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ANALYSIS OF THE EFFECT OF SIDE OBSTACLES ON STALL DEA 2 ON THE PERFORMANCE OF JALAN AHMAD YANI, BARABAI CITY

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ABSTRACT

Traffic flow density is very frequent on Jalan A. Yani, precisely during breakfast hours. The activity of several restaurants and the large number of buyers caused the parking load to be fully provided even to the point of using the shoulder of the road. So that this activity can affect the performance of the Jalan A Yani section in front of the Dea 2 stall and after the Dea 2 stall. This study aims to analyze traffic volume, speed, and density, as well as evaluate traffic performance on Jalan A Yani in front of Warung Dea 2 and after Warung Dea 2 and obtain the value of the service level index (ITP) and the influence of Warung Dea 2 on traffic performance on Jalan A Yani. The Greenshield model is one of the traffic flow characteristic relationship models where the linear relationship of speed and density is the relationship that is reviewed in the movement of traffic flow, considering the simplest function of the relationship so that it is easy to apply. Based on the results of the greenshield model research, it was found that the performance of the Jalan Ahmad Yani section of Barabai City in the area in front of Warung Dea 2 (there are side obstacles) has a maximum volume or capacity of 780,093 smp/h, a maximum speed of 38,416 km/h, and a maximum density of 30,962 smp/km and the performance of the Jalan Ahmad Yani section of Barabai City in the area in front of Warung Dea 2 in an area of 200 meters after Warung Dea 2 (no side obstacles) has a volume The maximum or capacity is 752,034 smp/h, the maximum speed is 47,007 km/h, and the maximum density is 18,469 smp/km. Side obstacles on the road body in the Warung Dea 2 area have an effect on increasing road capacity by 3.597%. However, the maximum speed decreased by 22.366% and the maximum density increased by 12.493% due to several side obstacle factors such as the density of pedestrian entry and exit activities, and the shoulder of the road being used as a parking lot in the Warung Dea 2 area which covered part of the lane on the road.

Keywords: *Density, Obstacles, Road Performance, Speed, and Traffic Peformance*

1. INTRODUCTION

In urban areas, roadside activities often cause conflicts, where the impact is affected by traffic flow. One of the effects of changes in traffic flow movement is caused by the imbalance between the increase in vehicle ownership and the growth of available infrastructure and the effective capacity of existing road sections is smaller than the planned road capacity due to roadside obstacles.

The existence of this traffic is very important because it is related to the level of safety and comfort. The existence of vehicles that run in accordance with existing traffic will make the condition of the highway more

stable. Stopped vehicles need a parking lot so as not to interfere with traffic on the highway. The roadside obstacles are often related to social activities.

South Hulu Sungai Regency, precisely in Barabai, is one of the areas that is currently experiencing development based on the percentage level produced every year, where the population from time to time is increasing. One of the main roads in Barabai is Jalan A Yani which is the place of this research, precisely in front of the Great Mosque where there are several restaurants that often use the highway as a vehicle parking. Traffic flow density is very frequent on this section of Jalan Ayani, precisely during breakfast hours.

The activity of several restaurants and the large number of buyers caused the parking load to be fully provided even to the point of using the shoulder of the road. So that this activity can affect the performance of the Jalan A Yani section in front of the Dea 2 stall and after the Dea 2 stall. The impact of this is in the form of an increase in traffic density around which makes traffic flow slow to congestion.

2. LITERATURE REVIEW

Transportation

Good transportation is transportation that is fast enough, Sufficient frequency of service, does not experience congestion, Is free from the possibility of existing accidents, and is safe. To achieve such conditions, several factors are determined that are components of this transportation, such as road conditions, existing road network systems, vehicle conditions and mental attitudes of users of these transportation facilities (Sinulingga, 1999).

Road Characteristics

According to the Indonesian Road Capacity Guidelines or commonly called PKJI (2023), the characteristics of the road that will affect are such as road geometry, flow composition and direction separation, activities on the side of the road, traffic regulation, and not forgetting the behavior of drivers and the existing vehicle population.

Traffic Flow Characteristics

In the characteristics of traffic flow, three main variables are needed to analyze the characteristics of traffic flow microscopically, namely volume, speed and density of traffic flow.

Side Obstacles

Side obstacles are the interaction between traffic flow and activities. Side obstacles that mainly affect the capacity and performance of urban roads are pedestrians, public transportation, slow vehicles (e.g. pedicabs, bicycles, carts, horse-drawn carriages) and vehicles entering and exiting.

Traffic Flow Characteristic Relationship Model

There are at least 3 (three) types of models that are often used to describe the relationship between the three traffic flow characteristic parameters, namely; *Model*

Greenshield, *Model Greenberg*, Model *Underwood*, and Model *Bell.*

Statistical Analysis

Data analysis was carried out to study the difference between the observed facts and what was expected. In the first stage, data analysis is a scientific activity to assess the value/score/size of the variable or indicator being reviewed, especially the non-free variable or the objective variable or indicator of the problem being reviewed. The results of this analysis can be used to determine whether or not there is a problem.

Degree of Saturation

Degree of saturation (DS) is defined as the ratio of road flow to capacity which is used as the main factor in determining the performance level of intersections and road segments.

Assessment of Road Sections

To measure the quality of service from the road section using the service level, it includes, among others, Speed, Volume / Capacity ratio (V/C), and Service Level.

3. RESEARCH METHODOLOGY

The form of the flow chart in this study is shown in Figure 3.1

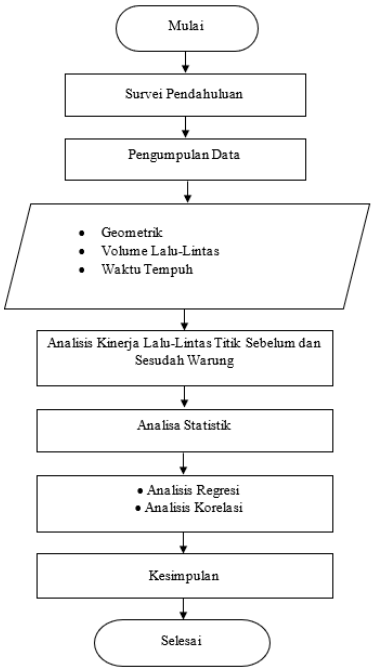

Figure 3. 1 Research Flow Diagram

Research Location

The research was conducted on Jalan Ahmad Yani, North Barabai District, Barabai City. Precisely in front of Warung Dea 2 which is on Jalan Ahmad Yani and also about 200 m after Warung Dea 2, with a road type (2/2-TT) and has a road width of 6 m. In the area of the road section that is reviewed, it is only carried out in one direction, namely from the direction of Jalan Ahmad Yani. Traffic flow recording is carried out for 12 hours with an interval of 10 minutes starting from 06.00 WITA and ending at 18.00 WITA.

Data Collection Techniques

The data that will be collected based on the survey conducted is vehicle volume and traffic speed data. In the volume collection, it is carried out at the first point, which is right in front of Warung Dea 2 where there are side obstacles and at the second point, which is 200

m after Warung Dea 2 where there are no side obstacles. As for speed data, it will be collected at each point from the area where there are side obstacles and areas where there are no side obstacles.

4. RESULTS AND DISCUSSION

Traffic Survey Data Analysis

The recapitulation of speed, volume and density data on road conditions in front of Warung Dea 2 and after Warung Dea 2 can be seen in Table 4.1. and Table 4.2.

Table 4.1 Data Recapitulation on Road Conditions in Warung Dea 2

No	Periode Waktu (Interval 10 Menit)	Kecepatan (S) (km/jam)	Volume (V) (smp/jam)	Kepadatan (D) (smp/km)
		Y		X
1	**06.00 – 07.00**	36,333	332,550	9,153
2	**07.00 – 08.00**	29,889	599,400	20,054
3	**08.00 – 09.00**	25,667	748,000	29,143
4	**09.00 – 10.00**	28,056	518,450	18,479
5	**10.00 – 11.00**	32,689	402,900	12,325
6	**11.00 – 12.00**	33,500	336,200	10,036
7	**12.00 – 13.00**	31,222	386,700	12,385
8	**13.00 – 14.00**	30,444	441,450	14,500
9	**14.00 – 15.00**	32,389	356,950	11,021
10	**15.00 – 16.00**	33,833	315,150	9,315
11	**16.00 - 17.00**	35,444	262,650	7,410
12	**17.00 - 18.00**	37,889	212,500	5,609
JUMLAH		**387,355**	**4,948,900**	**155,430**

Table 4.2 Data Recapitulation on the Condition of Warung Dea Street2

No	Periode Waktu (Interval 10 Menit)	Kecepatan (S) (km/jam)	Volume (V) (smp/jam)	Kepadatan (D) (smp/km)
		Y	X	X/Y
1	**06.00 – 07.00**	46,222	325,100	7,033
2	**07.00 – 08.00**	42,333	580,550	13,714
3	**08.00 – 09.00**	41,222	737,000	17,879
4	**09.00 – 10.00**	41,667	577,950	13,871
5	**10.00 – 11.00**	41,167	401,900	9,763
6	**11.00 – 12.00**	43,278	337,200	7,792
7	**12.00 – 13.00**	41,389	386,450	9,337
8	**13.00 – 14.00**	41,000	441,700	10,773
9	**14.00 – 15.00**	42,500	357,700	8,416
10	**15.00 – 16.00**	44,000	315,400	7,168
11	**16.00 - 17.00**	45,944	260,400	5,668
12	**17.00 - 18.00**	48,278	198,500	4,112
	JUMLAH	**519,009**	**4,919,850**	**115,526**

Table 4.3 Recapitulation of Speed Equation Model - Density and Correlation in Front of Warung Dea 2

Model	Persamaan	R	Keterangan
Linier	$y = 38{,}416 - 0{,}473x$	0,9352	**Sangat Kuat**
Logaritma	$y = 50{,}563 - 7{,}377 \ln x$	0,9598	**Sangat Kuat**
Eksponensial	$y = 39{,}288.\ e^{-0{,}016x}$	0,9491	**Sangat Kuat**
Eksponensial Kuadratis	$y = 34{,}823.\ e^{-0{,}000404x^2}$	0,8982	**Sangat Kuat**

From Table 4.3, it can be seen that the linear, logarithmic, exponential and quadratic exponential equations show ***a very strong relationship*** (correlation coefficient 0.8 – 0.9) between velocity and density in one model.

Table 4.4 Recapitulation of Speed Equation Model - Density and Correlation After Warung Dea 2

Model	Persamaan	R	Keterangan
Linier	$y = 47{,}007 - 0{,}410x$	0,7249	**Kuat**
Logaritma	$y = 53{,}309 - 4{,}651 \ln x$	0,8224	**Kuat**
Eksponensial	$y = 47{,}079\ .\ e^{-0{,}009x}$	0,7279	**Kuat**
Eksponensial Kuadratis	$y = 44{,}612.\ e^{-0{,}00035x^2}$	0,6264	**Kuat**

From Table 4.4, it can be seen that the linear, logarithmic, exponential and quadratic exponential equations show ***a strong relationship*** (correlation coefficient 0.6 – 0.8) between velocity and density in one model.

Traffic Characteristic Relationship

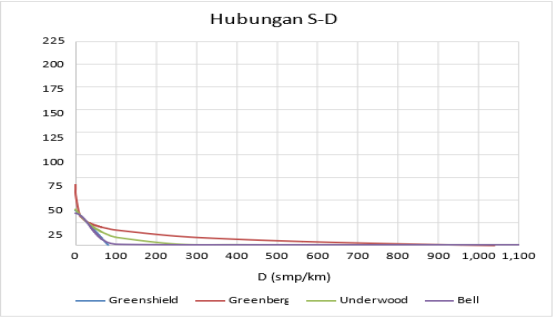

Figure 4.1 Graph of the relationship between S-D characteristics in front of Warung Dea 2

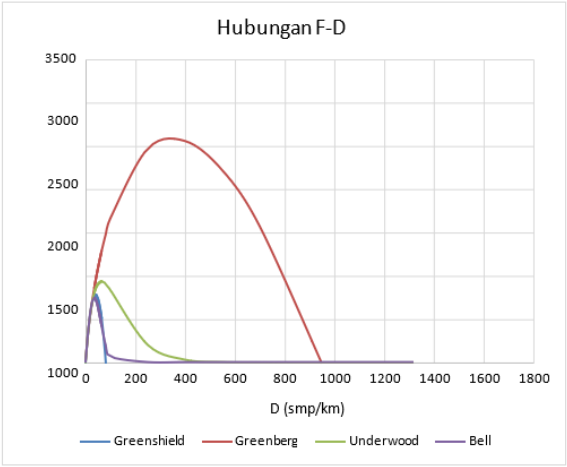

Figure 4.2 Graph of the relationship between F-D characteristics in front of Warung Dea 2

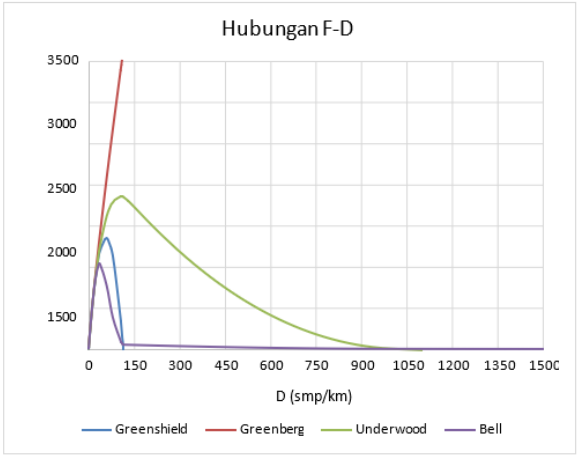

Figure 4.5 Graph of the Relationship Between F-D Characteristics After Warung Dea 2

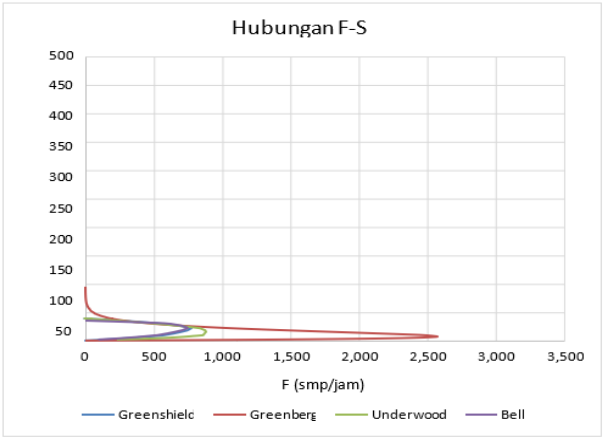

Figure 4.3 Graph of the relationship between F-S characteristics in front of Warung Dea 2

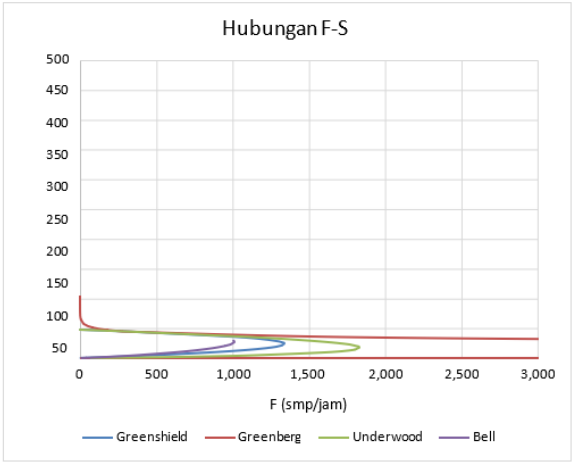

Figure 4.6 Graph of the relationship between F-S characteristics after Warung Dea 2

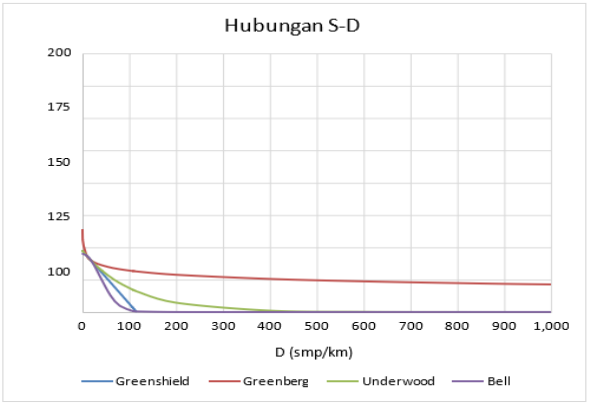

Figure 4.4 Graph of the Relationship between S-D Characteristics After Warung Dea 2

It can be seen in Figure 4.1 to Figure 4.6 the graph of the relationship between traffic characteristics such as volume (F), speed (S), and density (D) in the four models, namely *the greenshield, greenberg*, *underwood*, and *bell* models, which later based on the graphs obtained, then the best model will be selected to continue the calculation of data analysis on both conditions in the field.

A comparison of the traffic characteristics of each model as a whole is shown in Table 4.5 and Table 4.6.

Table 4.5 Comparison of Traffic Characteristic Values in Front of Warung Dea 2

Karakteristik	Model			
	Greenshields	Greenberg	Underwood	Bell
Sf (km/jam)	38,416	67,548	39,288	34,823
Dj (smp/km)	30,962	948,145	1230	1110
Fc (smp/jam)	780,093	2572,983	931,921	743,422
Koef. Korelasi	0,9352	0,9598	0,9491	0,8982

Table 4.6 Comparison of Traffic Characteristic Values After Warung Dea 2

Karakteristik	Model			
	Greenshields	Greenberg	Underwood	Bell
Sf (km/jam)	47,007	64,019	47,079	44,612
Dj (smp/km)	18,469	94941,365	101000	100100
Fc (smp/jam)	752,034	162456,988	1846,196	1020,851
Koef. Korelasi	0,7249	0,8224	0,7279	0,6264

Based on the traffic characteristics and correlation values in Table 4.5 and Table 4.6, the right model can be selected to describe the relationship between traffic characteristics on the reviewed road section. Correlations that show very strong relationships are the initial consideration in choosing a model. Furthermore, it is necessary to consider the value of traffic characteristics resulting from the model against the existing model.

Considering that the road type is 2/2-TT with a road width of 6.0 meters, the largest speed in front of Warung Dea 2 is 38.416 km/h and the largest speed after Warung Dea 2 is 47.007 km/h. The largest volume in front of Warung Dea 2 is 780,093 smp/hour and the largest volume after Warung Dea 2 is 752,034 smp/hour. The largest density in front of Warung Dea 2 is 30,962 smp/km and the largest density after Warung Dea 2 is 18,469 smp/km. So based on the recapitulation of the four conventional models used in calculating traffic characteristics on Ahmad Yani Street in front of Warung Dea 2 and after Warung Dea 2, it can be determined that the relevant model for these two conditions is *the Greenshield* model.

Comparison of Conditions in Front of Warung Dea 2 and After Warung Dea 2

It can be determined the comparison of the value and the percentage of decrease/increase between the conditions in front of Warung Dea 2 and after Warung Dea 2, see Table 4.7.

Table 4.7 Comparison of Maximum Volume, Speed and Density Values in Front of Warung Dea 2 and After Warung Dea 2

Karakterisrik Lalu Lintas	Setelah Warung	Di Depan Warung	Persentase Penurunan/Peningkatan
Volume Maksimum (smp/jam)	752,034	780,093	+3,597%
Kecepatan Maksimum (km/jam)	47,007	38,416	-22,366%
Kepadatan Maksimum (smp/km)	18,469	30,962	+12,493%

From Table 4.7, it is known that the maximum volume in front of Warung Dea 2 has

experienced a small increase of 3.597% to the area after Warung Dea 2. Then for the maximum speed in front of Warung Dea 2 decreased by 22.366%, and the maximum density in front of Warung Dea 2 increased by 12.493%.

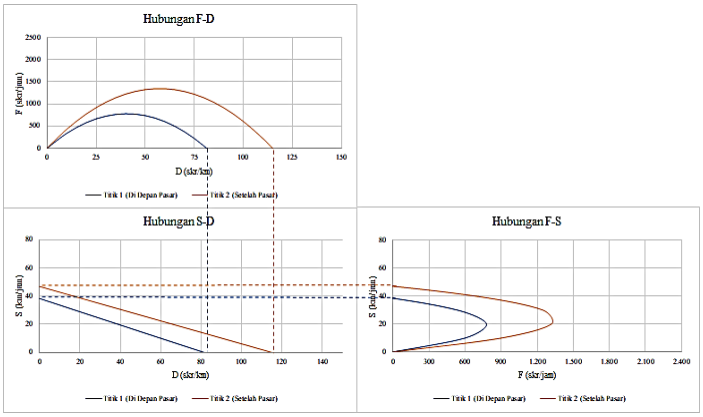

Figure 4.7 Graph of the relationship *between the Greenshield* model in front of Warung Dea 2 and after Warung Dea 2

From Figure 4.7, you can see the graph of the relationship of *the greenshield* model in the conditions in front of Warung Dea 2 and after Warung Dea 2. The graph of the relationship between traffic characteristics such as volume (F), speed (S), and density (D) in *the greenshield* model shows that the three traffic characteristic relationships show numbers and graphs that are relevant to the two conditions that occur in the field, when compared to the other three models such as *the greenberg*, *underwood*, and *bell models*.

Calculation of Service Level and Degree of Saturation Analysis

From the results of the modeling calculation, *Greenshield modeling was obtained*, so that the degree of saturation that occurred on the road section could be calculated, for example the calculation of the degree of saturation, reviewed from the lowest speed during the main hours of operation of the Food Shop

Table 4.8 Index of Service Level and Degree of Saturation in Front of Warung Dea 2

Waktu (WITA)	Volume (V) (smp/jam)	Kapasitas (C) (smp/jam)	Derajat Kejenuhan (DS)	ITP
06.00 – 07.00	332,550	780,093	0,4263	B
07.00 – 08.00	599,400	780,093	0,7684	D
07.40 – 08.40	782,650	780,093	1,0033	F
08.00 – 09.00	748,000	780,093	0,9589	E
09.00 – 10.00	518,450	780,093	0,6646	C
10.00 – 11.00	402,900	780,093	0,5165	C
11.00 – 12.00	336,200	780,093	0,4310	B
12.00 – 13.00	386,700	780,093	0,4957	B
13.00 – 14.00	441,450	780,093	0,5659	C
14.00 – 15.00	356,950	780,093	0,4576	B
15.00 – 16.00	315,150	780,093	0,4040	B
16.00 - 17.00	262,650	780,093	0,3367	B
17.00 - 18.00	212,500	780,093	0,2724	A

Table 4.9 Index of Service Level and Degree of Saturation After Warung Dea 2

Waktu (WITA)	Volume (V) (smp/jam)	Kapasitas (C) (smp/jam)	Derajat Kejenuhan (DS)	ITP
06.00 – 07.00	325,100	752,034	0,4323	B
07.00 – 08.00	583,550	752,034	0,7760	D
07.40 – 08.40	750,050	752,034	0,9974	E
08.00 – 09.00	732,000	752,034	0,9734	E
09.00 – 10.00	577,950	752,034	0,7685	D
10.00 – 11.00	401,900	752,034	0,5344	C
11.00 – 12.00	337,200	752,034	0,4484	B
12.00 – 13.00	386,450	752,034	0,5139	C
13.00 – 14.00	441,700	752,034	0,5873	C
14.00 – 15.00	357,700	752,034	0,4756	B
15.00 – 16.00	315,400	752,034	0,4194	B
16.00 - 17.00	260,400	752,034	0,3463	B
17.00 - 18.00	198,500	752,034	0,2640	A

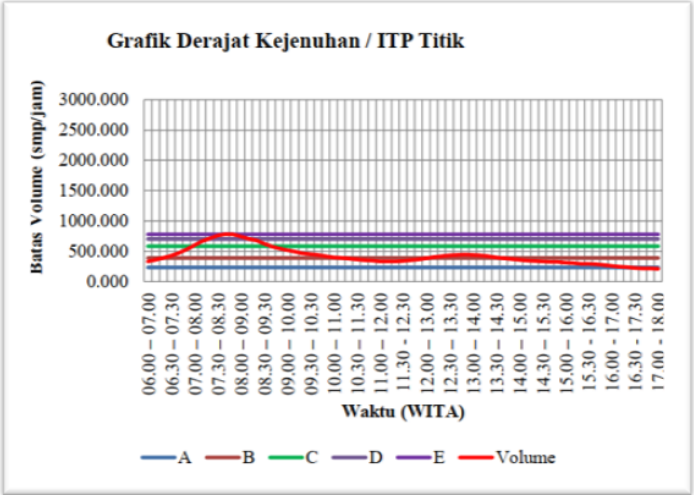

Figure 4.8 Graph of Degree of Saturation (DS) and Service Level Index (ITP) in Front of Warung Dea 2

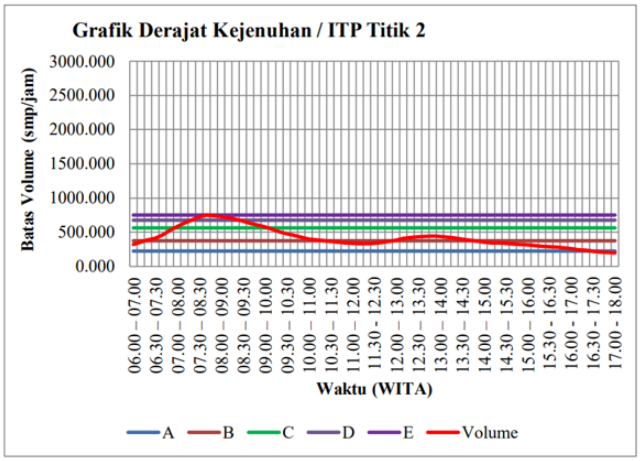

Figure 4.9 Graph of Degree of Saturation (DS) and Service Level Index (ITP) After Warung Dea 2

From Figure 4.8, it can be seen that in the condition in front of Warung Dea 2 has an ITP C percentage of 8.96%, ITP D of 79.10%, ITP E of 10.45%, and ITP F of 1.49%. Meanwhile, in Figure 4.9, it can be seen that in the condition after Warung Dea 2 had a percentage of ITP C of 11.94%, ITP D of 77.61%, and ITP E of 10.45%.

5. CLOSING

Conclusion

Based on the test results in this study, the following conclusions can be drawn:

1. Based on the results of the *greenshield model research, it* was found that the performance of the Ahmad Yani Street section in Barabai City in the area in front of Warung Dea 2 (there is a side obstacle) has a maximum volume or capacity of 780,093 cm/h, a maximum speed of 38,416 km/h, and a maximum density of 30,962 cm/km.

2. Based on the results of the *greenshield* model research, it was obtained that the performance of the section of Jalan Ahmad Yani, Barabai City, in the area in front of Warung Dea 2 in an area of 200 meters after Warung Dea 2 (no side obstacles) has a maximum volume or capacity of 752,034 smp/h, a maximum speed of 47,007 km/h, and a maximum density of 18,469 smp/km.

3. Based on the calculation results, it was stated that the side obstacles in the road body in the Warung Dea 2 area had an effect on increasing the road capacity by 3.597%. However, the maximum speed decreased by 22.366% and the maximum density increased by 12.493% due to several side obstacle factors such as the density of pedestrian entry and exit activities, and the shoulder of the road

was used as a parking lot in the Warung Dea 2 area which covers part of the lane on the road. This is supported by the results of the calculation on the Service Level Index which states that at 07.40 to 08.40 WITA it is worth F which means that the road has a restrained/obstructed flow.

Suggestion

As a result of the research conducted, the following suggestions can be given:

1. Based on research and the results of considerations related to the prediction of volume and traffic capacity in the Warung Dea 2 area, it is hoped that in the future it will be necessary to make some anticipations so that the performance problems of the Ahmad Yani Road section which has side obstacle factors in Warung Dea 2 can be reduced.
2. Anticipating to reduce the existing congestion on the Ahmad Yani Street section due to side obstacle factors on the Ahmad Yani Street section by providing a special vehicle parking area at Warung Dea 2.
3. Evaluate the influence of side obstacles on vehicles that can affect traffic performance on Jalan Ahmad Yani, so as to reduce road disturbances due to obstacles that occur around the research location

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