

# Walsh Property Redevelop: Preliminary Traffic Findings

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**Steven Tupper, P.E.**

**Deputy Director, Cape Cod Commission**

May 31, 2023

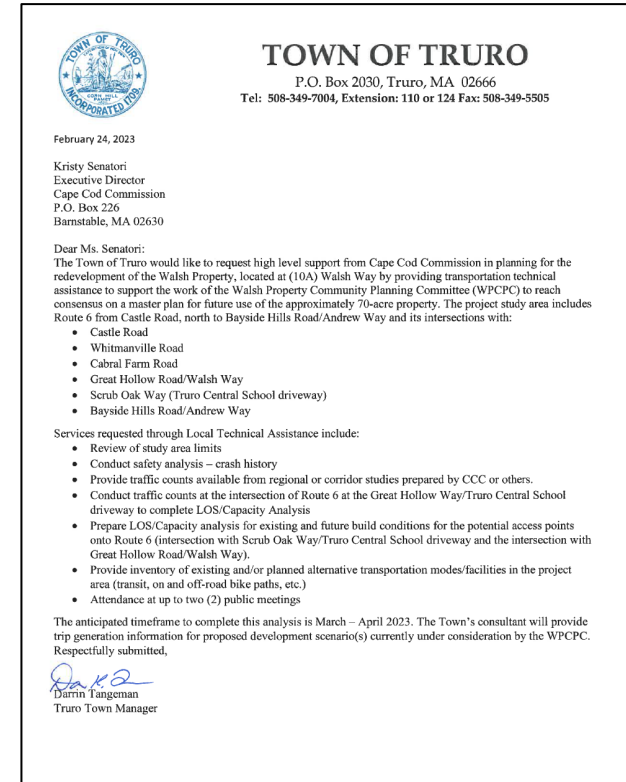


CAPE COD  
COMMISSION

# Presentation Agenda

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- Introduction and Background
- Existing Condition
  - Existing Transportation Infrastructure
  - Planned Roadway Projects
  - Crash History
  - Traffic Volumes
  - Traffic Operations
- Project Analysis
  - Safety
  - Trip Generation
  - Traffic Operations Analysis
- Recommendations

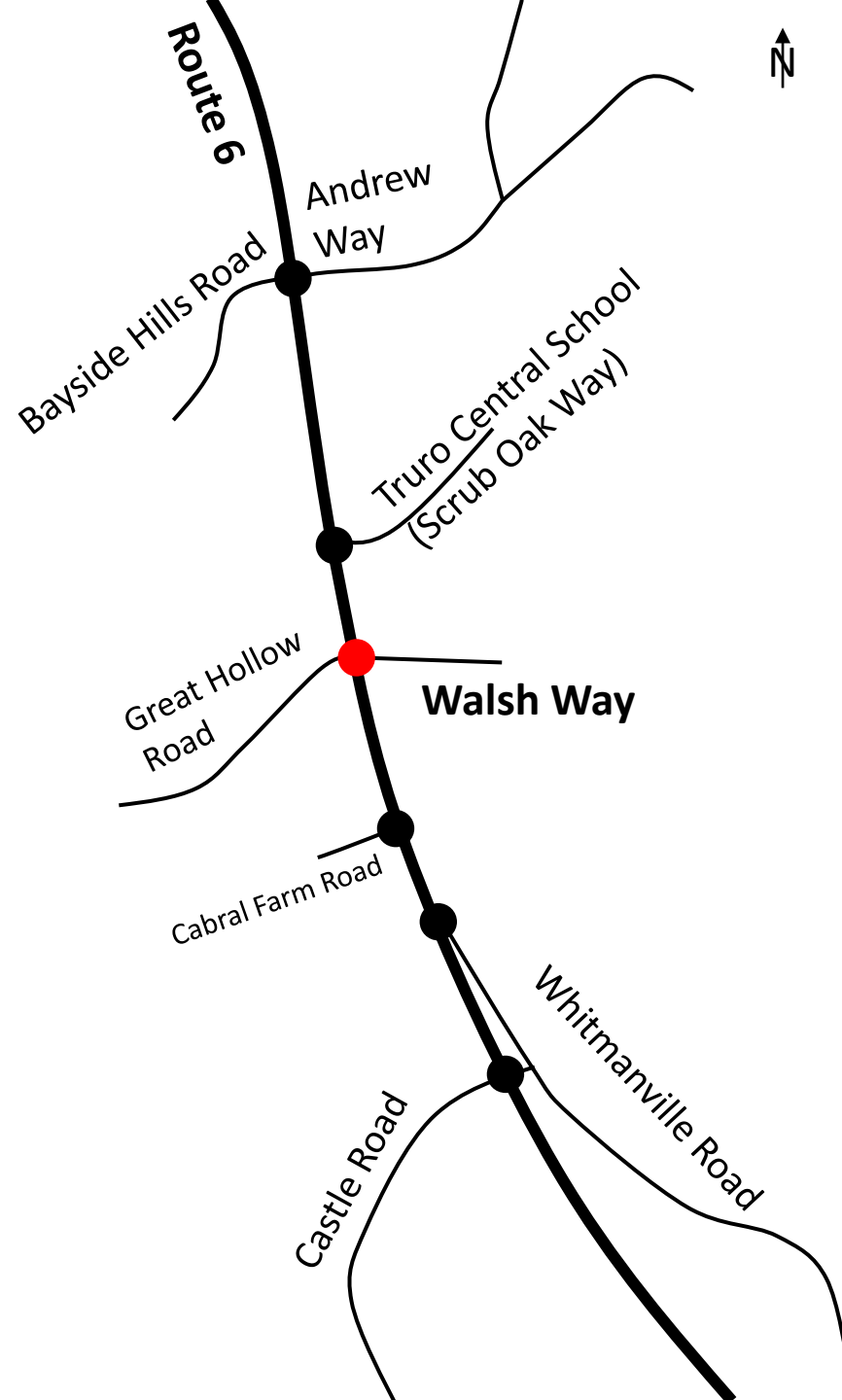


Note: Commission staff's comments herein are based on the information currently available, and the comments are more generalized than would be provided should the project be reviewed by the Cape Cod Commission as a Development of Review Impact (DRI). Should the project undergo DRI review, Commission staff comments reserves the ability to revise opinion based on the latest information available at the time of review.

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# PROJECT CONTEXT

## Study Area Roadways and Intersections



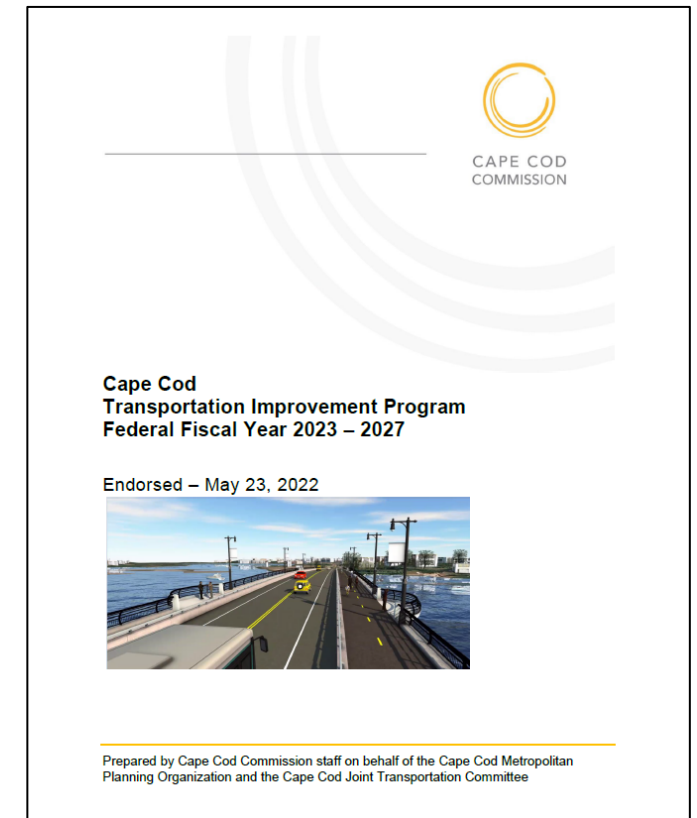
# EXISTING CONDITION – EXISTING INFRASTRUCTURE

- **Route 6 within the study area:**
  - Classified as principal arterial
  - Posted speed limit of 45 miles per hour
  - One travel lane in each
  - Designated, unprotected bike lane in each direction
  - Sidewalk on the western side from the Truro Central School to the Truro Police Department
  - Pedestrian crossing across Route 6 to the immediate north of the Truro Central School driveway
  - CCRTA fixed route and intercity bus service



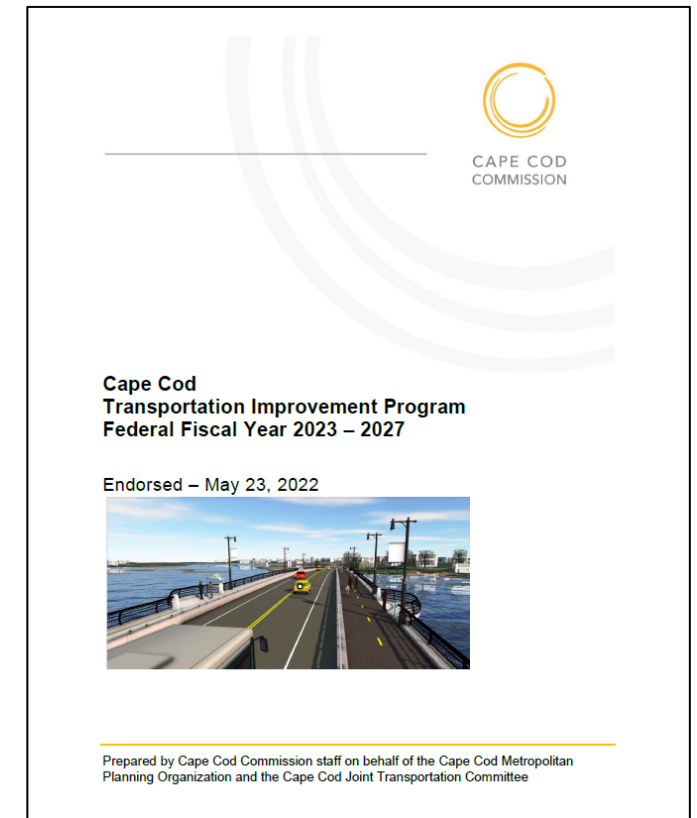
# EXISTING CONDITION – PLANNED PROJECTS

- **Provincetown-Truro-Wellfleet Resurfacing and Related Work on Route 6**
  - Funded in Federal Fiscal Year 2026
  - Repaving of Route 6
  - Repair of existing sidewalks and ramps needed. Minor sidewalk improvements have been discussed.
  - No significant expansion of bike/ped facilities.
- **Truro-Wellfleet Shared Use Path Construction on Route 6**
  - Under design by MassDOT, but currently unfunded
  - Fill some segments of the primary, or "spine" route, that will ultimately extend the Cape Cod Rail Trail from its current terminus in South Wellfleet to Provincetown.
  - In coordination with the secondary routes, it will connect bicyclists and pedestrians to community destinations and link together popular bicycle routes and trails in the region.



# EXISTING CONDITION – PLANNED PROJECTS

- **Additional MassDOT projects outside of the study area but on the Outer Cape:**
  - Wellfleet - Intersection Improvements & Related Work at Route 6 and Main Street (funded in FFY 2023)
  - Wellfleet - Pavement Preservation and Related Work on Route 6 (funded in FFY b2023)
  - Provincetown - Corridor and Related Work on Shank Painter Road from Route 6 to Bradford Street (funded in FFY 2025)
  - Wellfleet - Intersection Improvements on Route 6 at School Street and Lawrence Road (currently unfunded)
  - Provincetown-Truro- Route 6 Modernization from Shank Painter Road to Shore Road (currently unfunded)



# EXISTING CONDITION – CRASH HISTORY

**Table 1: Summary of Crashes**

Intersection	Number of Crashes (2018-2022)	Crash Rate (avg. per year)
Route 6 @ Castle Road	5	1
Route 6 @ Whitmanville Road	9	1.8
Route 6 @ Cabral Farm Road	0	0
Route 6 @ Great Hollow Road/Walsh Way	1	0.2
Route 6 @ Scrub Oak Way/Truro Central School Driveway	5	1
Route 6 @ Bayside Hills Road/Andrew Way	1	0.2

# EXISTING CONDITION – SIGHT DISTANCE

## Route 6 @ Walsh Way

**Table 2: Sight Distance**

Driveway	Movement	Speed (mph)	SSD Required (ft) <sup>1</sup>	SSD Measured (ft)	Meets SSD Requirements
Prop. Driveway @ Walsh Property	Right (North)	55	495	500+	Yes
	Left (South)	55	495	500+	Yes

<sup>1</sup> Based on AAHSTO requirements for stopping sight distance



# EXISTING CONDITION – TRAFFIC VOLUMES

**Table 3: Vehicle Traffic Volume Summary**

	ADT <sup>1</sup>	K <sup>2</sup>	85% Speed <sup>3</sup>	Weekday Morning Peak Hour Volume (8 AM to 9 AM)	Weekday Afternoon Peak Hour Volume (4 PM to 5 PM)
<b>Route 6 @ N of Castle Road</b>					
Northbound	3,192	10.9	53 mph	348	238
Southbound	<u>3,509</u>	10.8	52 mph	<u>261</u>	<u>379</u>
<b>Total</b>	6,701			609	617

Note:

<sup>1</sup> Average Daily Traffic (ADT)

<sup>2</sup> K factor (percentage of ADT during the peak hour)

<sup>3</sup> 85th percentile speed (miles per hour)

Example of radar equipment  
used to collect traffic data

# EXISTING CONDITION – TRAFFIC VOLUMES (CONT.)

- **Turning movement data collected at the Truro Central School driveway**
- **Summer conditions were estimated by developing an adjustment factor based on periodic counts conducted on Route 6 at the Wellfleet/Truro town line:**
  - Morning peak hour adjustment factor = **2.0** (i.e. July volumes were assumed to be twice as much as February volumes)
  - Afternoon peak hour adjustment factor = **2.5** (i.e. July volumes were assumed to be 2.5 times as much as February volumes)
- **For future analyses, it is suggested that additional traffic data is collected during the summer months.**



# EXISTING CONDITION – TRAFFIC OPERATIONS

- Traffic analysis conducted using industry standard software.
- This analysis tends to be conservative (high) in estimating congestion that will be experienced.

Intersection						
Int Delay, s/veh	2.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T			A
Traffic Vol, veh/h	27	18	327	37	18	192
Future Vol, veh/h	27	18	327	37	18	192
Conflicting Movs, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	None	None	None	None	None	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	42	42	80	80	89	89
Heavy Vehicles, %	0	17	14	8	17	9
Mvmt Flow	64	43	409	46	20	216
Major Mvmt						
	Minor1	Major1	Minor2			
Conflicting Flow All	488	432	0	0	455	
Stage 1	432	-	-	-	-	
Stage 2	256	-	-	-	-	
Critical Hdwy	6.4	6.37	-	-	4.27	
Critical Hdwy Stg 1	5.4	-	-	-	-	
Critical Hdwy Stg 2	5.4	-	-	-	-	
Follow-up Hdwy	3.5	3.453	-	-	2.353	
Pd Cap-1 Maneuver	415	593	-	-	1031	
Stage 1	659	-	-	-	-	
Stage 2	791	-	-	-	-	
Platoon blocked, %	-	-	-	-	-	
Max Cap-1 Maneuver	406	593	-	-	1031	
Max Cap-2 Maneuver	406	-	-	-	-	
Stage 1	659	-	-	-	-	
Stage 2	774	-	-	-	-	
Approach						
	WB	NB	SB			
HCM Control Delay, s	15	0	0.7			
HCM LOS	C					
Minor Lane/Major Mvmt						
	NBT	NBR/WBL	NBT	SBL	SBT	
Capacity (veh/h)	-	-	465	1031	-	
HCM Lane V/C Ratio	-	-	0.23	0.02	-	
HCM Control Delay (s)	-	-	15	8.6	0	
HCM Lane LOS	-	-	C	A	A	
HCM 95th %ile D(veh)	-	-	0.9	0.1	-	

## Key terminology

- **Movement:** L = left, T = through, R = right
- **Level of Service (LOS):** Letter-grade assigned to a vehicle movement based on the level of traffic congestion and delay. LOS A represents uncongested conditions with very little delay. LOS C or D indicates busy but acceptable conditions. LOS E/F indicates more significant delays but does not necessarily mean that that intersection presents safety issues.
- **Delay:** Average number of seconds the motorists will wait to make the indicated movement
- **V/C:** volume to capacity ratio. A V/C ratio less than 1 indicates there is sufficient capacity to process the vehicle demand. A V/C ratio over 1 indicates that the vehicle demand is anticipated to exceed the estimated capacity of the intersection.

# PROJECT ANALYSIS – TRAFFIC OPERATIONS

## Route 6 @ Truro Central School Driveway

Time of Year	Scenario	Movement		Morning Peak			Afternoon Peak		
				LOS <sup>1</sup>	Delay <sup>2</sup>	V/C <sup>3</sup>	LOS <sup>1</sup>	Delay <sup>2</sup>	V/C <sup>3</sup>
<b>Offseason (February)</b>	Existing Conditions	WB	LR	C	15.0	0.23	B	13	0.08
		NB	TR	A	-	-	A	-	-
		SB	LT	A	8.6	0.02	A	7.8	0.0

<sup>1</sup> Level-of-Service, <sup>2</sup> Average vehicle delay in seconds, <sup>3</sup> Volume to capacity ratio

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		NB	TR	A	-	-	A	-	-
		SB	LT	A	8.6	0.02	A	7.8	0.0
<b>Summer Season (July)</b>	Existing Conditions	WB	LR	-	-	-	-	-	-
		NB	TR	A	0	-	A	0	-
		SB	LT	A	0	-	A	0	-

<sup>1</sup> Level-of-Service, <sup>2</sup> Average vehicle delay in seconds, <sup>3</sup> Volume to capacity ratio

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# PROJECT ANALYSIS – TRIP GENERATION

- Assumed development scenario as provided by Tighe & Bond

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**Table 4: Estimated Site-Generated Trips**

<b>Time Period</b>	<b>(A) Residential Trips (260 units)<sup>1,2</sup></b>	<b>(B) Commercial Trips (32,000 sf commercial) <sup>1,3</sup></b>	<b>(C=A+B) Total Site-Generated Trips</b>
Weekday Daily	1752	531	2,273
Weekday Morning Peak Hour	104	96	200
Weekday Evening Peak Hour	133	95	228

Note:

<sup>1</sup> Based on May 2023 concept plan with Land Use Codes (LUC), from the Institute of Transportation Engineers, Trip Generation, 11th Edition, identified by Tighe & Bond

<sup>2</sup> Assumes 260 units of LUC 220 [Multifamily Housing (Low Rise)]

<sup>3</sup> Assumes 5,000 sf of LUC 565 [Daycare Center], and 27,000 sf of LUC 710 [General Office Building]

# PROJECT ANALYSIS – TRAFFIC OPERATIONS

- Traffic analysis conducted using industry standard software.
- This analysis tends to be conservative (high) in estimating congestion that will be experienced.
- **Key Assumptions:**
  - Future analysis year: 2030
  - Annual background growth: 0.5%
  - Trip distribution for new site-generated trip:
    - 75% to/from the south
    - 25% to/from the north
  - One-lane exiting from Walsh Way
  - All trips assumed to be made by car
  - No internal trip capture assumed

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				LOS <sup>1</sup>	Delay <sup>2</sup>	V/C <sup>3</sup>	LOS <sup>1</sup>	Delay <sup>2</sup>	V/C <sup>3</sup>
Offseason (February)	Future No Build	WB	LR	C	15.4	0.24	B	13.3	0.08
		NB	TR	A	-	-	A	0	-
		SB	LT	A	8.6	0.02	A	7.8	0.0
Summer Season (July)									

<sup>1</sup> Level-of-Service, <sup>2</sup> Average vehicle delay in seconds, <sup>3</sup> Volume to capacity ratio

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<b>Offseason (February)</b>	Future No Build	WB	LR	C	15.4	0.24	B	13.3	0.08
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		SB	LT	A	8.6	0.02	A	7.8	0.0
<b>Summer Season (July)</b>	Future No Build	WB	LR	-	-	-	-	-	-
		NB	TR	A	0	-	A	0	-
		SB	LT	A	0	-	A	0	-

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<b>Offseason (February)</b>	Future No Build	WB	LR	C	15.4	0.24	B	13.3	0.08
		NB	TR	A	-	-	A	0	-
		SB	LT	A	8.6	0.02	A	7.8	0.0
	Future Build	WB	LR	C	15.4	0.24	B	13.3	0.08
		NB	TR	A	-	-	A	-	-
		SB	LT	A	8.6	0.02	A	7.8	0.0
<b>Summer Season (July)</b>	Future No Build	WB	LR	-	-	-	-	-	-
		NB	TR	A	0	-	A	0	-
		SB	LT	A	0	-	A	0	-
	Future Build	WB	LR	-	-	-	-	-	-
		NB	TR	A	0	-	A	0	-
		SB	LT	A	0	-	A	0	-

<sup>1</sup> Level-of-Service, <sup>2</sup> Average vehicle delay in seconds, <sup>3</sup> Volume to capacity ratio

# PROJECT ANALYSIS – TRAFFIC OPERATIONS

## Route 6 @ Walsh Way

Time of Year	Scenario	Movement	Morning Peak			Afternoon Peak		
			LOS <sup>1</sup>	Delay <sup>2</sup>	V/C <sup>3</sup>	LOS <sup>1</sup>	Delay <sup>2</sup>	V/C <sup>3</sup>
<b>Offseason (February)</b>	Future No Build	WB -	-	-	-	-	-	-
		NB T	A	0	-	A	0	-
		SB T	A	0	-	A	0	-
<b>Summer Season (July)</b>	Future No Build	WB -	-	-	-	-	-	-
		NB T	A	0	-	A	0	-
		SB T	A	0	-	A	0	-

<sup>1</sup> Level-of-Service, <sup>2</sup> Average vehicle delay in seconds, <sup>3</sup> Volume to capacity ratio

# PROJECT ANALYSIS – TRAFFIC OPERATIONS

## Route 6 @ Walsh Way

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<b>Offseason (February)</b>	Future No Build	WB	-	-	-	-	-	-	-
		NB	T	A	0	-	A	0	-
		SB	T	A	0	-	A	0	-
	Future Build	WB	LR	C	17.3	0.29	F	18.1	0.31
		NB	TR	A	-	-	A	0.0	-
		SB	LT	A	8.4	0.02	A	8.1	0.03
<b>Summer Season (July)</b>	Future No Build	WB	-	-	-	-	-	-	-
		NB	T	A	0	-	A	0	-
		SB	T	A	0	-	A	0	-

<sup>1</sup> Level-of-Service, <sup>2</sup> Average vehicle delay in seconds, <sup>3</sup> Volume to capacity ratio

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<b>Offseason (February)</b>	Future No Build	WB -	-	-	-	-	-	-
		NB T	A	0	-	A	0	-
		SB T	A	0	-	A	0	-
	Future Build	WB LR	C	17.3	0.29	F	18.1	0.31
		NB TR	A	-	-	A	0.0	-
		SB LT	A	8.4	0.02	A	8.1	0.03
<b>Summer Season (July)</b>	Future No Build	WB -	-	-	-	-	-	-
		NB T	A	0	-	A	0	-
		SB T	A	0	-	A	0	-
	Future Build	WB LR	E	43	0.58	F	196.8	1.12
		NB TR	A	-	-	A	-	-
		SB LT	A	9.6	0.03	A	9.3	0.04

<sup>1</sup> Level-of-Service, <sup>2</sup> Average vehicle delay in seconds, <sup>3</sup> Volume to capacity ratio

# RECOMMENDATIONS

## ■ Additional analyses

- Collect additional traffic data under summer conditions
- Conduct a traffic study following industry standards, but should specifically include:
  - A gap study of Route 6 under summer conditions, and
  - An analysis of crash reports for Route 6 at Castle Road, Whitmanville Road, and the Truro Central School driveway.
- Evaluate configuration and treatment options for the driveway connection to Route 6

## ■ Infrastructure

- Consider all road users (pedestrians, bicyclists, transit riders, motorists, commercial vehicles, and emergency vehicles) in project design and in connections to Route 6
- Work with MassDOT on improvements to Route 6 to better accommodate pedestrians, bicyclists, and transit users



# RECOMMENDATIONS- ADDITIONAL CONTEXT

## Typical Elements of a Traffic Study

- **Project Description:** Locus Map, Study Area Map, Site Access and Context Map, Roadway Network, Multi-modal Network, Traffic Volumes
- **Trip Generation Analysis:** Trip Generation, Trip Generation Adjustments, Trip Distribution
- **Detailed Multi-modal Site Plan:** Vehicle, Pedestrian, Bicycle, and Transit Users Accommodation, Connections to the Regional Systems
- **Driveway Safety Analysis:** Access Management, Sight Distance
- **Off-site Safety Analysis:** Crash History and Analysis, Safety Impacts, Safety Mitigation
- **Trip Reduction Analysis:** Trip Reduction Measures and Estimation
- **Off-site Congestion Analysis:** Current and Future Traffic Volumes and Operation Analysis, Mitigation Analysis
- **Appendices**

### Notes:

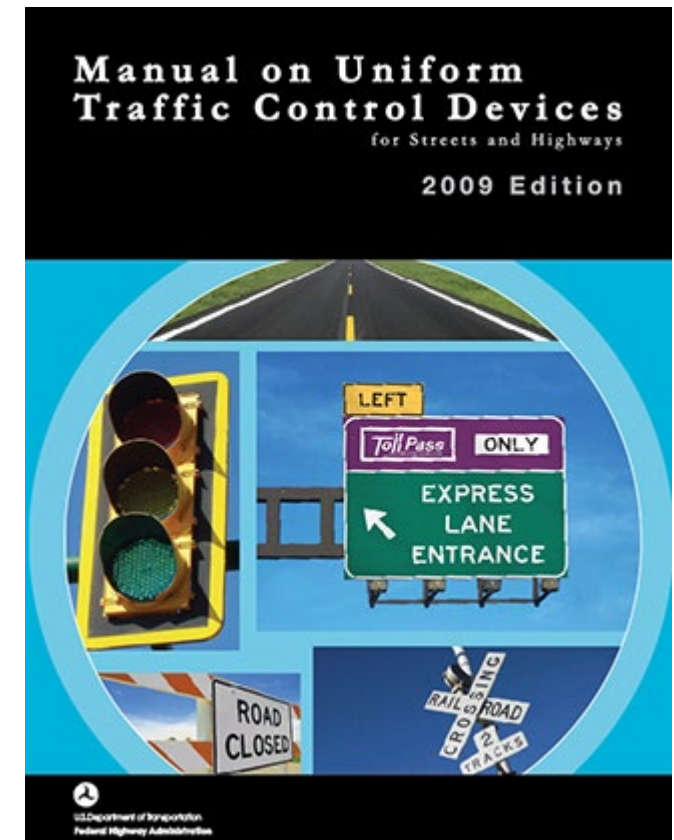
- Adapted from the [Cape Cod Commission Transportation Technical Bulletin](#)
- Not all study elements are applicable or appropriate for all projects.
- Additional industry standard publications also detail appropriate elements of a traffic study.



# RECOMMENDATIONS - ADDITIONAL CONTEXT

## Traffic Signal Warrants

- In order for a traffic signal to be installed, it must meet one of the following warrants:
  - 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
- MassDOT typically requires Warrant 1 (Eight-Hour Vehicular Volume) to be met in order to allow a signal to be installed on state roadway. It is unlikely this warrant would be met at the site driveway assuming the scale and mix of uses currently contemplated.



2009 MUTCD as Revised

# Walsh Property Redevelop: Preliminary Traffic Findings

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**Steven Tupper, P.E.**

**Deputy Director, Cape Cod Commission**

May 31, 2023



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