



The Impact of the Speed Humps on the 85th Speed at Local Streets

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Abstract

Riyadh is one of many cities where high speeds exist within residential neighborhoods. On local streets where these incidents occur, the Riyadh Municipality is already using speed humps to reduce the 85th speed limit.

The purpose of the research is to look into the effect of speed humps on the 85th speed on local streets, and whether implementing such speed humps will result in a lower 85th speed to reach the posted speed on local streets.

A representative local street in Riyadh was chosen, with two successive speed humps at its entrance. The impact of these Humps on the 85th speed level on this street, as well as whether the operating conditions were hazardous, were investigated. The speeds in both directions were measured and compared, as were the speeds on the affected and unaffected sides.

Keywords: Speed Humps, 85th Speed, Local Streets, Traffic Engineering, Traffic Calming



1. Introduction

According to the Institute of Traffic Engineers (ITE) Traffic calming is defined as “the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users” (Lockwood, 1997). The objective of traffic calming is to reduce the speed and volume of traffic to acceptable levels for increasing the safety of the roadway (Ewing, 1999).

The use of traffic calming devices such as speed humps, speed bumps, speed tables, transverse rumble strips, and textured pavement is increasing in line with the growth in speed on local streets.

Despite their effectiveness and ease of installation, speed humps are the most common type of traffic calming device. However, a large number of these humps are randomly placed on many Saudi roads without any engineering studies or justifications. This paper describes a case study that was used to collect and analyze measured inspection data in order to assess the impact of speed humps on 85th speed on local streets in Riyadh.

Speed humps, according to the Riyadh Traffic Calming Manual (2006), are defined as a raised section of pavement across a road intended to slow motorists down, particularly on local streets between buildings.

The 85th speed, according to the Riyadh Traffic Calming Manual (2006), is the speed at or below which (85%) of vehicles travel on the road without being affected by slower vehicles or inclement weather. As a useful indicator for setting speed limits on the road.

The primary goal of this study is to investigate the effect of speed humps on local streets in the domain of 85th speed and whether these Humps are useful in decreasing the 85th speed inside these streets, where these speed humps are useful in decreasing the speed and improving pedestrian safety.

2. Methodology

This chapter describes the study's research methodology. Following a broad description of the existing situation and evaluation of the location chosen as a case study, traffic counting and data collection types and methods used in this study are described.

After determining the study's objectives, a local street should be chosen using the following criteria:



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- 1-The street hierarchy is a local street.
- 2-The length of a street must be at least 200 meters in order to increase the speed.
- 3- There are speed bumps on the road.
- 4-A sufficient justification for the speed humps' existence.

Abu Al-Mothafar Al-Azji is a local street in Riyadh that contains all of the warrants required to achieve the study's objectives. Figure (2.1) depicts a satellite image of the street area.

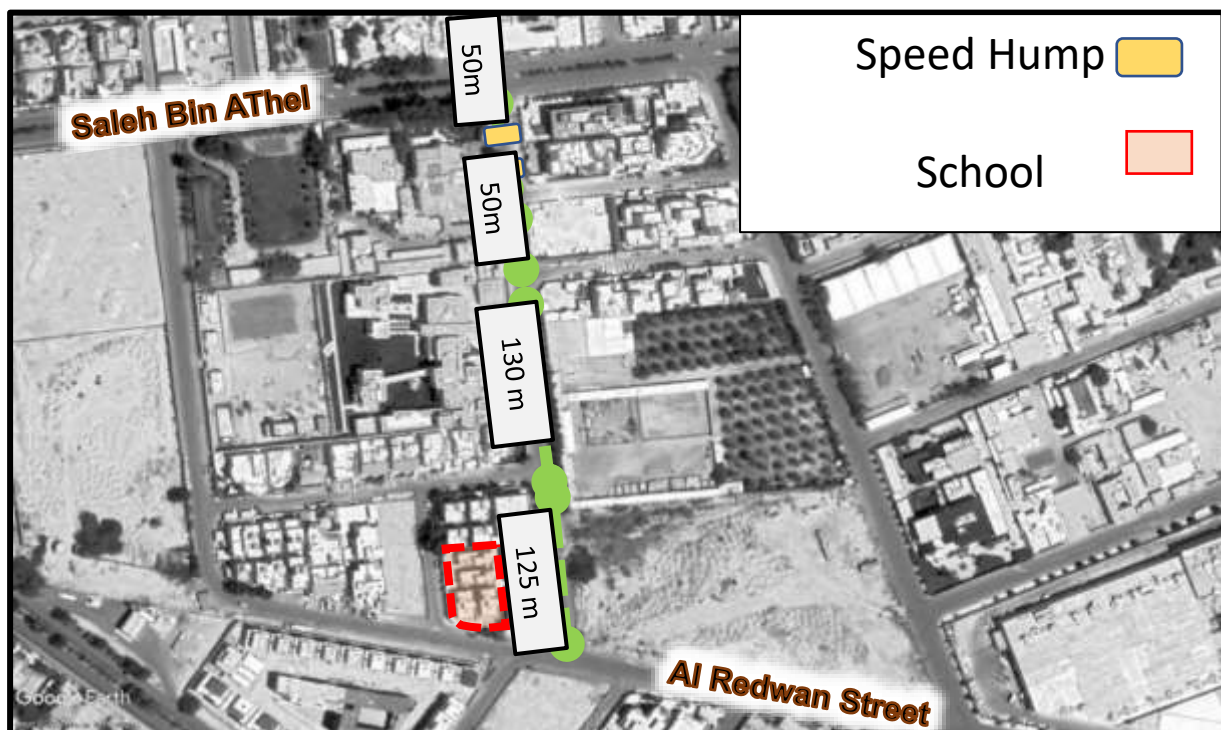


Figure (2.1): Abu Al-Mothafar Al-Azji Satelite Image

2.1 Traffic Survey

To collect the data, a metro count tube was added to the street, and the data was collected as follows:

- 1-An automatic count from Monday to Wednesday in both directions to collect traffic volumes on the road.
- 2-Collecting the speed of vehicles traveling in both directions on the same Automatic count days.



The metro count unit is defined in the middle of the targeted street to evaluate the effect of speed humps on the vehicles in the street; however, after reviewing the location of the speed humps, we can find that vehicles traveling to the south will be affected by the humps, while vehicles traveling to the north will not be affected. The metro count tube location is depicted in Figure (2.2).



Figure (2.2): Metro Count Location

2.2 Calculating 85th speed

The 85th speed was found by analyzing data collected by the metro count unit. To achieve the results, the speeds are divided into nine major groups, each of which contains ten speeds. For example, the first group will contain speeds ranging from 1 to 10 kilometers per hour.

Garber and Hoel (2018) define the steps for determining the 85th speed, which were used in this study by calculating the cumulative frequency for each category and drawing a chart with speed as the X-axis.

2.3 The Demand on the Road

Using the Automatic traffic count to determine the demand on the road is sufficient for determining the road's hierarchy and whether the street is local or not; this tactic is important to identify if the street chose to have fewer vehicles at peak hours, giving the driver an advantage to drive fast.



2.4 Define Street Hierarchy

The technical standards manuals for the elements and executive specifications for the components and elements of the road in Riyadh (2006) include several methods for determining the functional classification of streets and roads, which can be summarized as follows:

- ❖ Determine the daily traffic volumes crossing the road.
- ❖ road width.
- ❖ surrounding land use.

The guide for procedures for calming traffic in the city of Riyadh issued by the Ministry of Municipal and Rural Affairs / Riyadh Municipality in 2006 also specified the relationship between traffic volumes crossing the road and the functional classification of this road according to the table(1).

Table 1: The Functional Classification of the Roads According to Riyadh Manual

Road Hierarchy	The Boundary of Daily Traffic	The minimum Traffic Volume to applied the procedure of Traffic calming
Local Road	$\geq 1,000$	$\leq 1,000$ Vehicle/Day or ≤ 100 Vehicle/Hour
Collector Road	12,000 – 1,000	$\leq 4,000$ Vehicle/Day or ≤ 400 Vehicle/Hour
Secondary Arterial	30,000 – 5,000	$\leq 8,000$ Vehicle/Day or ≤ 800 Vehicle/Hour
Main Arterial	30,000 – 5,000	-

2.4 Define the Driving Severity

The severity of the speed problem is defined by ITE based on a comparison of the 85th speed and the posted speed on the roads; thus, finding the 85th speed will be useful for determining the driving conditions.

According to the figure (2.3), the 85th percentile of speed is compared to the approved speed limits to determine whether or not there is a severe speed problem in the site for several purposes, including reducing speeds for pedestrian crossings and others, as these colors represent the following:

- A. The first zone (green) represents the acceptable speed limits where there is no speed problem.
- B. The second region (yellow) represents the speed problem's moderate limits, and appropriate actions are required to address it.



- C. The third area (red) represents the boundaries where the speed problem is described as severe, necessitating appropriate measures to effectively address it.

Figure (2.3) depicts the severity of the speed based on the 85th and posted speeds.

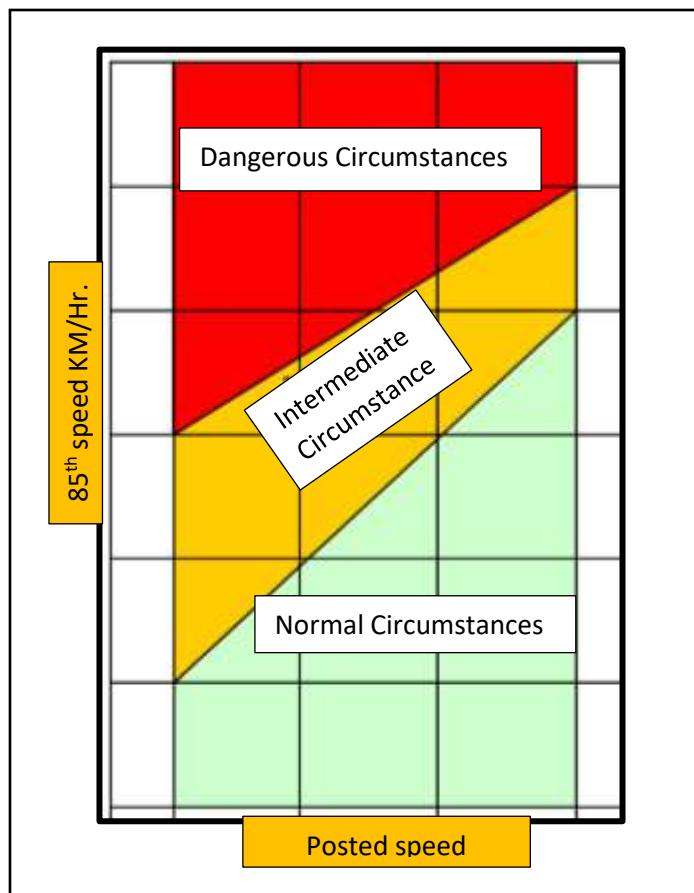


Figure (2.3): severity of the speed

3. Results And Discussion

This chapter describes how the study's traffic surveys were analyzed, as well as the data analysis results; however, the results' conclusions will be discussed in a separate section.

3.1 Analysis of Peak Hours

Peak hours were discovered through an analysis of traffic flow trends based on data collected in an automatic traffic count on the Abu Al-Mothafar Al-Azji street.



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The following were discovered during peak hours' analysis:

- During a working day, the traffic volume on Abu Al-Mothafar Al-Azji Road is 594 vehicles per day in both directions.
- During a working day, the average traffic flow on Abu Al-Mothafar Al-Azji Road is 202 vehicles heading north.
- During a working day, the average traffic flow on Abu Al-Mothafar Al-Azji Road is 392 vehicles heading south.

Figure (3.1) depicts the variation of volumes in the northbound direction, while Figure (3.2) depicts the variation of volumes in the southbound direction. The peak hour volume on Abu Al Mothafar AlAzji road is depicted in Figure (3.3).

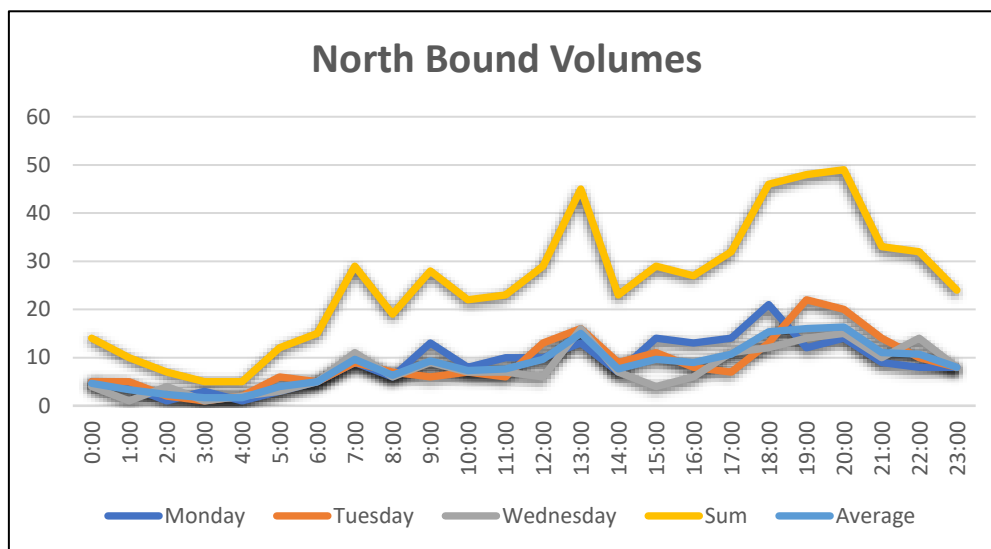


Figure (3.1): The Variation of volumes in the northbound direction.



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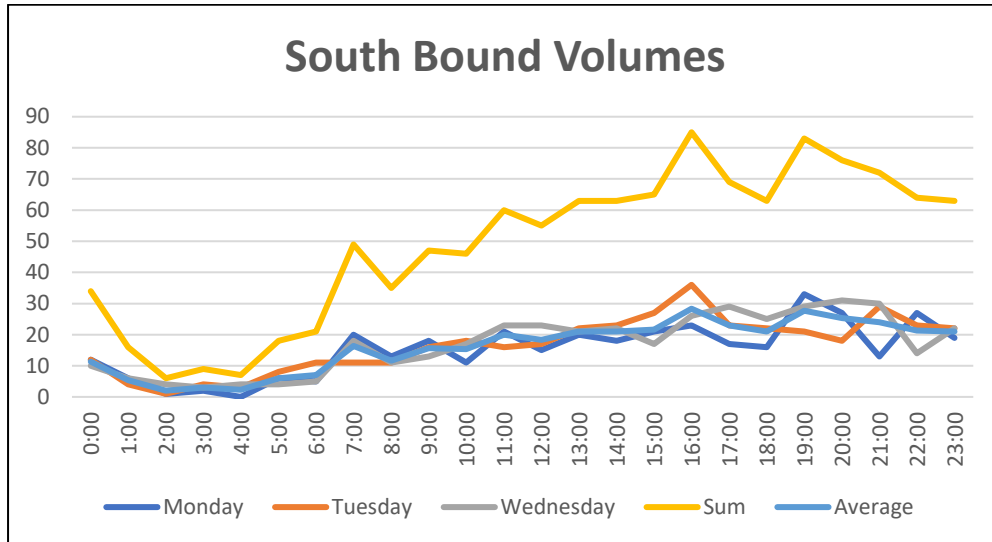


Figure (3.2): The Variation of volumes in the South Bound direction.

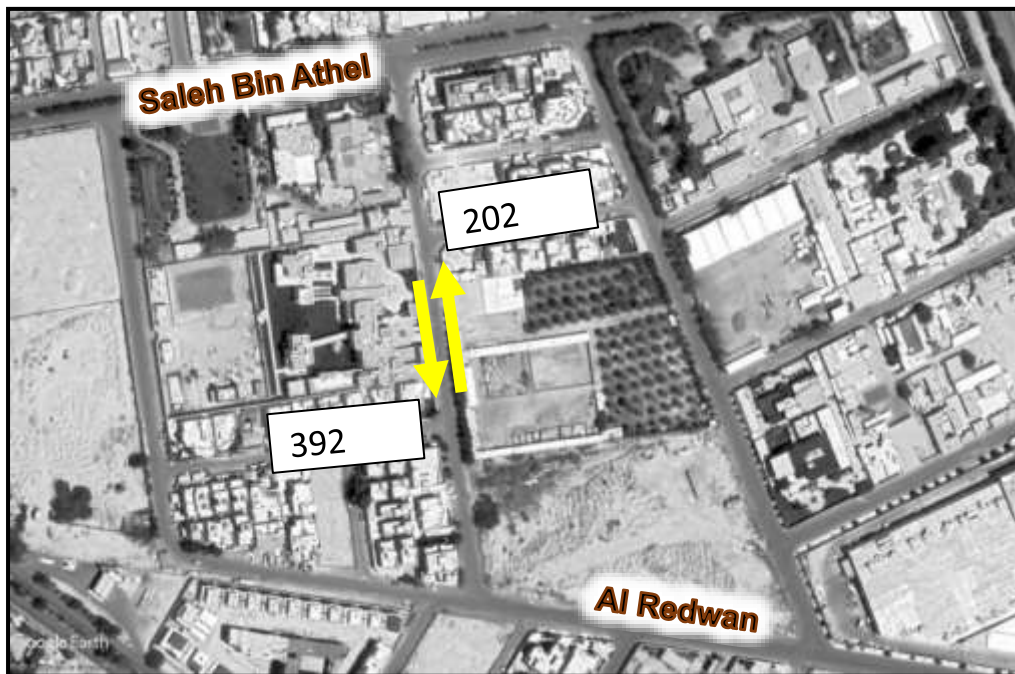


Figure (3.3): The peak hour volume on Abu Al Muthafar AlAzji road



According to Table 1 and a comparison of peak hour volume on the Abu AlMothafar Al-Azji road, it is definite that it is a local road.

3.2 The Speed Variation

Due to the lack of necessary traffic calming devices, 41 percent of vehicles traveling north are traveling at speeds greater than 50 km/h. Because of traffic calming measures implemented by the search section, most vehicles traveling south are traveling at speeds ranging from 20 to 30 km/h.

Figure (3.4) depicts the distribution of vehicle speed ratios (km/h) traveling north, while figure (3.5) depicts the distribution of vehicle speed ratios (km/h) traveling south.

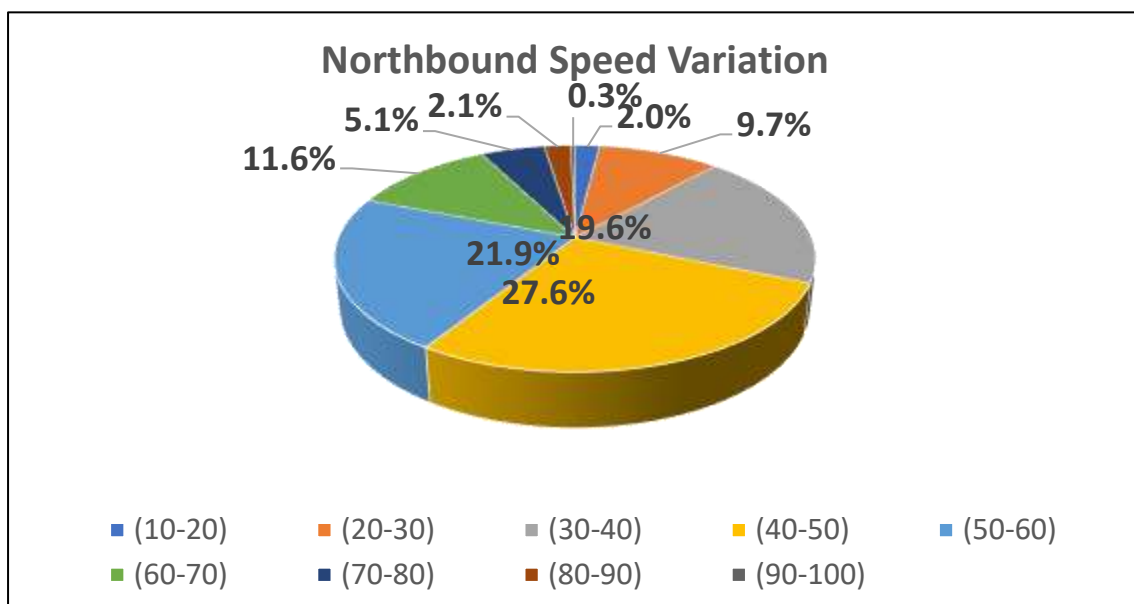


Figure (3.4): Speed Variation at Northbound of Abu Al Mothafar AlAzji road.

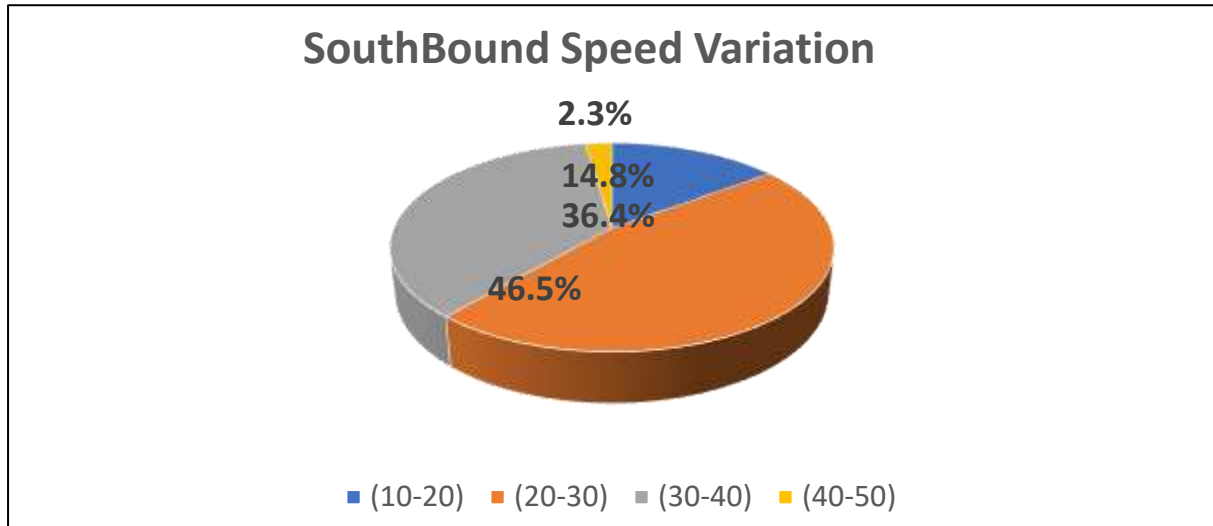


Figure (3.5): Speed Variation at Southbound of Abu Al Mothafar AlAzji road.

3.3 Speeds Analysis

The 85th percentile speed for vehicles traveling north was 61 kilometers per hour, while the 85th percentile speed for vehicles traveling south was 32 kilometers per hour.

Figure (3.6) depicts the cumulative percentage of vehicles with speed ranges in the northbound direction, while Figure (3.7) depicts the cumulative percentage of vehicles with speed ranges in the southbound direction.



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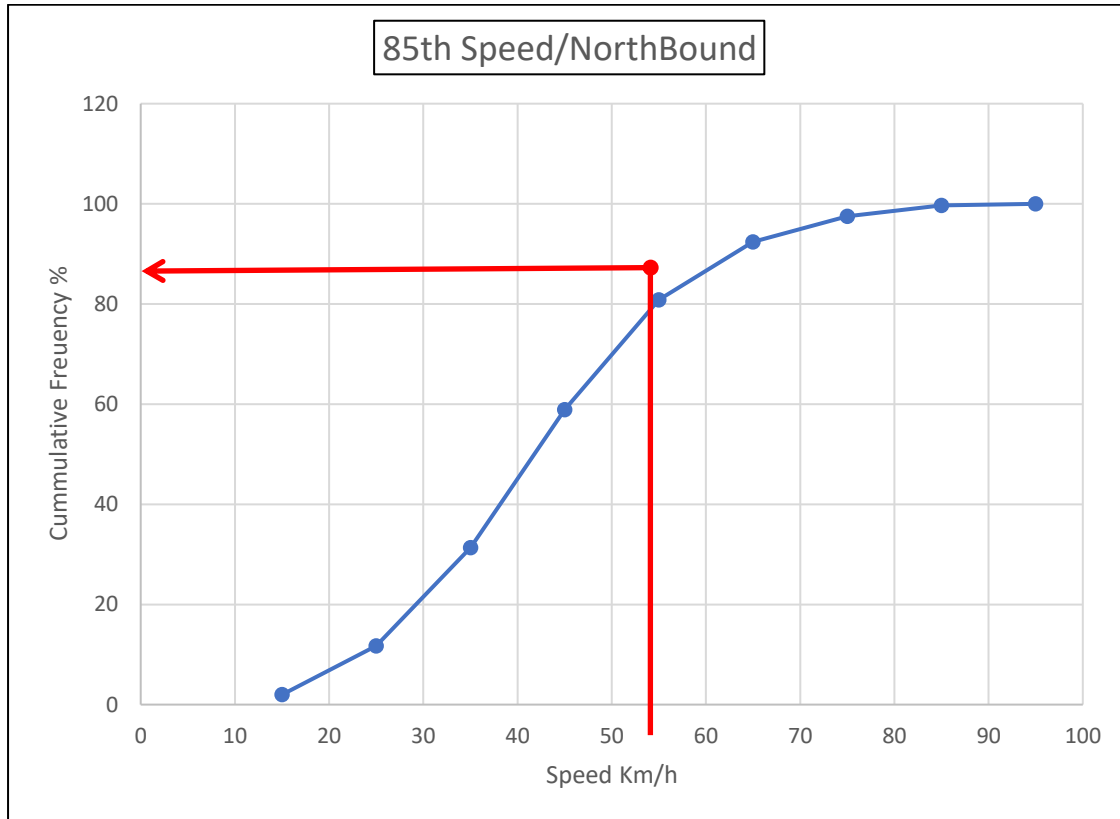


Figure (3.6): 85th speed for northbound vehicles

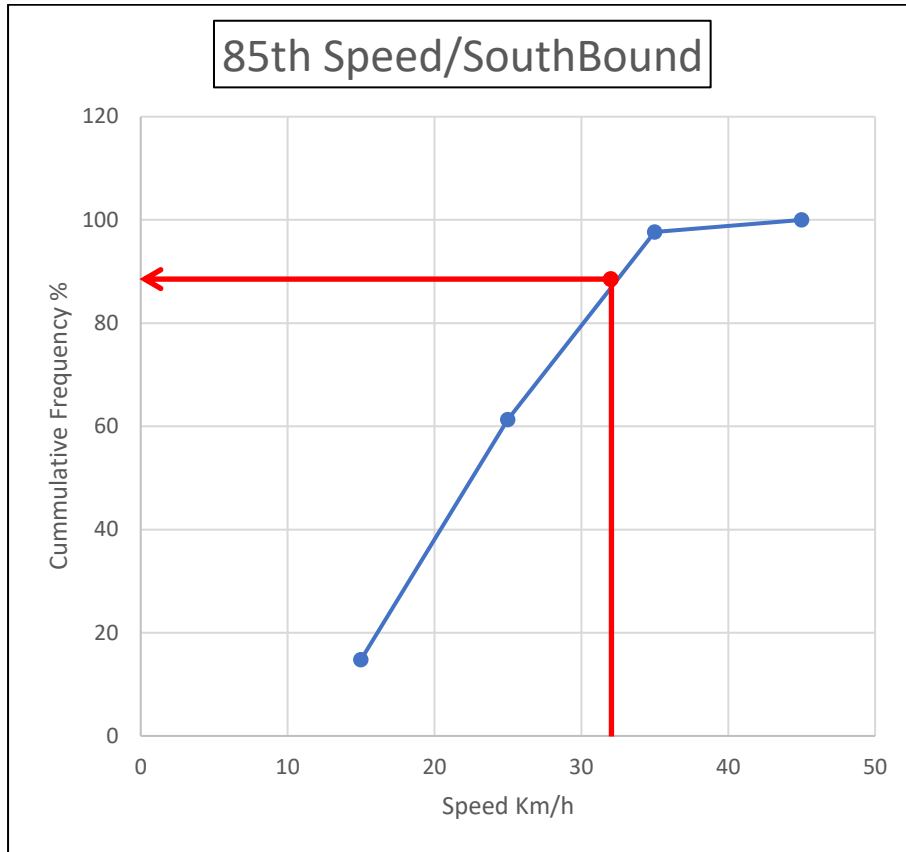


Figure (3.7): 85th speed for Southbound vehicles

3.5 Driving Severity

It is clear that the 85th speed for northbound vehicles falls within the dangerous conditions zone, whereas it falls within the normal conditions zone for southbound vehicles. Figure (3.8) depicts the analysis of the 85th speed for the road under consideration.

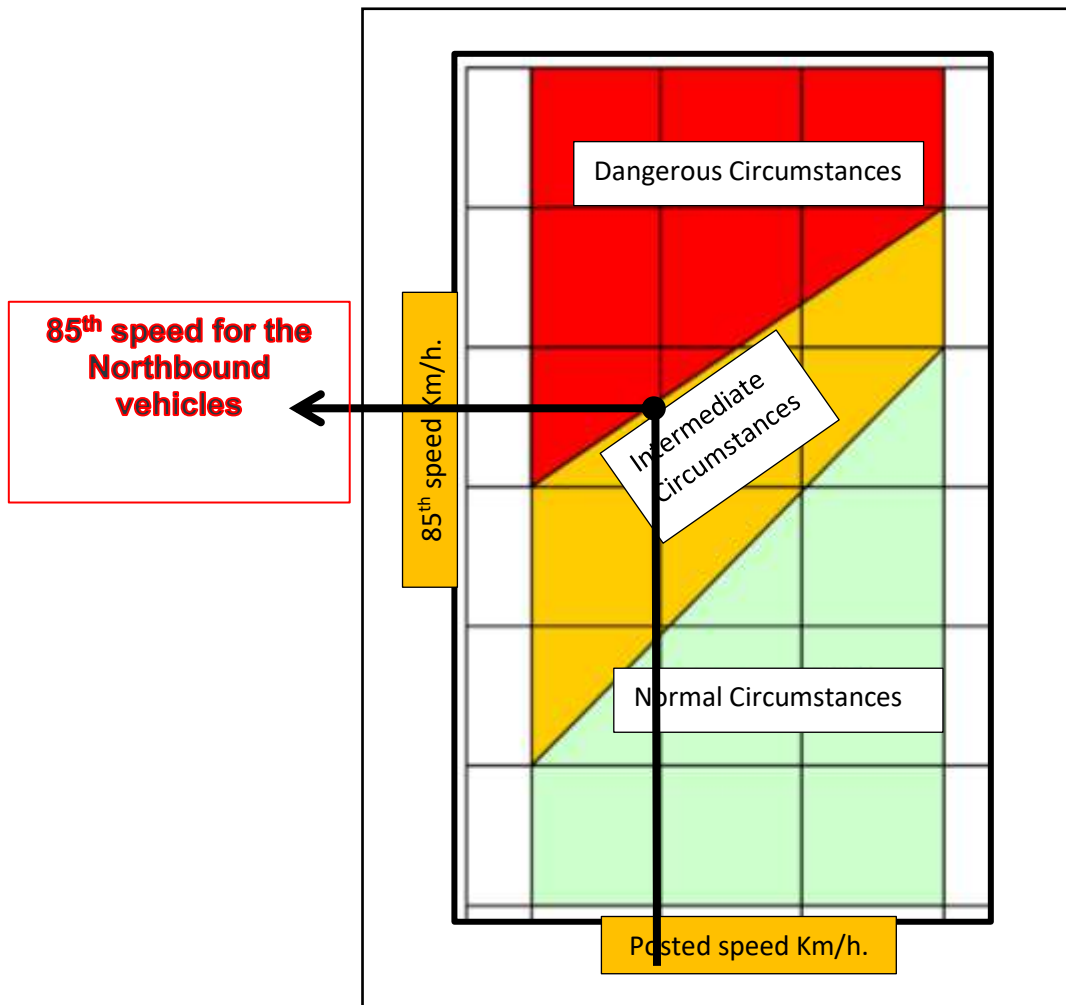


Figure (3.8): Driving severity.

4 Conclusions

One of the goals of institutions that manage transportation and traffic within cities around the world is to reduce traffic and speeds on local streets. The Speed hump is one of the most important traffic calming methods in Riyadh, particularly in local residential streets.

The speed of the eighty-five percent is one method of evaluating the speeds on the streets and roads within the city, as the driving conditions on this road were determined by comparing the speed of the eighty-five percent with the speed prescribed on the road.



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A traffic study is required for the desired objectives of installing a speed hump, and the effect of this speed hump after installation on the driving conditions and speed level on the road should be studied.

A local road in Riyadh was chosen for the installation of two speed hump, and the effect of the installation of these speed humps on the driving conditions of the affected and unaffected directions was studied.

The results showed that the two speed humps changed the driving conditions from dangerous to normal, and the speeds were reduced to the limits of the road speed on the side affected by the humps' position.

As a result, it is reasonable to state that placing the bumps inside the local streets reduces the 85th speed and restores normal driving conditions.

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