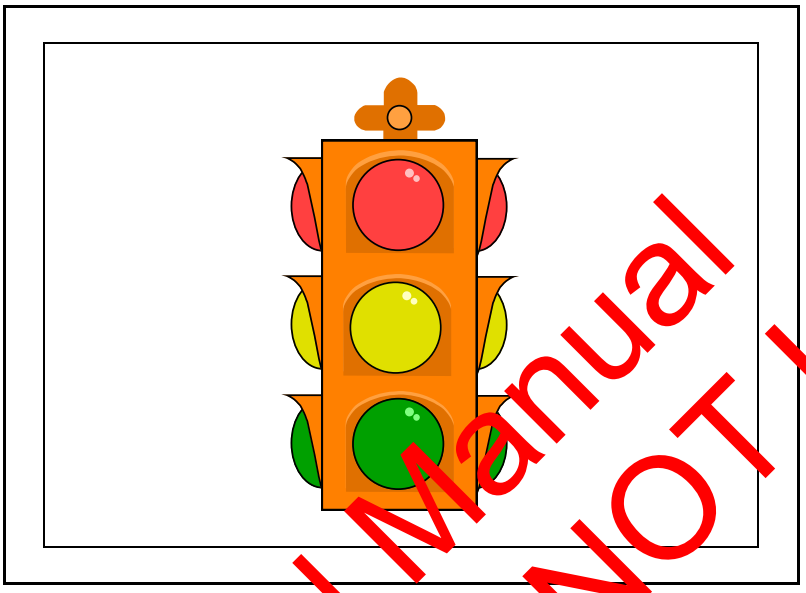
TABLE OF CONTENTS

INTERSECTION CONTROL UNIT



TRAFFIC SIGNAL WARRANT ANALYSIS

LOCATION

BOROUGH

New York City
Department of Transportation

ELECTED OFFICIAL ACKNOWLEDGMENTS

Location_____

Borough_____ Reference #_____ CB# _____

Date notification was sent out _____

BOROUGH PRESIDENT _____

CONGRESS MEMBER _____

STATE SENATOR _____

ASSEMBLY MEMBER _____

COUNCIL MEMBER _____

C.B. MANAGER _____

REQUESTOR _____

Signal Approval

Location

❒ RECOMMENDATION

❒ APPROVAL

❒ DENIAL

MELITA JAMES **Date**
Chief, Intersection Control Unit

❒ APPROVAL

❒ DENIAL

ERNEST ATHANASILOS, P.E. **Date**
Director of Signals and ITS Engineering

❒ APPROVAL

❒ DENIAL

ALAN BOROCK, P.E. **Date**
Director of Signal Operations & Street Lighting

Intersection Control Unit

Location:

_____

File#:

_____

Request:

_____

Requestor:

_____

Date:

_____

Determination:

_____

Comments:

Based upon our evaluation of data collected, it is our judgment that a traffic signal be approved under Warrant _____

_____

Melita James
Chief, Intersection Control Unit

INTRODUCTION

A comprehensive investigation of traffic conditions and physical characteristics of the location is required to determine the necessity for a signal installation and to furnish necessary data for the proper design and operation of a signal that is found to be warranted. Such data is included in this Traffic Signal Warrant Analysis.

An engineering study of traffic conditions, pedestrian characteristics, and pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location.

The investigation of the need for a traffic control signal shall include an analysis of the applicable factors contained in the following traffic signal warrants and other factors related to existing operation and safety at the study location:

Warrant 1, Eight-Hour Vehicular Volume.
Warrant 2, Four-Hour Vehicular Volume.
Warrant 3, Peak Hour
Warrant 4, Pedestrian Volume
Warrant 5, School Crossing
Warrant 6, Coordinated Signal System
Warrant 7, Crash Experience
Warrant 8, Roadway Network
Warrant 9, Intersection Near a Grade Crossing

Source: Manual on Uniform Traffic Control Devices (MUTCD) – FHWA
November 2009 Edition

Consultants Checklist

Client Commitment Letter (attached)

Please submit signed Client Commitment Letter to confirm your responsibilities related to all cost for the installation of the proposed traffic signals.

Project Description and Study Purpose

Please describe project.

Study Area

Please describe study area and include a study area map in Study Area Map section.

Data Collection

Please describe what data was collected and when (e.g. ATRs, turning vehicular counts, pedestrian counts, bike counts, radar studies, gap studies, etc)

Traffic Volumes

Existing Volumes – provide ATRs or manual counts if applicable. Complete Volume Classification and Turning Counts section if the study is based on existing conditions.

No-Build Volumes – describe process of deriving no-build volumes.

Site Generated Volumes – describe site generated volumes.

Trip Distribution – describe trip distribution.

Build Volumes – describe build volumes. Complete Volume Classification and Turning Counts section

In case the traffic volumes come from some other traffic studies (e.g. EIS, EAS, etc), refer to them (name, chapter, page number, chart number, etc) and provide a copy of the Traffic and Parking, Transit and Pedestrians, and Mitigation chapters.

Client Commitment Letter Template

Clients Letterhead

Date

Mr. Ernest Athanailos, P.E.
Director of Signals and ITS Engineering
34-02 Queens Boulevard
Long Island City, NY 11101

Re: Project's Name

Dear Mr. Athanailos:

This Letter of Commitment is to confirm our responsibilities related to the above development regarding the installation of the proposed traffic signals at the following location(s):

- ***Location A***
- ***Location B***

It is understood that if the traffic signals are warranted and approved by the New York City Department of Transportation (NYCDOT), ***Clients Name*** will engage a design consultant that will submit the necessary signal designs and timing plans and will work closely with the Signals Division at the NYCDOT (unless the City elects to provide the signal designs). All expenses related to the design, installation of the traffic signal(s), proposed geometric modifications, traffic signs and pavement markings removals/installations will be funded by ***Clients Name***. All signal work will be done by an approved electrical contractor and under the supervision of NYCDOT Electrical Inspection. We will notify Mr. Peter D'Amico at 718-786-2788 from the Electrical Inspection Division prior to starting any work at the location(s).

Our office will also contact Mr. Michael Lefosse at 718-786-2236 from the Design Division regarding the approval of the signal designs and the coordination of this work.

Sincerely,

_____
Title

_____
Type name

CC: Alan Borock, P.E., Ernest Athanailos, P.E., Peter D'Amico, Michael LeFosse, Melita James.

STUDY AREA MAP

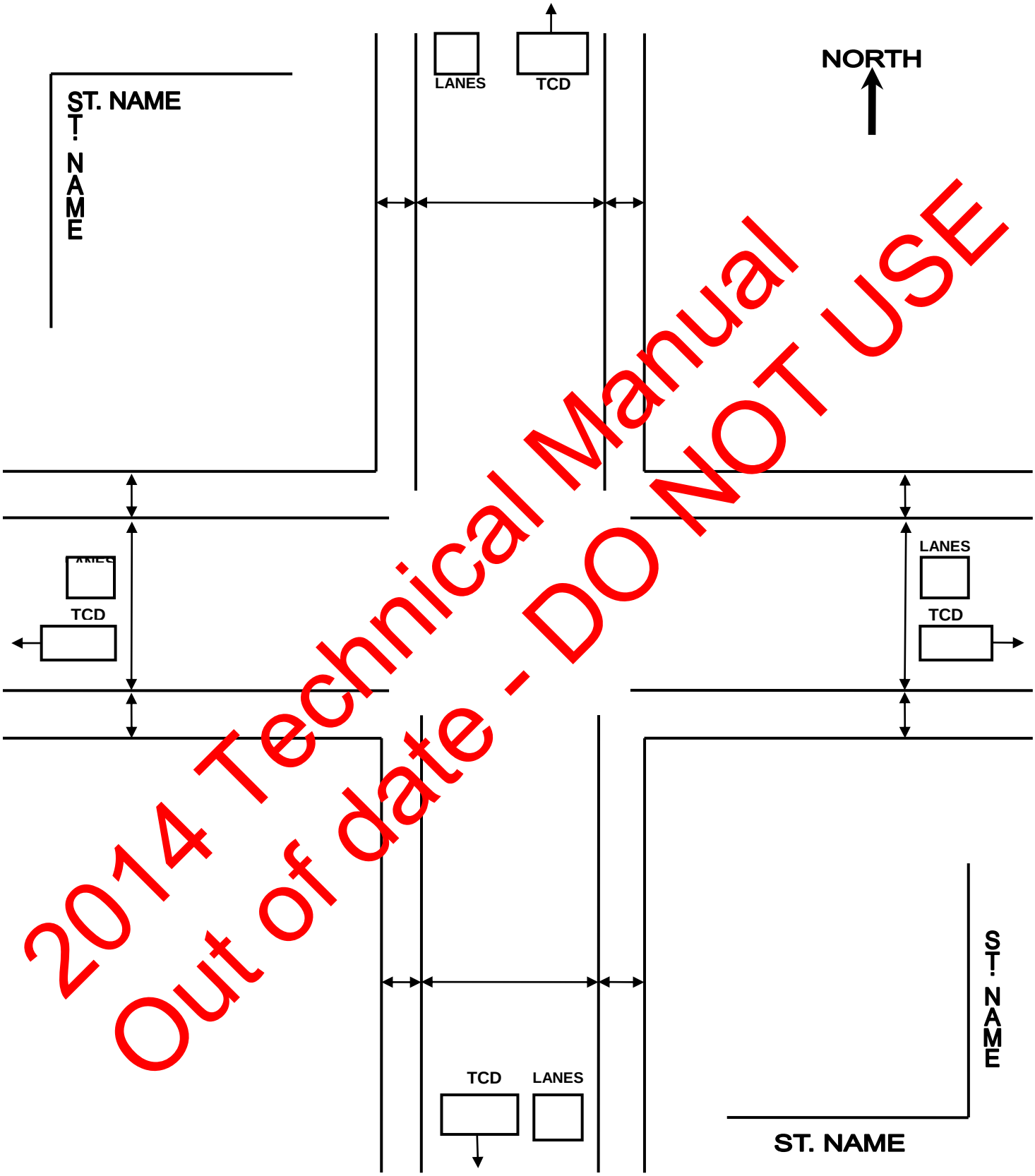
THE STUDY AREA MAP SHOULD INCLUDE THE FOLLOWING:

A. LOCATION OF REQUESTED SIGNAL IS TO BE HIGHLIGHTED BY A RED CIRCLE.

B. AN OFFICIAL SCHOOL MAP MAY BE USED AS A SUBSTITUTE.

CONDITION DIAGRAM

Ref#_____ Date: _____ Day:_____
Inspector:_____

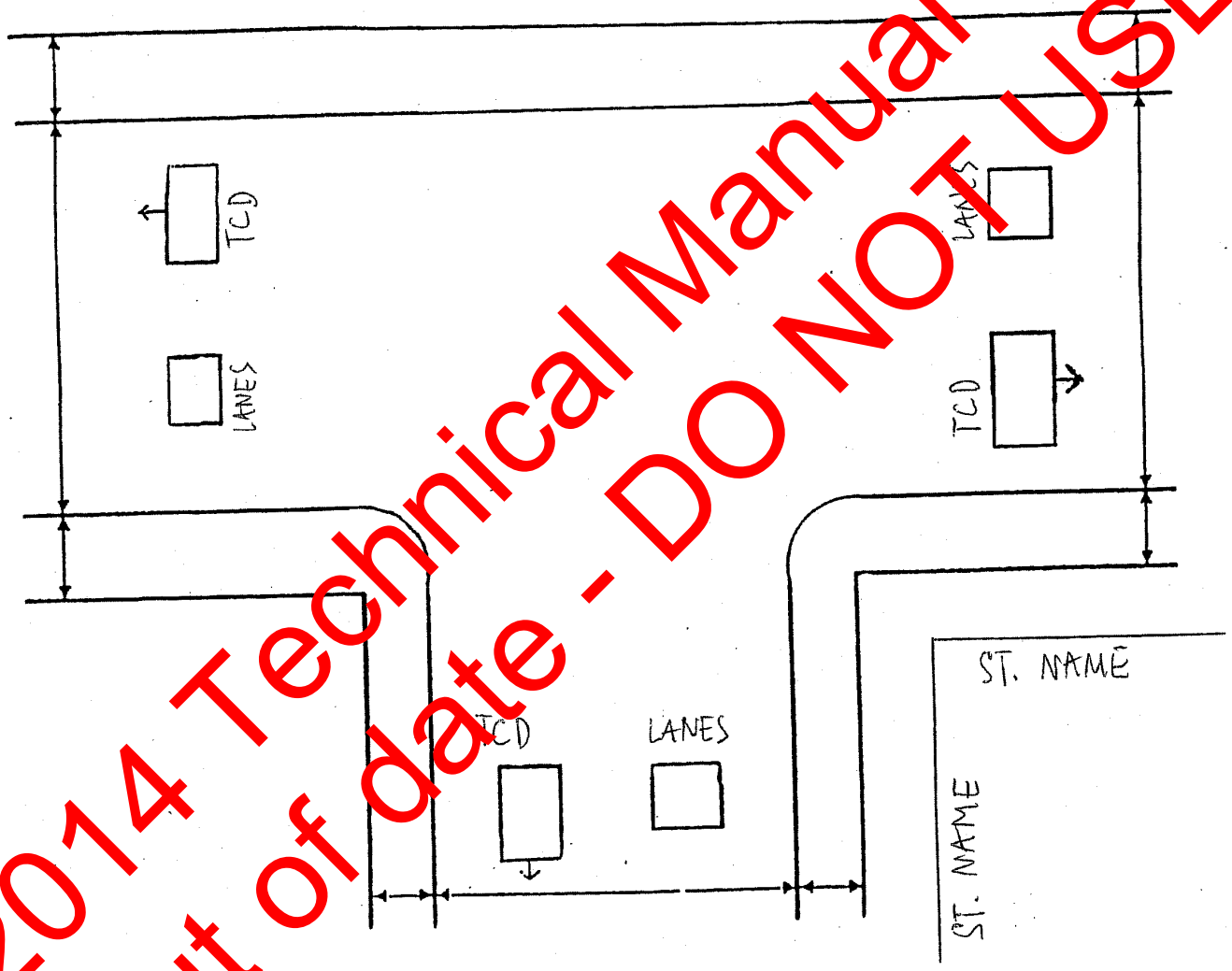


TCD = DISTANCE TO NEAREST TRAFFIC CONTROL DEVICE (Feet)
LANES = NUMBER OF MOVING LANES

NOTE: Indicate all curb regulations, street furniture, curb cuts, and all pavement markings related to the intersection. The # of lanes observed are the traveled lanes for each approach; parking lanes are not included. Show street direction by placing an arrow(s), indicating direction on all legs of the intersection.

CONDITION DIAGRAM

Ref#_____ Date: _____ Day:_____
Inspector:_____

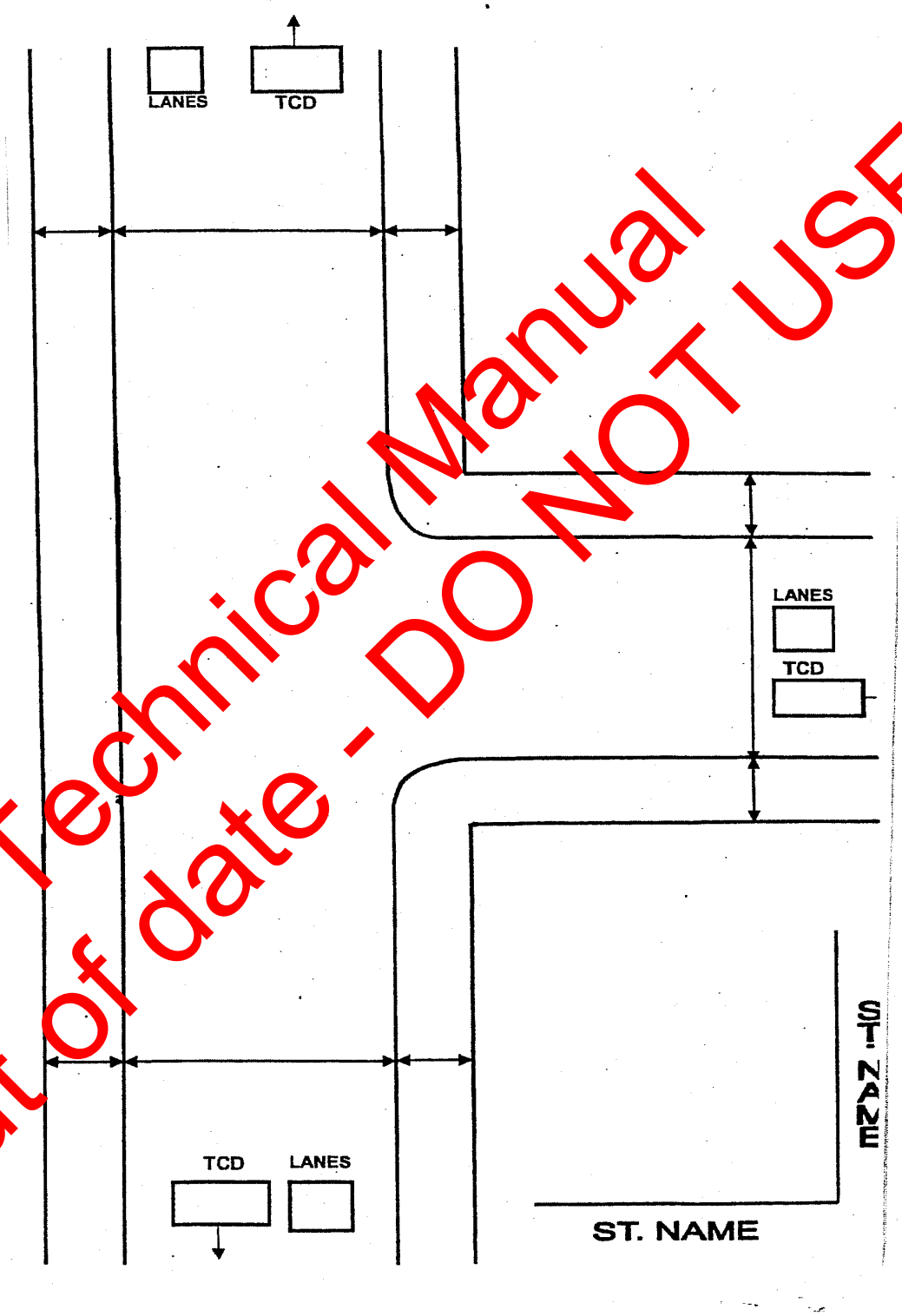


TCD = DISTANCE TO NEAREST TRAFFIC CONTROL DEVICE (Feet)
LANES = NUMBER OF MOVING LANES

NOTE: Indicate all curb regulations, street furniture, curb cuts, and all pavement markings related to the intersection. The # of lanes observed are the traveled lanes for each approach; parking lanes are not included. Show street direction by placing an arrow(s), indicating direction on all legs of the intersection.

CONDITION DIAGRAM

Ref#_____ Date: _____ Day:_____
Inspector:_____



TCD = DISTANCE TO NEAREST TRAFFIC CONTROL DEVICE (Feet)
LANES = NUMBER OF MOVING LANES

NOTE: Indicate all curb regulations, street furniture, curb cuts, and all pavement markings related to the intersection. The # of lanes observed are the traveled lanes for each approach; parking lanes are not included. Show street direction by placing an arrow(s), indicating direction on all legs of the intersection.

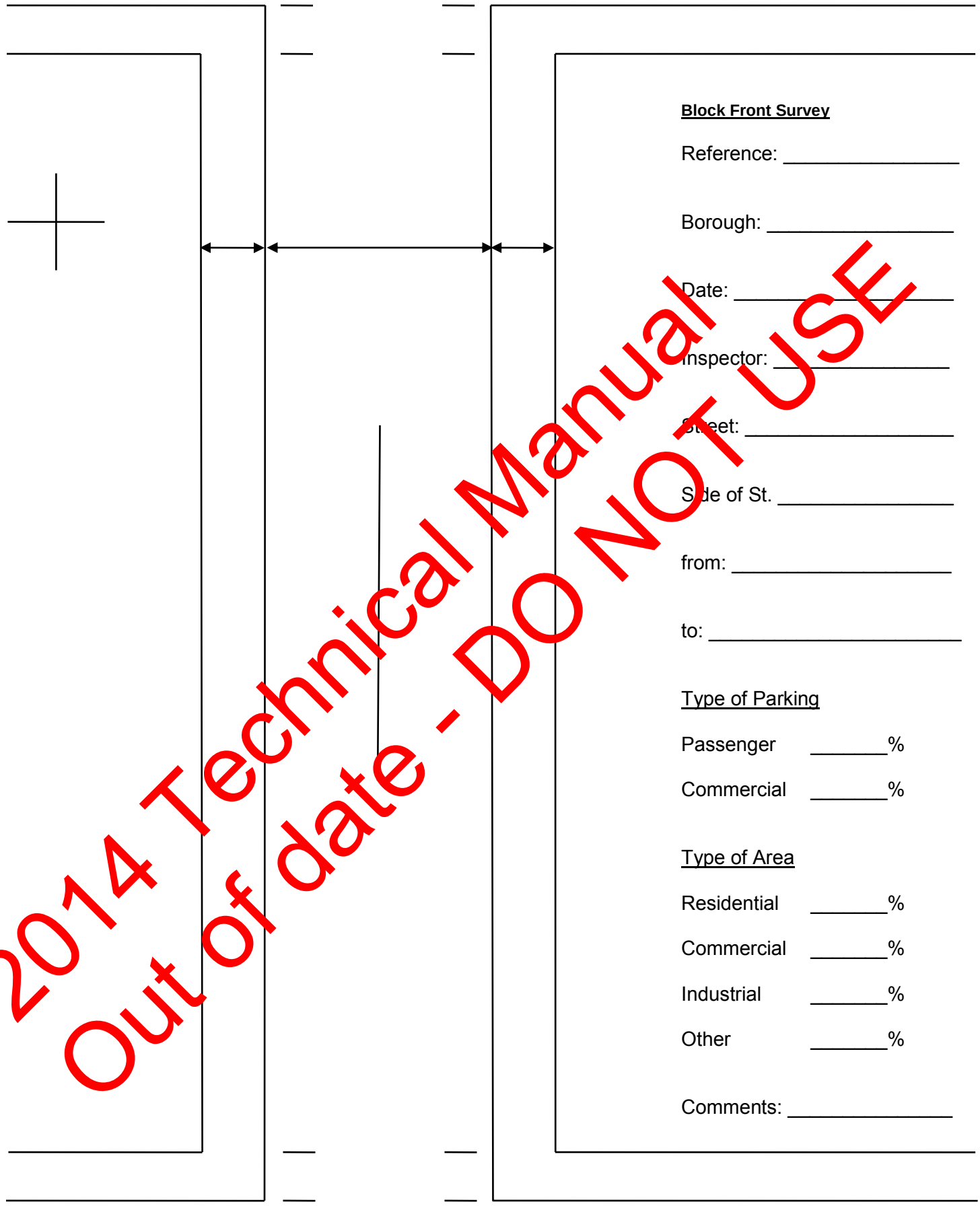
CONDITION DIAGRAM

Ref#_____ Date: _____ Day:_____
Inspector:_____

TCD = DISTANCE TO NEAREST TRAFFIC CONTROL DEVICE (Feet)
LANES = NUMBER OF MOVING LANES

NOTE: Indicate all curb regulations, street furniture, curb cuts, and all pavement markings related to the intersection. The # of lanes observed are the traveled lanes for each approach; parking lanes are not included. Show street direction by placing an arrow(s), indicating direction on all legs of the intersection.

Survey Sheet



Block Front Survey

Reference: _____

Borough: _____

Date: _____

Inspector: _____

Street: _____

Side of St. _____

from: _____

to: _____

Type of Parking

Passenger _____%

Commercial _____%

Type of Area

Residential _____%

Commercial _____%

Industrial _____%

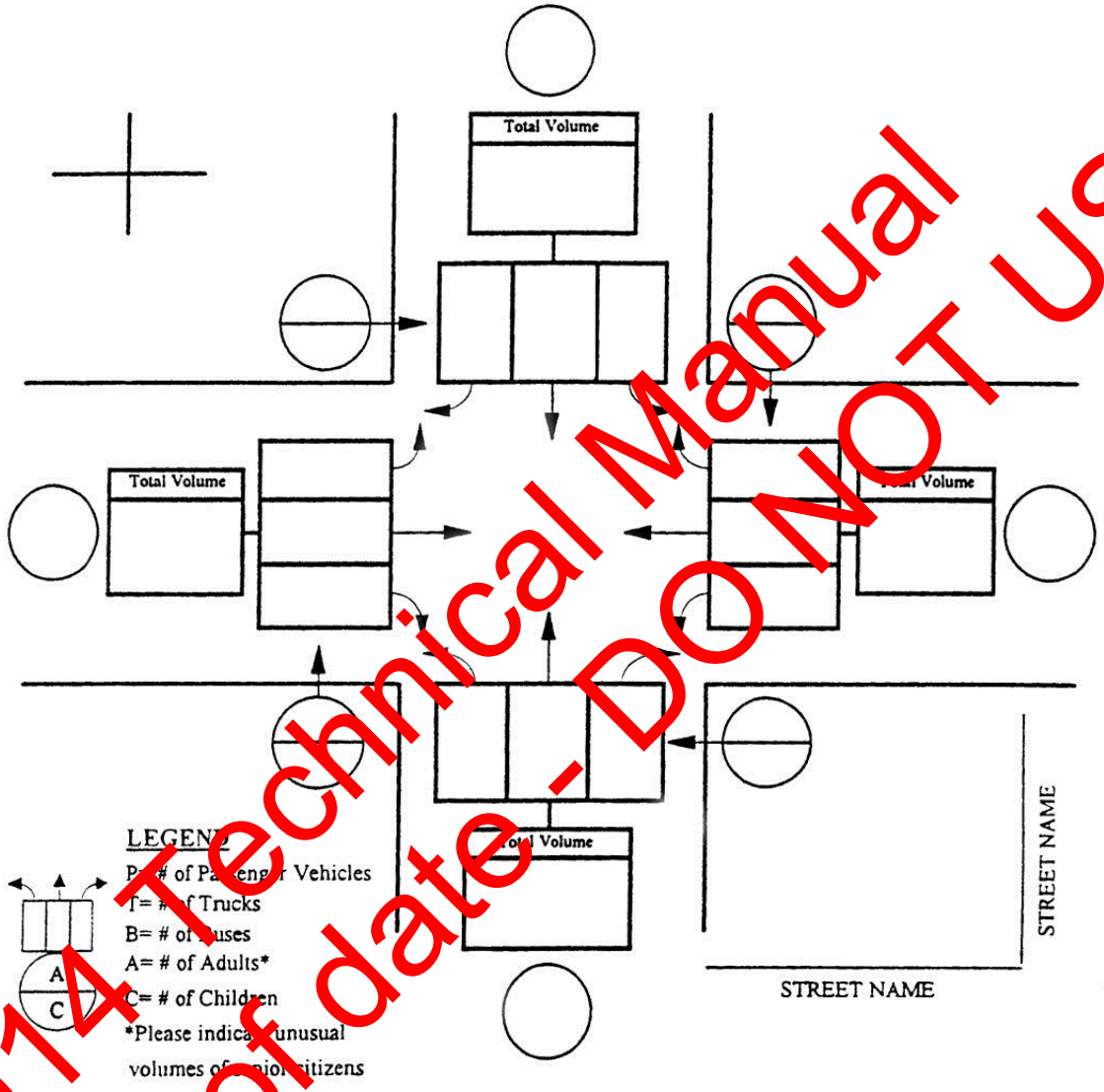
Other _____%

Comments: _____

VOLUME CLASSIFICATION AND TURNING COUNTS

DATE:_____ TIME:_____

DAY:_____ INSPECTOR:_____



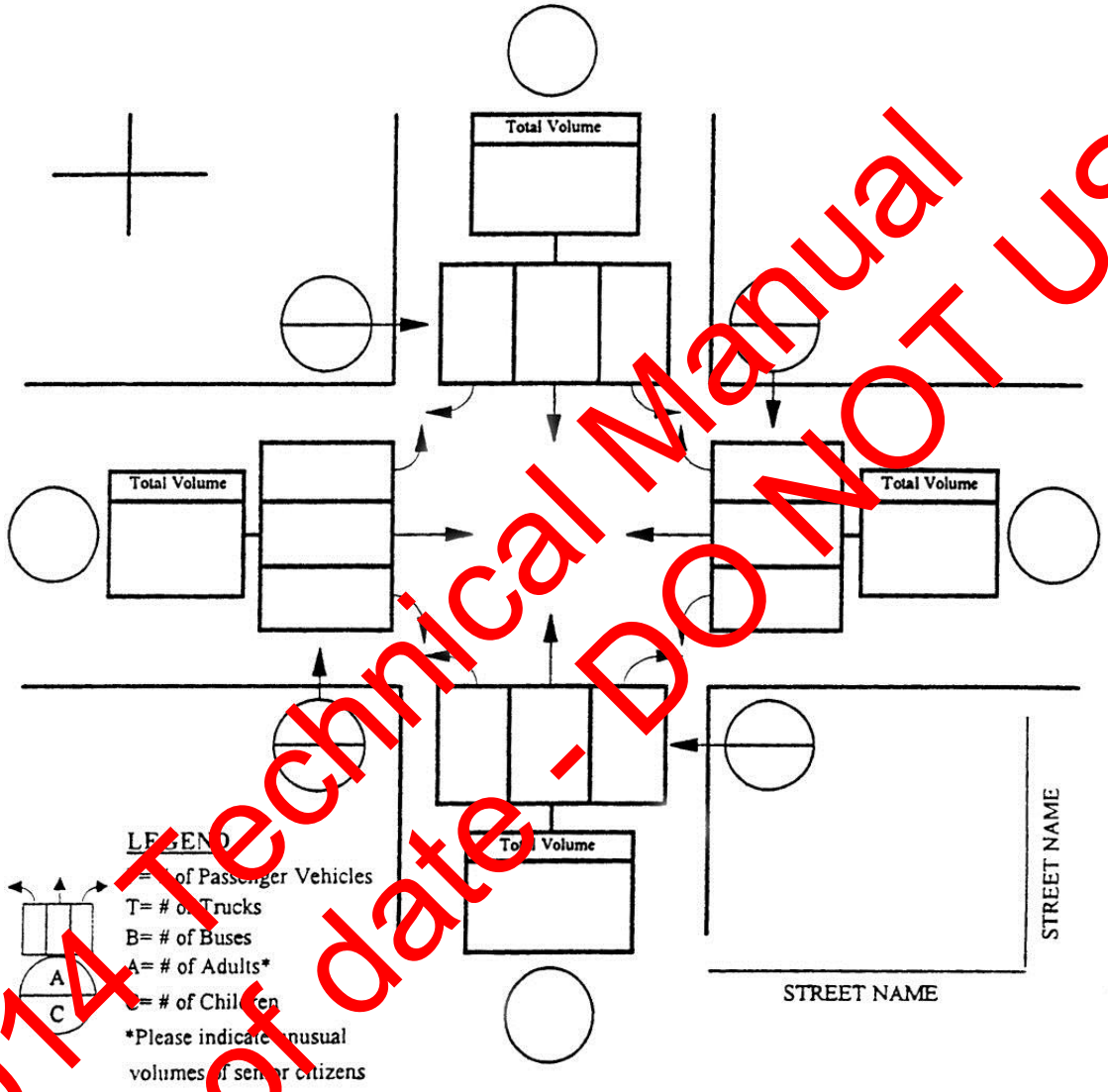
COMMENTS:

MAJOR	
MINOR	
PEDS	
SC	
Other	

VOLUME CLASSIFICATION AND TURNING COUNTS

DATE:_____ TIME:_____

DAY:_____ INSPECTOR:_____



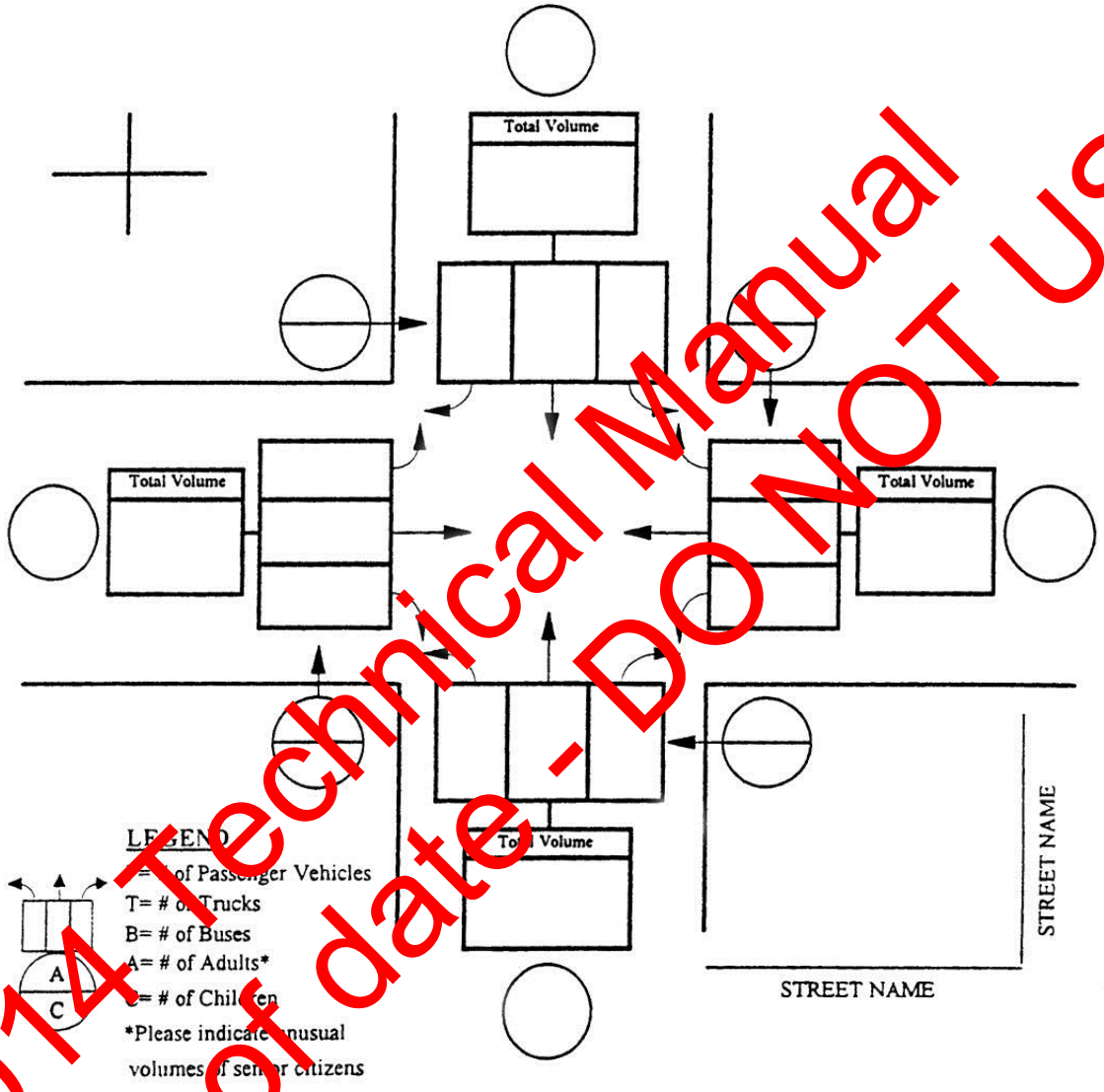
COMMENTS:

MAJOR	
MINOR	
PEDS	
SC	
Other	

VOLUME CLASSIFICATION AND TURNING COUNTS

DATE:_____ TIME:_____

DAY:_____ INSPECTOR:_____



COMMENTS:

_____

_____

_____

_____

_____

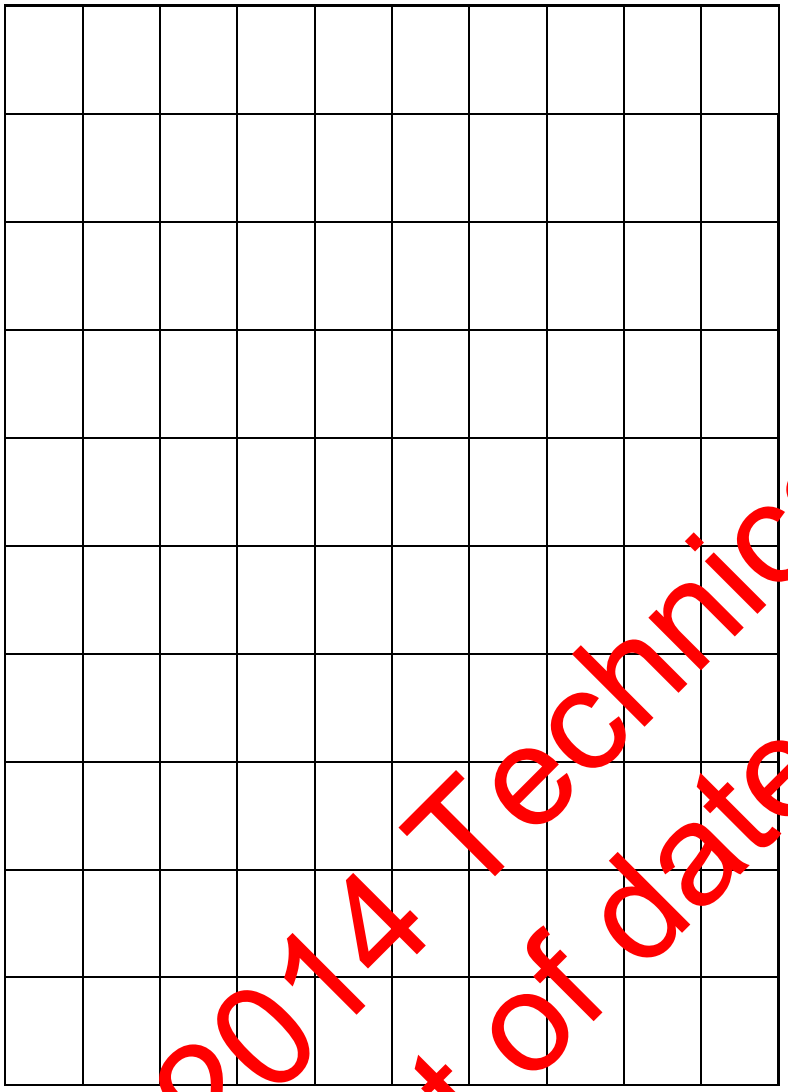
MAJOR	
MINOR	
PEDS	
SC	
Other	

REF._____ START:_____ END:_____ DATE: _____ START:_____ END:_____

WEATHER_____ DIRECTION:_____ DAY:_____ DIRECTION:_____

MPH SPEED LIMIT:_____ POSTED:_____ UNPOSTED:_____

(MAJOR)



Warrant 1, Eight-Hour Vehicular Volume ☐

The following should be included with Warrant 1:

- ATR printouts/reports with all information related to the intersection location, time and date.
- Date and time of any repairs of ATR tubes.
- Highlight 8 hours that meet the warrant.
- Speed study if applicable.

Table 4C-1: Warrant 1, Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume									
No. of lanes for moving traffic on each approach		**MAJOR STREET VOLUMES**				**MINOR STREET VOLUMES**			
		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher- volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	ATR's 8th Highest Hour	100%[a]	80%[b]	70%[c]	ATR's 8th Highest Hour
1	1	500	400	350		150	120	105	
2 or more	1	600	480	420		150	120	105	
2 or more	2 or more	600	480	420		200	160	140	
1	2 or more	500	400	350		200	160	140	

Condition B – Interruption of Continuous Traffic									
No. of lanes for moving traffic on each approach		**MAJOR STREET VOLUMES**				**MINOR STREET VOLUMES**			
		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher- volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	ATR's 8th Highest Hour	100%[a]	80%[b]	70%[c]	ATR's 8th Highest Hour
1	1	750	600	525		75	60	53	
2 or more	1	900	720	630		75	60	53	
2 or more	2 or more	900	720	630		100	80	70	
1	2 or more	750	600	525		100	80	70	

[a] Basic minimum hourly volume.
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures.
[c] May be used when the 85% major street speed exceeds 70 km/h (40 mph) or in an isolated community with a population of less than 10 000.

Accident Reduction Table for Warrant 1: Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume															
No. of lanes for moving traffic on each approach		MAJOR STREET VOLUMES							MINOR STREET VOLUMES						
		Vehicles per hour on major street (total of both approaches)							Vehicles per hour on higher- volume minor-street approach (one direction only)						
Major Street	Minor Street	100%[a]	96%[b]	92%[c]	88%[d]	84%[e]	80%[f]	70%[g]	100%[a]	96%[b]	92%[c]	88%[d]	84%[e]	80%[f]	70%[g]
1	1	500	480	460	440	420	400	350	150	144	138	132	126	120	105
2 or more	1	600	576	552	528	504	480	420	150	144	138	132	126	120	105
2 or more	2 or more	600	576	552	528	504	480	420	200	192	184	176	168	160	140
1	2 or more	500	480	460	440	420	400	350	200	192	184	176	168	160	140

Condition B – Interception of Continuous Traffic															
No. of lanes for moving traffic on each approach		MAJOR STREET VOLUMES							MINOR STREET VOLUMES						
		Vehicles per hour on major street (total of both approaches)							Vehicles per hour on higher- volume minor-street approach (one direction only)						
Major Street	Minor Street	100%[a]	96%[b]	92%[c]	88%[d]	84%[e]	80%[f]	70%[g]	100%[a]	96%[b]	92%[c]	88%[d]	84%[e]	80%[f]	70%[g]
1	1	750	720	690	660	630	600	525	75	72	69	66	63	60	53
2 or more	1	900	864	828	792	756	720	630	75	72	69	66	63	60	53
2 or more	2 or more	900	864	828	792	756	720	630	100	96	92	88	84	80	70
1	2 or more	750	720	690	660	630	600	525	100	96	92	88	84	80	70

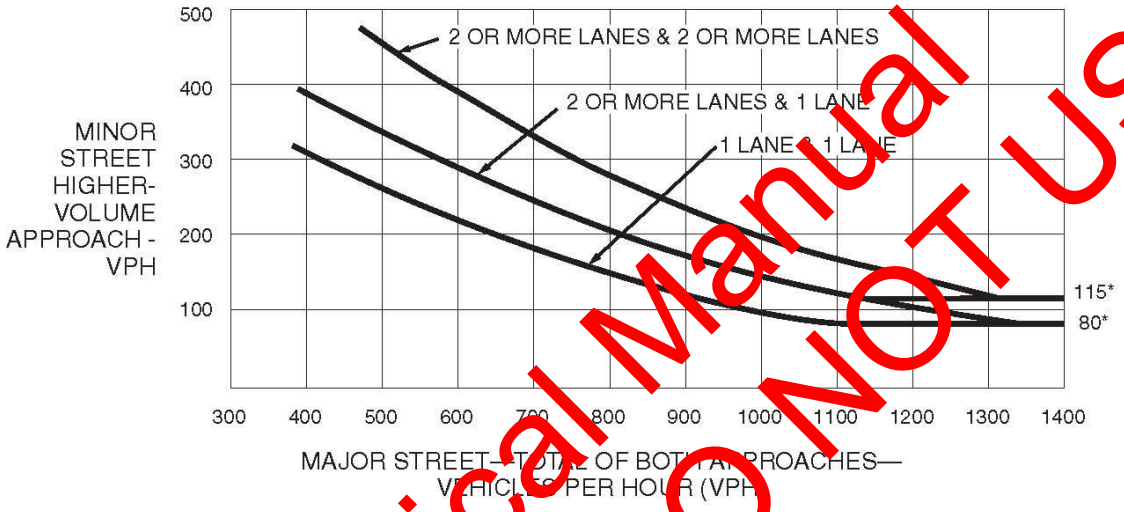
[a] Basic minimum hourly volume.
[b] 4% reduction for 1 accident.
[c] 8% reduction for 2 accidents
[d] 12% reduction for 3 accidents
[e] 16% reduction for 4 accidents
[f] 20% traffic volume reduction for 5 accidents
[g] 30% traffic volume reduction may be used when the 85% major street speed exceeds 70 km/h (40 mph) or in an isolated community with a population of less than 10,000.

Warrant 2 – Four-Hour Vehicular Volume

The following should be included with Warrant 2:

- ATR printouts/reports with all information related to the intersection location, time and date.
- Date and time of any repairs of ATR tubes.
- Highlight 4 hours that meet the warrant.
- Indicate major-minor street volumes and hours that satisfy warrant criteria.
- Speed study if applicable.

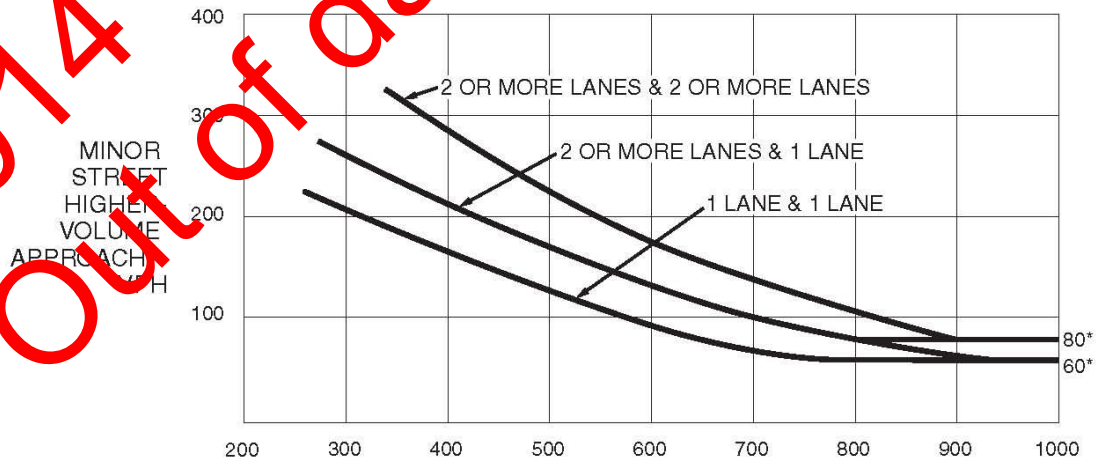
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

WARRANT 3, PEAK HOUR

If applicable, the following should be included with Warrant 3:

- ATR printouts/reports with all information related to the intersection location, time and date.
- Date and time of any repairs of ATR tubes.
- Peak hours that meet the warrant.
- Indicate major-minor street volumes and hours that satisfy warrant criteria.
- Speed study if applicable.

INTERSECTION DELAY STUDY

TOTAL DELAY = TOTAL VEHICLES STOPPED * SAMPLING INTERVAL

= _____ * 15 = _____Veh. Sec.

AVERAGE DELAY PER APPROACH VEHICLE = TOTAL DELAY / APPROACH VOLUME = _____

= _____ Sec.

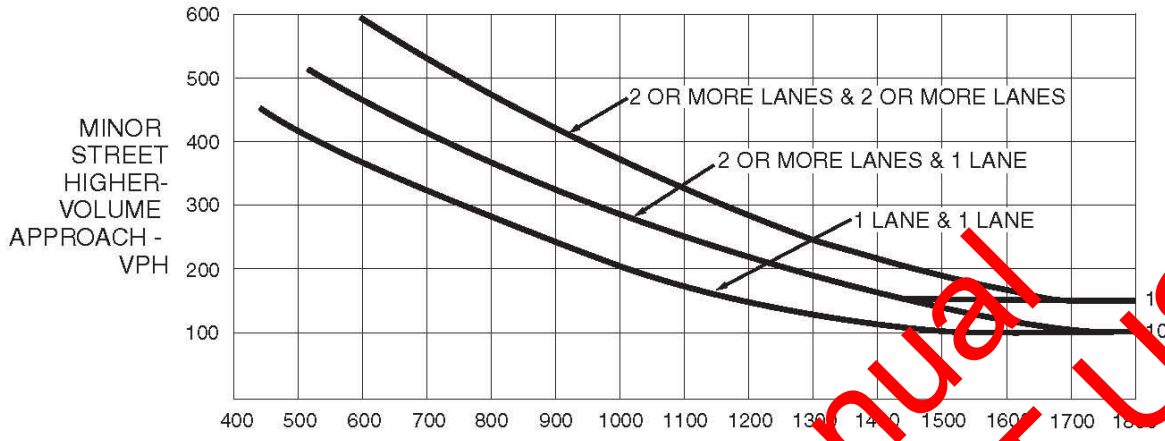
AVERAGE DELAY FOR WARRANT 3 = AVERAGE DELAY * PEAK HOUR VOLUME FROM MACHINE COUNTS

= _____ * _____

= _____ Veh. -Sec.

NOTE: The above information will be used for the Warrant 3 – Peak Hour analysis.

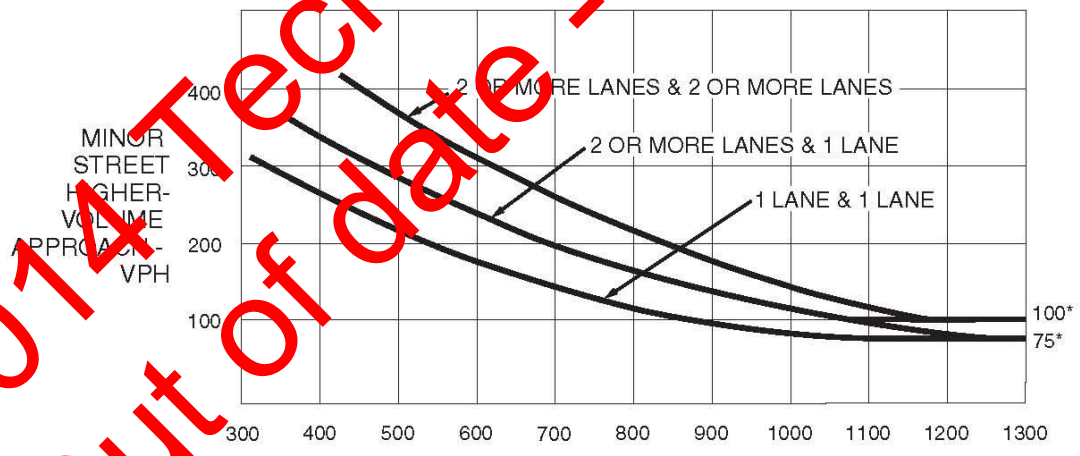
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION, OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

WARRANT 4, PEDESTRIAN VOLUME [ ]

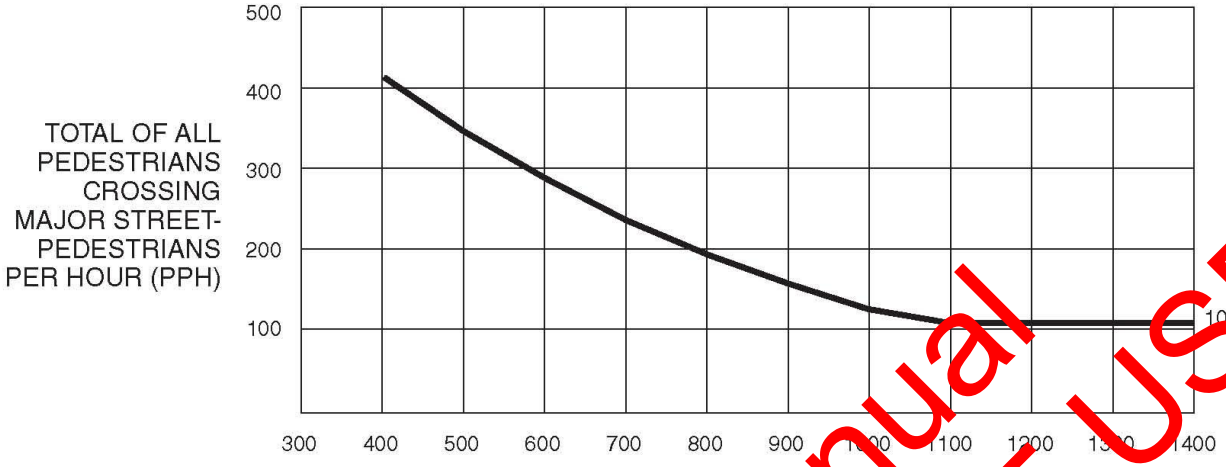
The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that one of the following criteria is met:

A. For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5; or

B. For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-7.

Note:
If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 35 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-6 may be used in place of Figure 4C-5 to evaluate Criterion A, and Figure 4C-8 may be used in place of Figure 4C-7 to evaluate Criterion B.

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

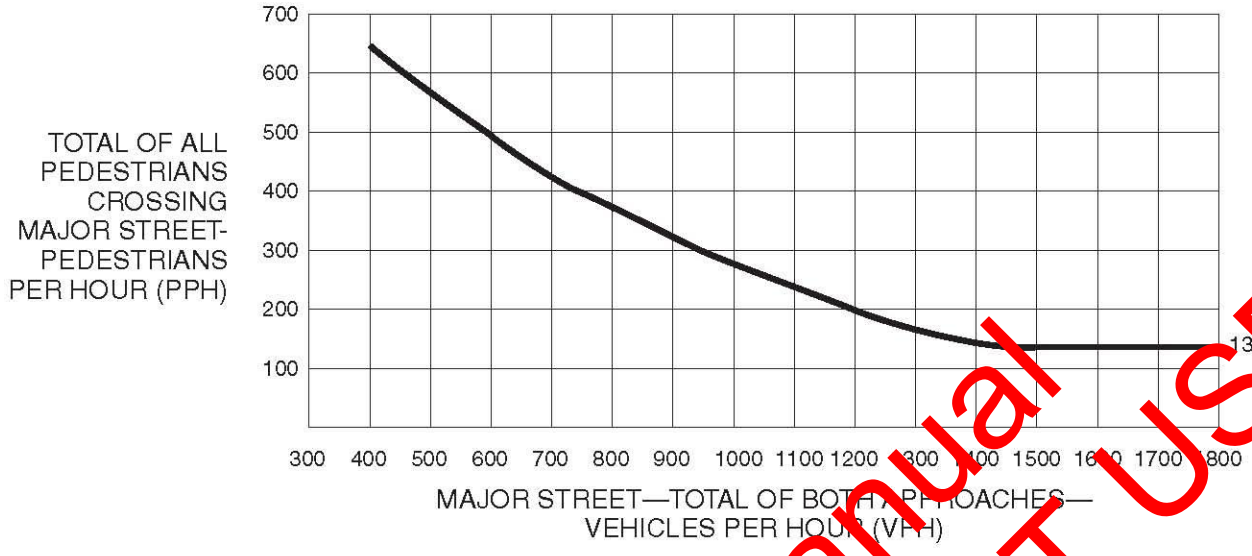


*Note: 107 pph applies as the lower threshold volume.

Figure 4C-6. Warrant 4, Pedestrian Four-Hour Volume (70% Factor)

*Note: 75 pph applies as the lower threshold volume.

Figure 4C-7. Warrant 4, Pedestrian Peak Hour



*Note: 133 pph applies as the lower threshold volume.

Figure 4C-8. Warrant 4, Pedestrian Peak Hour (70% Factor)

*Note: 93 pph applies as the lower threshold volume.

WARRANT 5, SCHOOL CROSSING ☐

If applicable, the following should be included with Warrant 5:

- ATR printouts/reports with all information related to the intersection location, time and date.
- Date and time of any repairs of ATR tubes.
- Highlight hours that meet the warrant.
- Radar study/speed analysis if applicable.

A gap study should be conducted on the leg of the major street with the higher volume of schoolchildren crossing.

The School Crossing signal warrant is intended for applications where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal.

The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of schoolchildren at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing is less than the number of minutes in the same period and there are a minimum of 20 schoolchildren during the highest crossing hour.

$$\text{Adequate Gap (sec)} = \frac{\text{Crosswalk Width (ft)}}{\text{Schoolchildren Speed (ft/sec)}} + \text{Reception Reaction Time (sec)}$$

$$\text{Adequate Gap (sec)} = \frac{\qquad}{3.0\ \text{ft/sec}} + 3\ \text{sec} = \_\_\_\_\_\ \text{sec}$$

School Crossing Guard on Duty _____

Observed Period		Volumes			No. of Adequate Gaps	Warrant Satisfied? (Yes/No)
		Total No. of Vehicles on All Approaches of the Major Street	Pedestrians Crossing Both Legs of the Major Street			
Date	Time Period		Adults	S. Children		

California School Crossing Warrant

The School Crossing Warrant (Warrant# 5) as contained in the federal Manual on Uniform Traffic Control Devices (MUTCD) is dependant on the frequency and adequacy of gaps in the traffic stream. At certain intersections with designated school crosswalks, gaps cannot be measured due to the presence of a school crossing guard, all-way stop control, or other field conditions.

In such cases, if no other warrant contained in the MUTCD is satisfied, the engineer, upon review of the traffic conditions and physical characteristics of the intersection, can use guidelines outlined in the California Department of Transportation (CALTRANS) Traffic Manual. These guidelines are based on satisfying minimum vehicular and schoolchildren volume requirements. In an urban area, 500 vehicles (total in both directions on the major street) and 100 schoolchildren for each of any two hours (not necessarily consecutive) are required.

California Warrant = A School Crossing with All-Way stop or School Crossing Guard present and 500 vehicles on major street and 100 schoolchildren crossing major street for each of any two hours.

This warrant should be used if school crossing guar is on duty or All-Way Stop control exists.

School Crossing Guard on Duty _____ All Way Stop Control _____

Observed Period		Volumes			Warrant Satisfied? (Yes/No)
		Total No. of Vehicles on All Approaches of the Major Street	Pedestrians Crossing Both Legs of the Major Street		
Date	TimePeriod		Adults	S. Children	

WARRANT 6, COORDINATED SIGNAL SYSTEM

The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:

A. On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.

B. On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.

Note: The Coordinated Signal System signal warrant should not be applied where the resultant spacing of traffic control signals would be less that 300 m (1000 ft).

WARRANT 7, CRASH EXPERIENCE

The crash experience signal warrant conditions are intended for applications where the severity and frequency of crashes are the principal reason to consider installing a traffic signal.

The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:

A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and

B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and

C. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 4C-1, or the vph in both of the 80 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

ACC. TIME PERIOD	ACCIDENT TYPE											PREV. Acc.'s before N.R.'s	PREV. Acc.'s after N.R.'s
12 MONTH PERIOD	T	NR	↳	↰	↲	↴	↱	↰	↓	→	PEDS		

Highest # of Preventable accidents in any 12 month period: ___/___/___ - ___/___/___

# of Preventable Accidents _____

Comments:

_____

Improvements/Changes:

_____

WARRANT 8, ROADWAY NETWORK

The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday, or

B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a nonnormal business day (Saturday or Sunday).

A major route as used in this signal warrant shall have one or more of the following characteristics:

A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow, or

B. It includes rural or suburban highways outside, entering, or traversing a city, or

C. It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.

WARRANT 9, INTERSECTION NEAR A GRADE CROSSING

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that both of the following criteria are met:

A. A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach; and

B. During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve in Figure 4C-9 or 4C-10 for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance as defined in MUTCD Section 1A.13.

Guidance

The following considerations apply when plotting the traffic volume data on Figure 4C-9 or 4C-10:

A. Figure 4C-9 should be used if there is only one lane approaching the intersection at the track crossing location and Figure 4C-10 should be used if there are two or more lanes approaching the intersection at the track crossing location.

B. After determining the actual distance D, the curve for the distance D that is nearest to the actual distance D should be used. For example, if the actual distance D is 95 feet, the plotted point should be compared to the curve for D = 90 feet.

C. If the rail traffic arrival times are unknown, the highest traffic volume hour of the day should be used.

Option:

The minor-street approach volume may be multiplied by up to three adjustment factors as provided in Paragraphs 6 through 8.

Because the curves are based on an average of four occurrences of rail traffic per day, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-2 for the appropriate number of occurrences of rail traffic per day.

Because the curves are based on typical vehicle occupancy, if at least 2% of the vehicles crossing the track are buses carrying at least 20 people, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-3 for the appropriate percentage of high-occupancy buses.

Because the curves are based on tractor-trailer trucks comprising 10% of the vehicles crossing the track, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-4 for the appropriate distance and percentage of tractor-trailer trucks.

Standard:

If this warrant is met and a traffic control signal at the intersection is justified by an engineering study, then

A. The traffic control signal shall have actuation on the minor street;

B. Preemption control shall be provided in accordance with Sections 4D.27, 8C.09, and 8C.10; and

C. The grade crossing shall have flashing-light signals (see Chapter 8C).

Guidance:

If this warrant is met and a traffic control signal at the intersection is justified by an engineering study, the grade crossing should have automatic gates.

Table 4C-2. Warrant 9, Adjustment Factor for Daily Frequency of Rail Traffic

Rail Traffic per Day	Adjustment Factor
1	0.67
2	0.91
3 to 5	1.00
6 to 8	1.18
9 to 11	1.25
12 or more	1.33

Table 4C-3. Warrant 9, Adjustment Factor for Percentage of High-Occupancy Buses

% of High-Occupancy Buses* on Minor-Street Approach	Adjustment Factor
0%	1.00
2%	1.09
4%	1.19
6% or more	1.32

*A high-occupancy bus is defined as a bus occupied by at least 20 people

Table 4C-4. Warrant 9, Adjustment Factor for Percentage of Tractor-Trailer Trucks

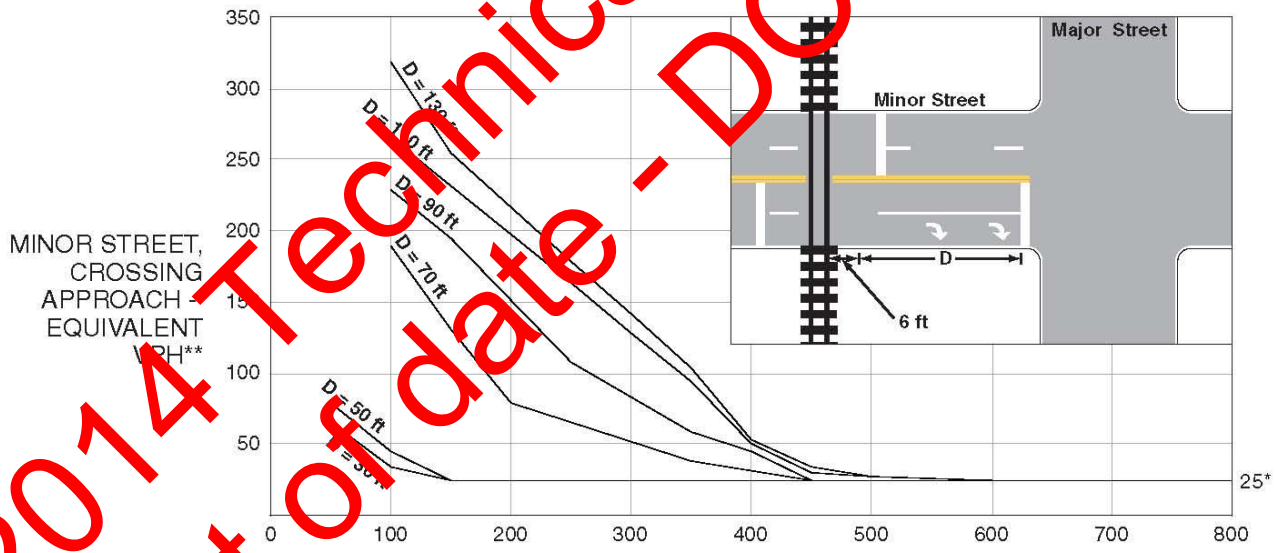
% of Tractor-Trailer Truck on Minor-Street Approach	Adjustment Factor	
	D less then 70 feet	D of 70 feet or more
0% to 2.5%	0.50	0.50
2.6% to 7.5%	0.75	0.75
7.6% to 12.5%	1.00	1.00
12.6% to 17.5%	2.30	1.15
17.6% to 22.5%	2.70	1.35
22.6% to 27.5%	3.28	1.64
More then 27.5%	4.18	2.09

Figure 4C-9. Warrant 9, Intersection Near a Grade Crossing (One Approach Lane at the Track Crossing)

* 25 vph applies as the lower threshold volume

** VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate

Figure 4C-10. Warrant 9, Intersection Near a Grade Crossing (Two or More Approach Lanes at the Track Crossing)



* 25 vph applies as the lower threshold volume

** VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate

FIELD OBSERVATION REPORT

LOCATION:_____

BOROUGH: _____ DATE: _____

TIME: _____ OBSERVER: _____

OPERATIONAL CHECKLIST:	**NO**	**YES**	**WHERE AND WHAT**
1. Are there any obstructions blocking the view of opposing or conflicting vehicles?	____	____	_____
2. Are drivers complying with intersection controls?	____	____	_____
3. Are Speed limit signs posted?	____	____	_____
4. Is vehicle delay causing a safety problem?	____	____	_____
5. Is the approach grade causing safety problems?	____	____	_____
6. Do you recommend more stringent enforcement of any regulations?	____	____	_____
7. Are signs faded, turned or defaced?	____	____	_____
8. Do pavement markings have to be installed or refurbished? e.g.: STOP messages, STOP lines, lane lines, crosswalks, etc.)	____	____	_____
9. Is there a need to install channelizations to reduce conflict areas?	____	____	_____
10. Do signs existing in field match current C-Order?	____	____	_____
11. Do Apex (diagonal curb) ramps exist at any of the corners of the intersection? If yes, which corners?	____	____	_____
12. Other	____	____	_____

NOTE: (N/A) NOT APPLICABLE

Attach All Relevant Crash Reports and Summaries

NEW YORK CITY
DEPARTMENT OF TRANSPORTATION
TRAFFIC OPERATIONS

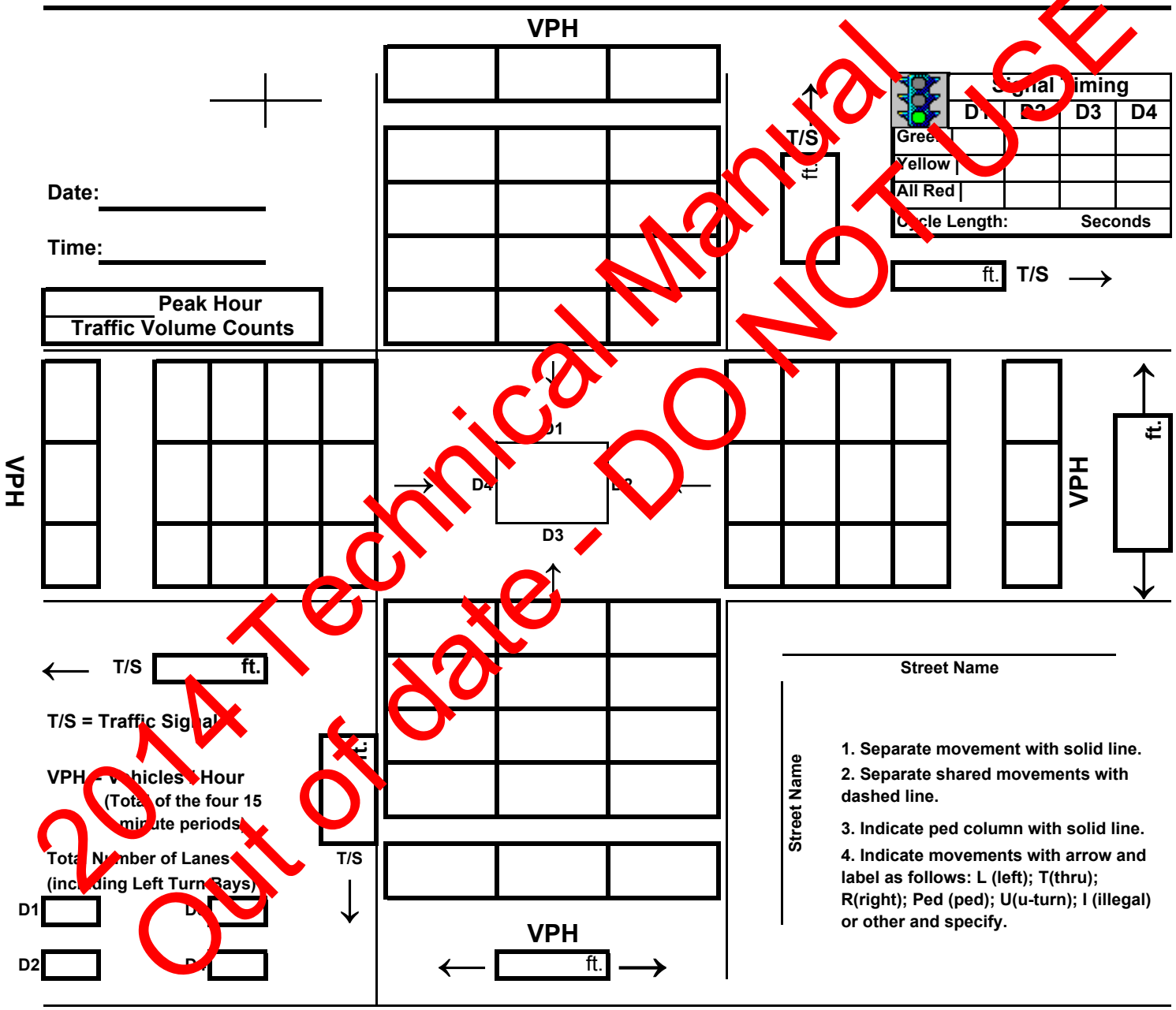
Left Turn Signal Survey Sheet

Borough: _____ **Log #:** _____ **Ref. #:** _____

Location: _____ **CB #:** _____

Requestor: _____ **Investigator:** _____

Date Completed: _____



Engineer: _____ **Date:** _____

Reviewed ☐ _____ **Date:** _____ **Satisfied** ☐

Recommended ☐ _____ **Date:** _____ **Warrant #** ☐

Denied ☐ _____ **Date:** _____ **Not Satisfied** ☐

NEW YORK CITY
DEPARTMENT OF TRANSPORTATION
TRAFFIC OPERATIONS

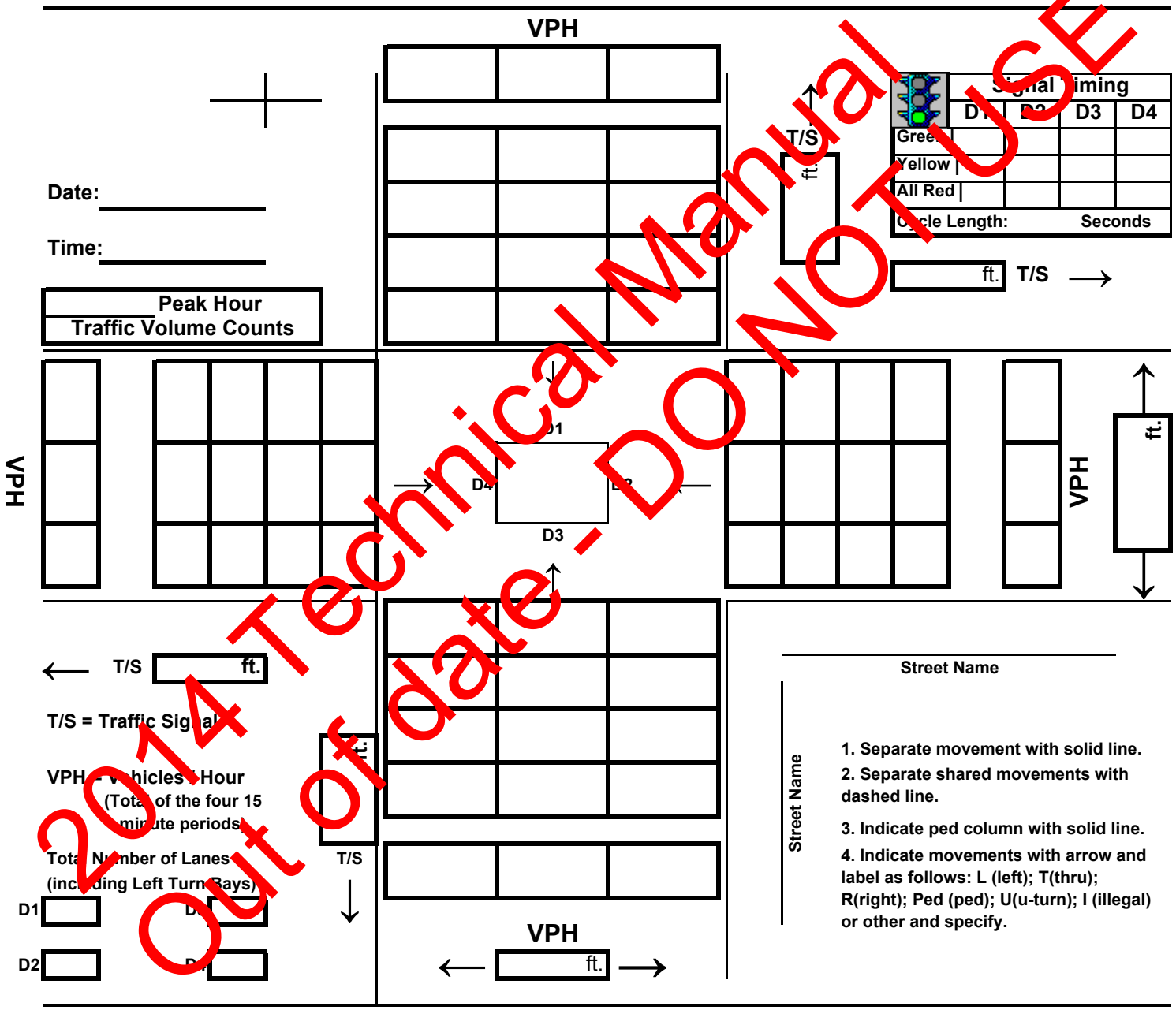
Left Turn Signal Survey Sheet

Borough: _____ **Log #:** _____ **Ref. #:** _____

Location: _____ **CB #:** _____

Requestor: _____ **Investigator:** _____

Date Completed: _____



Engineer: _____ **Date:** _____

Reviewed ☐ _____ **Date:** _____ **Satisfied** ☐

Recommended ☐ _____ **Date:** _____ **Warrant #** ☐

Denied ☐ _____ **Date:** _____ **Not Satisfied** ☐

NEW YORK CITY
DEPARTMENT OF TRANSPORTATION
TRAFFIC OPERATIONS

Left Turn Signal Warrant Sheet

WARRANT 1 (Accident Experience)

Satisfied ☐
Not Satisfied ☐

This Warrant is satisfied when a minimum of 5 related left turn accidents exist in the latest 12 month period in which accident records are available.

Year	Total Accidents	Left Turn Accidents

Accident sheets must be attached.

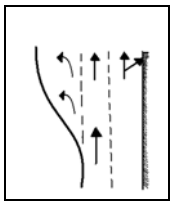
WARRANT 2 (Left Turn Capacity)

Satisfied ☐
Not Satisfied ☐

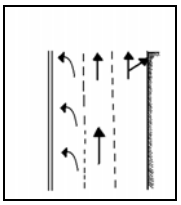
This Warrant is satisfied when for the analyzed direction the Left-Turn flow rate exceeds the left-turn capacity.
The left-turn capacity is the maximum flow rate that may be assigned to the designated phase.

— **On approaches with exclusive left-turn bays / lanes, the left-turn capacity is computed by using the following equations:**

(1A) $C_{ELT} = (1{,}400 - V_O)(g/c)_{LT}$



Exclusive Left-Turn Bay



Exclusive Left –Turn Lane

Or

(2) C_{ELT} **= 2 vehicles per signal cycle**

where:

C_{ELT} **= capacity of the left-turn protected / permitted phase, in vph;**

V_O **= opposing thru plus right-turn service flow rate*, in vph, and**

$(g/c)_{LT}$ **= effective green** ratio for the protected / permitted phase, in seconds.**

*Service flow rate is the equivalent hourly rate at which vehicles pass a roadway during a given time interval less than one hour, usually 15 minutes.

Service flow rate = (highest 15 minute count) x 4.

**Effective green time is the time during a given phase that is effectively available to the permitted movements: this is generally taken to be the green time (G) plus the change interval (Y + AR) minus the lost time (3.0 seconds) for the designated phase.

On approaches with shared left-turn and thru vehicles, the left-turn capacity is computed by using the following equations:

(1B) $C_{SLT} = [\,(1{,}400 - V_O)\,(g/c)_{LT}\,]\,f_{SLT}$

Shared Lanes

Or

(2) C_{SLT} = 2 vehicles per signal cycle

where:

C_{SLT} = capacity of the left-turn in the shared lane, in vph:

f_{SLT} = adjustment factor for left-turn vehicles

The adjustment factor basically accounts for the fact that the left-turn movements cannot be made at the same saturation flow rates as thru movements. They consume more of the available green time, and consequently, more of the intersection's available capacity.

The adjustment factor is computed as the ratio of the left-turn flow rate (which is converted to an approximate equivalent flow of thru vehicles) to the thru vehicles that share the same lane.

The following TABLE 1 may be used to convert the left-turn vehicles to equivalent thru vehicles.

TABLE 1

TOTAL OPPOSING FLOW RATE (V_O)	CONVERSION FACTOR (f_{pce})	TOTAL OPPOSING FLOW RATE (V_O)	CONVERSION FACTOR (f_{pce})
0 – 200	1.50	1001 – 1050	5.00
201 - 500	2.00	1051 – 1075	5.50
501 - 700	2.50	1076 – 1100	6.00
701 – 800	3.00	1101 – 1125	6.50
801 – 900	3.50	1126 – 1145	7.00
901 – 950	4.00	> 1146*	
951 - 1000	4.50		

*Use exclusive Left-Turn lane procedure.

Comments:_____

_____

_____

_____

COMPUTATIONS
EXCLUSIVE LEFT-TURN LANE

Opposing Thru Plus Right Turn Service Flow Rate

V_O = (highest 15 minute count) x 4

V_O = [ ] x 4 = [ ] vph

Left Turn Service Flow Rate (Direction analyzed for Left-Turn Phase)

V_{LT} = (highest 15 minute count) x 4

V_{LT} = [ ] x 4 = [ ] vph

Left Turn Capacity

$C_{ELT} = (1{,}400 - V_O)\ (g/c)_{LT}$

where:

$g = [\ G + Y + AR - 3.0\ ] \times f_q{}^* =$ [ ] x [ ] = [ ] seconds

* Adjustment factor used to calculate the portion of the green phase that is not blocked by an opposing queue of vehicles. The fq factor is given for each case in TABLE 2.

c = cycle length = [ ] seconds

thus, $(g/c)_{LT}$ = [ ]

TABLE 2	
OPPOSING THRU LANES	f_q
1	.85
2	.90
≥ 3	.95

and

C_{ELT} = (1400 [ ]) ([ ])$_{LT}$ = [ ] vph

or

C_{ELT} = 2 vehicles per signal cycle

$C_{ELT} = 2 \times (3600 \div C)$ = [ ] vph

V_{LT} = vph	>	or	<	C_{ELT}** = vph

**Select the highest left turn capacity

- If V_{LT} (Left turn service flow rate) is greater than (>) the C_{ELT} (left turn capacity), the Warrant is satisfied and a left turn phase is needed.
- If V_{LT} is less then (<) the C_{ELT} the Warrant is not satisfied because the signal and geometric design can accommodate the left turn volume at the intersection.

This form is also available here in .xls format

COMPUTATIONS
SHARED LEFT-TURN / THRU LANE

Adjustment Factor for Left-Turn Vehicles
(Opposing Thru Plus Right Turn Service Flow Rate)

V_O = (highest 15 minute count) x 4

V_O = _____ x 4 = _____ vph

Using TABLE 1, f_{PCE} = _____

V_{TV} = _____ x 4 = _____ vph

where: V_{TV} = Thru vehicles in the shared lane.

Left Turn Service Flow Rate
(Direction analyzed for Left-Turn Phase)

V_{LT} = (highest 15 minute count) x 4

V_{LT} = _____ x 4 = _____ vph

$V_{PCE} = V_{LT} \times f_{PCE}$ = _____ x _____ = _____ vph

$f_{SLT} = V_{PCE} \div (V_{TV} + V_{PCE})$ = _____ ÷ (_____ + _____) = _____

TABLE 2	
OPPOSING THRU LANES	f_q
1	.85
2	.90
≥ 3	.95

Left Turn Capacity

$C_{SLT} = [(1{,}400 - V_O) (g/c)_{LT}] f_{SLT}$

where:

g = [G + Y + AR – 3.0] x f_q = _____ x _____ = _____ seconds

c = cycle length = _____ seconds thus, $(g/c)_{LT}$ = _____

and C_{SLT} = [(1400 - _____) (_____) $_{LT}$] x _____ = _____ vph

or

C_{SLT} = 2 vehicles per signal cycle

C_{SLT} = 2 x (3600 ÷ C) = _____ vph

V_{LT} = _____ vph | > | or | < | C_{SLT}* = _____ vph

*Select the highest left turn capacity

-If V_{LT} (Left turn service flow rate) is greater than (>) the C_{SLT} (left turn capacity), the Warrant is satisfied and a left turn phase is needed.
-If V_{LT} is less then (<) the C_{SLT}, the Warrant is not satisfied because the signal and geometric design can accommodate the left turn volume at the intersection.

This form is also available here in .xls format

Level of Service Criteria (LOS) at Signalized Intersections	
LOS	**Control Delay per Vehicle (s/veh)**
A	≤ 10
B	$> 10 - 20$
C	$> 20 - 35$
D	$> 35 - 55$
E	$> 55 - 80$
F	> 80
Source: Transportation Research Board, *Highway Capacity Manual 2000*	

Level of Service Criteria at Unsignalized Intersections	
LOS	**Average Control Delay (s/veh)**
A	$0 - 10$
B	$> 10 - 15$
C	$> 15 - 25$
D	$> 25 - 35$
E	$> 35 - 50$
F	> 50
Source: Transportation Research Board, *Highway Capacity Manual 2000*	

Level of Service Criteria at Freeway-Ramp Junctions	
LOS	**Density (passenger car/mile/lane)**
A	≤ 10
B	$> 10 - 20$
C	$> 20 - 28$
D	$> 28 - 35$
E	> 35
F	Demand exceeds capacity
Source: Transportation Research Board, *Highway Capacity Manual 2000*	

TOP HIGH ACCIDENT INTERSECTIONS 2012

INTERSECTION	NUMBER	RANK	BORO
ATLANTIC AV AND PENNSYLVANIA AV	80	1	Brooklyn
HAMILTON AV AND COURT ST	70	2	Brooklyn
LINDEN BL AND PENNSYLVANIA AV	48	3	Brooklyn
FLATBUSH AV EXT AND TILLARY ST	43	4	Brooklyn
AVENUE D AND KINGS HW	38	5	Brooklyn
MAJOR DEEGAN XW AND REST AREA	37	6	Bronx
ROCKAWAY BL AND BROOKVILLE BL	35	7	Queens
WOODHAVEN BL AND 101ST AV	35	7	Queens
BOWERY AND CANAL ST	34	9	Manhattan
ATLANTIC AV AND LOGAN ST	32	10	Brooklyn
HOWARD AV AND ST JOHNS PL	31	11	Brooklyn
ATLANTIC AV AND EASTERN PW EXT	30	12	Brooklyn
UTICA AV AND EASTERN PW	29	13	Brooklyn
WOODHAVEN BL AND JAMAICA AV	29	13	Queens
CHRYSTIE ST AND DELANCEY ST	29	13	Manhattan
LINDEN BL AND EUCLID AV	29	13	Brooklyn
NOSTRAND AV AND EASTERN PW	28	17	Brooklyn
BRUCKNER BL AND HUNTS POINT AV	27	18	Bronx
LINDEN BL AND IN678 SR	27	18	Queens
IN95 SR AND RMP IN95 TO WHITE PLAINS RD	27	18	Bronx
RMP GCP TO JEWEL AV AND JEWEL AV	26	21	Queens
WOODHAVEN BL AND METROPOLITAN AV	26	21	Queens
ATLANTIC AV AND CRESCENT ST	26	21	Brooklyn
FLATBUSH AV AND ATLANTIC AV	26	21	Brooklyn

INTERSECTION	NUMBER	RANK	BORO
LENOX AV AND W 125TH ST	26	21	Manhattan
ROCHESTER AV AND EASTERN PW	25	26	Brooklyn
11TH AV AND W 57TH ST	25	26	Manhattan
WOODHAVEN BL AND ROCKAWAY BL	24	28	Queens
WEBSTER AV AND E FORDHAM RD	24	28	Bronx
WESTCHESTER AV AND WHITE PLAINS RD	24	28	Bronx
ATLANTIC AV AND NOSTRAND AV	24	28	Brooklyn
AVENUE C AND OCEAN PW	24	28	Brooklyn
BROADWAY AND HOUSTON ST	24	28	Manhattan
BUFFALO AV AND EASTERN PW	24	28	Brooklyn
NORTHERN BL AND JACKSON AV	23	35	Queens
6TH AV AND CENTRAL PK S	23	35	Manhattan
2ND AV AND E 42ND ST	23	35	Manhattan
20TH AV AND IN678 SR	23	35	Queens
BRUCKNER BL AND E 140TH ST	23	35	Bronx
BROOKVILLE BL AND S CONDUIT AV	23	35	Queens
CANAL ST AND LAFAYETTE ST	23	35	Manhattan
MYRTLE AV AND COLD ST	23	35	Brooklyn
S CONDUIT AV AND 230TH PL	22	43	Queens
QUEENS BL AND THOMSON AV	22	43	Queens
1ST AV AND E 96TH ST	22	43	Manhattan
7TH AV AND W 145TH ST	22	43	Manhattan
AVENUE P AND OCEAN PW	22	43	Brooklyn
18TH AV AND OCEAN PW	22	43	Brooklyn
AVENUE J AND FLATBUSH AV	22	43	Brooklyn
AVENUE J AND OCEAN PW	22	43	Brooklyn
EMPIRE BL AND ROGERS AV	22	43	Brooklyn
LINDEN BL AND STONE AV	22	43	Brooklyn
IN495 SR AND PENROD ST	22	43	Queens

TOP HIGH ACCIDENT INTERSECTIONS 2011

INTERSECTION	NUMBER	RANK	BORO
ATLANTIC AV AND LOGAN ST	39	1	Brooklyn
ATLANTIC AV AND PENNSYLVANIA AV	38	2	Brooklyn
BRUCKNER BL AND HUNTS POINT AV	38	2	Bronx
LINDEN BL AND PENNSYLVANIA AV	36	4	Brooklyn
BROOKVILLE BL AND S CONDUIT AV	35	5	Queens
BRUCKNER BL AND WHITE PLAINS RD	34	6	Bronx
WOODHAVEN BL AND UNION TP	33	7	Queens
AVENUE J AND OCEAN PW	31	8	Brooklyn
UTICA AV AND EASTERN PW	30	9	Brooklyn
ESSEX ST AND DELANCEY ST	30	9	Manhattan
ATLANTIC AV AND NOSTRAND AV	29	11	Brooklyn
WOODHAVEN BL AND JAMAICA AV	28	12	Queens
AVENUE U AND FLATBUSH AV	28	12	Brooklyn
LINDEN BL AND 234TH ST	28	12	Queens
TILLARY ST AND ADAMS ST	27	15	Brooklyn
WOODHAVEN BL AND 111ST AV	27	15	Queens
3RD AV AND 157TH ST	27	15	Manhattan
CHURCH AV AND OCEAN PW	27	15	Brooklyn
S CONDUIT AV AND 230TH PL	26	19	Queens
8TH AV AND W 34TH ST	26	19	Manhattan
7TH AV AND W 34TH ST	26	19	Manhattan
METROPOLITAN AV AND 75TH AV	26	19	Queens
LINDEN BL AND ROCKAWAY PW	26	19	Brooklyn
FLATBUSH AV AND ATLANTIC AV	25	24	Brooklyn

INTERSECTION	NUMBER	RANK	BORO
NORTHERN BL AND DOUGLASTON PW	25	24	Queens
LINDEN BL AND ROCKAWAY AV	25	24	Brooklyn
WOODHAVEN BL AND ATLANTIC AV	24	27	Queens
ATLANTIC AV AND UTICA AV	23	28	Brooklyn
AMSTERDAM AV AND W 125TH ST	23	28	Manhattan
HYLAN BL AND TYSENS LA	23	28	Staten Island
OCEAN PW AND CORTELYOU RD	23	28	Brooklyn
LINDEN BL AND VAN SINDEREN AV	23	28	Brooklyn
DITMAS AV AND OCEAN PW	23	28	Brooklyn
YELLOWSTONE BL AND QUEENS BL	22	34	Queens
8TH AV AND W 42ND ST	22	34	Manhattan
ATLANTIC AV AND CRESCENT ST	22	34	Brooklyn
HILLSIDE AV AND IN678 SR	22	34	Queens
FLATBUSH AV AND CHURCH AV	22	34	Brooklyn
NOSTRAND AV AND EASTERN PW	22	34	Brooklyn
LINDEN BL AND NOSTRAND AV	22	34	Brooklyn
SEDGWICK AV AND W FORDHAM RD	21	41	Bronx
ROCKAWAY BL AND IN678 SR	21	41	Queens
VANDERBILT AV AND ATLANTIC AV	21	41	Brooklyn
SPRINGFIELD BL AND N CONDUIT AV	21	41	Queens
BOWERY AND CANAL ST	21	41	Manhattan
AVENUE P AND CONEY ISLAND AV	21	41	Brooklyn
3RD AV AND E 34TH ST	21	41	Manhattan
BAYCHESTER AV AND BARTOW AV	21	41	Bronx
NOSTRAND AV AND KINGS HW	21	41	Brooklyn
NEPTUNE AV AND OCEAN PW	21	41	Brooklyn
PARSONS BL AND NORTHERN BL	21	41	Queens
WOODHAVEN BL AND METROPOLITAN AV	20	52	Queens
UTICA AV AND KINGS HW	20	52	Brooklyn

TOP HIGH PEDESTRIAN ACCIDENT INTERSECTIONS 2012

INTERSECTION	NUMBER	RANK	BORO
1ST AV AND E 23RD ST	14	1	MANHATTAN
AMSTERDAM AV AND W 125TH ST	13	2	Manhattan
LEXINGTON AV AND E 125TH ST	11	3	MANHATTAN
ATLANTIC AV AND COURT ST	10	4	BROOKLYN
7TH AV AND W 23RD ST	10	4	MANHATTAN
8TH AV AND W 42ND ST	10	4	MANHATTAN
8TH AV AND W 34TH ST	10	4	Manhattan
8TH AV AND W 42ND ST	10	4	Manhattan
UTICA AV AND EASTERN PW	9	9	Brooklyn
FOREST AV AND MORNINGSTAR RD	9	9	Staten Island
	9	9	Manhattan
2ND AV AND E 96TH ST	8	12	MANHATTAN
BROADWAY AND W 86TH ST	8	12	MANHATTAN
UTICA AV AND EASTERN PW	8	12	BROOKLYN
NORTHERN BLVD AND UNION ST	8	12	QUEENS
BRUCKNER BL AND HUNTS POINT AV	8	12	BRONX
4TH AV AND 39TH ST	8	12	BROOKLYN
HAMILTON AV AND COURT ST	8	12	Brooklyn
1ST AV AND E 57TH ST	8	12	MANHATTAN
7TH AV AND W 34TH ST	8	12	MANHATTAN
PARSONS BL AND ARCHER AV	8	12	Queens
LENOX AV AND W 125TH ST	8	12	Manhattan
LENOX AV AND W 116TH ST	8	12	Manhattan
9TH AV AND W 34TH ST	8	12	Manhattan
1ST AV AND E 23RD ST	8	12	Manhattan
WEBSTER AV AND E FORDHAM RD	8	12	Bronx
5TH AV AND E 34TH ST	8	12	Manhattan

INTERSECTION	NUMBER	RANK	BORO
LIBERTY AV AND 120TH ST	7	28	QUEENS
BROADWAY AND	7	28	MANHATTAN
SUTPHIN BL AND ARCHER AV	7	28	QUEENS
SOUTHERN BL AND WESTCHESTER AV	7	28	BRONX
LENOX AV AND W 125TH ST	7	28	MANHATTAN
BOERUM PL AND LIVINGSTON ST	7	28	BROOKLYN
SPRINGFIELD BL AND HEMPSTEAD AV	7	28	QUEENS
ST NICHOLAS AV AND W 181ST ST	7	28	MANHATTAN
UNIVERSITY AV TU AND W FORDHAM RD	7	28	BRONX
UTICA AV AND CHURCH AV	7	28	BROOKLYN
FLATLANDS AV AND PAERDEGAT AV S	7	28	BROOKLYN
FLATBUSH AV AND NEVINS ST	7	28	BROOKLYN
3RD AV AND EAST FORDHAM RD	7	28	BRONX
8TH AV AND 60TH ST	7	28	BROOKLYN
ESSEX ST AND DELANCEY ST	7	28	MANHATTAN
ATLANTIC AV AND BOND ST	7	28	Brooklyn
AVENUE D AND DITMAS AV	7	28	BROOKLYN
	7	28	Brooklyn
FLATBUSH AV AND CHURCH AV	7	28	Brooklyn
3RD AV AND E 42ND ST	7	28	MANHATTAN
COLUMBUS AV AND W 97TH ST	7	28	MANHATTAN
LEXINGTON AV AND E 86TH ST	7	28	MANHATTAN
5TH AV AND W 34TH ST	7	28	BROOKLYN
2ND AV AND E 33RD ST	7	28	Manhattan
9TH AV AND W 42ND ST	7	28	Manhattan
7TH AV AND W 42ND ST	7	28	Manhattan
COLUMBUS AV AND W 66TH ST	7	28	Manhattan
7TH AV AND W 14TH ST	7	28	Manhattan
WESTCHESTER AV AND WHITE PLAINS RD	7	28	Bronx
1ST AV AND E 14TH ST	7	28	Manhattan
PARSONS BL AND HILLSIDE AV	7	28	Queens
6TH AV AND BROADWAY	7	28	Manhattan

TOP HIGH PEDESTRIAN ACCIDENT INTERSECTIONS 2011

INTERSECTION	NUMBER	RANK	BORO
7TH AV AND W 34TH ST	16	1	Manhattan
FLATBUSH AV AND CHURCH AV	11	2	Brooklyn
8TH AV AND W 42ND ST	10	3	Manhattan
AMSTERDAM AV AND W 125TH ST	9	4	Manhattan
AVENUE U AND FLATBUSH AV	9	4	Brooklyn
4TH AV AND 86TH ST	8	6	Brooklyn
8TH AV AND W 34TH ST	8	6	Manhattan
6TH AV AND BROADWAY	8	6	Manhattan
3RD AV AND E 34TH ST	8	6	Manhattan
3RD AV AND E 14TH ST	8	6	Manhattan
8TH AV AND W 57TH ST	8	6	Manhattan
10TH AV AND W 52ND ST	7	12	Manhattan
UTICA AV AND EASTERN PW	7	12	Brooklyn
GRAND BL AND CONCOURSE AND E 196TH ST	7	12	Bronx
9TH AV AND W 42ND ST	7	12	Manhattan
2ND AV AND E 26TH ST	7	12	Manhattan
9TH AV AND W 55TH ST	7	12	Manhattan
7TH AV AND W 31ST ST	7	12	Manhattan
PARSONS BL AND HILLSIDE AV	7	12	Queens
1ST AV AND E 60TH ST	7	12	Manhattan
YORK AV AND E 72ND ST	7	12	Manhattan
MERMAID AV AND STILLWELL AV	7	12	Brooklyn
NOSTRAND AV AND FULTON ST	6	23	Brooklyn
FLATLANDS AV AND ROCKAWAY PW	6	23	Brooklyn
CHURCH AV AND E 96TH ST	6	23	Brooklyn
AVENUE D AND DITMAS AV	6	23	Brooklyn
BUFFALO AV AND EASTERN PW	6	23	Brooklyn

INTERSECTION	NUMBER	RANK	BORO
FRANKLIN AV AND EASTERN PW	6	23	Brooklyn
SPRINGFIELD BL AND UNION TP	6	23	Queens
UNION TP AND 168TH ST	6	23	Queens
WOODHAVEN BL AND JAMAICA AV	6	23	Queens
BROADWAY AND W 162ND ST	6	23	Manhattan
9TH AV AND W 39TH ST	6	23	Manhattan
AVENUE P AND CONEY ISLAND AV	6	23	Brooklyn
HYLAN BL AND BURBANK AV	6	23	Staten Island
BRUCKNER BL AND HUNTS POINT AV	6	23	Bronx
ATLANTIC AV AND NOSTRAND AV	6	23	Brooklyn
E GUN HILL RD AND WHITE PLAINS RD	6	23	Bronx
COURTLANDT AV AND E 149TH ST	6	23	Bronx
MORRIS AV AND E 149TH ST	6	23	Bronx
7TH AV AND W 33RD ST	6	23	Manhattan
6TH AV AND W 46TH ST	6	23	Manhattan
LEXINGTON AV AND E 86TH ST	6	23	Manhattan
2ND AV AND E 49TH ST	6	23	Manhattan
8TH AV AND W 23RD ST	6	23	Manhattan
6TH AV AND W 23RD ST	6	23	Manhattan
2ND AV AND E 14TH ST	6	23	Manhattan
CHURCH AV AND OCEAN AV	5	48	Brooklyn
PUTNAM AV AND FRESH POND RD	5	48	Queens
THROOP AV AND PARK AV	5	48	Brooklyn
7TH AV AND VARICK ST	5	48	Manhattan
5TH AV AND 36TH ST	5	48	Brooklyn
LINDEN BL AND ASHFORD ST	5	48	Brooklyn
BAYCHESTER AV AND GRENADA PL	5	48	Bronx
OCEAN AV AND FOSTER AV	5	48	Brooklyn
	5	48	Queens
OCEAN PW AND CORTELYOU RD	5	48	Brooklyn
CHURCH AV AND BEDFORD AV	5	48	Brooklyn
FLATBUSH AV AND PARKSIDE AV	5	48	Brooklyn