Road Safety Audit
Intersection of NH 101, NH 123 and Old Street Road, Peterborough, NH
1.0 Introduction

1.1 Scope and purpose of Road Safety Audit

A Road Safety Audit (RSA) is a formal, proactive safety performance examination of a roadway or intersection by an audit team. It is a qualitative assessment that reports on potential safety issues and identifies opportunities for improvements in safety for all types of road users.

The audit team assembled for an RSA is independent of a highway design team and it is multidisciplinary in order to provide a variety of qualitative perspectives that inform the future safety design considerations by the design team. The RSA team assembled for this project is composed of local people that contribute valuable “context-sensitive” information and observations that are not ordinarily available to a highway design team through data sets, maps and other standard tools and resources ordinarily used to inform highway project designs.

Road Safety Audits are not meant to be a checklist of compliance with design standards and they are not meant to be a crash investigation or crash data analysis, although the crash history of an existing road is reviewed to make sure that previous crash patterns have been addressed.

The RSA process used for this particular project involved the following steps:

1. Identification of project to be audited.
2. Selection of an RSA team and NHDOT designated liaison(s).
3. Meeting with RSA team to review the RSA process and review project information.
4. Documentation of field observations.
5. Analysis of findings and preparation of an RSA report.

Upon completion of the Road Safety Audit for the Intersection of NH 101, NH 123 and Old Street Road, Peterborough, NH, SWRPC and the Road Safety Audit Team will present the audit findings to the NHDOT designated liaison(s) and request a formal response to the findings and suggestions in the Report. The Report shall be used as a tool to incorporate findings into the project when appropriate.

1.2 Identification of project

This RSA Report describes a safety evaluation of the intersection of NH 101, NH 123 and Old Street Road in Peterborough, NH. The project was identified as a candidate for an RSA for several reasons. The intersection has been identified as a high-profile safety concern by the Town of Peterborough and SWRPC’s Transportation Advisory Committee for a number of years. Although the intersection was programmed as a reconstruction effort in the 2007-2016 New Hampshire Ten Year Transportation Improvement Plan (TIP) at a cost of $2.24 million, the project was later deferred in the 2009-2018 TIP. The project’s deferral was a result of the limited transportation funds available to the state of NH. The RSA was identified as a positive step toward proactively seeking ways that the State, Town, intersection abutters and other interested parties can make the road safer by offering short-term as well as long-term improvements that can be implemented at various stages into the future.
1.3 Project limits

This RSA focuses on the safety of the intersection of NH 101, 123 and Old Street Road and its approaches. The approaches were reviewed to the extent at which the RSA team surmised the approaches were impacting the safety of the intersection. Factors such as slope, driver speed, signage, sight distance and other factors were the kinds of variables used to determine the project limits of the approaches to the intersection.

2.0 Background

2.1 Audit team, affiliation and qualifications

The RSA team assembled for this audit has qualifications and expertise in public safety, emergency management, maintenance and planning issues as well as a rich local knowledge on the historic performance of the intersection. Participants on the RSA Team include the following people:

- Rodney Bartlett, Peterborough Director of Public Works
- Scott Guinard, Peterborough Chief of Police
- Gene Kellogg, Former Peterborough Select Board
- Joseph Lenox, III, Peterborough Chief of Fire Department & Director of Emergency Management
- Carol Ogilvie, Peterborough Director of the Office of Community Development

NHDOT’s Bureau of Traffic provided direct support for this RSA process. Other NHDOT personnel used as resources to investigate the intersection included John Kallfelz, C. R. Willike, Craig Green and Stuart Thompson. NHDOT liaisons involved in the RSA included:
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- William Lambert, Administrator of Bureau of Traffic
- Subramanian Sharma, Bureau of Traffic

SWRPC transportation planning staff facilitating the RSA included:

- J. B. Mack, Senior Planner
- Neel Patel, Planning Technician

2.2 Data and information received from NH DOT and other sources

The following existing data and information was collected and reviewed for this RSA:

- 2006 Report on Intersection Design Support (IDS) Pooled Fund study
- Interviews with C. R. Willike and Subramanian Sharma regarding background of a proposed IDS study for the Intersection of NH 101, 123 and Old Street Road
- SWRPC, “NH 101 Corridor Study,” 1999
- NH DOT available crash data from 1995 to 2007
- NH DOT available average annual daily traffic (AADT) for NH 101, NH 123 and Old Street Road
- Aerial photos, parcel data and zoning information

Additional information collected by SWRPC for this project included:

- Peterborough Police Department crash reports from 2006 to present-2009
- AM and PM peak hour turning movement counts for the intersection
- Volume, vehicle class, speed and gap analysis data for NH 101 east of the intersection
- Photo inventory

Key data used for this audit are available at ftp.swrpc.org. The case sensitive username and password for the data is “RoadSafetyAudit” and “safety4u!!” respectively. Additional information cited above is available from SWRPC upon request.

2.3 Key observations from data and information

Crash data from January 2006 to April 2009 showed a total of 19 crashes, including 6 resulting in injury. Historically, most crashes have involved another motor vehicle on a clear day in the daytime on dry road conditions. Crashes since 1995 appear to occur throughout the year.

NHDOT’s 2006 IDS preliminary study of the intersection diagnosed a crash trend that vehicles entering or moving through the intersection from Old Street Road or NH 123 tend to be involved in crashes on the far side of the intersection. A possible reason for this trend is that people from the side roads may be willing to take greater risks to enter the mainline traffic flow or cross the roadway where there are unsafe gaps in traffic and are occasionally hit. An analysis of crashes from 2006 to available 2009 data shows slightly more than a third of these crashes are “far-side” crashes. The gap between vehicles for traffic east of the intersection was recorded as 8 or fewer seconds 60% of time during a weeklong recording of gap data. Gaps between vehicles are predictably smaller during the day and smaller still during peak hours.

August 31, 2009
Turning movement data shows a relatively low number of left hand turns from NH 101 in either direction. However, turning movement data from Old Street Road and NH 123 reveal a relatively high number of left turns. NH 123 left hand turns account for 60% and 71% of all traffic movements from the Route in the a.m. and p.m. respectively. Old Street Road left hand turns account for 43% and 46% of all traffic movements from that Road in the a.m. and p.m. respectively.

The 85th percentile speed traveling westbound into the intersection are on average 53 miles per hour during a 24 hour period in this 40 mile per hour speed zone.

2.4 Observations regarding site visit

The RSA team performed a site visit at the intersection which included driving through the intersection from all approaches as well as observing other road users from each corner of the intersection. The RSA team used a prompt list and followed Federal Highway Administration recommendations to observe the site using the GORE prompt method. GORE stands for Geometry, Operations, Road users and Environment. The following observations were made:

Geometry:

- NH 123 and Old Street Road are situated at an offset alignment with one another although both roads are roughly 90 degrees to NH 101. NH 123’s intersection with NH 101 is farther to the east while Old Street Road’s intersection with NH 101 is farther to the west.
- The turning radius at the northeast corner of the intersection is very small.
- There is virtually no shoulder at the northeast approach to the intersection on NH 101.
- The width of NH 123 at NH 101 and Old Street Road at NH 101 are both wide enough to allow for queuing of side by side vehicles at the egress point. This creates situations in which driver’s block each other’s vision.
- There is a curve and steep grade on the NH 101 westerly approach to the intersection. The markings for NH 101 on this stretch are squeezed toward the northerly side of the pavement on this approach so that the shoulder on the north side is very narrow and the shoulder on the south side is very wide.

Operations:

- Sight distance is limited
  - between NH 123 northbound drivers and NH 101 westbound drivers due to vegetation and embankment on southeast corner.
  - between NH 123 northbound drivers and NH 101 eastbound drivers due to embankment on southwest corner.
  - between Old Street Road and NH 101 westbound drivers due to landscaping (wall, shrubs) and embankment on northeast corner.
- On NH 123 northbound approaching the intersection, the stop sign is partially covered up by vegetation. The stop sign is showing age and is conventional size (2.5 feet by 2.5 feet).
- On Old Street Road heading southbound on the approach to the intersection there are two stop ahead signs. The sign farther away from the intersection is partially covered up by vegetation. The stop sign is showing age and is conventional size (2.5 feet by 2.5 feet).
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- There are a high number of existing signs (eight) on the NH 101 westbound approach to the intersection within .5 miles of the intersection in addition to several chevrons. The “intersection ahead” sign is somewhat confusing and contains information about driveways intersecting the roadway. There is no “steep grade/truck” sign on this approach.
- The flashing beacon is visible from all approaches. Due to the offsetting of Old Street Road and NH 123, the positioning of the beacon for Old Street Road is somewhat offset towards the east instead of being positioned in the center of the road.
- There is speeding on NH 101 through the intersection, particularly for traffic going downhill and westbound. It is difficult for motor vehicles to turn from Old Street Road or NH 123 and climb the slope eastbound on NH 101 with speeding vehicles already traveling eastbound on NH 101.

Road Users:

- Old Street Road is a primary gateway to Monadnock Community Hospital traffic coming from the eastern and southern approaches of the intersection.
- Old Street Road users include a high number of patients, elderly and other drivers that might be higher crash risk due to age and/or physical constraints.
- NH 123 serves as an informal bypass of US 202 for traffic coming from and going toward the Fitchburg, Massachusetts area.
- NH 123 is a fairly fast and interrupted rural country highway. The stop sign at NH 123 and NH 101 is the first stop sign for many miles and drivers may be caught unaware.
- There are a high number of commuters and regional traffic motorists passing through the intersection on NH 101.
- A number of trucks from all approaches were noted by the RSA Team. Vehicle class data is available for NH 101 as a result of this audit.
- Some bicycle use on NH 101 was observed.

Environment:

- Most signs appear to have good reflectivity during the night hours. The flashing beacon draws better attention to the risk of the intersection for all approaches during the nighttime.
- There is a sun glare issue going eastbound in the a.m. and westbound in the p.m. on NH 101.
- Snow conditions do not appear to markedly improve or detract from sight distance issues of this intersection.
- Drainage ditch/storm drain are noted as being absent from the northeastern corner of the intersection.
- There is some shading around the intersection, which includes a number of coniferous trees.
- There is one street light on the northwest corner of the intersection which is functioning properly at night.
3.0 Priority Issues and RSA Team Suggestions

The RSA team identified four theme-related issues as well as suggestions that should improve safety at this intersection. The bullet list of suggestions under each issue are in an order that is meant to reflect short term, less expensive measures before long term, more expensive improvements.

Issue 1: There is limited sight distance between NH 101 westbound drivers and NH 123 drivers, NH 101 westbound drivers and Old Street Road drivers and NH 101 eastbound drivers and NH 123 drivers.

- Consider posting advisory signage encouraging NH 101 traffic to turn on headlights during daytime through this section. This can be incorporated with other safety issue areas on NH 101 including the “S” curves in Temple. This concept is currently employed on NH 101 from Milford to Bedford, NH.
- Consider adjusting the positions of the stop bars on Old Street Road and NH 123 so that they are closer than 10 feet from NH 101 and provide better guidance for suitable sight distance.
- Consider a maintenance schedule for clearing vegetation/snow from the existing ROW in the vicinity of the intersection.
- Evaluate changing pavement markings on the NH 123 and Old Street Road approaches so as to discourage vehicles lining up side by side in same lane and blocking each other’s sight lines.
- Consider enhancing the existing flashing beacon (with strobes or with enlarged lens) or coupled with additional beacon (or beacon and sign) for NH 101 westbound traffic.
- Evaluate opportunities for installing Intelligent Transportation Systems technologies called “Intersection Collision Avoidance Warning Systems.” These signs can warn either mainline or sideline traffic about oncoming vehicles when there is limited sight distance.
- Evaluate opportunities to remove or adjust the location of existing embankments, trees and landscaping that currently limits sight distance. This should include improving the geometry of the turning radius at the northeast corner of the intersection.

Issue 2: RSA Team observations and data found that speeding is an issue on NH 101 for traffic passing through the intersection. Speeding and the large number of trucks greatly increase sight distance issues at the intersection.

- Consider installing a truck/hill sign showing the grade of the hill on the approach to the intersection. Evaluate the effectiveness of coupling a sign with a flashing yellow beacon.
- Increase the law enforcement presence and speed patrol in the vicinity of the intersection.
- Consider reducing the speed limit to 35 mph. The existing speed limit is 40 mph but data suggests an 85th percentile speed of existing traffic to be 53.2 mph westbound and 47.4 mph eastbound.
- Explore pavement applications that warn drivers to slow down before approaching the intersection.
- Evaluate the possible application of a flashing speed limit sign on the westbound approach to intersection. The flashing speed limit sign in Hillsborough on NH 9 and the sign on NH 101 in Marlborough were referenced as examples by the Road Safety Audit team.
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- Evaluate the curvature on the westbound approach to intersection as delineated by existing yellow center lines and white shoulder delination lines. Examine if there is potential to create a safe traffic calming affect by manipulating the existing curve.
- Examine ways in which to discourage right hand passing for left hand turners entering NH 123 or Old Street Road from NH 101

**Issue 3:** The intersection warrants some new signage improvements.

- Institute a vegetation clearing maintenance schedule for all signs on all approaches.
- Evaluate the existing signage clutter and consider reducing unwarranted signs on the NH 101 westbound approach. There are currently eight sign posts with assorted signs as well as chevrons within a half of a mile of the intersection. Very few of the signs are oriented towards safety.
- Consider replacing the existing NH 101 intersection sign (traffic turning and entering) with a new sign. The existing sign includes a driveway as one of the legs of the intersection and it does not clearly emphasize the intersection of NH 101/123 and Old Street Road.
- Signage on Old Street Road and NH 123 is old and worn and should be replaced with new signs. Consider upgrading both signs (particularly NH 123 stop sign) to a larger sign acceptable by MUTCD standards.

**Issue 4:** NH 123 and Old Street Road drivers going straight or making left-hand turn have difficulty executing movement when vehicles are simultaneously on both sides of the intersection.

- Improvement of sight distance issues will mitigate confusion for driver’s negotiating traffic on NH 101 at the same time as traffic from the opposite side of the intersection.
- Consider aligning NH 123 with Old Street Road so that drivers do not experience awkward simultaneous left hand turns.

**4.0 Contact Information**

Southwest Region Planning Commission has agreed to be the principal contact for any questions or comments relating to this Road Safety Audit report. Please contact SWRPC for any explanation of data or field reviews used during this report or if clarification is required for project development purposes at the intersection of NH 101, 123 and Old Street Road.

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