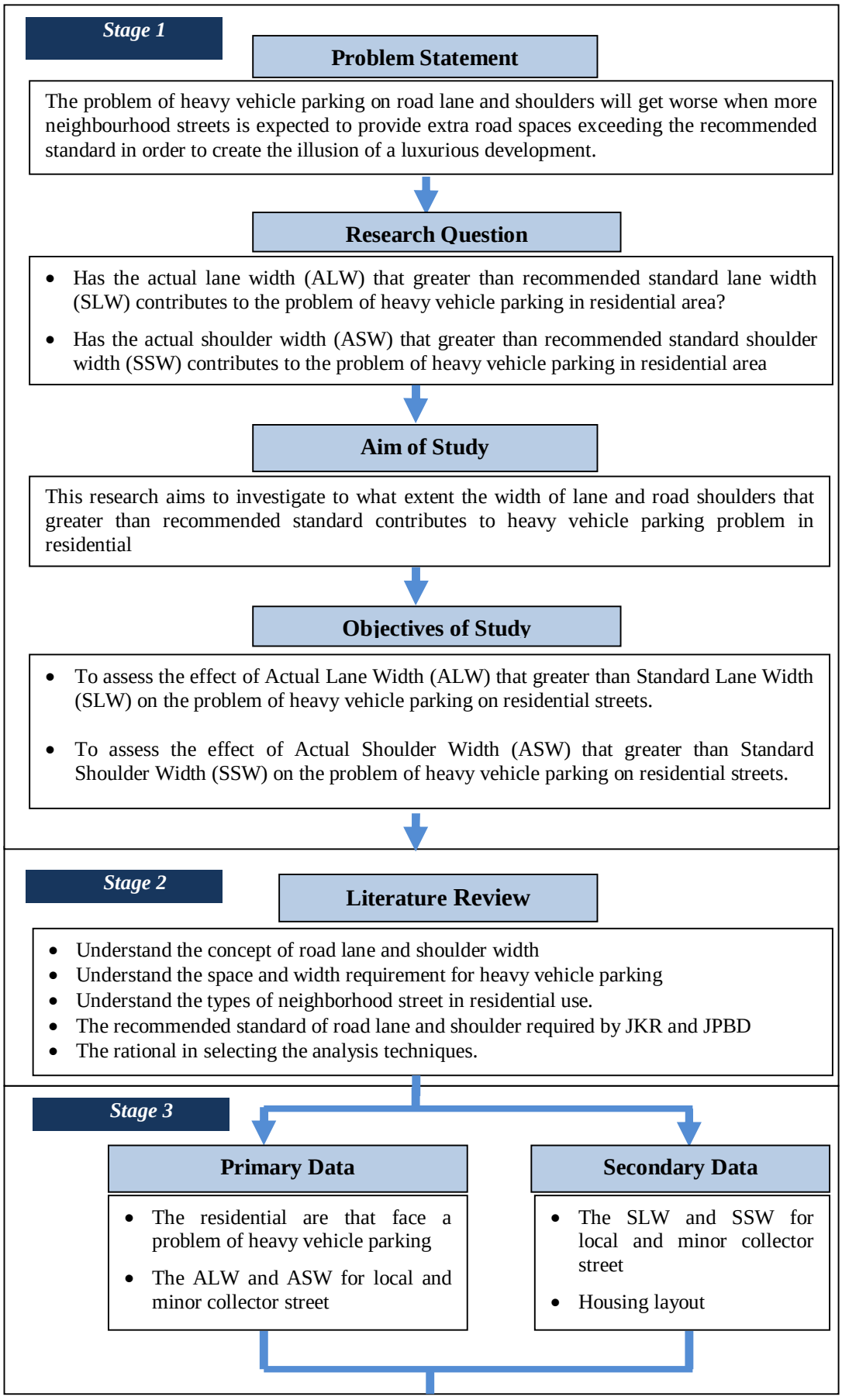
1.12 Research Design

This study is divided into five stages (refer Figure 1-5). The first stage is to identify the problem statement of study, research question and aim and objectives of study.

In second stage of study, previous studies and report have been reviewed to understand the concept of the road lanes and shoulder width and heavy vehicle requirement for parking spaces. This includes the functions, types of lane and road shoulder of neighbourhood streets and factor that affect heavy vehicles to park. The information is reviewed in order to identify the recommended standard of lane and road shoulder width as the evaluation guidelines for this study

Third stage of the study began with interviewing the officers from Enforcement and Regulatory Department of MPJBT. The purpose of conducting the interview is to find out the residential areas that are frequently having a problem with heavy vehicle parking. The obtained data are in the form of a number of heavy vehicle parking compounds issued by neighbourhood areas in MPJBT. This information is essential to calculate the survey sample, sample selection and survey time estimation, as well as the map for survey route marking. Then, a site survey will be carried out to measure the actual lane and road shoulder width of neighbourhood streets that have a heavy vehicle park on it. The data are then categorised into street types based on the recommended standard required by JKR and JPBD.

Stage four is to analyse the collected survey data. Descriptive statistic is used to understand and computing the proportion of the mean of the actual lane and road shoulder width that pass and fail the recommended standard required by JKR and JPBD. The data of actual road lane and shoulder width were compared with the recommended standard. The information will then be added into the inferential statistic to study whether the width of lane and road shoulders that greater than recommended standard contributes to heavy vehicle parking problem in residential. Microsoft office Excel is the software used to present the results of descriptive analysis. Statistical Package for the Social Science (SPSS) is used to perform one sample *t-test*. Last stage is to summarise the research findings and to recommend solution to improve the provision road lane and shoulder in residential area.


Stage 1
Problem Statement
The problem of heavy vehicle parking on road lane and shoulders will get worse when more neighbourhood streets is expected to provide extra road spaces exceeding the recommended standard in order to create the illusion of a luxurious development.
Research Question
Has the actual lane width (ALW) that greater than recommended standard lane width (SLW) contributes to the problem of heavy vehicle parking in residential area?
Has the actual shoulder width (ASW) that greater than recommended standard shoulder width (SSW) contributes to the problem of heavy vehicle parking in residential area
Aim of Study
This research aims to investigate to what extent the width of lane and road shoulders that greater than recommended standard contributes to heavy vehicle parking problem in residential
Objectives of Study
To assess the effect of Actual Lane Width (ALW) that greater than Standard Lane Width (SLW) on the problem of heavy vehicle parking on residential streets.
To assess the effect of Actual Shoulder Width (ASW) that greater than Standard Shoulder Width (SSW) on the problem of heavy vehicle parking on residential streets.
Stage 2
Literature Review
Understand the concept of road lane and shoulder width
Understand the space and width requirement for heavy vehicle parking
Understand the types of neighborhood street in residential use.
The recommended standard of road lane and shoulder required by JKR and JPBD
The rational in selecting the analysis techniques.
Stage 3
Primary Data
The residential are that face a problem of heavy vehicle parking
The ALW and ASW for local and minor collector street
Secondary Data
The SLW and SSW for local and minor collector street
Housing layout

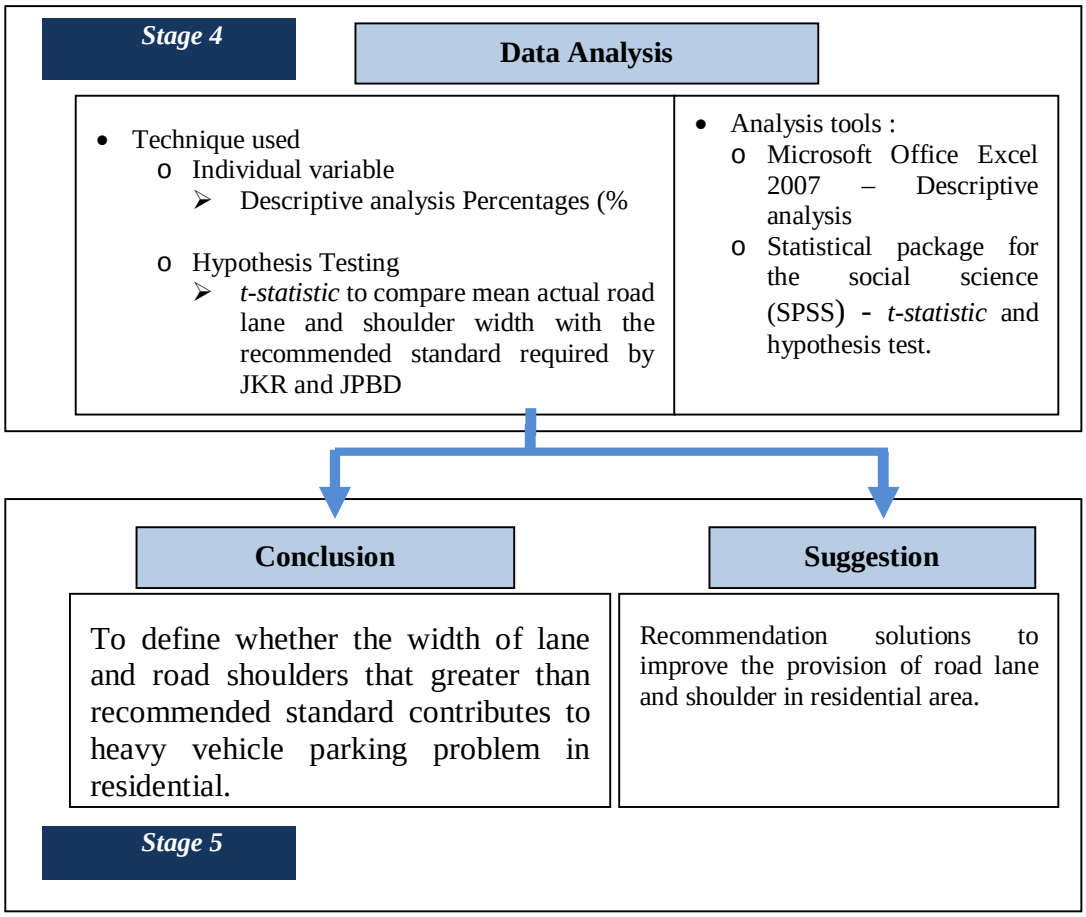


Figure 1-6: Study flow Chart

1.13 Thesis Outlines

This section describes the organization of the research from Chapter 1 to the last chapter. The chapters are involved in this research are as follows:-

i. **Chapter 1**

This chapter provides a clear explanation of the issues related to illegal heavy vehicle parking in the neighbourhood where it is the main reason for this research. Result of verifying the issues and problems will help in formulating research aims, objectives, scopes and significance of the research.

ii. Chapter 2

This stage involves literature studies to understand and reviewing the road lane and shoulder width concept and heavy vehicle requirement for parking spaces. This also includes the types of neighbourhood street and current recommended standards. The reviews that are described in this phase will be organized and used to formulate research methodology, data collection and analysis.

iii. Chapter 3

In this chapter, the process used to gather the data and other types of information were outlined. Explanations are available for data sources, research equipment, survey time, site selection, the determination of sample size, sampling method and the application of analytical techniques for data analysis. It will also touch about the data needed for performing the analysis where it comes from both primary and secondary sources.

iv. Chapter 4

Collected data will be analysed through the use of appropriate methods that have been designed in chapter 3. The analysis will focus on the comparison between the actual lane and road shoulder width with the recommended standard required by JKR and JPBD

v. **Chapter 5**

After analysing the data obtained, a conclusion on the findings of the research will be presented and discussed in order to propose the improvement in provision of road lane and shoulder

1.14 Summary

Chapter 1 introduces the background of the problem regarding the heavy vehicle parking on road lane and shoulder and how it brings various negative impacts to residents and other road users. The actual width of road lane and shoulder is used as the factor to evaluate the characteristic of road lane and road shoulder that contribute to the problem of heavy vehicle parking in residential areas. Current situation shows the gap exists between the actual road lane and shoulder width with their recommended standard required. This might be because the wider than usual road width which is exceeding the recommended standard to create the illusion of a luxurious development and to give the impression that the developers are generous to the automobile users.

This research aims to investigate to what extent the width of lane and road shoulders that greater than recommended standard contributes to heavy vehicle parking problem in residential. As a result, there are three objectives were

formulated; first, to compare ALW of road lane that have heavy vehicles park on it with the recommended SLW required by JKR and JPBD. Second, to compare ASW of road lane that have heavy vehicles park on it with the recommended SSW required by JKR. Finally, to propose improvements in provision of road lane and road shoulder of neighbourhood street. The first two objectives then are furthered into the hypothesis in order to investigate to what extent the width of lane and road shoulders that greater than recommended standard contributes to heavy vehicle parking problem in residential. The theoretical and conceptualized framework explains the road lane and shoulder as the variables that depend on recommended standard required by JKR and JPBD

The information concerning location of heavy vehicle parking in the neighbourhood area was obtained through the number of heavy vehicle parking compounds issued by neighbourhood areas in MPJBT. Sample streets that have heavy vehicle park on it are selected from five neighbourhood area as they face heavy vehicle parking problem in their area. The research finding assumed all selected survey road lanes and shoulder width remain constant during the survey period and the study only considered recommended standard required by JKR and JPBD for the study area. This report will provide an answer whether the width of the lane and road shoulders that greater than recommended standard contributes to heavy vehicle parking problem in residential.

In chapter two, there are reviews on some concepts of the current geometric standard of road lanes and shoulder and relevant requirement for heavy vehicle parking spaces. The concept and types of neighbourhood street and analytical are reviewed in this chapter. Chapter three introduces the detailed of methodology used to conduct this study. Data collection, survey information, sample size, sampling and analytical techniques are explained. Analysis for data from the site survey will be presented in chapter 4. Lastly, chapter 5concludes the analysis of the findings and provides the suggestions to improve the provision of road lane and road shoulder of the neighbourhood street.

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