

TOWN OF BROOKLINE

Department of Public Works
333 Washington Street
Brookline, MA 02445-6863

Right Turn On Red Restriction

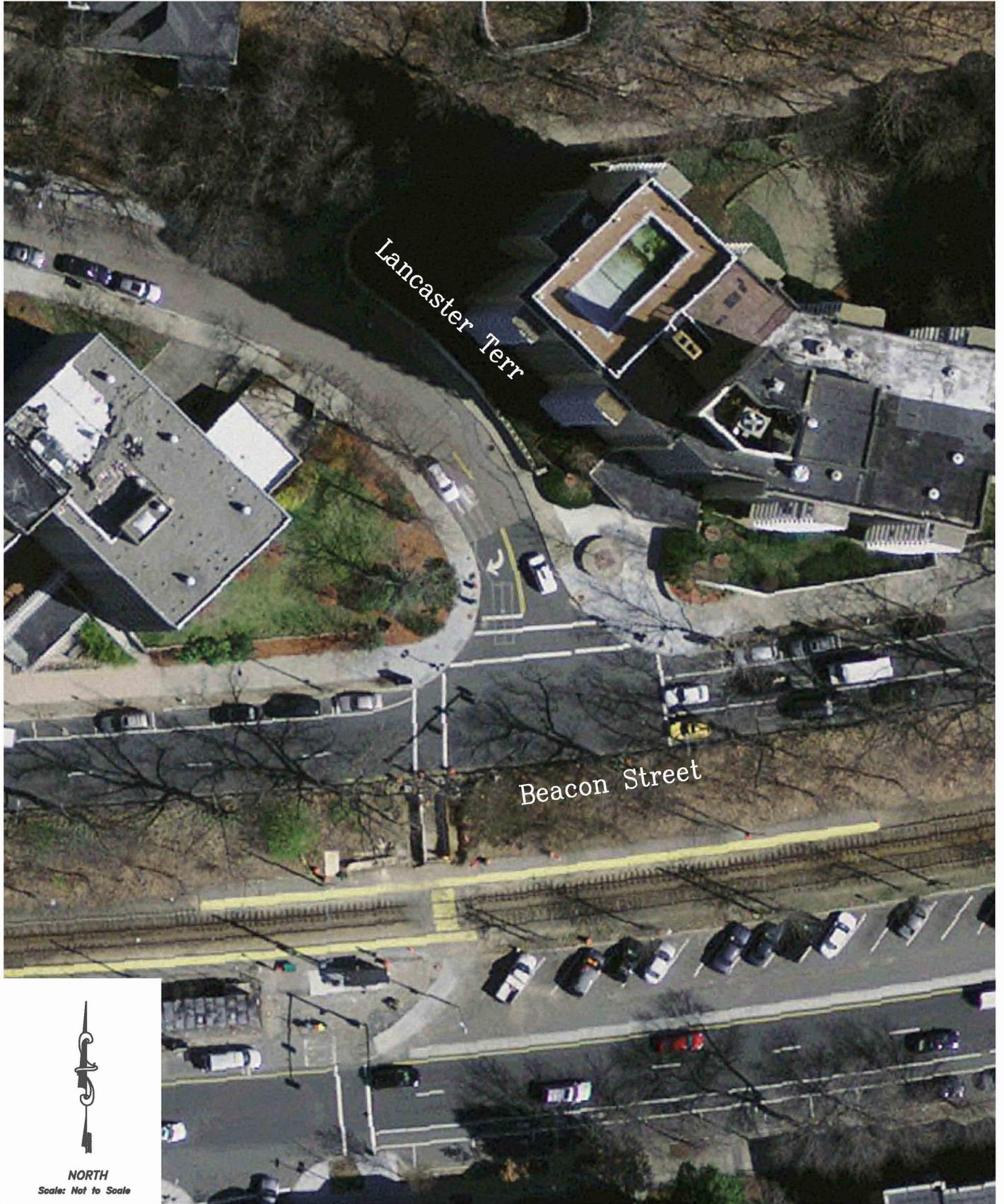
For

Beacon Street at Lancaster Terrace

The purpose of this study is to determine if the right turn restriction at Lancaster Terrace at Beacon Street is needed. Currently the restriction is in place for the Lancaster Terrace Southbound approach. The study location can be seen in **Figure 1**. Recommendations will be based on the guidelines found in the latest version of the Manual of Uniform Traffic Control Devices (MUTCD). The MUTCD suggests the following factors should be considered for the implementation of a NO TURN ON RED restriction:

1. Sight distance of vehicles approaching from the Left;
2. Geometric or operational characteristics of the intersection that might result in unexpected conflicts;
3. An exclusive (“Barn Dance”) pedestrian phase;
4. An unacceptable number of pedestrian conflicts with right-turn-on-red maneuvers, especially involving children, older pedestrians, or persons with disabilities;
5. More than three (3) right-turn-on-red accidents reported in a 12 month period for the particular approach.

According to our files the Transportation Board, or it’s predecessor the Traffic Council, implemented the NO TURN ON RED restriction based on the fact that there was an exclusive “barn dance” pedestrian phase.



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Figure 1

Study Location

SIGHT DISTANCE

The American Association of State and Transportation Officials (AASHTO) standards reference two types of sight distances which are relevant for the intersection at Beacon Street and Lancaster Terrace: stopping sight distance (SSD) and intersection sight distance (ISD). Stopping sight distance pertains to roadway segments (i.e., Beacon Street) and intersection sight distance, as the name implies, relates specifically to intersections. Sight lines for right turning vehicle movements at the intersection of Beacon Street at Lancaster Terrace are compared to minimum safe stopping sight distance (SSD) and intersection sight distance (ISD) guidelines for the regulatory speed limit below in **Table 1**. Sight line calculations are provided in the **Appendix**.

Table 1
Sight Distance

<u>Approach /Travel Direction</u>	<u>Available Sight Distance</u>	<u>AASHTO Recommended¹ Posted Speed (30 mph)</u>
Stopping Sight Distance Beacon Street westbound	200'	190'
Intersection Sight Distance - Stop Control Lancaster Terrace Looking Eastbound	<100'	290'

¹Recommended sight distance based on A Policy on Geometric Design of Highways and Streets, AASHTO, 4th edition 2001. Based on driver height of eye of 3.5 feet to object height of 2.0 feet for SSD or 3.5 feet for ISD and adjustments for roadway grade.

The existing stopping sight distance is adequate. However the intersection sight distance is deficient for vehicles making a right on red from Lancaster Terrace onto Beacon Street. Intersection sight triangles are obstructed by on street parking and a line of trees. The MUTCD recommends no turn on red when there are restricted sight lines.

GEOMETRIC AND OPERATIONAL CHARACTERISTICS

Lancaster Terrace meets Beacon Street at 90 degrees to form a T-intersection under signalized control. The Lancaster Terrace approach provides one general purpose travel lane and the Beacon Street approach provides a through lane and one general purpose travel lane. Land use at the intersection consists of a mix residential housing, retail and commercial uses. No Geometric or operational Characteristics would restrict a right turn on red.

PEDESTRIAN CONFLICTS AND SIGNAL PHASING

Pedestrian activity at the Lancaster Terrace at Beacon Street intersection is high. The MBTA has a stop adjacent to the intersection. The signal timing provides an exclusive pedestrian phase for pedestrians. The MUTCD recommends no turn on red when an exclusive pedestrian phase is used.

CRASH ANALYSIS.

In order to identify accident trends and safety characteristics for the study intersection accident reports were obtained from MassDOT Highway Crash Database for a three-year period covering 2006 through 2008. This data can be found in the **Appendix**. A summary of the crash data for the study intersection is detailed in **Table 2**.

Table 2
Accident Summary

<u>Data Category</u>	<u>Lancaster Terr at Beacon St</u>
Year:	
2006	1
2007	0
2008	<u>2</u>
Total	3
Type:	
Angle	1
Rear-End	1
Right-On-Red	0
Head-On	0
Pedestrian	1
Unknown/Other	0
Severity:	
P. Damage Only	3
Personal Injury	0
Fatality	0
Unknown/Other	0
Conditions:	
Dry	1
Wet	2
Snow/Ice	1
Other/Unreported	0
Time:	
7:00 AM to 9 AM	0
4:00 AM to 6 PM	0
Rest of Day	3

As summarized in **Table 2**, a total of three crashes were reported for Lancaster Terrace at Beacon Street for the three-year period studied from 2006 to 2008. None of the reported crashes were from vehicles taking a right turn at the intersection. However right turn on red maneuvers are currently restricted. The MUTCD warrants a right-turn-on-red restriction if three (3) or more accidents were caused by right turn on red maneuvers within three years.

CONCLUSIONS

The Lancaster Terrace approach to Beacon Street has restricted sight lines, significant pedestrian usage with an exclusive pedestrian phase during which time all vehicles are stopped and pedestrians are allowed to walk. Using the MUTCD guidelines 2, 3, and 4. The removal of the right turn on red restriction would not be recommended.

Appendix

- Sight Line Calculations
- Accident Data

- Sight Distance Calculations

Sight Line Calculations

Intersection Sight Distance		Speed		
	<u>Posted</u>	<u>Average</u>	<u>85th</u>	
Stop Control Left Turning	0			
Stop Control Right Turning/Crossing	287			
Yield Control Left Turning	0			
Yield Control Right Turning/Crossing	309			
Stopping Sight Distance		Speed		
	<u>Posted</u>	<u>Average</u>	<u>85th</u>	
Westbound Stopping Sight Distance	190			
Southwest bound Stopping Sight Distance	0			

<u>Inputs</u>	West Bound			East Bound		
	Posted	Average	85th	Posted	Average	85th
Speed:	30					
Grade:	3					

Sight Distance Formulas - Source: AASHTO

$$\text{Intersection Sight Distance} = 1.47 \times V \times t$$

$$\text{Stopping Sight Distance} = (1.47 \times V \times s) + \frac{V^2}{(30 \times ((a/32.2) + (G/100)))}$$

Where:

s = Reaction Time (sec) = 2.5 s

V= Travel Speed (mph)

G= Roadway Grade

a = Deceleration Rate (ft/sec²) = 11.2 ft/s²

- t= Time Gap (sec) =
- Stop Control Left Turning = 7.5 s
 - Stop Control Right Turning = 6.5 s
 - Yield Control Left Turning = 8 s
 - Yield Control Right Turning = 7 s

- Accident Data



MassHighway Crash Report for Brookline in the year 2006

Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicles Travel Directions	Most Harmful Events	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type
2035585	BROOKLINE	02-May-2006	8:30 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	V1:Southbound	V1: Collision with pedestrian	Wet	Dark - lighted roadway	Rain		BEACON STREET Rte 2 / LANCASTER TERRACE Rte 2				P2-Pedestrian

**MassHighway Crash Report for Brookline in the year 2008**

Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicle Action Prior to Crash	Vehicle Travel Directions	Most Harmful Events	Vehicle Configuration	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type	
2324867	BROOKLINE	23-May-2008	5:25 AM	Property damage only (none injured)	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1: Westbound / V2: Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with parked motor vehicle	V1: Passenger car / V2: Light truck/van, mini-van, panel pickup, sport utility) with only four tires V1: Light truck/van, mini-van, panel pickup, sport utility) with only four tires / V2: Light truck/van, mini-van, panel pickup, sport utility) with only four tires	Dry	Daylight	Cloudy	BEACON STREET / LANCASTER TERRACE						
2430215	BROOKLINE	17-Dec-2008	12:15 PM	Property damage only (none injured)	2	0	0	Angle	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1: Northbound / V2: Eastbound	V1: Not reported / V2: Not reported	V1: Passenger car / V2: Light truck/van, mini-van, panel pickup, sport utility) with only four tires	Wet	Daylight	Rain		1530 BEACON STREET / LANCASTER TERRACE					