FW PUBLIC WORKS
Traffic Engineering
In Your Neighborhood

TRAFFIC SIGNALS

GENERAL INFORMATION

TRAFFIC SIGNALS

Traffic Signals are a common request to the department. A proper review of an intersection would determine whether or not a traffic signal is warranted. Since traffic signals cost approximately $150,000 and require annual maintenance, determination on installation is an important process. Signals do not guarantee that an intersection will be "safer," but should control traffic in a high traffic volume intersection.

Installation of a new traffic signal within the City of Fort Wayne follows Indiana Code 9-21-3-2. A traffic study is needed that will determine whether or not a traffic signal is warranted based on criteria set forth in the Manual on Uniform Traffic Control Devices (MUTCD). Warrants needed to justify the placement of a new signal.

Eight-Hour Vehicular Volume

Minimum Vehicular Volume (Large volumes of intersecting traffic)

Interruption of Continuous Traffic (Minor street has excessive delay)

Four-Hour Vehicular Volume

Volume of intersecting Traffic

Peak Hour

Excessive delay at peak hours crossing major street

Pedestrian Volume

Pedestrian excessive delays

School Crossing

Coordinated Signal System

Crash Experience

Severity and Frequency – 5+ within a 1 year period

Alternate Methods are ineffective

Roadway Network

Intersection near a grade crossing

Installation should not be considered unless an engineering study determines that safety and operation of the intersection will improve.

Traffic Engineering Department

200 E Berry Street
Suite 210
Fort Wayne, IN 46802

Main Line Phone: 260-427-1172

FW PUBLIC WORKS

Traffic Engineering

In Your Neighborhood

TRAFFIC SIGNALS

GENERAL INFORMATION

THIS IS AN EXAMPLE OF TYPICAL INTERSECTION REVIEW

Existing condition:

3-way stop at a busy intersection.

Request: *Add a signal since the cross traffic is more than the side street volume and it is reported to the department that it is hard to get onto the main road.*

1. **Review of the intersection's geometry, current conditions, crash history and area network is done.**
2. **Traffic counts may be conducted at the intersection and a warrant analysis is performed.**
3. **Traffic modeling if deemed appropriate after a warrant analysis**
4. **Review of traffic modeling data**
5. **Determination on whether or not it is feasible to install a new traffic signal or program installation as a future project.**

SAMPLE VIDEO—shows same layout & traffic volumes comparing the 3 way stop and a signal installation.

Traffic Engineering Department

200 E Berry Street
Suite 210
Fort Wayne, IN 46802

Main Line Phone: 260-427-1172

FW PUBLIC WORKS
Traffic Engineering
In Your Neighborhood

TRAFFIC SIGNALS

GENERAL INFORMATION

TERMS & CONSIDERATIONS –

LEVEL OF SERVICE (LOS):

Level of Service is a measure describing operational conditions of roadway or intersection. Factors such as speed, density, congestion, delay, driver perception are factors in determining LOS. Level of Service is graded based on an A-F scale, with A being the best, and F being the worst.

LOS Grading / Thresholds	
Control Delay (Seconds/vehicle)	LOS at V/C < 1
< 10	**A**
> 10-20	**B**
> 20-35	**C**
> 35-55	**D**
> 55-80	**E**
> 80	**F**

VOLUME-TO-CAPACITY RATION (V/C)

V/C Ratio is defined as the maximum flow rate at which vehicles can pass through a point on a roadway under prevailing conditions. It also represents the ability of an intersection to accommodate vehicular demand. The closer to 1.0, the worse the traffic flow is at an intersection, which would include excessive delay, long que lengths, flow of vehicles.

V/C Ratio	
< 0.85	Intersection Operating Under Capacity
0.85 - 0.95	Intersection Operating Near Capacity
0.95 - 1.00	Unstable flow, wide range of delay, Intersection Improvements should be re-
> 1.00	Demand exceeds capacity - excessive delay and que is expected

This information will help make a determination if there is a benefit or improvement by comparing information about signalization or changes in signalization, such as adding a designated left turn phase or turn lane.

Traffic Engineering Department

200 E Berry Street
Suite 210
Fort Wayne, IN 46802

Main Line Phone: 260-427-1172

FW PUBLIC WORKS

Traffic Engineering

In Your Neighborhood

TRAFFIC SIGNALS

GENERAL INFORMATION

SAMPLE DATA - 3 Way Stop

3:

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	271	35	218	97	35	183
Future Volume (Veh/h)	271	35	218	97	35	183
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	295	38	237	105	38	199
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	512	237			342	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	512	237			342	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	42	95			97	
cM capacity (veh/h)	506	802			1217	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	295	38	237	105	38	199
Volume Left	295	0	0	0	38	0
Volume Right	0	38	0	105	0	0
cSH	506	802	1700	1700	1217	1700
Volume to Capacity	0.58	0.05	0.14	0.06	0.03	0.12
Queue Length 95th (ft)	92	4	0	0	2	0
Control Delay (s)	21.6	9.7	0.0	0.0	8.1	0.0
Lane LOS	C	A			A	
Approach Delay (s)	20.3		0.0		1.3	
Approach LOS	C					

Intersection Summary			
Average Delay	7.7		
Intersection Capacity Utilization	39.8%	ICU Level of Service	A
Analysis Period (min)	15		

Traffic Engineering Department

200 E Berry Street
Suite 210
Fort Wayne, IN 46802

Main Line Phone: 260-427-1172

FW PUBLIC WORKS

Traffic Engineering

In Your Neighborhood

TRAFFIC SIGNALS

GENERAL INFORMATION

SAMPLE DATA - Signalized 3:

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	300	35	225	97	35	190
Future Volume (vph)	300	35	225	97	35	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	11
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	1863	1583	1711	1801
Flt Permitted	0.95	1.00	1.00	1.00	0.61	1.00
Satd. Flow (perm)	1770	1583	1863	1583	1093	1801
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	326	38	245	105	38	207
RTOR Reduction (vph)	0	26	0	55	0	0
Lane Group Flow (vph)	326	12	245	50	38	207
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	12.5	12.5	19.7	19.7	19.7	19.7
Effective Green, g (s)	12.5	12.5	19.7	19.7	19.7	19.7
Actuated g/C Ratio	0.30	0.30	0.48	0.48	0.48	0.48
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	537	480	890	756	522	861
v/s Ratio Prot	c0.18		c0.13			0.11
v/s Ratio Perm		0.01		0.03	0.03	
v/c Ratio	0.61	0.02	0.28	0.07	0.07	0.24
Uniform Delay, d1	12.3	10.1	6.5	5.8	5.8	6.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	0.0	0.8	0.2	0.3	0.7
Delay (s)	14.2	10.1	7.2	6.0	6.1	7.0
Level of Service	B	B	A	A	A	A
Approach Delay (s)	13.8		6.8			6.9
Approach LOS	B		A			A

Intersection Summary				
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	41.2	Sum of lost time (s)	9.0
Intersection Capacity Utilization	43.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Traffic Engineering Department

200 E Berry Street
Suite 210
Fort Wayne, IN 46802

Main Line Phone: 260-427-1172

FW PUBLIC WORKS
Traffic Engineering
In Your Neighborhood

TRAFFIC SIGNALS

GENERAL INFORMATION

SUMMARY:

Both conditions have an Intersection Capacity Utilization LOS of A

Approach Delay for westbound movement, which is the request for change, is improved from a LOS of C to a LOS of B. Delay is decreased by almost 7 seconds. Que length is reduced.

There will be an increase in level of comfort for westbound traffic onto the main road. The decision to pull onto the main road has been decided by the signal and no longer has to be made by looking both ways and looking for a gap.

Consideration into this also has to be made for the main road. Can the main road afford to be stopped? Will it have a negative effect on that traffic and the adjacent signals or platoons of cars? Is there nearby accesses that need to be considered? Is the roadway geometry favorable for the 3 way, or does the signal help provide safety?

Since the delay for the existing condition is 20 seconds, and the signal cycle is 23 seconds, which would be on the far low end of a normal signal, consideration has to be made on the benefit of installation for the time savings. In this instance, the cost and long term upkeep of a new signal may not be warranted. Other considerations may be made such as restricting movement at certain times of day, adjusting upstream or downstream traffic signals, road widening or other changes.

Traffic Engineering Department

200 E Berry Street
Suite 210
Fort Wayne, IN 46802

Main Line Phone: 260-427-1172