City of Rocky River
Quiet Zone Evaluation

Draft Report
Presented by:
Railroad Controls Limited
August 28, 2006

RCL
Railroad Controls Limited

Quiet Zone Evaluation
City of Rocky River, OH

Introduction

The City of Rocky River requested Railroad Controls Limited (RCL) to conduct an evaluation of the grade crossings within the city to determine appropriate treatments to create a new Quiet Zone. The goal of this evaluation is to also provide budget level costs associated with each crossing.

The evaluation was conducted on the Norfolk Southern Railway corridor and included four (4) public roadway crossings. The crossings evaluated were located between Linda Street (NS - MP 192.94) and Elmwood Road (NS - MP 193.78) on the Lake Subdivision. The evaluation was based on the criteria for the establishment of quiet zones as outlined in the *Final Rule on Use of Locomotive Horns at Highway-Rail Grade Crossings*.

The focus of the evaluation was to determine which supplemental safety measures could be used to fully compensate for the absence of the train horn. The engineering improvements considered, as identified in the *Final Rule*, included the following:

- Temporary closure used with a nighttime-only zone
- Four quadrant gates with or without vehicle detection
- Median/Channelization arrangements at least 60/100 feet in length on each side
- One-way street with a gate or gates across the roadway
- Permanent crossing closure
- Automated wayside horns

Background

The Federal Government, in response to the concerns initiated by the Federal Railroad Administration (FRA) regarding increased grade crossing collisions at highway-rail grade crossings in whistle ban areas, enacted the Swift Rail Development Act of 1994. This Act mandated that the Secretary of Transportation issue regulations requiring the use of locomotive horns at public grade crossings, but gives the agency the authority to make reasonable exceptions.

On January 13, 2000, the FRA published a Notice of Proposed Rule Making in the Federal Register addressing the use of locomotive horns at public highway-rail grade crossings. The ruling clarified that locomotive horns must be sounded while approaching and entering upon each public highway-rail grade crossing and prescribed maximum and minimum allowable sound levels. The rule also provided exceptions in circumstances where there is not a significant risk of increased grade crossing collisions, where the use of the locomotive horn is impractical, or where safety measures can be installed to fully compensate for the absence of the warning provided by the horn. As a result, the rule allowed for the creation of designated Quiet Zones

where locomotive engineers would only be required to sound the train horn in emergency situations.

After reviewing almost 3,000 public comments on the Notice of Proposed Rule Making, the FRA issued the Interim Final Rule on December 18, 2003. An additional 1,400 public comments were received and reviewed on the Interim Final Rule, after which the FRA issued the Final Rule on April 27, 2005. The Final Rule went into effect on June 24, 2005.

Creation of Quiet Zones

The FRA's final rule entitled "Use of Locomotive Horns at Highway-Railroad Grade Crossings – Final Rule" allows Quiet Zones to be created either by public authority designation or by application through the FRA by the public authority.

The Public Authority Designation process is the preferred method. If certain requirements are met, the Quiet Zone will not require FRA approval. This method can be utilized if:

- Each highway-rail grade crossing within the Quiet Zone is equipped with an approved Supplemental Safety Measure (SSM) or Wayside Horn
- The Quiet Zone Risk Index (QZRI) is less than the Nationwide Significant Risk Threshold (NSRT) or the Risk Index With Horns (RIWH).

The Public Authority Application method can be used if the requirements to conform to the method above can not be achieved. This method allows for the use of Alternative Safety Measures (ASM). ASMs include Modified SSMs, Non-engineering ASMs or other Engineering ASMs. An example of a Modified SSM is a shorter median than is currently allowable under the rule. A Non-engineering ASM might include education and enforcement efforts, while other Engineering ASMs might include some other engineering treatment that has not yet been approved as an SSM. Effectiveness rates for ASMs need to be determined and provided with the application. This can result in significant monitoring activities before an application can even be submitted.

The FRA has determined acceptable alternatives for elimination of the requirement to sound the train after commissioning and reviewing countless studies on the issue. Based on the research conducted and reviewed by the FRA, it is our opinion that communities should adopt the Public Authority Designation approach with the goal of treating each highway-rail grade crossing in the corridor with an approved SSM or wayside horn. If a community chooses to only reduce the QZRI below the NSRT or RIWH and not treat each highway-rail grade crossing within the corridor, they could be scrutinized later for not treating a specific highway-rail grade crossing if a collision occurs.

Overview of Railroad Operations

There is one NS rail corridor of interest in the City of Rocky River. The corridor is the Lake Subdivision. The NS is the only railroad that operates over the corridor. There are approximately 22 trains per day using this corridor. The maximum operating speed through Rocky River is 35 mph.

The corridor in red on Figure 1 is the Lake Subdivision.

Figure 1. NS Rail Corridor in the City of Rocky River, OH

Summary of Grade Crossings and Warning System

There are four (4) highway-rail grade crossings in the City of Rocky River that were selected for review. The crossings are summarized in the table below.

Corridor Crossings

Street Name	DOT No.	Warning Device	Circuitry
Linda Street	472237B	Flashing Lights and Gates	constant warning
Morewood Pkwy	472239P	Flashing Lights and Gates	constant warning
Wagar Road	472240J	Flashing Lights and Gates	constant warning
Elmwood Road	472241R	Flashing Lights and Gates	motion detector

Quiet Zone Alternatives Considered

Under the Train Horn Rule, the FRA allows specific engineering improvements at highway-rail grade crossings that when implemented allows for the elimination of the train horn. Each of those alternatives and their specific requirements are described below.

Four-Quadrant Gate System

Install gates at a crossing sufficient to fully block highway traffic from entering the crossing when the gates are lowered, including at least one gate for each direction of traffic on each approach.

Requirements:

Four-quadrant gate systems shall conform to the standards for four-quadrant gates contained in the MUTCD and shall, in addition, comply with the following:

1. When a train is approaching, all highway approach and exit lanes on both sides of the highway-rail crossing must be spanned by gates.
2. The railroad crossing must be equipped with Constant Warning Time Circuitry and Power Out Indicator.
3. If medians are not present, the gap between the ends of the entrance and exit gates (when the gates are lowered) must be less than two feet. If equipped with a median or a channelization device between the approach and exit lanes, the lowered gates must reach to within one foot of the median or channelization device.

Figure 2. Example of Four Quadrant Gate Installation

Gates With Medians or Channelization Devices

Install medians or channelization devices on both highway approaches to a public highway-rail grade crossing denying highway users the option of circumventing the approach lane gates by switching into the opposing (oncoming) traffic lane and driving around the lowered gates to cross the tracks.

Requirements:

1. Opposing traffic lanes on both highway approaches to the crossing must be separated by either: (1) medians bounded by non-traversable curbs or (2) channelization devices.
2. Medians or channelization devices must extend at least 100 feet from the gate arm, or if there is an intersection within 100 feet of the gate, the median or channelization device must extend at least 60 feet from the gate arm.
3. Intersections of two or more streets, or a street and an alley, which are within 60 feet of the gate arm must be closed or relocated.
4. The railroad crossing must be equipped with Constant Warning Time Circuitry, a Power Out Indicator, gates and flashing lights.
5. The gap between the lowered gate and the curb or channelization device must be one foot or less.
6. ‘‘Break-away’’ channelization devices must be frequently monitored to replace broken elements.

Figure 3. Gates with Medians

Figure 4. Gates with Channelization Devices

One Way Street with Gate(s)

Gate(s) must be installed such that all approaching highway lanes to the public highway-rail grade crossing are completely blocked.

Requirements:

1. Gate arms on the approach side of the crossing should extend across the road to within one foot of the far edge of the pavement. If a gate is used on each side of the road, the gap between the ends of the gates, when both are in the lowered or down position, must not be more than two feet.
2. If only one gate is used, the edge of the road opposite the gate mechanism must be configured with a non-traversable curb extending at least 100 feet.
3. The railroad crossing must be equipped with Constant Warning Time Circuitry, a Power Out Indicator, gates and flashing lights.

Figure 5. One-way Street with Gates

Wayside Horns

Stationary horn system activated by the railroad-highway grade crossing warning system, mounted at the crossing, rather than on the locomotive, to deliver an audible warning to motorists and pedestrians. The wayside horn can be used within or outside of a Quiet Zone. It is the simplest way to reduce train horn noise since a Quiet Zone is not required. The wayside horn is considered by the FRA to be a one-for-one substitute for the train horn.

Requirements:

1. The railroad crossing must be equipped with Constant Warning Time Circuitry, a Power Out Indicator, gates and flashing lights.
2. The crossing must have an indicator to notify the train crew of the status of the system.
3. The railroad must adopt an operating rule, bulletin, or special instruction.
4. The horn system must provide a minimum sound level of 92 dB(A) when measured 100 feet from the centerline of the nearest track.
5. The horn system must sound at a minimum of 15 seconds prior to the train's arrival at the crossing or simultaneously with the flashing lights or descent of the gate arm.
6. The horn shall be directed toward approaching traffic.

Figure 6. Example of a Wayside Horn Installation

Installing Wayside Horns Outside of a Quiet Zone

A railroad or public authority installing a wayside horn at a grade crossing located outside a quiet zone shall provide written notice of installation to the following parties: all railroads operating over the public highway-rail grade crossing, the highway or traffic control authority or law enforcement authority having control over vehicular traffic at the crossing, the State agency responsible for grade crossing safety, the State agency responsible for highway and road safety, and the Associate Administrator. This notice shall provide the date on which the wayside horn will be operational and identify the grade crossing at which the wayside horn shall be installed by both the U.S. DOT National Highway-Rail Grade Crossing Inventory Number and street or highway name. The railroad or public authority shall provide notification of the operational date at least 21 days in advance.

Temporary Closures

Close the crossing to highway traffic during designated quiet periods. (This SSM can only be implemented within Partial Quiet Zones.)

Requirements:

1. The closure system must completely block highway traffic on all approach lanes to the crossing.
2. The closure system must completely block adjacent pedestrian crossings.
3. The crossing shall be closed from 10 p.m. until 7 a.m. every day.
4. Barricades and signs shall conform to the standards contained in the MUTCD.
5. Daily activation and deactivation of the system is the responsibility of the public authority.
6. The system must be tamper and vandal resistant
7. The closure system shall be equipped with a monitoring device that contains an indicator which is visible to the train crew prior to entering the crossing. The indicator shall illuminate whenever the closure device is deployed.

Figure 7. Example of a Temporary Closure System

Permanent Closure of a Public Highway- Rail Grade Crossing

Permanently close the crossing to highway traffic.

Requirements:

1. The closure system must completely block highway traffic from entering the grade crossing.
2. Barricades and signs used for closure of the roadway shall conform to the standards contained in the MUTCD.
3. The closure system must be tamper and vandal resistant.

Grade Crossing Field Reviews

On April 11, 2006, RCL conducted a field evaluation of each of the crossings as directed by the City of Rocky River. The evaluation findings are described in detail in Appendix C.

Summary of Proposed Quiet Zone Improvements

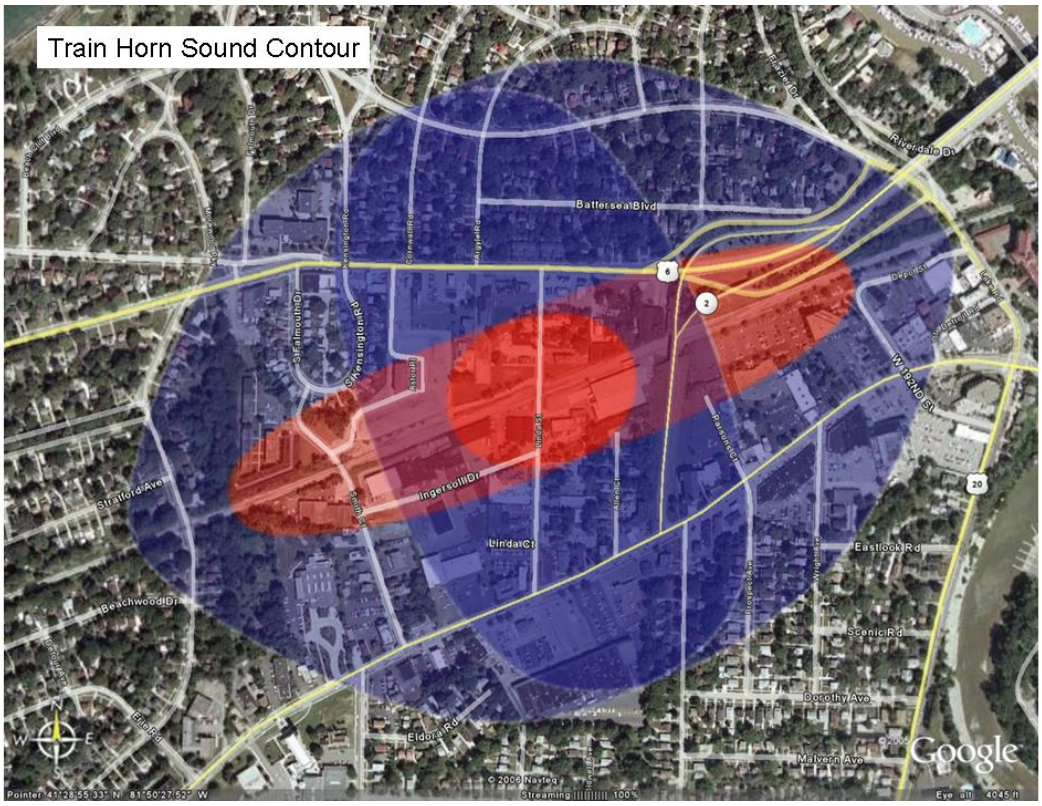
If the City of Rocky River is to pursue the creation of a New Quiet Zone the Linda Street, Morewood Parkway and Wagar Road crossings will need to be upgraded with power-out indicators. The Elmwood Road crossing will need to be upgraded to constant warning time circuitry and a power-out indicator will need to be installed. Based on the findings from the field evaluation the most economical solutions are listed in the table below.

Cleveland Subdivision Corridor

Street Name	DOT No.	Possible Treatment		Budgetary Cost
Linda Street	472237B	Raised medians		$70,000
Morewood Pkwy	472239P	Raised medians		$40,000
Wagar Road	472240J	Raised medians		$40,000
Elmwood Road	472241R	Raised medians		$195,000
			Total	**$345,000**

The total for improving all four locations is approximately $345,000. The $20,000 estimate for the installation of power-out indicators and the $175,000 estimate for constant warning circuitry at each location is based on the information provided by the NS.

There was one location where commercial driveways would have to be closed to allow the raised medians to be an acceptable alternative. The crossing is Linda Street. If it is not feasible to close the commercial driveways, the City may want to consider the use of wayside horns at this location. While wayside horns will not provide a complete quiet zone, the sound levels as compared to the train horn can be reduced significantly. The following page provides a graphic comparison of the train horn sound contours as compared to the wayside horn sound contours for Linda Street. The blue graphic represents 80db and greater. The red graphic represents 90db and greater.


Train Horn Sound Contour
Battersea Blvd
Riverdale Dr
Ingersoll Dr
Linda Ct
Eastlook Rd
Scenic Rd
Dorothy Ave
Malvern Ave
Eldora Rd
Beachwood Dr
Stratford Ave
Google


Wayside Horn Sound Contour
Battersea Blvd
Riverdale Dr
Ingersoll Dr
Linda Ct
Eastlook Rd
Scenic Rd
Dorothy Ave
Malvern Ave
Eldora Rd
Beachwood Dr
Stratford Ave
Google

Appendix A. Installing Wayside Horns

Once it has been determined that Wayside Horns are the desired solution, the following procedure may begin.

1. The City of Rocky River should make initial contact to the NS relating to possible Wayside Horn installation to:

   Mr. Rick Ray
   Administrator Highway Grade Crossings
   Norfolk Southern Corporation
   1200 Peachtree Street NE
   Atlanta, GA 30309

2. The City of Rocky River will be required to pay a Quiet Zone Administrative Handling Fee of $2,800.

3. RCL will schedule a diagnostic meeting with the NS, FRA, Ohio Rail Development Commission (ORDC) and Public Utilities Commission of Ohio (PUCO) to determine the placement of the Wayside Horns and Quiet Zone Indicators.

4. RCL will provide a detailed plan and estimate to the City of Rocky River for each Wayside Horn location.

5. Once the City of Rocky River receives the detailed plan from RCL for each Wayside Horn location the City of Rocky River is to send the plans to NS to request an estimate for the interconnection and an agreement. This request is to be sent to the NS Administrator Highway Grade Crossings along with carbon copies to Mr. Kurt Anderson. The NS Administrator for Highway Grade Crossings for your area is:

   Mr. Rick Ray
   Administrator Highway Grade Crossings
   Norfolk Southern Corporation
   1200 Peachtree Street NE
   Atlanta, GA 30309

   Mr. Kurt Anderson
   Director of Public Projects
   Railroad Controls Limited
   7471 Benbrook Parkway
   Benbrook, TX 76126

6. NS will then design the interconnection for each Wayside Horn location and produce estimates.

7. NS will furnish the agreement and cost estimate to the City of Rocky River.

8. City of Rocky River executes agreement and sends it to NS. The City will then issue a Purchase Order to RCL for Wayside Horn material and installation.

9. Within 90 days the Wayside Horn material will be delivered and installation will begin. RCL will assist the City of Rocky River in coordination efforts with NS to provide the interconnection to their crossing warning system. If the crossing needs to be upgraded to constant warning, additional time may be required to coordinate work with NS.

10. Once the Wayside Horn has been placed in-service, the City of Rocky River will need to send notification 21 days in advance of the effective date for NS to cease sounding the locomotive horn.

Appendix B. Creating a New Quiet Zone

If the City of Rocky River decides to pursue the Creation of a New Quiet Zone based on most cost effective treatments given by RCL (utilizing Raised Medians and/or Wayside Horns) there will be several steps required to be completed before the Quiet Zone can be enacted. Below is a list of the steps:

1. The City of Rocky River will be required to update the USDOT Grade Crossing Inventory Form to reflect the current conditions at each public crossing.

2. The City of Rocky River will need to submit notification of intent to create a New Quiet Zone in accordance with the rule. The Notice of Intent shall be provided to Norfolk Southern Corporation, Ohio Rail Development Commission, Public Utilities Commission of Ohio and the Associate Administrator of the Federal Railroad Administration. The Notice of Intent shall include the following:

    a. A list of each public highway-rail grade crossing that would be included within the proposed quiet zone, identified by both U.S. DOT National Highway-Rail Grade Crossing Inventory Number and street or highway name.
    b. A statement that a 24 hour restriction would be imposed on the routine sounding of the locomotive horn.
    c. A brief explanation of the City of Rocky River's tentative plans for implementing improvements within the proposed quiet zone.
    d. The name and title of the person who will act as point of contact during the quiet zone development process and the manner in which that person can be contacted.
    e. A list of the names and addresses of each party that will receive notification.

3. The City of Rocky River will be required to pay a $2,800 Quiet Zone Administrative Handling Fee to the Norfolk Southern Corporation.

4. There will be a 60-day comment period. All parties that have receives a copy of public authority's Notice of Intent may submit information or comments about the proposed quiet zone to the public authority during the 60-day period after the date on which the Notice of Intent was mailed.

    a. The 60-day comment period may terminate when the public authority obtains from Norfolk Southern Corporation, Ohio Rail Development Commission and Public Utilities Commission of Ohio either written comments or written statements that Norfolk Southern Corporation, Ohio Rail Development Commission or Ohio Public Utilities Commission do not have any comments on the Notice of Intent ("no-comment statements").

The following steps relate specifically to the crossings to be treated with the installation of the Wayside Horn.

1. RCL will schedule a diagnostic meeting with the NS, FRA, Ohio Rail Development Commission (ORDC) and Public Utilities Commission of Ohio (PUCO) to discuss all of the Quiet Zone options available for each crossing. If one or more crossings are identified as Wayside Horn candidates the diagnostic team will also determine the placement of the Wayside Horns and Quiet Zone Indicators.

2. RCL will provide a detailed plan and estimate to the City of Rocky River for each Wayside Horn location.

3. Once the City of Rocky River receives the detailed plan from RCL for each Wayside Horn location the City of Rocky River is to send the plans to NS to request an estimate for the interconnection and an agreement. This request is to be sent to the NS Administrator Highway Grade Crossings along with carbon copies to Mr. Kurt Anderson. The NS Administrator for Highway Grade Crossings for your area is:

   Mr. Rick Ray
   Administrator Highway Grade Crossings
   Norfolk Southern Corporation
   1200 Peachtree Street NE
   Atlanta, GA 30309

   Mr. Kurt Anderson
   Director of Public Projects
   Railroad Controls Limited
   7471 Benbrook Parkway
   Benbrook, TX 76126

4. NS will then design the interconnection for each Wayside Horn location and produce estimates.

5. NS will furnish the agreement and cost estimate to the City of Rocky River.

6. City of Rocky River executes agreement and sends it to NS. The City will then issue a Purchase Order to RCL for Wayside Horn material and installation.

7. Within 90 days the Wayside Horn material will be delivered and installation will begin. RCL will assist the City of Rocky River in coordination efforts with NS to provide the interconnection to their crossing warning system. If the crossing needs to be upgraded to constant warning, additional time may be required to coordinate work with NS.

8. Once the Wayside Horn has been placed in-service, the City of Rocky River will need to send notification 21 days in advance of the effective date for NS to cease sounding the locomotive horn.

The following steps are to be followed in order to finalize the Quiet Zone.

1. The City of Rocky River will be required to install Advance Warning Signs. Each highway approach to every public highway-rail grade crossing within the New Quiet Zone shall be equipped with an advance warning sign that advises the motorist that train horns are not sounded at the crossing. Such sign shall conform to the standards contained in the MUTCD.

2. The City of Rocky River will be required to update the National Grade Crossing Inventory to reflect the current conditions (after the installation of Wayside Horns and Medians) at each public crossing within the Quiet Zone.

3. The City of Rocky River will be required to submit a Notice of Quiet Zone Establishment. The Notice of Quiet Zone Establishment will require the following:

    a. The Notice of Quiet Zone Establishment shall provide the date upon which routine locomotive horn use at highway-rail grade crossings shall cease, but in no event shall the date be earlier than 21 days after the date of mailing.

    b. The Notice of Quiet Zone Establishment shall not be mailed less than 60 days after the date on which the Notice of Intent was mailed, unless the Notice of Quiet Zone Establishment contains a written statement affirming that written comments and/or "no-comment" statements have been received from Norfolk Southern Corporation, Ohio Rail Development Commission and Public Utilities Commission of Ohio.

    c. The Notice of Quiet Zone Establishment will include the following:

        i. A list of each public highway-rail grade crossing within the quiet zone, identified by both U.S. DOT National Highway-Rail Grade Crossing Inventory Number and street or highway name.

        ii. A specific reference to section 49 CFR Part 222.39(a)(1) Use of Locomotive Horns at Highway-Rail Grade Crossings; Final Rule that provides the basis for quiet zone establishment.

        iii. A statement there will be a 24 hour restriction imposed on the routine sounding of the locomotive horn.

        iv. An accurate, complete and current Grade Crossing Inventory Form for each public highway-rail grade crossing within the quiet zone that reflects the conditions existing at the crossing before Medians or Wayside Horns were implemented.

        v. An accurate, complete and current Grade Crossing Inventory Form for each public highway-rail grade crossing within the quiet zone that reflects Medians and Wayside Horns in place upon establishment of the quiet zone.

vi. The Notice of Quiet Zone Establishment shall contain a written statement affirming that the Notice of Intent was provided in accordance with paragraph (a)(1) of section 222.43. This statement shall also state the date on which the Notice of Intent was mailed.

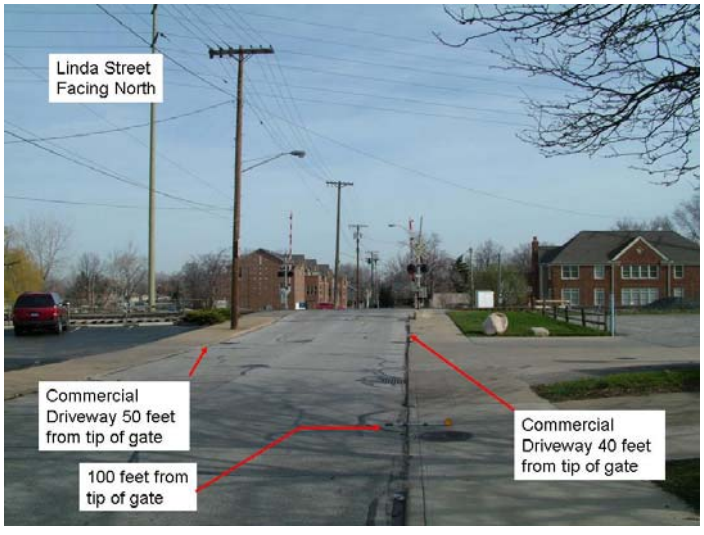
vii. If the City of Rocky River submits the Notice of Establishment before 60 days after the mailing of the Notice of Intent, the Notice of Establishment shall also contain a written statement affirming that written comments and/or "no comment" statements have been received from Norfolk Southern Corporation, Ohio Rail Development Commission and Public Utilities Commission of Ohio.

viii. The name and title of the person responsible for monitoring compliance with the requirements of this part and the manner in which that person can be contacted.

ix. A list of the names and addresses of each party that shall be notified of the Notice of Quiet Zone Establishment.

x. A statement signed by the chief executive officer of the City of Rocky River, in which the chief executive officer shall certify that the information submitted by the City of Rocky River is accurate and complete to the best of his/her knowledge and belief.

4. The City of Rocky River will be required to submit periodic updates, including updated USDOT Grade Crossing Inventory Forms, must be submitted to FRA every 4.5-5 years.



Grade Crossing Field Review:

Linda Street is a City roadway crossed by the Lake Subdivision of NS. The crossing is currently equipped with flashing lights and gates with constant warning time circuitry.

Since closure of the crossing and conversion to one-way streets were not options that the City was willing to consider, the following treatments may be considered:

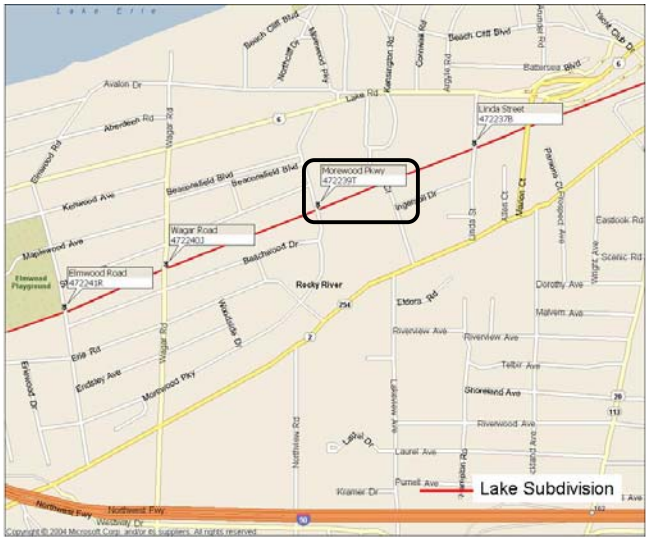
-100' Raised Medians
-Wayside Horns
-Four Quadrant Gates

There are two commercial driveways located to the south of the tracks. The first commercial driveway is located in the southeast quadrant 40 feet measured from the tip of the gates. The second commercial driveway is located in the southwest quadrant 50 feet measured from the tip of the gate. If raised medians are selected as the preferred treatment, the commercial driveways must be closed or relocated.

The *Final Rule* requires all crossings within the Quiet Zone to be equipped with flashing lights, gates, constant warning circuitry and power-out indicators. As a result, the upgrade of power-out indicators is required for all the options listed below.

Possible Treatments for Linda Street	Budgetary Cost
Upgrade of Power-Out Indicators	$20,000
Install 100' Raised Median on each approach @ $100/ft	$20,000
Close Commercial Driveways	$30,000
Install Wayside Horns	$75,000
Install Four Quadrant Gates	$300,000

Rocky River, OH
Linda Street
DOT No. 472237B



Grade Crossing Field Review:

Morewood Parkway is a City roadway crossed by the Lake Subdivision of NS. The crossing is currently equipped with flashing lights and gates with constant warning time circuitry.

Since closure of the crossing and conversion to one-way streets were not options that the City was willing to consider, the following treatments may be considered:

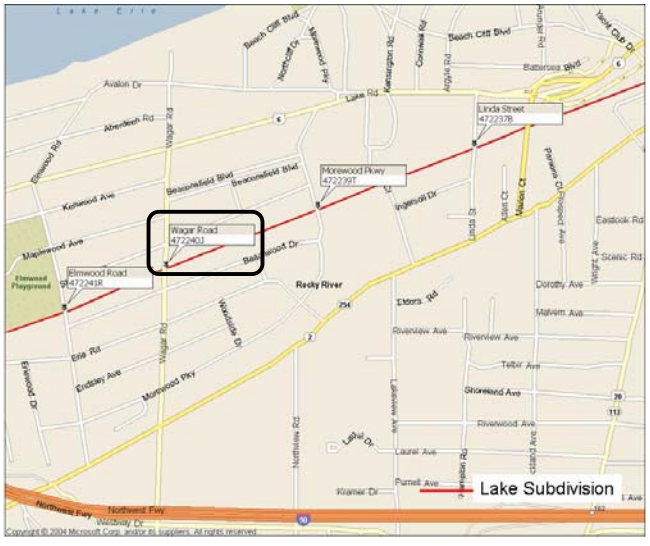
-100' Raised Medians
-Wayside Horns
-Four Quadrant Gates

There are no commercial driveways located within 60 feet of the tip of the gate on either side of the crossing.

The *Final Rule* requires all crossings within the Quiet Zone to be equipped with flashing lights, gates, constant warning circuitry and power-out indicators. As a result, the upgrade of power-out indicators is required for all the options listed below.

Possible Treatments for Morewood Parkway	Budgetary Cost
Upgrade of Power-Out Indicators	$20,000
Install 100' Raised Median on each approach @ $100/ft	$20,000
Install Wayside Horns	$75,000
Install Four Quadrant Gates	$300,000

Rocky River, OH
Morewood Parkway
DOT No. 472239P



Grade Crossing Field Review:

Wagar Road is a City roadway crossed by the Lake Subdivision of NS. The crossing is currently equipped with flashing lights and gates with constant warning time circuitry.

Since closure of the crossing and conversion to one-way streets were not options that the City was willing to consider, the following treatments may be considered:

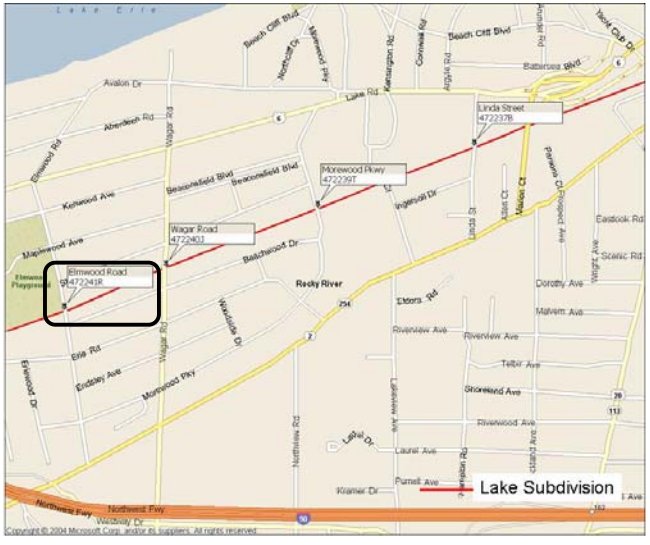
-100' Raised Medians
-Wayside Horns
-Four Quadrant Gates

There are no commercial driveways located within 60 feet of the tip of the gate on either side of the crossing.

The *Final Rule* requires all crossings within the Quiet Zone to be equipped with flashing lights, gates, constant warning circuitry and power-out indicators. As a result, the upgrade of power-out indicators is required for all the options listed below.

Possible Treatments for Wagar Road	Budgetary Cost
Upgrade of Power-Out Indicators	$20,000
Install 100' Raised Median on each approach @ $100/ft	$20,000
Install Wayside Horns	$75,000
Install Four Quadrant Gates	$300,000

Rocky River, OH
Wagar Road
DOT No. 472240J



Grade Crossing Field Review:

Elmwood Road is a City roadway crossed by the Cleveland Subdivision of CSX. The crossing is currently equipped with flashing lights and gates with motion detection track circuits.

Since closure of the crossing and conversion to one-way streets were not options that the City was willing to consider, the following treatments may be considered:

-100' Raised Medians
-Wayside Horns
-Four Quadrant Gates

There are no commercial driveways located within 60 feet of the tip of the gate on either side of the crossing.

The *Final Rule* requires all crossings within the Quiet Zone to be equipped with flashing lights, gates, constant warning circuitry and power-out indicators. As a result, the upgrade to constant warning is required for all the options listed below.

Possible Treatments for Elmwood Road	Budgetary Cost
Upgrade to Constant Warning Circuitry	$175,000
Install 100' Raised Median on each approach @ $100/ft	$20,000
Install Wayside Horns	$75,000
Install Four Quadrant Gates	$300,000

Middleburg Heights, OH
Elmwood Road
DOT No. 472241R