Route 9 Railroad Overpass Safety Study

FINAL REPORT

Prepared for:
City of Northampton

Prepared by:
Pioneer Valley Planning Commission

August 2006

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Prepared in cooperation with the Executive Office of Transportation, the Massachusetts Highway Department and the U.S. Department of Transportation - Federal Highway Administration and the Federal Transit Administration.

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INTRODUCTION

The Pioneer Valley Planning Commission (PVPC) was approached by the City of Northampton to conduct a safety study of the existing low-clearance railroad bridge over Route 9 as part of the FY 2005 Unified Planning Work Program. The Northampton railroad bridge is currently posted at 11 feet, a low-clearance bridge that most large-sized trucks are not able to utilize. A high volume of truck traffic travels through the City of Northampton to serve both Northampton and other neighboring cities and towns. On numerous occasions, overheight vehicles have collided with the bridge. Many damaged areas can be seen under this bridge. The Northampton Police Department also must routinely provide assistance to clear traffic for vehicles that have not struck the bridge but must back up to a suitable detour point. Warning signs are provided and alternate routes have been assigned to assist trucks around the railroad bridge. Bridge Street (Route 9) has also been redesigned to provide more clearance and can no longer be lowered.

The purpose of this safety study is to determine possible causes for these incidents at the railroad bridge. To determine possible future recommendations, the locations and conditions of the truck signs were assessed as well as the locations of alternate truck routes to avoid the railroad bridge.

A. Study Area

The railroad bridge is located to the east of the intersection of King Street and Pleasant Street (Route 5/10) with Main Street and Bridge Street (Route 9) in Northampton, Massachusetts. The City of Northampton has maintenance jurisdiction over downtown Northampton on Routes 5 and 9. The Massachusetts Highway Department District 2 (MassHighway) has maintenance jurisdiction over Routes 5 and 9 at locations closer to Interstate 91 and outside of the downtown district. This includes signage. On-street parking is provided along Bridge Street and sidewalks are provided on each side of the street. Bridge Street also intersects with Hawley Street to form a four way signalized intersection immediately to the west of the railroad bridge.

The railroad bridge is on the Boston and Maine's ConnRiver Line. Boston and Maine is a subsidiary of Guilford Transportation of North Billerica, Massachusetts. This line is mainly used to transport coal to and from the Mount Tom Power Plant as well as providing a connection to Guilford Railroad Operations in Connecticut.

II. INVENTORY RESULTS

A. Crash Data

Crash information was gathered for the railroad bridge based on the information provided by the Northampton Police Department to identify any existing safety problems. The crashes were separated by actual bridge strikes and incidents where an overheight vehicle did not strike the bridge but required police assistance to back up and turn down a detour route. A total of 21 incidents were reported from February of 2002 until June of 2005. Nine of these incidents consisted of a vehicle striking the railroad bridge, while twelve consisted of vehicles that did not collide with the bridge but required police assistance. Comments received from the Northampton Police Department indicated that there are many more instances where police were required to assist an overheight vehicle that has not actually struck the bridge but has missed the detour. Due to the frequency of these occurrences, they may not always be documented. Tables II-2 and II-3 present a summary of this information.

Table II-1 Bridge Strikes

Year		**Direction**		**AM Peak**	**PM Peak**
2002	0	EB	4	1	3
2003	1	WB	5		
2004	4				
2005	4				
Total	**9**				

Source: Northampton Police Department, 2002-2005

Table II-2 Trucks Requiring Police Assistance Due to Low Clearance

Year		**Direction**		**AM Peak**	**PM Peak**
2002	2	EB	1	0	2
2003	2	WB	11		
2004	6				
2005	2				
Total	**12**				

Source: Northampton Police Department, 2002-2005

As can be seen from the tables, the nine incidents involving a vehicle colliding with the bridge are equally distributed between eastbound and westbound traffic on Route 9. This changes dramatically for incidents involving vehicles that have not struck the bridge but require police assistance. Eleven of the twelve documented incidents involved vehicles traveling westbound on Route 9.

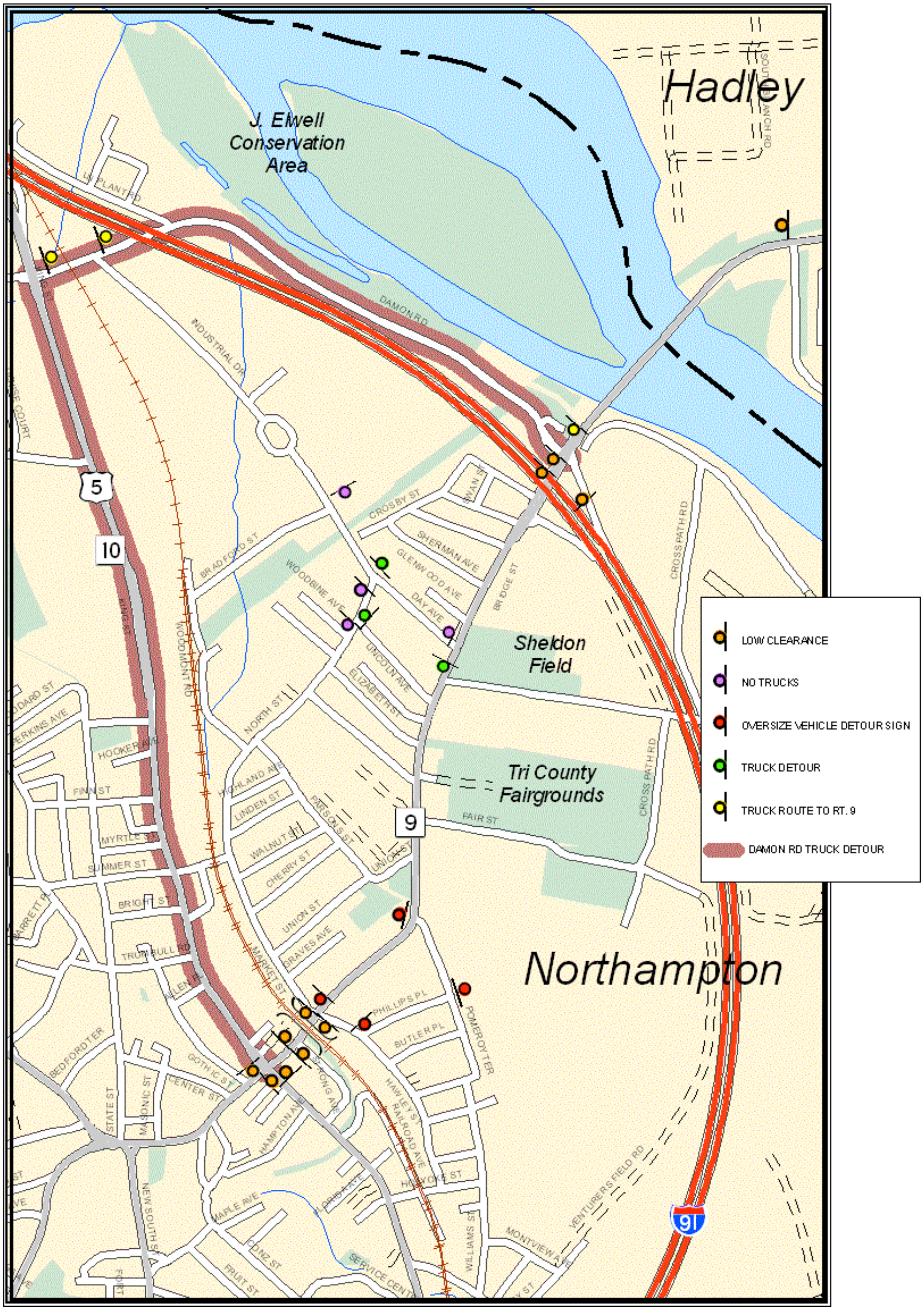
Many alternate routes have been dedicated to truck drivers to bypass the low clearance bridge and signs are posted in various areas in downtown Northampton and near Interstate 91. However, some may not be visible due to their size, height or growing vegetation. Other signs were also noted to be facing the wrong direction, laying on the ground due to a recent collision or facing the wrong direction. This information was gathered at the time of the field inventory.

B. Signage and Alternate Routes

Low-clearance signs are located one and a half mile's from the railroad bridge on Bridge Street, beginning at the Calvin Coolidge Bridge. There are also low-clearance signs provided to the west of the railroad bridge throughout some areas of downtown. It was noted that many of these low-clearance signs are hard to see due to their size and height. Some of them were also noted to be obstructed by growing vegetation. A map of existing low-clearance warning signs for the area is presented in Figure II-1.

Alternate truck route signs are located on the westbound approach of Route 9 at its intersection with Damon Road and the I-91 Exit 19 off-ramp. This alternate route directs trucks to utilize Damon Road to access King Street (Route 5/10) and bypass downtown. An additional alternate route is posted on Route 9 to use Lincoln Street to access Industrial Avenue and King Street (Route 5/10). However, trucks are only permitted to travel along this route in the southbound direction. Signs are posted restricting trucks from using Day Avenue and other side streets in this area. Currently, there are no marked alternate routes in the downtown area to the west of the railroad bridge. It was noted during the field inventory that many of the alternate route signs were white, and therefore difficult to find among other signs that were in their close proximity. In addition, some of the signs were posted too low, which combined with their small size, could cause them to not be easily observed by truck drivers.

Figure II-1 - Existing Truck Signs



Source: Pioneer Valley Planning Commission

III. RECOMMENDATIONS

Based on the results of the truck sign inventory, a series of recommendations were developed to address existing traffic deficiencies and improve safety in the study area. MassHighway has maintenance jurisdiction over Bridge Street (Route 9) beginning at Grant Street and extending eastbound onto the Calvin Coolidge Bridge. MassHighway also has maintenance jurisdiction over a portion of Pleasant Street (Route 5), approximately a half mile to the south of the intersection of Bridge Street (Route 9) with Pleasant Street (Route 5). Any proposed transportation improvement project for these areas will require the approval of MassHighway prior to its installation. A map displaying potential new warning sign locations are presented in Figure III-1.

- The City of Northampton should consider installing additional low-clearance warning signs on the existing traffic signal mast arms at the following locations. A structural engineering analysis should be conducted to determine if the mast arm can support the loading of an additional sign. A summary of the proposed new signs is included in Table III-1.

Table III-1 – Installation of New Signage

Location	Direction	Landmark	Sign Type	Recommendations
Bridge Street (Route 9) with Hawley Street	WB	Mast Arm	Alternate Truck Route	The installation of a sign on the mast arm may improve awareness to utilize the alternate route.
Bridge Street (Route 9)	EB	Lincoln Avenue Approach	Alternate Truck Route	The installation of a sign on the mast arm may improve awareness to utilize the alternate route.
Main Street (Route 9) with Pleasant Street (Route 5)	EB	Mast Arm	Alternate Truck Route - Take Left onto King Street (Route 5)	The installation of a sign on the mast arm may improve awareness to utilize the alternate route.

- At the intersection of Bridge Street with Lincoln Avenue, a sign facing eastbound traffic should be installed to assist truck drivers to this alternate route.
- At the time of the field inventory, the alternate route signs were noted to be too small and low to be visible to truck drivers. Increasing the size and height of these signs may assist truck drivers in taking these alternate routes. A summary of proposed recommendations to improve the visibility of existing truck signage is provided in Table III-2.

Table III-2 - Possible Improvements for Current Signage

Location	Direction	Landmark	Sign Type	Existing Conditions	Recommendations
Bridge Street (Route 9)	WB	By I-91 Overpass	Low-Clearance	Obstructed by growing vegetation.	Removal of vegetation would improve visibility for truck drivers.
Bridge Street (Route 9) with Damon Road	WB	Calvin Coolidge Bridge	Alternate Truck Route	Not visible due to its close proximity to other posted signs and the small size of the sign.	Possible relocation and enlargement of sign would increase visibility.
Bridge Street (Route 9) with Hawley Street	WB	Utility Pole	Alternate Truck Route	Not visible due to small size and height of sign.	Increasing the height and size of this sign may improve visibility of this sign for truck drivers.
Main Street (Route 9) with Pleasant Street (Route 5)	EB	Mast Arm	Low-Clearance	Not visible due to small size of sign.	Increasing the size of this sign may improve visibility of this sign for truck drivers.
Bridge Street (Route 9)	WB	Lincoln Avenue Approach	Alternate Truck Route	Not visible due to height of sign.	Increasing the height of this sign may alert truck drivers to utilize this alternate route.
Pleasant Street (Route 5) with Bridge Street (Route 9)	NB	Utility Pole	Low-Clearance	Not visible due to its small size and height of sign.	Increasing the size of this sign may improve visibility of this sign for truck drivers.
Main Street (Route 9) with Pleasant Street (Route 5)	EB	Mast Arm	Low-Clearance	Not visible due to its small size and height of sign.	Increasing the height of this sign may alert truck drivers to utilize this alternate route.
King Street (Route 9) with Pleasant Street (Route 5)	SB	Median	Low-Clearance	Not visible due to its size and height of sign.	Increasing the size and height of this sign may alert truck drivers to utilize this alternate route.

WB = Westbound, EB = Eastbound, NB = Northbound, SB = Southbound

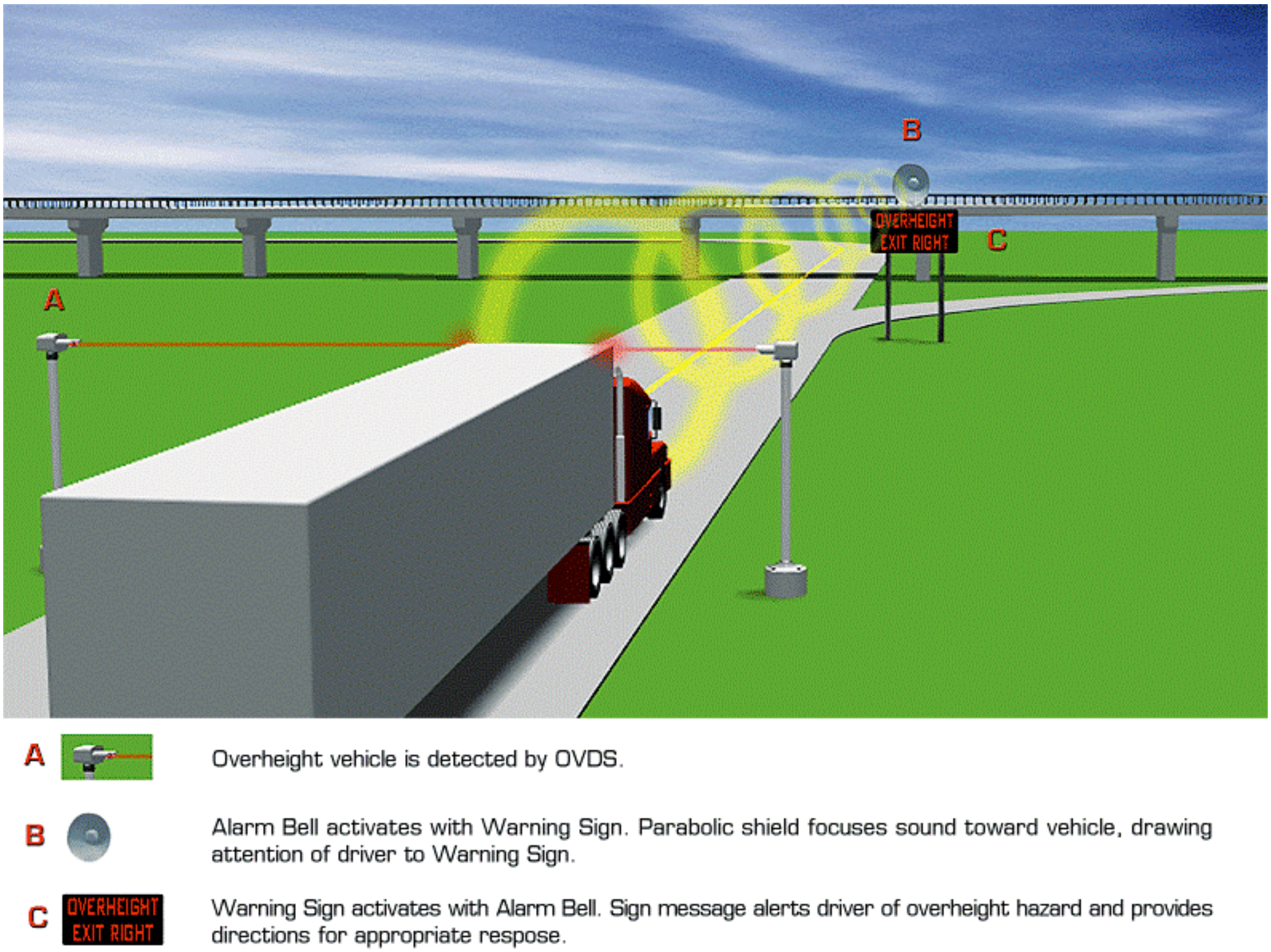
Figure III-1 - Installation of New Signage

Source: Pioneer Valley Planning Commission

A. Overhead Vehicle Warning System

In the long term, the City of Northampton should consider consulting with the MassHighway District 2 Office to determine the feasibility of installing an "Overheight Vehicle Warning System." Typically such an installation would consist of an overhead infrared beam set at the maximum clearance height of the underpass. Overheight vehicles would "break" the beam and trigger a secondary warning device that would alert drivers to use a detour route. A concept of a typical installation is presented in Figure III-2.

Figure III-2 – Overheight Vehicle Warning Concept



Source: Trigg Industries International, Inc.

Ideally, such a system would be placed on both sides of the railroad bridge. This could be problematic on the western side of the bridge due to the high density of development in downtown Northampton. On the eastern side of the bridge, a system could be developed on Route 9 in the vicinity of Coolidge Avenue. This would allow overheight vehicles adequate time to locate the detour route on Lincoln Avenue. This section of Route 9 falls under the maintenance jurisdiction of the MassHighway District 2 Office. It will be important for the City of Northampton to consult with MassHighway to determine if an Overheight Vehicle Warning System can be installed in this area. In addition, the City of Northampton is also encouraged to obtain the input of local residents in the vicinity of the installation that could be adversely impacted.

The estimated cost to install this warning system is dependent on the type of equipment required for the study area. A dual eye detection system is required because the detection of eastbound movement is not needed. The sign also varies, depending on whether or not a variable message on the sign is desired. From a quote recently acquired to PVPC, the dual eye detection system costs slightly less than $5000. This can be wired into many sign types including a variable message sign and many other devices as well. The variable message sign can provide 2 lines of space and characters sizing up to 6 feet long. The estimated cost for signage starts at almost $6500 for a blank-out sign, averaging out to be 7 feet in length. .Poles and mounting brackets are also available for an extra cost, however, poles are not required.

If an Overheight Vehicle Warning System is installed on Route 9, the City of Northampton is encouraged to explore opportunities to install a similar system in the downtown area. Again, this may not be feasible due to the high density of development, but could reduce the existing history of incidents between overheight vehicles and the railroad bridge. Photographs of an existing Overheight Vehicle Warning System are shown in Figure III-3.

Figure III-3 – An Existing Overheight Vehicle Warning System

Source: MassHighway, District 2

APPENDIX

CMAQ Analysis

Note: The number of incidents is known as a crash or near crash.

Based on the feedback from the Northampton Police Department, the assumed number of crashes that occur per year is 20.

Therefore, $\frac{\text{20 Crashes/Year}}{\text{365 days/Year}}$ = 0.055 Crashes Per Day

Based on data provided by PVPC, within the past five years, the average number of vehicles that travel along Route 9 throughout the study area is roughly 16,000.

The average length of Route 9 that is affected during an Event is about ¾ of a mile.
16,000 vehicles per day **X** .09 = 1440 vehicles per peak hour.

VOC (g/mi) Emissions
No Event - $VOC_{20\ mph}$ = 1440 vehicles **X** 0.75 miles **X** 0.642 g/mile = 693.36 grams/hour

Event - $VOC_{3\ mph}$ = 1440 vehicles **X** 0.75 miles **X** 3.112 g/mile = 3,360.96 grams/hour

3,360 g– 693.36 g= 2667.6 g per hour

Average incident lasts 1.5 hours, therefore 2667.6 g **X** 1.5 hours= 4001.4 g per event

4001.40 g per event **X** 20 events= 80,028 g per year

80,028 grams of VOC will be saved without any events

NOx (g/mi) Emissions
No Event – $NOx_{\ 20\ mph}$ = 1440 vehicles **X** 0.75 miles **X** 1.438 g/mile = 1,553.04grams/hour

Event – $NOx_{\ 3\ mph}$ = 1440 vehicles **X** 0.75 miles **X** 2.409 g/mile = 2,601.72 grams/hour

2,601.72 g– 1,553.04 g= 1,048.68 g per hour

Average incident lasts 1.5 hours, therefore 1048.68g **X** 1.5 hours= 1573.02g per event

1573.02 g per event **X** 20 events= 31,460.4g per year

31,460.4 grams of NOx will be saved without any events