



ENGINEERING SUCCESS TOGETHER

December 08, 2015

Anthony L. Del Gaizo, P.E.
Town Engineer
500 Dedham Street
Needham Massachusetts 02492

Re: ***Draft At-Grade Crossing Feasibility Study***

Dear Mr. Del Gaizo,

BETA Group, Inc. (BETA) is pleased to present this report to the Town of Needham, on the results of an investigation of the opportunity to create a Quiet Zone along the MBTA rail line within the town.

To make sure that all parties are entirely clear about the nature of a Quiet Zone, it is best to understand it as a reduced horn use zone. While the normal sounding of train horns is suspended in a Quiet Zone, the locomotive engineer is still obligated to sound the train horn in any case of emergency, in order to warn trespassers on the right of way, rail workers along the right of way, or vehicles within in the crossing of the approach of the train.

BETA and Egan Consulting Group (ECG) have reviewed the relevant Code of Federal Regulations (CFR) and additional guidance on the establishment of Quiet Zones as issued by the Federal Railroad Administration (FRA), met on site to review conditions, and met with Public Works. Additionally, a meeting and site visit was held with the FRA grade crossing manager for Region One, Mr. Lou Frangella. Attending that meeting were; yourself; Tom Egan, ECG; Lou Frangella, FRA; and the writer.

A detailed description of each of the grade crossings being considered in this Quiet Zone Study is found in the report prepared for the Needham Transportation Committee in 2013, entitled, "Proposed Quiet Zone Safety Improvements along the Needham Line of the Massachusetts Bay Commuter Rail At Six At-Grade Rail Crossings". The six crossings mentioned in that report include the five public crossings at grade (West Street, Rosemary Street, May Street, Great Plain Avenue, and Oak Street), as well as a private grade crossing at the Needham Golf Club. The 2013 report is not appended to this report since it is assumed that it was distributed to all interested stakeholders previously. Aerial photos of each crossing are included in Appendix 1, as are track charts and relevant sections from the Operating Rules and Instructions for the rail line.

This report will not duplicate the information from the 2013 report, but will note a number of changes since the 2013 report:

- The operator of the line is no longer Massachusetts Bay Commuter Rail. As result of a competitive bid process by the MBTA, MCR was supplanted by Keolis Commuter Services effective July 1, 2015.

- As part of that procurement, MBTA established itself as the railroad under Federal regulations, and thereby Keolis is strictly the operator of the railroad for MBTA.
- The National Average risk index and values for various SSM change on an annual basis based on new information to the system, therefore the resultant risk index for the same crossings are different in 2015 compared to the 2013 values.
- There is no current freight traffic on the line. Freight operating rights between Medfield Junction, Needham Junction and Needham Heights have not, to our understanding, been extinguished.

Additionally, while this report and the 2013 report agree that the public grade crossings in Needham can meet the conditions required to constitute a Quiet Zone, we believe that the town needs to consider several additional issues to make a fully informed decision on this topic.

Regulatory Issues and Requirements

The FRA process for determining whether a specific set of grade crossings qualifies for establishment of a Quiet Zone is quite specific and includes the following:

1. Each grade crossing is carried in an FRA database, and given a risk index based on historic data (number and speed of trains, traffic count, speed, number of accidents at the crossing and warning devices in place).
2. Utilizing an FRA on-line tool, the Quiet Zone Calculator, a series of assessments can be made to determine if the risk level can be brought down to one of two thresholds by applying specific safety measures at the crossings within the proposed Quiet Zone.
3. Either Supplemental Safety Measures (SSMs) or Alternate Safety Measures (ASMs) must be put in place at some or all of the grade crossings on the line segment. A full list of SSMs is included in Appendix 2 of this report however for the reader's benefit the following SSMs are most relevant to this discussion: Four Quadrant Gates, both with and without Presence Detection, and Channelization (including both mountable and non-mountable devices).
4. A value is given for each SSM or ASM proposed within the Quiet Zone. The Quiet Zone Calculator generates a cumulative risk index based on the specific SSMs proposed.
5. The Quiet Zone Risk Index must be reduced to a point either below the Nationwide Significant Risk Threshold, or at minimum, below the Risk Index with Horns.
6. Additionally, each grade crossing on the line segment under consideration must be equipped with two specific rail signal enhancements. These enhancements are Constant Warning Time Devices, and Power Out features.
 - a. Constant Warning Time devices identify the speed of the approaching train and adjust the warning device activation to meet the FRA advance warning time period, therefore assuring the warning time is constant regardless of the train's approaching speed. On the basis of information available in the Keolis Operating Rules and Instructions (NORAC Rules, dated 7/1/14), we believe that the grade crossing circuits currently in place are not Constant Warning Time circuits. We will need to confirm this with MBTA and Keolis.. If standard

approach circuits are in place, it would require an upgrade to constant warning time circuits. This is a cost that would be incurred by the MBTA, and for which they would expect to be compensated by the Town. The cost to upgrade these approach circuits is not included in the cost estimates below, but could be significant.

- b. Power Out Indicators are a type of safety device that warns locomotive engineers in the event that the electric power to a particular grade crossing has failed. The presence and functionality of these devices must be confirmed with MBTA and Keolis. The Town should be prepared that the MBTA would expect to be compensated for any additional infrastructure required to institute a Quiet Zone.

FRA regulations specify that, except in certain conditions, which do not apply in this case, a Quiet Zone cannot start or finish at a private grade crossing. This is relevant to the Needham Golf Course grade crossing. The Golf Course grade crossing is a private crossing. Private crossings have different liability attached compared with public crossings at grade. Authorized track speed through the Golf Club crossing is posted as 50 mph. While as a practical matter, virtually all trains make a station stop at Hersey Station, this speed limit is a complicating factor in seeking any relief.

We have asked the FRA for a clarification and the possibility of an exemption from the private grade crossing regulation. The regional manager did not believe that the FRA would consider including the private crossing in the quiet zone. He did commit to discussing the matter with his superiors. Alternatively, there may be an option to explore whether the golf club and the Town could reach an accommodation with the MBTA regarding the crossing and amend the private grade crossing agreement accordingly. Then the parties could jointly present that information to the FRA. Absent agreement from the FRA regarding the Golf Club crossing, the Quiet Zone could only encompass the five public grade crossings, and the locomotive horns would continue to be sounded at the Needham Country Club grade crossing.

Observations and Recommendations

Using the FRA on-line tool, we have determined that the proposed Quiet Zone between West Street and Oak Street currently has a risk factor of 33,954.07. As noted above, to be considered for Quiet Zone status that risk must be reduced to one of two levels; below the current Risk Index with Horns (20,356.16) or below the Nationwide Significant Risk Threshold (14,347.00). Below are mechanisms for reducing the risk factor.

Four Quadrant Gates

The Four quadrant gate system is a relatively new improvement over the traditional two quadrant gates in use on these grade crossings today. Traditional grade crossing gates close access to the grade crossing from the approaching roadway lane. The traditional gates do not protect against a vehicle "slaloming" around the gates. (To "slalom" around the gates means that the driver upon approaching a lowered gate, leaves his/her lane, crosses into the opposing traffic lane and enters the grade crossing from the opposite lane (where there is no gate), weaving to the right to miss the lowered gate beyond the track in that lane, and exiting the crossing on the original lane.). Unfortunately the behavior described is altogether too common.

Four Quadrant Gates consist of gates that come down in all four quadrants of the crossing, with the gate closest to approaching traffic coming down generally before the gate closing off the exit lane, thereby allowing any vehicles on the grade crossing when the gates begin to decent to escape before the arrival of the train. For maximum safety, we believe that the town should consider 4 quadrant gates, and include Presence Detectors. Presence Detectors recognize when a vehicle is "trapped" between the gates, and opens the outlet side gate to allow escape. Additionally, all warning devices should include preemption circuits with proximate traffic signals, in order to make sure that traffic signals allow vehicular traffic to flow away from the grade crossing when a train approaches.

Channelization

Channelization is an additional safety measure that is used in some circumstances. The term refers to placing barriers between the traffic lanes to prevent a vehicle from crossing into the opposite lane of traffic. Channelization devices can include both mountable devices and non-mountable devices. While generally an effective mechanism for traffic separation, consideration must be given to two particular elements in considering using channelization at any of these grade crossings.

The first consideration is the impact on snow removal efforts. The channelization devices would in effect narrow the roadway, and provide an additional obstacle for the plow drivers to consider in their rounds. The ultimate determination as to the effect of channelization on snow removal efforts would reside with the highway department.

The second element to be considered is how channelization would impact access to and egress from various commercial and residential driveways and parking lots. Channelization in effect makes the roadway in the area of the grade crossing a divided roadway. Any vehicle entering these driveways/parking lots would have to approach the entrance from the same side of the street only (no left hand turn across opposing traffic lanes would be possible). Also, any vehicles exiting these driveways/parking lots would have to make a right hand turn, as crossing the near lane to make a left into the opposite lane would not be possible. Obviously, all current traffic precluded from making left hand turns (either into or out of the parking lots/driveways) would have to seek alternate routes through the local streets to redirect themselves to their destination, therefore impacting traffic in the general area.

FRA Quiet Zone Calculator

Having run various scenarios through the FRA Quiet Zone Calculator, we have determined that risk indices below the Risk Index with Horns, and below the Nationwide Significant Risk Threshold, can be achieved. There is, however a continuum of risk and cost attached with each of the various scenarios. That is to say, to get below the Nationwide Significant Risk Threshold will cost more than to get below the Risk Index with Horns. To get the lowest possible risk index, or to apply like safety measures on all grade crossings, will cost more than simply getting below the Nationwide Significant Risk Threshold.

At this point the exercise reduces to a cost/risk analysis. While it is possible to reduce the Quiet Zone Risk Index below the Risk Index with Horns, we strongly recommend exceeding the minimum corrective action in order to reduce future liability in the event of a vehicle/train accident at one of the crossings.

The options available to the Town range from:

- Adding Four Quadrant Gates at two grade crossings, channelization at two crossings and no supplemental safety measures at the fifth crossing
- Four Quadrant gates at four crossings and no supplemental safety measures at the remaining crossing
- Adding Four Quadrant gates at all five public grade crossings.

Recommendations

To maximize the safety of the driving public, the crews and customers on the commuter trains, and the citizenry of the Town of Needham, we recommend Four Quadrant Gates be considered for West Street, Rosemary Street, May Street, Great Plain Avenue and Oak Street.

We further recommend that the Town give strong consideration to including Presence Detectors at the five public grade crossings.

While it is unclear at this time whether the FRA will authorize including the Golf Club crossing in the Quiet Zone, we recommend repurposing a set of crossing gates from one of the public crossings to this location to improve safety.

For reasons cited above, it is unclear if the benefit of channelization is outweighed by the implications to snow removal and local access. Therefore, we have not included channelization in our recommendations. If the Town elects to explore channelization either in concert with Four Quadrant gates, or as an alternative to Four Quadrant gates, that would change the cost estimates below.

Anticipated Costs

BETA has developed an estimate of "all in" costs to accomplish the Quiet Zone based on the recommendations above. The total cost of West Street, Rosemary Street, May Street, Great Plain Avenue and Oak Street being upgraded to Four Quadrant gates, and two quadrant gates added to the Needham Golf Club crossing would be in the range of \$1.3 million dollars. Details for this cost estimate are included in Appendix 3. This estimate does not include Grade Crossing surface work, additional or alternate power drops for the signals, any work on rail constant warning time devices (need to confirm current infrastructure by discussion with MBTA), and any Power Out upgrades.

Next Steps

- a. Present this report to Needham officials
- b. Continue discussion with FRA regarding the private grade crossing at the Needham Golf Club.

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c. Presentation at Board of Selectmen's meeting (12/19/15)

Additionally, the following steps should be taken if the town determines that they would like to continue to pursue establishing the Quiet Zone

- d. Request a meeting with MBTA, and their rail operator, Keolis, to discuss establishment of Quiet Zone
- e. Establish Diagnostic team to assess Pedestrian Crossings (Needham Center and Hersey Stations).
- f. Negotiate terms of the Quiet Zone
- g. Begin conceptual design

If we can be of any further assistance regarding this matter, please contact us at our office.

Very truly yours,
BETA Group, Inc.



Robert T. Mackle, PE, BCEE
Senior Associate

cc: File
Thomas Egan, ECG

Job No: 5176