Re-Evaluation Of the Traffic Signaling Systems in Jasa - Mexico Public Market Road Junction and Jasa - Tinajero Road

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Abstract: This study aimed to re-evaluate the currently installed traffic signaling systems at JASA - Mexico Public Market Road Junction and JASA - Tinajero Road. This traffic signaling systems are currently non-operational as they were observed to worsen the traffic congestion when turned on. This study utilized two (2) out of nine (9) traffic signaling warrants from MUTCD (2009): Warrant 2: Four-Hour Vehicular Volume and Warrant 4: Pedestrian Volume. These two warrants utilized vehicle and pedestrian volume counts in analysis. The study was deductive in nature and utilized quantitative approach for data gathering and analysis.

Key Words: — *Intersection, Pedestrian, Traffic Signaling System, Traffic Signaling Warrants.*

I. INTRODUCTION

Traffic Lights are a form of traffic control devices that aim to warn, guide, and regulate drivers. Traffic Control Devices (TCDs) are commonly used at intersections where there is a complex flow of vehicles that needs to be regulated to avoid accidents. TCDs provide simple information to drivers to ensure a fast reaction from the drivers (Jensen et al., 2016). The failure of TCDs can cause disorganized traffic flow that will require intervention from traffic enforcing personnel. This situation is common in the Philippines.

Pedestrians are a major component of the road. They are considered to be the most vulnerable as 30% of the traffic fatalities are concerned with pedestrians (Ni et al., 2016). Central Business Districts (CBDs) have dense population of both vehicles and people.

Given the large number of pedestrians especially on CBDs, it is important to conduct further study on the behavior characteristics of pedestrians as they are the most unpredictable and vulnerable road users (Ni et al., 2016).

The Manual on Uniform Traffic Studies (2016) study sheets and techniques are intended to allow field collection sheets, reduction sheets, and summary sheets; thus, lowering the amount of paperwork and time needed to complete field work. According to the Traffic Signal Warrant Summary of MUTS (2016), a warrant is a set of criteria used to determine the relative need for, and suitability of, a specific traffic control device. Warrants should be regarded as guidelines rather than absolute values.

All nine warrants do not need to be accomplished if the engineer determines they are irrelevant. An analysis shall be undertaken as part of the investigation into a need for a traffic control signal of the relevant factors in the following traffic signal warrants, furthermore, the nine warrants discussed in the MUTS (2016) are as follows:

- Warrant 1: Eight-Hour Vehicular Volume
- Warrant 2: Four-Hour Vehicular Volume
- Warrant 3: Peak Hour
- Warrant 4: Pedestrian Volume

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- Warrant 5: School Crossing
- Warrant 6: Coordinated Signal System
- Warrant 7: Crash Experience
- Warrant 8: Roadway Network
- Warrant 9: Intersection near a Grade Crossing

1.1 Related Studies

A previous local study was already conducted by KIV Marketing Company (2021) at the same study area: JASA – Mexico Public Road and the JASA – Tinajero Road. This related study utilized utilized Warrant 1: Eight-Hour Vehicular Volume. The data from this study were utilized to program the traffic signaling system for the study area but no significant change in traffic congestion was observed. This led the researchers to conduct another traffic study on the are utilizing different traffic signaling warrants: Warrant 2: Four-Hour Vehicular Volume and Warrant 4: Pedestrian Volume.

II. METHODOLOGY

This study applied deductive approach in its data analysis. Established Traffic Signaling Warrants from MUTCD (2009) and MUTS (2016) were utilized in data gathering and analysis. This study was also confirmative in nature as it aimed to prove if the installed traffic signaling systems at JASA – Mexico Public Market Road and JASA – Tinajero Road were really needed.

The study was conducted at JASA – Mexico Public Market Road and JASA – Tinajero Road in the Municipality of Mexico, Pampanga. The two intersections are both located at the Central Business District of Mexico.

The traffic count data gathering was done through a tally method utilizing a survey form that aided the observation of the movement of vehicles and pedestrians on a specific road. The researchers utilized videotaping method to ensure the accuracy of the data collected.

The survey form used in this study was drafted based on the survey form used by the University of the Philippines – National Center for Transportation Studies (UP-NCTS). The data gathering was done for seven consecutive days.

Fig.1. UP-NCTS Survey Form

III. DATA ANALYSIS AND EVALUATION

After the data were tallied using the survey forms, the data was summed up and transferred to an excel file to easily produce the summary of the traffic data. The data were multiplied to a Passenger Car Equivalent (PCE) Factor based on the vehicle type to convert heterogenous traffic streams into homogenous ones where it was assumed that only passenger cars were travelling in a specific stream (Adnan, 2014).

VEHICLE TYPE	PCEF
Private vehicle, taxi, AUV, Sedan	1.0
Jeepney, goods utility vehicle, small bus	1.5
Large Bus	2.0
Rigid truck, 2 axles	2.0
Rigid truck, 3 axles	2.5
Truck Semi-trailer, 3 and 4 axles	2.5
Truck Semi-trailer, 5+ axles	2.5
Truck Trailer, 4 axles	2.5
Truck trailer, 5 axles	2.5
Motorcycle	2.5
Bicycle	2.5
Tricycle	2.5

Fig.2. Passenger Car Equivalent Factors

The data were then plotted on the parameters for Warrant 2: Four-Hour Vehicular Volume and Warrant 4: Pedestrian Volume.
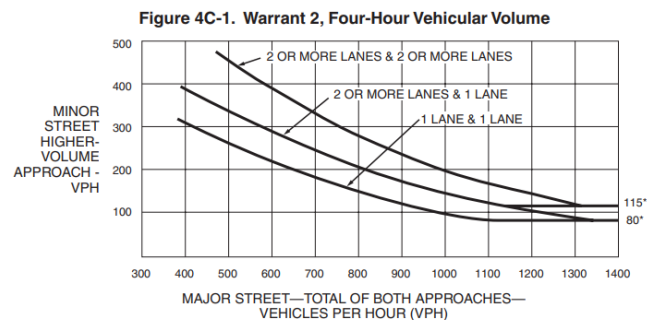

Fig.3. Warrant 2, Four-Hour Vehicular Volume

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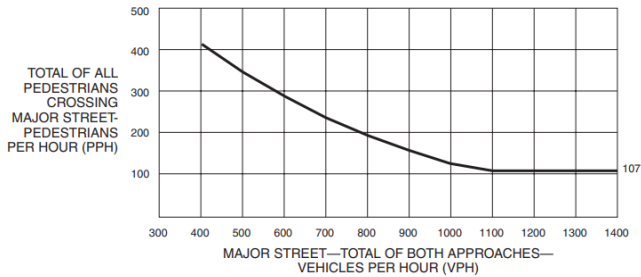Figure 4C-5. Warrant 4, Pedestrian Four-Hour Volume

Fig.4. Warrant 2, Pedestrian Four-Hour Vehicular Volume

IV. RESULTS AND DISCUSSION

The factored data plotted on the curves satisfied the parameters for both Warrant 2: Four-Hour Vehicular Volume and Warrant 4: Pedestrian Volume. The variation on colors of the plotted points represents the different days during the 7-day data gathering procedure.
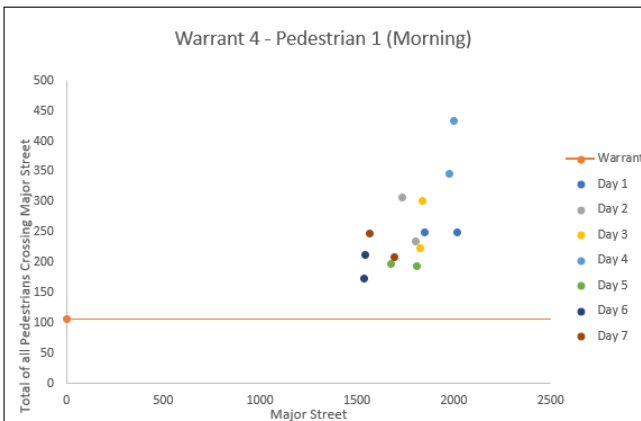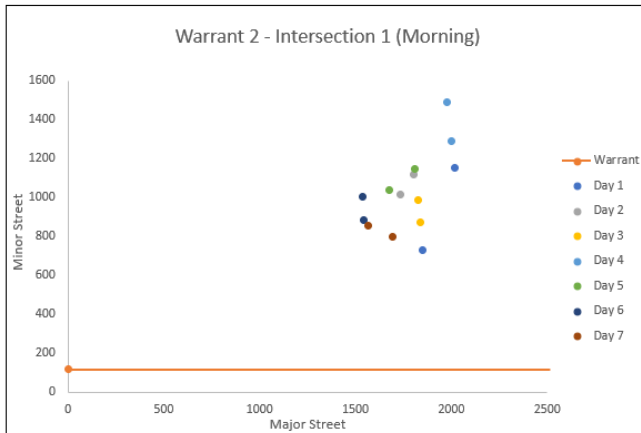

Fig.5. The satisfaction of Warrant 2 and Warrant 4

The satisfaction of Warrant 2 and Warrant 4 led the researchers to reprogram the traffic signaling systems on both JASA –

Mexico Public Market Road and JASA – Tinajero Road utilizing PTV Vistro.

INTERSECTION 1		SG: 1	SG: 2	SG: 3	SG: 4
Monday	Morning	19	71	19	71
	Afternoon	41	49	41	49
Tuesday	Morning	19	71	19	71
	Afternoon	42	48	42	48
Wednesday	Morning	22	68	22	68
	Afternoon	43	47	43	47
Thursday	Morning	49	41	49	41
	Afternoon	53	37	53	37
Friday	Morning	19	71	19	71
	Afternoon	46	44	46	44
Saturday	Morning	36	54	36	54
	Afternoon	21	69	21	69
Sunday	Morning	19	71	19	71
	Afternoon	37	53	37	53

INTERSECTION 2		SG: 1	SG: 2	SG: 3	SG: 4
Monday	Morning	19	71	19	71
	Afternoon	24	66	24	66
Tuesday	Morning	32	58	32	58
	Afternoon	56	34	56	34
Wednesday	Morning	30	60	30	60
	Afternoon	48	42	48	42
Thursday	Morning	23	67	23	67
	Afternoon	45	45	45	45
Friday	Morning	20	70	20	70
	Afternoon	28	62	28	62
Saturday	Morning	31	59	31	59
	Afternoon	43	47	43	47
Sunday	Morning	34	56	34	56
	Afternoon	41	49	41	49

Fig.6. Programming Scheme for Intersections from PTV Vistro

V. CONCLUSION

The traffic signaling system is needed in both JASA – Mexico Public Market Road and JASA – Tinajero Road as permitted by Warrant 2 and Warrant 4 of MUTCD (2009). The reactivation of the traffic signaling system will utilize the reprogramming scheme produced by PTV Vistro. These data can be used by future researchers to assess the effectiveness of the reprogramming scheme as it is not included in the objectives of this study.

The reprogramming scheme done by the PTV Vistro for seven days' worth of factored traffic data is comparatively more adaptive and customized for the study areas, as compared to the previous study done in the area, as it varies from morning and afternoon and from day to day. It is a more realistic approach as it considers the variation in traffic volume in the study area that is affected by a lot of factors.

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