

Lane Departure Road Safety Audit for Route 130 in Mashpee, Massachusetts



Prepared by
Cape Cod Commission
and
University of Massachusetts Traffic Safety Research Program



Prepared for

Massachusetts Highway Department

Federal Highway Administration



1.0 Introduction to Road Safety Audits & Lane Departure Crashes in Massachusetts

The Federal Highway Administration defines a Road Safety Audit (RSA) as *the formal safety examination* of an existing or future road or intersection by an *independent, multidisciplinary team*. The purpose of an RSA is to *identify potential safety issues and possible opportunities for safety improvements* considering all roadway users. Specific objectives of an RSA include, but are not limited to the following:

- Minimizing the risk and severity of road crashes that may be affected by the existing or future roadway at a specific location or nearby network;
- Improving the awareness of safe design practices which are likely to result in safety benefits based upon potential safety concerns.

Although RSA's have been employed in other countries for some time, they are being fully embraced across the United States as a low cost opportunity to make significant safety improvements at any number of stages ranging from project development and planning through existing operation. Furthermore, RSA's have proven to be effective on projects of all shapes and sizes. The RSA program here in the Commonwealth presents a unique and exciting opportunity for improvements in roadway safety.

The RSA program in Massachusetts is being implemented in accordance with the Commonwealth's role as a lead state in preventing run-off the road (lane departure) crashes and in conjunction with the Strategic Highway Safety Plan (SHSP). Lane departure crashes are a notable problem area for Massachusetts, especially for crashes with high injury severities. Between 2002 and 2004, lane departure crashes accounted for nearly 20 percent of all crashes in Massachusetts and approximately one-quarter of crashes involving an incapacitating injury. Almost one-half of fatal crashes between 2002 and 2004 were lane departure crashes. As the crash severity increases, so too does the percent of crashes that are lane departures as shown in Figure 1.

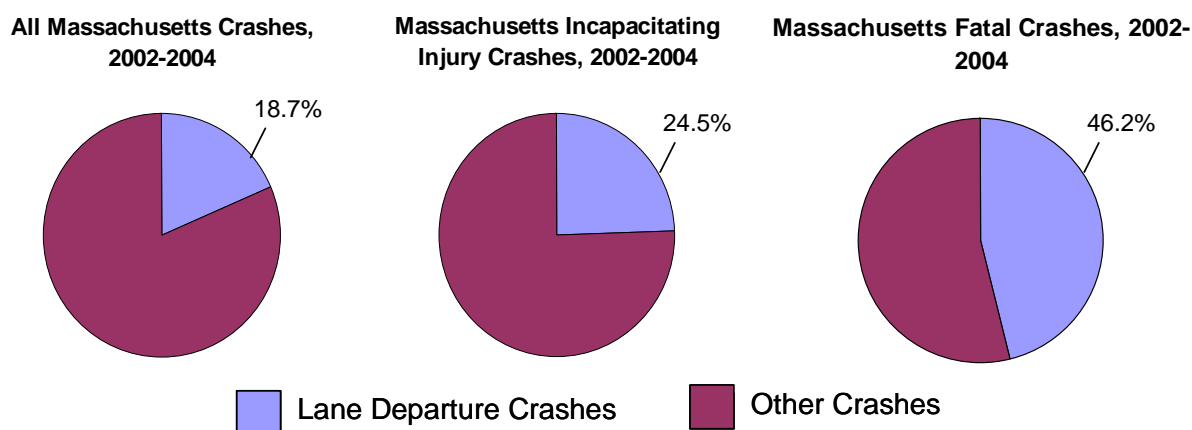


Figure 1. Relationship Between Lane Departure Crashes and Injury Severity

In an effort to combat the lane departure problem, a strategy was developed for the SHSP to identify hot spot lane departure locations, perform road safety audits and implement low-cost comprehensive countermeasures. The following report summarizes the findings of a RSA focused on lane departure crashes (LD) along Route 130 in Mashpee, Massachusetts.

2.0 Background Material for Route 130 in Mashpee

Mashpee is a Massachusetts municipality with approximately 13,000 residents and is located within Barnstable County on Cape Cod. Given the proximity to leisure activities and the general attraction of Cape Cod, Mashpee roadways experience a significant fluctuation in traffic with myriad visitors during the summer months. It should be noted that the year-round population growth in the Town of Mashpee nearly quadrupled from 1980 to 2000. Approximately 80 percent of employed residents work in Barnstable County, while a few hundred commute off the Cape. State Route 130 is the major arterial connection to U. S. Route 6 for both inter-regional and intra-regional travel. Route 130 is a town-owned, two-lane, bidirectional mixed residential and undeveloped arterial roadway that bisects Mashpee and connects the community to both Sandwich and Barnstable. The length of Route 130 through Mashpee is approximately 4.08 miles. This stretch of Route 130 has travel lanes ranging from 9 to 10 feet and 2 foot shoulders with limited horizontal (2 major) and vertical curvature (1 crest curve). A typical view of Route 130 is shown in Figure 2. Some of the major characteristics, including crash clusters, for Route 130 are summarized in Figure 3.



Figure 2. View of Route 130

The LD-RSA for Route 130 was held on May 30, 2007 at the Mashpee Town Hall. In total, 13 team members participated in the road safety audit as listed in Table 1. As indicated in Table 1 representatives were present from Federal, State, Regional and Local agencies and included a cross-section of engineering/planning, education, and enforcement expertise.

Table 1 Participating Audit Team Members

Audit Team Members ^a	Agency/Affiliation
Bonnie Polin	Massachusetts Highway Department – Safety Section
Jennifer Inzana	Massachusetts Highway Department – Safety Section
Neil Boudreau	Massachusetts Highway Department – Traffic Engineering
Jemal Ali	Massachusetts Highway Department – Highway Design
Greg Taylor	Director, Mashpee DPW
Priscilla Leclerc	Barnstable County / Cape Cod Commission
Robert Gregory	Massachusetts Highway Department, District 5
Tim White	Federal Highway Administration
George Baker	Chief, Mashpee Fire & Rescue
Rodney Collins	Chief of Police, Mashpee
Catherine Laurent	Mashpee DPW
Joyce Mason	Mashpee Town Manager
Michael Knodler	University of Massachusetts - Amherst
^a Please note there were additional attendees, including members of the press and Selectman John Cahalane, that did not participate in audit activities.	

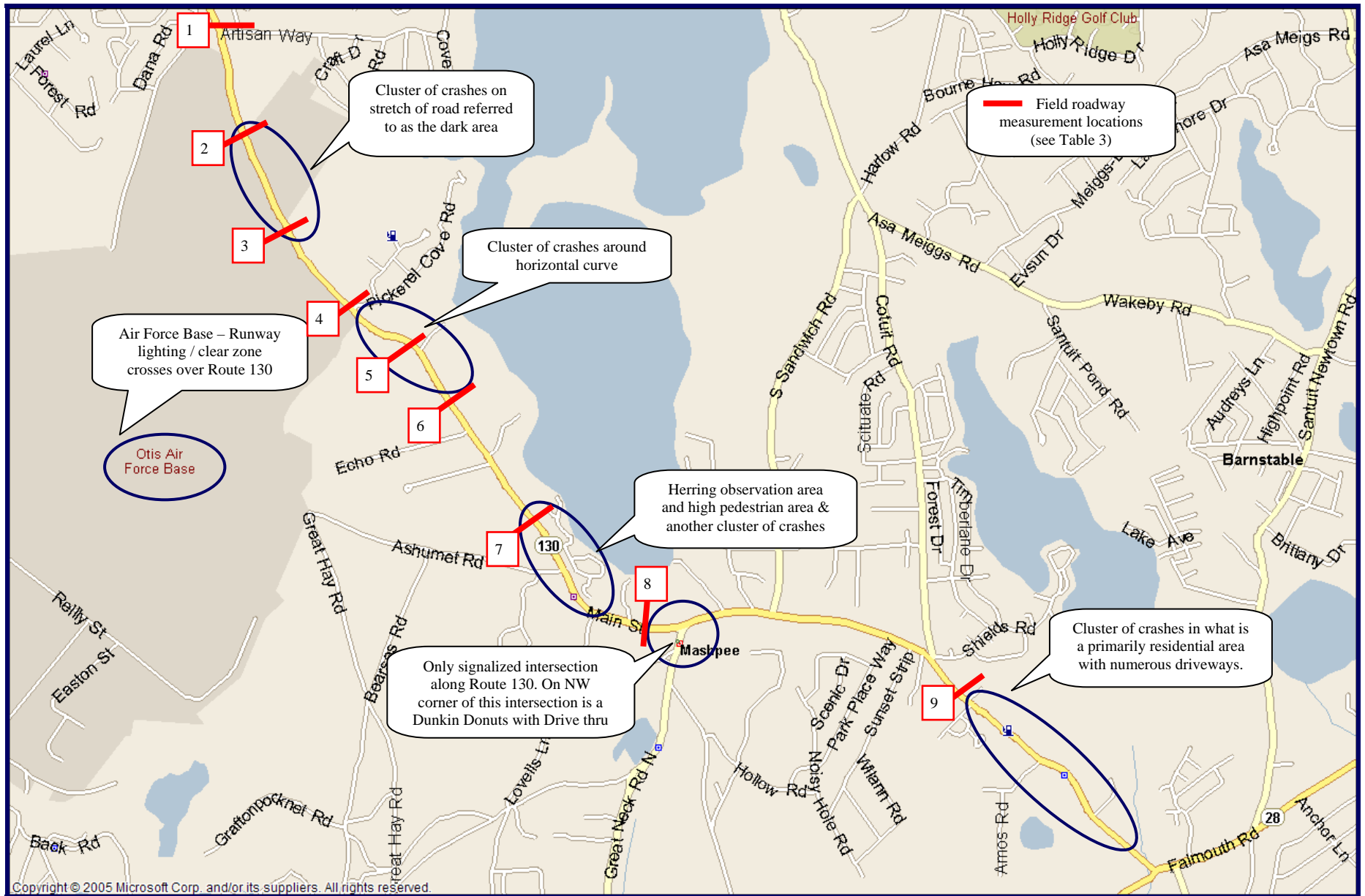


Figure 3. Characterization of Roadway Features for Route 130

Given the length of the Route 130 through Mashpee, audit team members were asked to visit the site in advance of the meeting to familiarize themselves with the roadway attributes and characteristics. A copy of the meeting agenda and instructions as well as a packet of pertinent information was distributed to meeting invitees prior to the meeting (this information is included in Appendix A of this report). Specifically, the additional information provided was pertinent to the LD-RSA safety initiative and included traffic volumes and speeds as well as a description of relevant crashes which are summarized below:

- Figure 5 presents an hourly distribution of traffic volumes along Route 130 at various locations for several summer month observation periods. From the compiled data collection that are part of the Cape Cod Commission traffic counting program the maximum average daily traffic (ADT) was 13,654 (7/24/06) with approximately equal directional splits.
- Similar to many roadways, the posted speeds vary along Route 130 in Mashpee. Route 130 has segments posted at 35, 40, and 45 mph. The official speed regulations for Route 130 in Mashpee are summarized below in Table 2. An available speed study at two locations (see Figure 4, inset) from December 2005 indicated that 95 percent of vehicles were exceeding the posted limit and 15 percent were exceeding the posted limit by greater than 10 mph. This separate report was shared with participants during the meeting and attached as Appendix B.
- Between 8/25/03 and 9/21/06 there were 69 reported crashes consistent with the lane departure initiative. Sixty-five of those crashes were able to be geolocated and are presented in Figure 6. A complete summary of the 69 identified crashes over the 3-year period is included in Appendix A and was provided to participants prior to the audit meeting. Please note that this does not reflect all crashes along Route 130, but those deemed relevant to this initiative.
- As previously noted, the lane and cross-sectional widths varied slightly throughout Route 130. This information is critical as it impacts possible countermeasures. Table 3 provides measured lane widths provided by the Town of Mashpee, Department of Public Works.



Figure 4. Speed Study Locations

Table 2 Summary of Speed Regulations for Route 130 in Mashpee

Northbound		Southbound	
Beginning at the Barnstable-Mashpee line		Beginning at the Sandwich-Mashpee line	
1.44 miles	at 40 mph	0.92 miles	At 45 mph
0.41 miles	at 35 mph	0.33 miles	At 40 mph
0.23 miles	at 40 mph	0.75 miles	At 45 mph
0.75 miles	at 45 mph	0.23 miles	At 40 mph
0.33 miles	at 40 mph	0.41 miles	At 35 mph
0.92 miles	at 45 mph	1.44 miles	At 40 mph
Ending at the Sandwich-Mashpee line		Ending at the Barnstable-Mashpee line	

Additional resources made available to the team during the audit meeting included field videos from several drives along Route 130 which were used in aiding discussion of specific roadway elements. Also available were possible resources including the AASHTO Strategic Highway Safety Plan and the related National Cooperative Highway Research Program (NCHRP) 500 series reports.

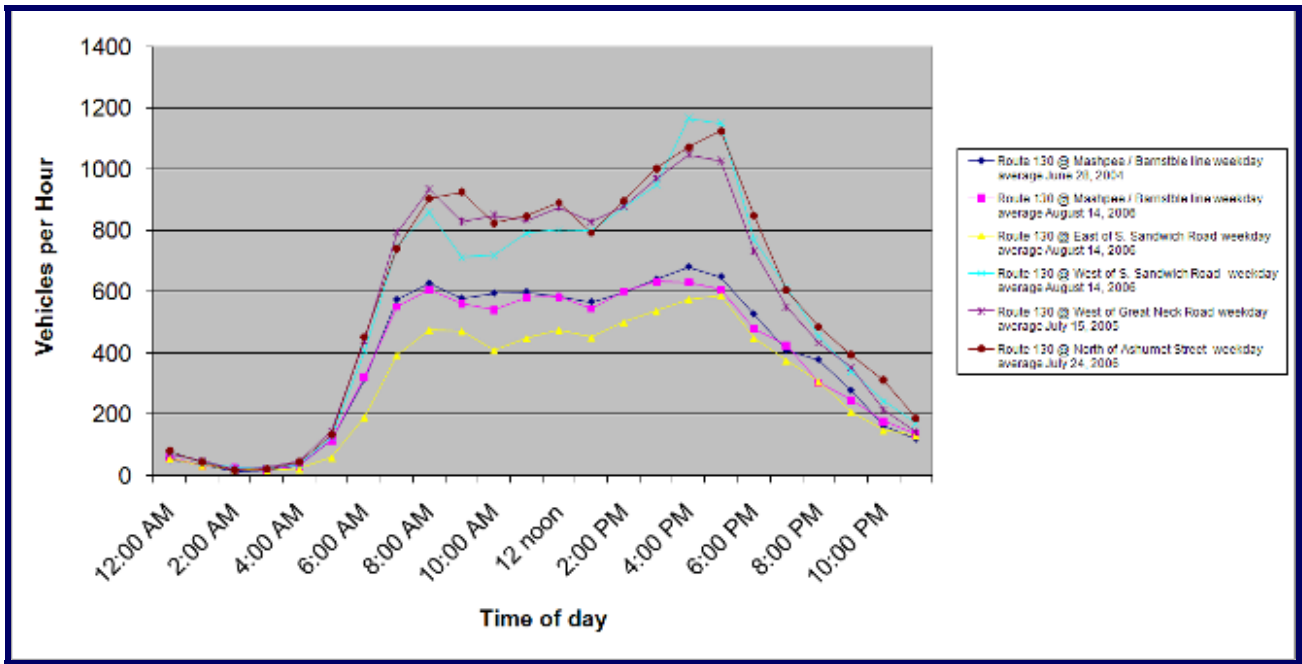


Figure 5. Hourly Distributions of Volumes for Route 130

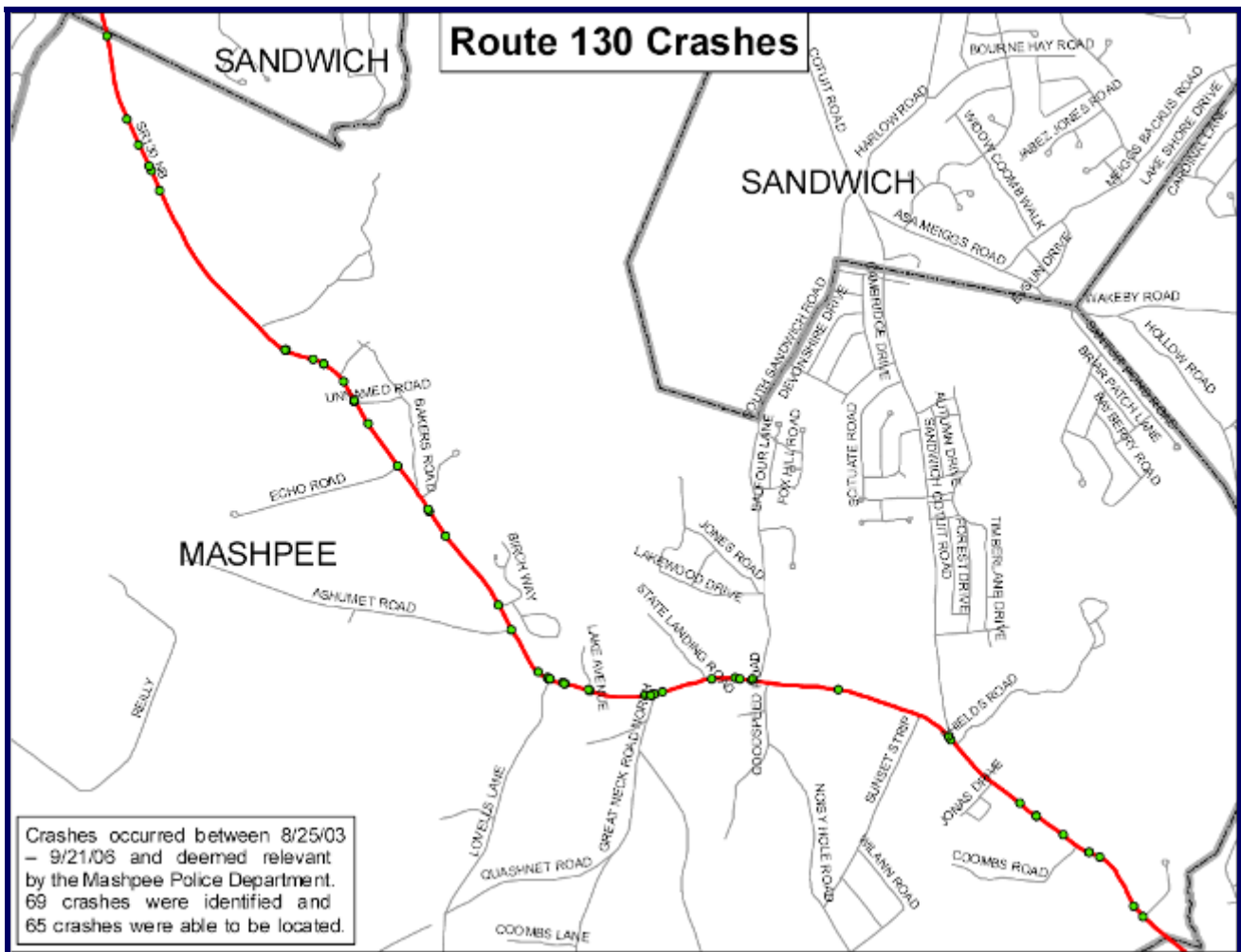


Figure 6. 3-Year Summary of Route 130 Lane Departure-Related Crashes

Table 3 Summary of Measured Roadway Widths for Route 130

Location Number (see Figure 3)	Lane Width ^a	Measured (Edgeline to Edgeline)
1	9' 10"	20' 8"
2	9' 10 ^{1/2} "	20' 9"
3	9' 10 ^{1/2} "	20' 9"
4	10' 1 ^{1/2} "	21' 3"
5	10' 4"	21' 8"
6	10' 1 ^{1/2} "	21' 3"
7	9' 10"	20' 8"
8	9' 1"	19' 2"
9	9' 3"	19' 6"

^aPlease note that the LANE WIDTH in this table consists of ½ of the field measurements, made across the centerline between the inside edge of the fog lines, with 12" deducted for the centerline itself. Locations are depicted by number on Figure 3. Field measurements source: Gregory Taylor, P.E., Director, Department of Public Works, Town of Mashpee

3.0 Characterization of Major Traffic Safety Challenges

Following a brief introduction to the RSA process in general, the meeting participants were asked to summarize and characterize potential safety considerations along Route 130. The initial characterization of the major safety considerations focused on several key elements as follows:

- Speed was immediately cited as a major factor in the operational elements of the roadway and in turn a significant factor in roadway crashes. Topics also included in the discussion were: variation in posted speeds, changing roadside environments (residential, retail, undeveloped), and the amount of motorists exceeding the posted speed limit by more than 10 mph. Police Chief Collins discussed some of the potential challenges with enforcing Route 130 including the varying speed limit (i.e. changes from 35 to 45 mph) and limited spaces from which to physically enforce.
- A second major characterization of the crashes along Route 130 involved distracted and/or drowsy drivers. Given the constrained cross-section there is little room for error. Related to this discussion was the lack of significant lighting, coupled with the cover provided by trees on the northwest portions of Route 130 which has horizontal curves, little light, and is a typical route for drivers working varied shifts. This particular stretch of road was referred to as the dark area of Route 130 (see Figure 7). Recessed reflective markers installed in the roadway centerline assist in this area without electrical service, but additional solar powered lights or signs may prove beneficial.
- Weather was discussed as a possible factor in approximately 20 percent of the considered crashes. The most common weather events involved vehicles sliding/losing control due to roadway conditions, and given the proximity of the adjacent travel lane or roadside resulted in a



Figure 7. Dark Area of Route 130

lane departure crash. Further exploration of the impact of excessive speed associated with these weather-related crashes should be undertaken.

- Other significant factors mentioned at the outset of the meeting that are discussed in further detail later in this report also included the following:
 - Proximity of utility poles along the roadside;
 - Sight distance issues associated with the Dunkin Donuts site drive;
 - The presence of slower moving or stopped vehicles near Herring observation station.

4.0 Summary of Short Term Recommendations for Route 130

The formal review of potential safety concerns along Route 130 was completed by the entire audit team. Following identification of a potential safety issue the dialogue subsequently focused on possible countermeasures with some preliminary discussion regarding the feasibility of implementation (timeframe and cost) as well as the potential payoff of safety benefits. Given the potential for an immediate impact there was an added focus on short term (less than 1 year) and low cost (less than \$10,000) improvements that could be done almost instantaneously resulting in a positive safety impact. Resulting recommendations for immediate actions along Route 130 include the following:

- Install “Curve Ahead” warning signs for each direction of the two horizontal curves. Signs should be placed in advance of the curve to allow adequate response time for motorists. To further enhance the delineation (given the lack of lighting) roadside reflectors and/or chevrons should be considered as budget permits.
- Given the reported prevalence of high speeds among the lane departure crashes, it is recommended that Route 130 continue to remain a high speed enforcement area. It is also recommended that speed data collection be completed by the Town of Mashpee to track current operating speeds throughout the year; this may also prove useful in the establishment of enforcement thresholds. Installation of solar powered radar detector signs at key locations to bring awareness to the operator though the instant message “YOUR SPEED IS “__”” may assist in reducing in speed violations.
- It is recommended that advance yield lines (see MUTCD Figure 3B-14) and accompanying sign (R5-1 – Yield Here to Pedestrians) be installed on both approaches to the existing midblock crosswalk along Route 130.
- There are several signs (see Figure 8) located near the Mashpee-Barnstable line adjacent to the bike path which feature a nearly illegible message based upon the small font size. It is recommended that these signs be revised or removed as drivers may spend an increased amount of time fixated away from the roadway attempting to read the signs.
- Utility poles are in close proximity to the traveled way along Route 130. While longer term strategies are considered for possible relocation of the most hazardous poles, it is recommended that the poles be reflectorized to add conspicuity. Specific locations may include the utility poles at the following addresses 84 (struck 3 times), 223, 520, 544, and 621 Route 130. All utility poles along the corridor, however, should be considered.

















Figure 8. Small Font Signs





- Continue to maintain level surface along roadside edges. At the time of the audit several spots of edge drop-off were observed north and west of the Great Neck Road North intersection which may in turn accelerate the impacts of lane departure crashes as motorists are unable to return to the roadway.





5.0 Summary of Additional Route 130 Countermeasures






Although an emphasis was placed upon short term and low cost improvements that could be carried out immediately, the focus of the team was not limited to solely those countermeasures. The following section details countermeasures discussed by the team, which are reflective of all costs and timeframes and includes both general (entire corridor) and specific safety opportunities. Please note that with respect to the timeframe there are some unknown variables that must be further explored. Additionally, some of the potential treatments discussed were experimental in nature resulting in an unknown level of safety benefits. Several definitions exist for low, mid, and high cost as well as for short, mid and long term implementation timeframes. For purposes of this report, low cost improvements will be under \$10,000, mid costs will be under \$50,000, and high costs will be above \$50,000. From a timeframe perspective short term will refer to less than 1 year while mid and long term will refer to countermeasures that will take 1 to 3, and greater than 3 years, respectively.

Potential Safety Issue	Possible Countermeasures	Implementation Timeframe & Cost	Potential Safety Payoff	Photos
Speed-related issues along entire Route 130 corridor	Continue and expand upon a concentrated enforcement and educational (i.e. speed feedback, community meetings, etc) effort.	Short Term & Low/Mid Cost	Mid	
	Investigate and explore possible low-cost speed-related strategies such as optical speed bars.	Short Term & Low Cost	Experimental	 
	Implement established traffic calming measures to meet specific needs. A candidate location would be bulb outs in the vicinity of the midblock pedestrian crossing.	Long Term & Mid/High Cost	High	 
Distracted or drowsy drivers	Consider rumble strips/stripes in future reconstruction for non residential areas along roadway in the vicinity of the Air Force Base.	Long Term & High Cost	Mid	 
Pavement markings	Maintain pavement markings for continued visibility.	Short Term & Mid/High Cost	Mid	 

Potential Safety Issue	Possible Countermeasures	Implementation Timeframe & Cost	Potential Safety Payoff	Photos	
Horizontal curve delineation	Assure curve ahead warning signs, chevrons and roadside reflectors for the north/west horizontal curves.	Short Term & Low/Mid Cost	Mid		
Driver failure to properly identify slowing/stopping vehicles in advance of a turn	Educational campaign alerting motorists to the frequency of turning vehicles. On the low end this may entail a warning sign “Watch for Turning Vehicles”, but may include the strategic use of a Variable Message Sign, Newspaper Articles, or other PI&E activities.	Mid Term & Mid Cost	Low		
	To the extent possible (based on available right-of-way) explore the feasibility for turning bays or lanes for frequent turn pockets as part of access management program. Candidate locations would be in the vicinity of roadway N/W of the Great Breakneck Road intersection.	Mid Term & Mid Cost	Mid		
Cross over the centerline crashes resulting from passing vehicles	Although there are currently no passing zones, it is recommended that the Town continue to restrict, and enforce no passing zones along the corridor.	Short Term & Low Cost	Low		

Potential Safety Issue	Possible Countermeasures	Implementation Timeframe & Cost	Potential Safety Payoff	Photos
Sight distance turning from Dunkin Donuts site drive	Install warning sign for SB traffic.	Short Term & Low Cost	Low	
	Roadway modifications to improve sight distance (i.e. cut back crest vertical curve inhibiting sight to west).	Long Term & High Cost	High	
Presence of utility poles within the roadway clear zone	Reflectorize utility poles.	Short Term & Low Cost	Low	
	Add guard rails for particularly hazardous utility poles (see address locations listed in Section 4.0).	Mid Term & Low/Mid Cost	Low	
	Work with utility company to remove utility poles from clear zone.	Long Term & Mid/High Cost	Mid	
Edge drop-off at roadside	Maintain and fill roadside as needed to prevent edge drop-off.	Short Term & Low Cost	Low	
Safe crossing opportunities for pedestrians	Install advance yield line with accompanying sign (R5-1) for existing midblock crosswalk location.	Short Term & Low Cost	Low/Mid	

Potential Safety Issue	Possible Countermeasures	Implementation Timeframe & Cost	Potential Safety Payoff	Photos
Guard rail opportunities	In areas with insufficient clear zone, guard rail installation should be considered, including but not limited to embankments and utility poles. Specific locations include the dark area in the vicinity of the runway clear zone.	Mid Term & Mid/High Cost	Mid	
Sign efficiency	Identify unnecessary signs in heavily signed areas (i.e. signalized intersection) that can be moved/removed to prevent sign clutter. A specific example is the pedestrian warning sign on the approach to a signalized intersection, as pedestrians would be expected.	Short Term & Low Cost	Low	
	Remove/change warning signs located near the Mashpee-Barnstable line adjacent to the bike path with small font requiring significant driver attention for comprehension.	Short Term & Low Cost	Low	
Illumination and supports for runway crossing at Otis Air Force Base	Explore possibilities to shield runway supports and glare from runway lights for passing motorists.	Unknown	Low	

Potential Safety Issue	Possible Countermeasures	Implementation Timeframe & Cost	Potential Safety Payoff	Photos
Dark stretches of Roadway	Install lighting along dark stretches of road on the N/W section of Route 130. Given challenges with power, it may be necessary to explore solar power option for the lighting.	Long Term & Mid/High Cost	Mid	
Continued maintenance	The pavement condition, drainage, and coverage resulting from brush are in good condition. To assure safety this needs to be maintained.	Short Term & Low Cost	Mid	 
Herring observation area where vehicles and pedestrians conflict	Consider warning sign and additional parking restrictions.	Short Term & Low Cost	Low/Mid	 

6.0 Discussion

With respect to the safety improvement opportunities described in the previous section it is important to consider the following: 1) many treatments are both low cost and short term and 2) there is a complimentary nature of many of the safety strategies in that one improvement will aid with multiple safety issues. Please note that although this document provides a series of specific recommendations which warrant short term implementation, it should be noted that the approach towards improved safety is dynamic in nature and warrants revisiting over time.

Several additional topics that were discussed at the audit meeting and warrant consideration include the following:

- Construction of an expanded bike path is proposed along Route 130. At each stage of the project, the audit team recommends proper consideration of safety impacts, including but not limited to, crossing opportunities, warning signs, and vehicle/pedestrian/bicycle separation.
- Alcohol-related crashes are observed along Route 130 in Mashpee. The safety strategies associated with the reduction of alcohol-related crashes are centered upon educational and enforcement initiatives and best done as part of regional/town-wide effort rather than as roadway specific issue. Nevertheless, Route 130 should be considered for inclusion in any future or ongoing initiatives related to drunk driving. For example a variable message sign with the *Over the Limit, Under Arrest* message could be placed along Route 130 at various times.

7.0 Appendix A: Distributed RSA Meeting Materials

Materials provided to RSA team members in advance of the meeting included the following:

1. Agenda
2. RSA and Lane Departure Introduction
3. Tabulated Crash Summary
4. Map of Geolocated Crashes
5. Summary of Volumes
6. LD-RSA Checklist

Agenda

Road Safety Audit for Route 130

Meeting Location: Mashpee Town Hall
Room 2

Mashpee, MA

Wednesday, May 30, 2007

10:00 AM to 12:00 PM

Type of meeting: Lane Departure – Road Safety Audit
Attendees: Invited Participants to Comprise a Multidisciplinary Team
Please bring: Thoughts and Enthusiasm!!

10:00 AM Welcome and Introductions

10:15 AM Introduction to Road Safety Audits and Lane Departure Crashes

10:30 AM Review of Site Specific Material

- Crash & Volume – provided in advance
- Existing Geometries and Conditions
- Video and Images

11:00 AM Completion of RSA

- Identification of Safety Concerns – using checklists as a guide
- Identification of Possible Countermeasures

12:00 PM Adjourn for the Day – but the RSA has not ended

Instructions for Participants:

- Before attending the RSA on May 30th participants are encouraged to drive Route 130 within Mashpee, MA and complete/consider elements on the RSA advisory checklist with a focus on safety factors affecting roadway departure crashes.
- All participants will be actively involved in the process throughout. Participants are encouraged to come with thoughts and ideas, but are reminded that the synergy that develops and respect for others' opinions are key elements to the success of the overall RSA process.
- After the initial RSA meeting, participants will be asked to comment and respond to the document materials to assure it is reflective of the RSA completed by the multidisciplinary team.

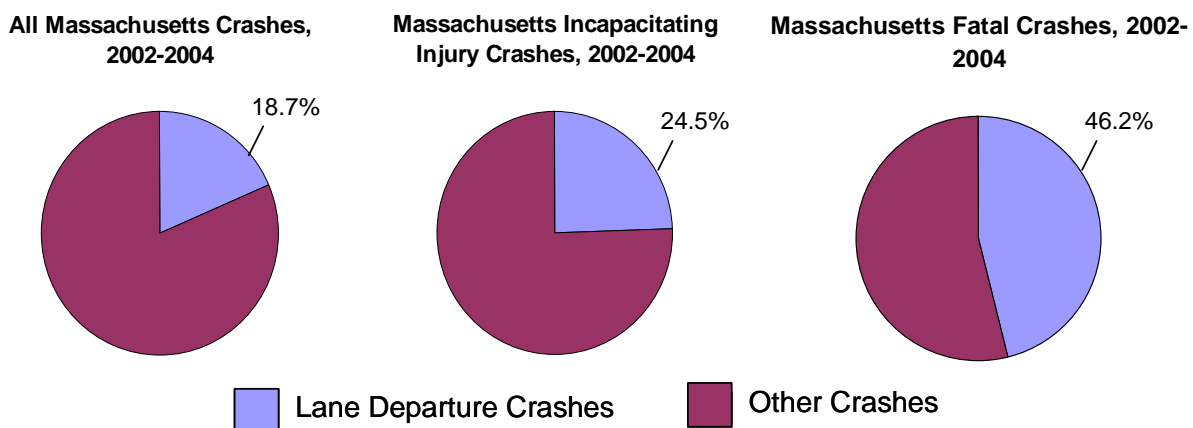
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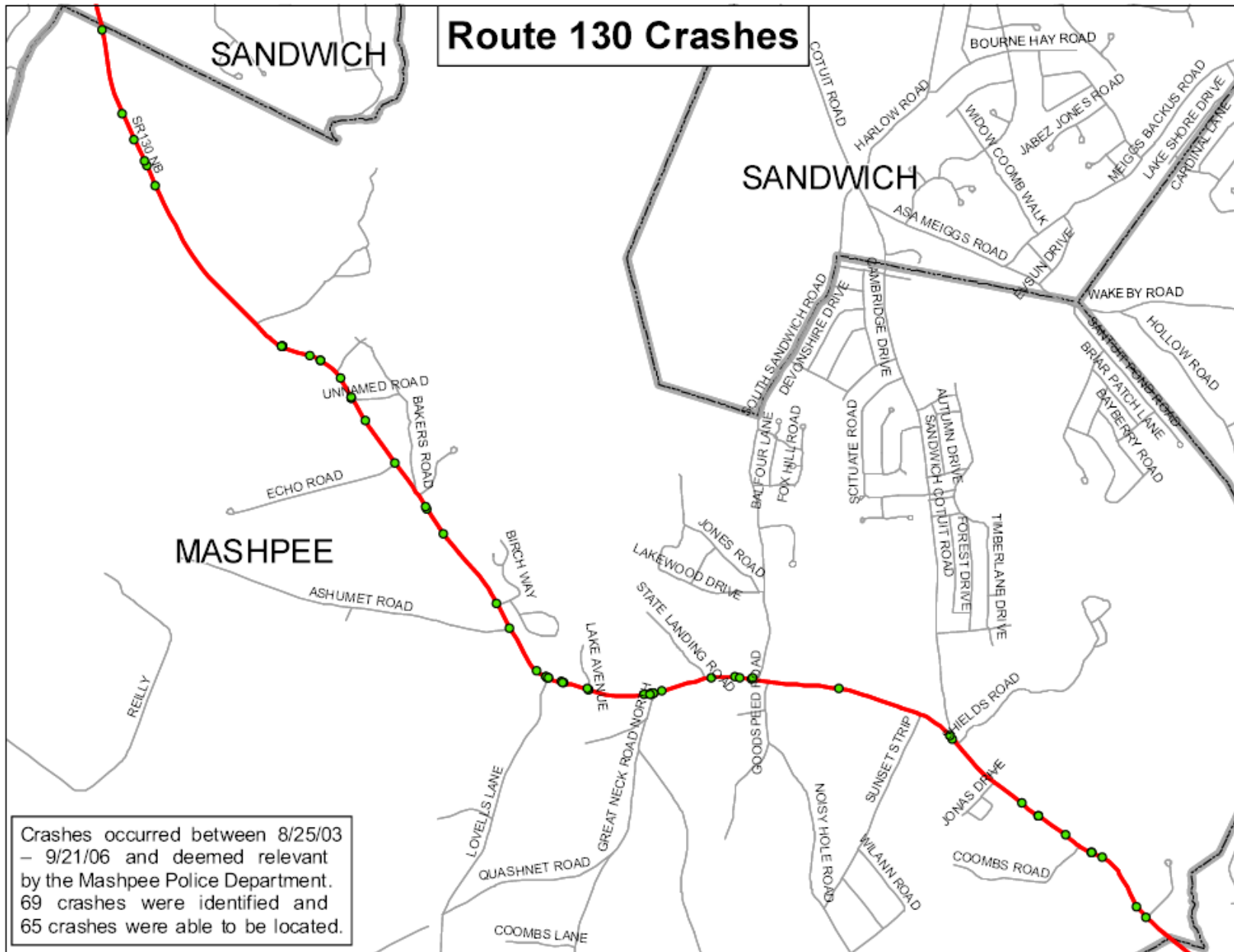
CRASH DATE	MAPPED (Y/N)	CRASH LOCATION	Intersection Related (Y/N)	Direction	Object Struck	Curve (Y / N)	WEATHER 1	WEATHER 2	ROAD SURFACE TYPE	BRIEF SUMMARY/NARRATIVE
8/25/2003	Y	28 Main Street (Rte 130)	Y	W/S	Vehicle	N	Clear		Dry	As vehicle was turning into driveway/intersection it hit another vehicle that had the right of way
9/7/2003	Y	859 Rte 130	N	E	Guardrail	N	Clear		Dry	Vehicle veered off the roadway into the guardrail - driver was on medication & on her way to hospital for an unrelated injury
10/20/2003	Y	687 Rte 130	Not Sure	S	NA	Not Sure	Not Sure		Not Sure	Dog ran in front of vehicle and driver skid off the road - speed appeared to be a factor
11/17/2003	Y	84 Rte 130	N	E	Utility Pole	Y	Not Sure		Note Sure	Vehicle swerved off the road due to unknown reason & struck a guardrail - speed may have been a factor
12/5/2003	Y	Rte 130/Lake Ave	Y	N/S	Vehicle	N	Snow		Ice	One vehicle cut off another which caused a string of crashes to occur - bad roads were a factor
12/6/2003	Y	334 Rte 130	Not Sure	Not Sure	Vehicle	Not Sure	Not Sure		Not Sure	Unknown vehicle struck his vehicle - no information on the vehicle that caused the crash
12/6/2003	Y	667 Rte 130 @ 55 Pickerel Cove Rd	Not Sure	Not Sure	Not Sure	Not Sure	Not Sure		Not Sure	Vehicle off roadway and car into the woods
12/17/2003	Y	379 Rte 130	Y	S/N	Vehicle	N	Rain		Wet	Vehicle struck another vehicle at intersection - alcohol was involved
12/29/2003	Y	431 Rte 130	N	S/N	Vehicle	N	Clear		Ice	Vehicle slid on ice and struck another vehicle
12/29/2003	Y	687 Rte 130/Pickerel Cove Rd	N	N	Tree	Y	Clear		Ice	Vehicle slid on ice and struck a tree
12/29/2003	Y	84 Rte 130	N	N	Utility Pole	Y	Clear		Ice	Vehicle slid on ice and struck a utility pole on the opposite side of the road
1/18/2004	N	Rte 130	N	S	Construction Signpost	N	Snow	Cloudy	Snow	Operator lost control of vehicle due to road conditions. Vehicle swerved across oncoming lane and struck a signpost.
1/18/2004	Y	431 Rte 130	N	S/N (report says both vehicles driving S)	Vehicle	Y	Snow	Cloudy	Snow	Operator lost control of vehicle due to road conditions. Vehicle swerved into oncoming lane and struck another vehicle.

1/19/2004	Y	628 Rte 130 (just past Pickeral Cove Rd)	N	E	Traffic Sign & Tree	Y	Cloudy	Severe Crosswinds	Ice	Vehicle lost control due to icy road conditions & struck a traffic sign and then a tree.
1/19/2004	Y	687 Rte 130	N	E (although report says west)	NA	Y	Snow	Blowing Snow	Wet	Vehicle slid off the roadway due to icy and snowy conditions
1/24/2004	N	Rte 130	N	S	Utility Pole & Trees	N	Clear		Dry	Operator lost control of vehicle and struck utility pole & several trees
2/2/2004	Y	Rte 130/Lovells Ln	Y	N/N	Vehicle	N	Clear		Wet	Vehicle thought that she was being pulled over, panicked and turned to the left rather than the right.
2/4/2004	Y	Rte 130/Near Lovells Ln	N	E	NA	Y	Cloudy	Rain	Ice	Operator lost control of vehicle due to black ice, spun out and went down an embankment.
2/7/2004	Y	599 Rte 130	Not Sure	Not Sure	Fence & Mailbox	Not Sure	Not Sure		Not Sure	Hit & Run involving property damage
3/11/2004	Y	Rte 130/300 ft S of Run Way Lights	N	N/S	Vehicle	N	Sleet	Blowing Snow	Slush	Operator lost control of vehicle due to icy road conditions and struck a vehicle in the oncoming lane
3/11/2004	Y	84 Rte 130	N	N	Utility Pole	N	Sleet	Rain	Snow	Operator lost control of vehicle due to icy road conditions, skidding across the street and struck a utility pole.
3/13/2004	Y	272 Rte 130	N	E	Tree?	N	Clear		Dry	No Narrative Included
5/4/2004	Y	135 Rte 130	Y	S/N	Wall	N	Clear		Dry	Operator made improper turn and almost hit another vehicle - swerved to get out of the way and hit a wall instead
5/27/2004	Y	147 Rte 130	N	W/E	Vehicle	N	Clear		Dry	Operator had to make an emergency turn in order to avoid a rear end collision and in doing so, he hit oncoming vehicle almost head on
5/28/2004	Y	531 Rte 130	N	S/N	Vehicle	N	Clear		Dry	Operator dropped cell phone, bent down to pick up & when he did this he crossed the median and sideswiped another vehicle
6/10/2004	Y	401 Rte 130	Y	S/S	Vehicle	N	Clear		Dry	Operator pulled out of Dunkin Donuts driveway incorrectly and struck another vehicle.
7/5/2004	Y	Rte 130/Cotuit Rd	Y	W/W	Vehicle	N	Cloudy	Rain	Wet	Unknown vehicle cut off another vehicle in a merge situation which led to 2 rear end collisions

7/22/2004	Y	387 Rte 130	Y	S/N	Vehicle	N	Clear		Dry	Operator was turning into the intersection when her leg cramped and she drove into the oncoming traffic lane and struck another vehicle
7/30/2004	Y	387 Rte 130	Y	S/W	Vehicle	N	Clear		Dry	Operators turned into intersection at the same time and collided - one operator may have been fixing their hair at the time of the accident
9/30/2004	Y	71 Rte 130	N	W	House	Y	Clear		Dry	Operator was traveling over the posted speed limit and lost control of vehicle. Vehicle crossed over the oncoming lane, and traveled for approx. 100 yards & hit a residence. Alcohol may have been involved.
10/6/2004	Y	223 Rte 130/ 50 ft S of Cotuit Rd	Possibly	N	Utility Pole	N	Clear		Dry	Vehicle drifted out of its lane & hit a utility pole due to the operator having a possible diabetic incident.
12/5/2004	Y	Rte 130/Juniper Rd	Y	E/W	Motorcycle	N	Clear	Cloudy	Dry	Vehicle was turning in an intersection & hit a motorcyclist
12/7/2004	Y	135 Rte 130	Not Sure	S	Vehicle	Not Sure	Rain		Wet	There were conflicting narratives about the accident and no diagram was attached
12/11/2004	Y	544 Rte 130	N	E	Utility Pole	N	Rain	Cloudy	Wet	Operator fell asleep at the wheel and then drove from the roadway and struck a utility pole.
12/25/2004	Y	Rte 130/Ashumet Rd	Y	N/E/S	Vehicle	N	Clear		Dry	Vehicle swerved to avoid hitting another vehicle and instead hit a third vehicle - occurred at an intersection.
1/25/2005	Y	Rte 130/Lake Avenue	Y	E/W	Vehicle	N	Clear	Cloudy	Snow	Vehicle hit another vehicle in an intersection - roads were icy & snowy.
2/1/2005	Y	Rte 130/Echo Rd	Y	W/W	Vehicle	N	Clear	Cloudy	Dry	Vehicle attempted to make a turn but did not give right away to other vehicle and struck vehicle that had right of way
2/21/2005	Y	415 Rte 130	N	E	Tree	Y	Cloudy	Snow	Snow	Vehicle ran off road - officer stated that operator was traveling too fast for the weather conditions (snow)
3/11/2005	Y	Rte 130/South Sandwich Rd.	Y	S/N	Vehicle	N	Cloudy	Snow	Wet	Operator may have had a seizure while driving and she hit another vehicle in oncoming lane
3/25/2005	Y	Rte 130/Great Neck Rd. North	Y	E/W	Vehicle	N	Clear	Cloudy	Dry	Vehicle attempted to make a turn but did not give right away to other vehicle and struck vehicle that had right of way & also hit another vehicle
4/23/2005	Y	Rte 130/200 ft S of Lovells Ln	Y	N/N	Vehicle	Y	Cloudy	Clear	Dry	Vehicle rear ended another vehicle that was waiting to turn left and then crossed into the oncoming lane & hit another vehicle FATAL.

6/6/2005	Y	Rte 130/Great Neck Rd. North	Y	E/S	Vehicle	N	Clear		Dry	No Narrative Included
6/30/2005	Y	110 Rte 130	N	N	Not Sure	Not Sure	Cloudy	Other	Dry	No Narrative Included (single vehicle rollover crash from newspaper)
7/22/2005	Y	387 Rte 130	Y	N/S	Vehicle	N	Clear		Dry	Vehicles collided at an intersection - both claimed that they had a green light.
8/5/2005	Y	387 Rte 130	Y	E/W	Vehicle	N	Clear		Dry	No Narrative Included
8/15/2005	NA	335 Cotuit Road	NA	W	Guardrail	N	Cloudy		Dry	Operator was sneezing and put her head down as a result, the vehicle veered to the right and made contact with 5 guardrails.
9/16/2005	Y	Rte 130 (Sandwich town line)	N	S/N	Not Sure	Not Sure	Clear		Wet	Head On crash FATAL
9/26/2005	Y	348 Rte 130	Y	W/E	Vehicle	N	Clear		Dry	Vehicle made a turn without yielding to oncoming traffic and hit another vehicle.
9/27/2005	Y	Rte 130/Lovells Ln	N	E	Not Sure	Not Sure	Cloudy	Rain	Wet	Single vehicle rollover based on newspaper - FATAL
10/6/2005	Y	621 Rte 130	N	S	Not Sure	Not Sure	Cloudy		Wet	single vehicle run off road and struck tree according to newspaper - FATAL
10/16/2005	Y	Rte 130/400 ft N of Runway Lights	N	S	Yes - but not sure what	N	Clear		Dry	No Narrative Included - Occurred in a Parking Lot
11/26/2005	Y	Rte 130/Runway Lights	Not Sure	S	tree	Not Sure	Clear		Dry	81 year old ran off road and crashes into a tree - FATAL (may have been heart attack prior to crash)
12/4/2005	Y	Rte 130/Herring Run	N	S	Fence	N	Snow		Ice	Vehicle skid off the road & knocked over a fence
12/4/2005	Y	Rte 130/Herring Run	N	Not Sure	Not Sure	N	Snow		Ice	Vehicle skid off the road due to weather conditions
1/31/2006	N	Rte 130	N	S/N	Vehicle/Tree	N	Rain	Severe Crosswinds	Wet	Operator lost control of vehicle, went into oncoming lane and hit a vehicle, then overcorrected and crashes into the woods.
3/11/2006	Y	687 Rte 130	N	N	Guardrail	N	Clear		Dry	Operator crossed the center line and the oncoming lane and struck a guardrail. Alcohol was a factor.
3/11/2006	Y	520 Rte 130	Not Sure	N	Utility Pole	N	Clear		Dry	Vehicle exited the lane and hit a utility pole
3/18/2006	Y	600 Rte 130	N	S	Tree	N	Clear		Dry	No Narrative Included

3/25/2006	Y	621 Rte 130	N	N	Tree	Y	Cloudy	Rain	Dry	Operator fell asleep at the wheel, ran off the road, and struck a tree.
4/5/2006	Y	621 Rte 130	Not Sure	N	Guardrail/ Utility Pole	Not Sure	Clear		Dry	Vehicle lost control and struck a guardrail and then a utility pole - alcohol may have been a factor.
5/2/2006	Y	4 South Sandwich Road	Y	S/N	Vehicle	N	Rain	Cloudy	Wet	Vehicle slid on wet roadway & struck another vehicle in oncoming lane
5/6/2006	Y	476 Rte 130	N	N/S	Vehicle/Tree	N	Clear		Dry	Vehicle was following too close, attempted to slow down due to traffic slowing but was unable to. Vehicle made contact with another vehicle in oncoming lane and then continued on and made contact with a tree.
5/6/2006	Y	Rte 130/Meadowh aven Drive	N	N/S	Vehicle	Y	Clear		Dry	Vehicle crossed over the double yellow line and hit another vehicle - FATAL
6/9/2006	Y	Rte 130/South of Runway Lights	N	N	Guardrails	N	Cloudy	Rain	Wet	Operator was distracted while picking up his medication from the center console and veered off the road and hit guardrail.
7/14/2006	Y	Rte 130/Great Neck Rd. North	Y - Possibly	N/S	Vehicle	N	Clear		Dry	Operator was hit by a vehicle that swerved into her lane and then drove away
7/19/2006	Y	628 Rte 130	N	S	Guardrail	Y	Clear		Dry	Vehicle struck guardrail - alcohol was a factor
7/21/2006	Y	135 Rte 130	N	E/W	Vehicle	N	Cloudy		Wet	Vehicles collided as a result of one lane being shut down to repair work. Vehicles were restricted to one lane of travel for both directions and the accident occurred due to poor visibility & wet road surface. Narrative was cut off.
9/21/2006	Y	431 Rte 130/25 Ft N of Lovells Ln	N	E/W	Vehicle	Y	Clear		Dry	Vehicle crossed into the oncoming lane of traffic and struck another vehicle head on. The vehicle that was struck then hit another vehicle. Narrative was cut off.



Route 130 @ East of S. Sandwich Road
 weekday average August 14, 2006
 Raw count weekday average August 14, 2006

Start Time	WB	EB	Total
12:00 AM	24	31	55
1:00 AM	15	18	33
2:00 AM	7	13	20
3:00 AM	5	10	15
4:00 AM	12	8	20
5:00 AM	36	22	58
6:00 AM	112	78	190
7:00 AM	224	169	393
8:00 AM	270	205	475
9:00 AM	246	225	471
10:00 AM	212	196	408
11:00 AM	234	214	448
12 noon	244	230	474
1:00 PM	222	228	450
2:00 PM	256	244	500
3:00 PM	257	279	536
4:00 PM	276	299	575
5:00 PM	293	294	587
6:00 PM	210	238	448
7:00 PM	172	202	374
8:00 PM	142	164	306
9:00 PM	102	106	208
10:00 PM	67	80	147
11:00 PM	60	70	130
	3698	3623	7321

Route 130 @ West of S. Sandwich Road
 weekday average August 14, 2006
 Raw count weekday average August 14, 2006

Start Time	WB	EB	Total
12:00 AM	29	48	77
1:00 AM	19	23	42
2:00 AM	9	16	25
3:00 AM	10	12	22
4:00 AM	22	12	34
5:00 AM	82	43	125
6:00 AM	273	134	407
7:00 AM	445	304	749
8:00 AM	514	346	860
9:00 AM	394	318	712
10:00 AM	390	328	718
11:00 AM	412	379	791
12 noon	412	390	802
1:00 PM	389	409	798
2:00 PM	439	437	876
3:00 PM	460	487	947
4:00 PM	572	594	1166
5:00 PM	558	591	1149
6:00 PM	358	410	768
7:00 PM	266	347	613
8:00 PM	194	261	455
9:00 PM	144	194	338
10:00 PM	98	144	242
11:00 PM	74	96	170
	6563	6323	12886

Route 130 @ West of Great Neck Road
 weekday average July 15, 2005
 Raw count weekday average July 15,
 2005

Start Time	NB	SB	Total
12:00 AM	30	37	67
1:00 AM	26	22	48
2:00 AM	8	10	18
3:00 AM	10	13	23
4:00 AM	26	18	44
5:00 AM	94	51	145
6:00 AM	252	189	441
7:00 AM	356	437	793
8:00 AM	412	523	935
9:00 AM	383	446	829
10:00 AM	398	452	850
11:00 AM	376	456	832
12 noon	428	449	877
1:00 PM	420	408	828
2:00 PM	415	465	880
3:00 PM	476	494	970
4:00 PM	512	536	1048
5:00 PM	508	519	1027
6:00 PM	354	378	732
7:00 PM	264	286	550
8:00 PM	216	216	432
9:00 PM	167	184	351
10:00 PM	113	100	213
11:00 PM	68	74	142
	6312	6763	13075

Route 130 @ North of Ashumet Street
 weekday average July 24, 2006
 Raw count weekday average July 24,
 2006

Start Time	NB	SB	Total
12:00 AM	41	40	81
1:00 AM	24	21	45
2:00 AM	8	9	17
3:00 AM	8	12	20
4:00 AM	28	16	44
5:00 AM	86	47	133
6:00 AM	274	179	453
7:00 AM	346	396	742
8:00 AM	418	488	906
9:00 AM	441	485	926
10:00 AM	401	424	825
11:00 AM	408	440	848
12 noon	418	474	892
1:00 PM	394	399	793
2:00 PM	456	442	898
3:00 PM	469	534	1003
4:00 PM	512	561	1073
5:00 PM	491	635	1126
6:00 PM	381	468	849
7:00 PM	302	304	606
8:00 PM	258	228	486
9:00 PM	222	172	394
10:00 PM	195	116	311
11:00 PM	101	86	187
	6682	6976	13658

GEOMETRIC DESIGN	
Issue	Comment
A. Speed – (Design Speed; Speed Limit & Zoning; Sight Distance; Overtaking)	
<p>Are there speed-related issues along the corridor? Please consider the following elements:</p> <ul style="list-style-type: none"> • Horizontal and vertical alignment; • Posted and advisory speeds • Driver compliance with speed limits • Approximate sight distance • Safety passing opportunities 	
B. Road alignment and cross section	
<p>With respect to the roadway alignment and cross-section please consider the appropriateness of the following elements:</p> <ul style="list-style-type: none"> • Functional class (Urban Principal Arterial) • Delineation of alignment; • Widths (lanes, shoulders, medians); • Sight distance for access points; • Cross-slopes • Curbs and gutters <p>Drainage features</p>	
C. Intersections	
<p>For intersections along the corridor please consider all potential safety issues. Some specific considerations should include the following:</p> <ul style="list-style-type: none"> • Intersections fit alignment (i.e. curvature) • Traffic control devices’ alert motorists as necessary • Sight distance and sight lines seem appropriate • Vehicles can safely slow/stop for turns • Conflict point management • Adequate spacing for various vehicle types <p>Capacity problems that result in safety problems</p>	
D. Auxiliary lanes	
<ul style="list-style-type: none"> • Do auxiliary lanes appear to be adequate? 	
<ul style="list-style-type: none"> • Could the taper locations and alignments be causing safety deficiencies? 	
<ul style="list-style-type: none"> • Are should widths at merges causing safety deficiencies? 	

E. Clear zones and crash barriers	
<p>For the roadside the major considerations are clear zone issues and crash barriers. Consider the following:</p> <ul style="list-style-type: none"> • Do there appear to be clear zones issues? <ul style="list-style-type: none"> — Are hazards located too close the road? — Are side slopes acceptable? • Are suitable crash barriers (i.e, guard rails, curbs, etc.) appropriate for minimizing crash severity? • Barrier features: end treatments, visibility, etc. 	
F. Bridges and culverts – (if necessary)	
Are there specific issues related to bridges and culverts that may result in safety concerns?	
G. Pavement – (Defects, Skid Resistance, and Flooding)	
<ul style="list-style-type: none"> • Is the pavement free of defects including excessive roughness or rutting, potholes, loose material, edge drop-offs, etc.) that could result in safety problems (for example, loss of steering control)? • Does the pavement appear to have adequate skid resistance, particularly on curves, step grades and approaches to intersections? • Is the pavement free of areas where flooding or sheet flow of water could contribute to safety problems? • In general, is the pavement quality sufficient for safe travel of heavy and oversized vehicles? 	
H. Lighting (Lighting and Glare)	
<p>It is important to consider to the impacts of lighting. Some specifics include the following:</p> <p>Is lighting required and, if so, has it been adequately provided?</p> <p>Are there glare issues resulting from headlights during night time operations or from sunlight?</p>	

TRAFFIC CONTROL DEVICES	
Issue	Comment
I. Signs	
<p>Signage is a critical element in providing a safe roadway environment. Please consider the following:</p> <ul style="list-style-type: none"> • Are all current signs visible? Are they conspicuous and clear? Are the correct signs used for each situation? 	
<ul style="list-style-type: none"> • Are signs visible (consider both night and day)? • Does the retroreflectivity or illumination appear satisfactory? • Are there any concerns regarding sign supports? 	
J. Traffic signals	
<p>Although the focus of this RSA are lane departures, this does present an opportunity for us to consider any traffic signals. Specifically:</p> <ul style="list-style-type: none"> • If present, do the traffic signals appear to be designed, installed, and operating correctly? • Is the controller located in a safe position? (where it is unlikely to be hit, but maintenance access is safe) • Is there adequate sight distance to the ends of possible vehicle queues? 	
K. Marking and delineation	
<ul style="list-style-type: none"> • Is the line marking and delineation: <ul style="list-style-type: none"> — appropriate for the function of the road? — consistent along the route? — likely to be effective under all expected conditions? (day, night, wet, dry, fog, rising and setting sun, oncoming headlights, etc.) • Are centerlines, edgelines, and lane lines provided? If not, do drivers have adequate guidance? 	

ROADWAY ACTIVITY	
Issue	Comment
<p>With respect to roadway activity please consider safety elements related to the following:</p> <ul style="list-style-type: none"> • Pedestrians • Bicycles • Public transportation vehicles and riders • Emergency vehicles • Commercial vehicles • Slow moving vehicles 	

ENVIRONMENTAL CONSIDERATIONS	
Issue	Comment
Weather & Animals	
<p>From an environmental perspective it is important to consider any potential impacts. Most notably is likely to be the impacts of weather or animals, including:</p> <ul style="list-style-type: none"> • Possible effects of rain, fog, snow, ice, wind on design features. • Has snow fall accumulation been considered in the design (storage, sight distance around snowbanks, etc.)? • Are there any known animal travel/migration routes in surrounding areas which could affect design? 	

8.0 Appendix B: Route 130 Traffic Speed Information Memorandum



Town of Mashpee

Department of Public Works

*350 Meetinghouse Road
Mashpee, Massachusetts 02649
Telephone - (508) 539-1420
Fax - (508) 539-3894*

MEMORANDUM

TO: Chief Rodney Collins
Joyce M. Mason, Town Manager
The Board of Selectmen

FROM: Greg Taylor, Director, DPW *GTC*

DATE: January 25, 2006

SUBJECT: Traffic Speed Information on Route 130

A traffic count and speed analysis study was done mechanically from Wednesday, December 14th through Friday, December 16th, 2005. Two locations were monitored. The first location was between Pickerel Cove Road and the Otis runway and the second location was at the top of the hill between Lovell's Lane and Ashumet Avenue. The weather was clear on the 14th and 15th with some freezing rain and light rain on the 16th.

In total, nearly 40,000 vehicle trips were recorded. The posted speed limit of 40 mph in three cases and 35 mph in one case was exceeded by 95% of the vehicles. In addition, 5,943 (15%) of the vehicles exceeded the speed limit by more than 10 mph. There were 715 (2%) vehicles exceeding 55 mph. Speeds were recorded between 61 and 75 mph for 116 vehicles. These speeds were noted at all times of day. There were no accidents during this period.

A comprehensive study using radar would likely provide beneficial information along the entire route 130 corridor.

Route 130 Study
 December 14, 15 & 16, 2005
 Location – Utility pole #85 near runway

Posted Speed – 40 mph - Southbound Lane Total # vehicles = 11,200 (2 days) -		
	# of Vehicles	Total Percentage
Over 40 mph	10,659	95%
Over 45	5,973	53%
Over 50	1,528	13%
At or under 40	541	5%
Over 55	313	3%
Posted Speed – 40 mph - Northbound Lane Total # vehicles = 8,714 (2 days)		
	# of Vehicles	Total Percentage
Over 40 mph	8,288	95%
Over 45	5,763	66%
Over 50	1,994	23%
At or under 40	426	5%
Over 55	329	4%

Data collected by VHB/TLC
 Submitted by Department of Public Works

1/25/2006
 1

Route 130 Study
 December 14, 15 & 16, 2005
 Location – South of Ashumet Avenue

Posted Speed – 35 mph - Southbound Lane		
Total # vehicles = 10,059 (2 days) -²		
	<i># of Vehicles</i>	<i>Total Percentage</i>
Over 35 mph	9,728	97%
Over 40	6,129	61%
Over 45	2,036	20%
At or under 35	331	3%
Over 55	59	0.5%
Posted Speed – 40 mph - Northbound Lane		
Total # vehicles = 9,932 (2 days)		
	<i># of Vehicles</i>	<i>Total Percentage</i>
Over 40 mph	6,148	62%
Over 45	2,266	23%
Over 50	385	4%
At or under 40	3,784	38%
Over 55	52	0.5%

Data collected by VHB/TLC
 Submitted by Department of Public Works

1/25/2006
 1