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Road and Rail and Vibration Noise Impact Study

Valeriote Subdivision, Guelph, Ontario

For

Attn: Nancy Shoemaker
Black, Shoemaker, Robinson & Donaldson Limited
351 Speedvale Ave. West
Guelph, Ontario
N1H 1C6

Prepared by

Megan Munro, BASc

Reviewed by

Sheeba Paul, MEng, PEng

LICENSED PROFESSIONAL ENGINEER
S. PAUL
PROVINCE OF ONTARIO

October 28, 2011

CONTENTS

1 INTRODUCTION AND SUMMARY

HGC Engineering was retained by Black, Shoemaker, Robinson & Donaldson Limited (BSRD) to conduct a noise and vibration impact study for their proposed residential development, to be located north of the Goderich Exeter Railway (GEXR) and York Road (King's Highway No. 7), east of Elizabeth Street and west of Watson Parkway, in the Geographical Township of Guelph, Ontario. The surrounding area is existing residential and proposed residential. The study is required by the municipality and as part of their planning and approvals process. The GEXR has adopted the noise and vibration guidelines of the Canadian National Rail (CNR) for this railway line because it is leased from the CNR.

Road traffic information for York Road (King's Highway No. 7) between Watson Parkway and Elizabeth Street was obtained from City of Guelph personnel and rail traffic data was obtained from the Goderich-Exeter Railway (GEXR) and GO Transit. Traffic noise predictions were used to find the future worst case zones of impact. The data was used to investigate the general type and extent of noise mitigation required for the proposed dwelling facades and backyard outdoor living areas (OLA's). The predicted sound levels were compared to the guidelines of the Ministry of Environment (MOE) and the Canadian National Railway (CN).

Future nighttime sound levels will exceed MOE guideline limits at the bedroom windows of many of the proposed dwelling units. Upgraded ventilation in the form of forced air ventilation with ducts sized to accommodate the future installation of central air conditioning by the occupant is required for many of the dwelling units. Physical mitigation in the form of acoustic barriers is required for Lot 133 and Lots 136 - 141 on the west side of Cityview Drive. The MOE and CN guidelines recommend that warning clauses be used to inform future residents of the traffic noise impacts and to address residual sound level excesses.

Vibration measurements were conducted by HGC Engineering in February, 2003. The measured vibration levels were well within the CNR limits and therefore no vibration mitigation measures are required for this development. The results are summarized in this report.

2 SITE DESCRIPTION AND NOISE SOURCES

Figure 1 is a key plan of the subdivision. The proposed property is to be located north of the Canadian National Railway and York Road, east of Elizabeth Street and west of Watson Parkway, in Guelph, Ontario. Figure 2 represents a draft plan, prepared by Black, Shoemaker, Robinson & Donaldson Limited (BSRD) and dated August 9, 2011.

The surrounding area is existing residential lands and proposed residential lands. The CN railway line which is leased by the GEXR is located approximately 77 m to south of the closest dwelling façade. York Road is located approximately 137 m to the south of the closest dwelling façade. The subject lands are elevated by approximately 10 m above the railway and approximately 20 m above York Road. In some cases the elevation drop is very steep and acts as a natural barrier. In the south-east and south-west of the proposed development the elevation change is more gradual.

The primary noise sources are road traffic on York Road and rail traffic from the GEXR railway line. Cityview Drive is a low volume residential street and it has not been considered in this analysis. There are no significant sources of stationary noise within 500 m of the proposed development.

3 NOISE LEVEL CRITERIA

3.1 Traffic Noise Sources

Guidelines for acceptable levels of road and rail traffic noise impacting residential developments are given in the MOE publication LU-131 “Noise Assessment Criteria in Land Use Planning”, its Annex and its accompanying document “Requirements, Procedures and Implementation, 1997” and are listed in Table I below. The values in Table I are energy equivalent (average) sound levels [L_{EQ}] in units of A-weighted decibels [dBA].

Table I: MOE Road and Rail Traffic Noise Criteria (dBA)

Location	ROAD		RAIL	
	Daytime $L_{EQ\,(16)}$ (07:00 to 23:00)	Nighttime $L_{EQ\,(8)}$ (23:00 to 07:00)	Daytime $L_{EQ\,(16)}$ (07:00 to 23:00)	Nighttime $L_{EQ\,(8)}$ (23:00 to 07:00)
Outdoor Living Area (OLA)	55 dBA	--	55 dBA	--
Outside Bedroom Windows	--	50 dBA	--	50 dBA
Inside Bedrooms	--	40 dBA	--	35 dBA
Inside Living /Dining Areas	45 dBA	--	40 dBA	--

Daytime refers to the period between 07:00 and 23:00. Nighttime refers to the time period between 23:00 and 07:00. The term "Outdoor Living Area" (OLA) is used in reference to an outdoor patio, backyard, terrace, or other area where passive recreation is expected to occur, provided that it has a minimum depth of 4 m, and is outside the exterior building façade and unenclosed.

The guidelines in the MOE publication allow the daytime sound levels in an Outdoor Living Area to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in the purchase and rental agreements to the property. Where OLA sound levels exceed 60 dBA, physical mitigation is required to reduce the OLA sound level to below 60 dBA and as close to 55 dBA as technically, economically and administratively feasible.

A central air conditioning system as an alternative means of ventilation to open windows is required for dwellings where nighttime sound levels outside bedroom windows exceed 60 dBA or where daytime sound levels outside living room windows exceed 65 dBA. Forced-air ventilation with ducts sized to accommodate the future installation of air conditioning is required when nighttime sound levels at bedroom windows are in the range of 51 to 60 dBA or when daytime sound levels at living room windows are in the range of 56 to 65 dBA.

Building components such as walls, windows and doors must be designed to achieve indoor sound level criteria when the plane of window sound level is greater than 60 dBA or the daytime sound

level is greater than 65 dBA due to road traffic noise and when the plane of window sound level is greater than 55 dBA due to rail traffic noise. The use of warning clauses to notify future residents of possible excesses is also recommended.

3.2 Ground-borne Vibration from Rail Traffic

Vibration is typically measured in terms of velocity or acceleration. The CN Rail vibration guidelines are given in terms of ground-borne velocity. In this report, vibration levels are quoted in RMS velocity levels (Lv) in units of decibels [dB] relative to a velocity of 1 mm/sec [i.e., 1 mm/s = 0 dB]. The CN guideline limit is 0.14 mm/s, which is equivalent to –17 dB re 1 mm/s.

4 TRAFFIC NOISE PREDICTIONS

4.1 Rail Traffic Data

Rail traffic data for typical operations of the Goderich-Exeter Railway Guelph Subdivision was obtained from the Goderich-Exeter Railway (GEXR) and is provided in Appendix A. The maximum permissible train speed in the area of the site is 89 km/h (55 mph) for freight trains and 113 km/h (70 mph) for commuter and passenger trains. This maximum speed, as well as the maximum number of cars and locomotives per train was used in the traffic noise analysis to yield a worst cast estimate of train noise. The data was projected to the year 2021. The number of rail cars for the freight traffic was grown using a 7.5% per year growth rate for the first 3 years and freight traffic was grown using a 2.5% per year growth rate for the remaining 7 years. It is expected that in 2012 commuter rail service will add an additional 3 trains during daytime hours and 1 train during nighttime hours. Commuter rail traffic was grown at a rate of 2.5% for 9 years to the year 2021. Passenger rail traffic is expected to double over the next three years and the passenger data was grown at a 2.5% per year growth rate for the remaining 7 years. Table II summarises the rail traffic data used in the analysis.

Table II: 2021 Projected Rail Traffic Data*

Type of Train	Number of locomotives Day/Night	Number of cars Day/Night	Max Speed (km/h)	Existing Volumes Day/Night	Predicted Daytime (07:00-23:00) trains	Predicted Nightime (23:00-07:00) trains	Total
Freight	2/2	73/73	89	2/0	3	0	**3**
Commuter	1/1	10/10	113	0/0	4	2	**6**
Passenger	1/1	5/5	113	5/1	12	3	**15**
Total	**--**	**--**	**--**	**--**	**19**	**5**	**24**

Note: *Values are rounded up to the higher integer value for use in the prediction.

In addition, rail traffic data for the GO Transit railway line was obtained from GO Transit personnel and is provided in Appendix A. The data is projected to the year 2021. Table III summarises the rail traffic data used in the analysis.

Table III: GO Transit Rail Traffic Data Projected to Year 2021

Type of Train	Number of Trains Day/Night	Maximum Number of locomotives	Average Number of cars	Max Speed (KPH)
GO	6/2	1	12	32

4.2 Road Traffic Data

Road traffic data for York Road, between Elizabeth Street and Watson Parkway, was obtained from City of Guelph personnel in the form of turning movement counts and is included in Appendix B. The Annual Average Daily Traffic (AADT) from 2008 was used in the analysis and a growth rate of 2.5% for 13 years was applied, as a conservative worst case estimate. Additionally, a day/night split of 85%/15% was used, in conjunction with commercial vehicle percentages of 3.6%/5.3% medium and heavy trucks. Finally, a posted speed limit of 60 km/h was used for the analysis. Table IV summarizes the traffic volume data.

Table IV: 2021 Projected Road Traffic Data for York Road (King's Highway No. 7)

Road Name		Cars	Medium Trucks	Heavy Trucks	Total
York Road	Daytime	13,536	529	792	14,857
	Nighttime	2,389	93	140	2,622
	Total	**15,925**	**622**	**932**	**17,479**

4.3 Road and Rail Traffic Noise Predictions

To assess the levels of road and rail traffic noise which will impact the site in the future, predictions were made using STAMSON version 5.0, a computer algorithm developed by the MOE. Sample STAMSON output is included in Appendix C. As required by the MOE, train whistle noise has been included in the calculation of the night-time sound levels since whistles are sounded when approaching a public grade crossing, east of Watson Road. Whistle noise has not been included for the OLA sound level calculation as per MOE guidelines.

Predictions of the traffic sound levels were made at various locations. The results of these predictions are summarized in Tables V, VI and VII. If the orientation of the lots is changed, the acoustic recommendations will need to be revised.

Sound levels were predicted at ground level in the rear yards during daytime hours to investigate the need for noise barriers. Sound levels were also predicted in the plane of second floor bedroom windows during nighttime hours and in the plane of the first floor living/dining room windows to investigate ventilation and building construction requirements. A 7 m front and rear yard setback, a 4.5 m side yard setback for lots flanking major roadways and a 1.5 m setback for interior side yards setbacks were used in the analysis.

Table V: Future Daytime Traffic Sound Levels, Road and Rail Traffic, at First Story Living/Dining Room Windows, [dBA]

Lot/Block	Road Traffic, [dBA] Daytime, at Façade $L_{EQ(16)}$	Rail Traffic, [dBA] Daytime, at Façade $L_{EQ(16)}$	Daytime, at Façade Total $L_{EQ(16)}$
1	55	62	62
5	49	53	55
10	48	50	52
41	43	54	54
57	50	58	59
60	49	49	52
71	50	50	53
87	51	51	54
90	50	53	54
92	51	54	55
97	56	62	63
100	49	47	51
101	50	50	53
108	47	49	51
109	52	57	58
131	49	54	55
133	53	61	62
142	48	51	53

Table VI: Future Nighttime Traffic Sound Levels, Road and Rail Traffic, at Second Story Bedroom Windows, [dBA]

Lot/Block	Road Traffic, [dBA] Nighttime, at Façade $L_{EQ(8)}$	Rail Traffic, [dBA] Nighttime, at Façade $L_{EQ(8)}$	Nighttime, at Façade Total $L_{EQ(8)}$
1	51	58	59
5	45	50	51
10	45	47	49
41	39	51	52
57	47	55	55
60	45	49	51
71	49	47	51
87	48	48	51
90	46	49	51
92	47	50	52
97	53	58	59
100	46	44	48
101	51	46	53
108	44	45	48
109	49	53	55
131	46	50	52
133	50	57	58
142	45	48	50

Table VII: Future Daytime Traffic Sound Levels, Road and Rail Traffic, in Outdoor Living Area (OLA), [dBA]

Lot/Block	Road Traffic, [dBA] Daytime, at OLA $L_{EQ(16)}$	Rail Traffic, [dBA] Daytime, at OLA $L_{EQ(16)}$	Daytime, at OLA Total $L_{EQ(16)}$
133, 136-141	53	61	62

4.4 Assessment of Ground-borne Vibration from Rail Traffic

Ground-borne vibration generated by passing trains was measured during site visits on February 7, 9 and 14, 2003 at locations V1 and V2 as shown in Figure 2.

The results of the measurements are presented as plots of the overall measured vibration velocity levels versus time in Figures 4 to 17 in Appendix D. Each figure also shows the criteria for comparison. The vibration measurements were conducted using a Hewlett Packard 3569A Real Time Frequency Analyzer outfitted with Wilcoxon Research Type 793V velocity transducers correctly field calibrated before and after the measurements.

For all train pass-bys and at all locations, the measured vibration was well within the limits of the CNR. The site has not changed since 2003 and the vibration measurement results remain valid. Railway vibration is not anticipated to be a concern for this site, and no special vibration control measures are warranted.

5 DISCUSSION AND RECOMMENDATIONS

The predictions indicate that the future traffic sound levels will exceed MOE guidelines at the majority of the proposed dwellings. Recommendations to address these excesses are discussed below.

5.1 Outdoor Living Areas

The predicted daytime sound levels in the OLA of Lots 133 and Lots 136 through 141 will be up to 7 dBA in excess of the MOE's limit of 55 dBA, due to road and rail traffic combined. Physical mitigation in the form of acoustic barriers will be requires for these lots. An acoustic barrier on the order of 2 m in height will achieve a sound level of 56 dBA.

All noise barriers must return back to the dwelling units so that the rear yards are entirely shielded from the roadways. The acoustic barrier can be an acoustic wall or an earth berm or a combination of both. The wall component should be of a solid construction with a surface density of no less than 20 kg/m^2. The walls may be constructed from a variety of materials such as wood, brick, pre-cast concrete or other concrete/wood composite systems provided that it is free of gaps or cracks. All barrier heights are stated relative to the grade 3 m from the rear façade of the dwellings. The heights and extents of the barriers should be chosen to reduce the sound levels in the OLA's to as close to 55 dBA as is technically, administratively and economically feasible.

The predicted daytime sound levels in the OLA's of the remainder of the lots included in the analysis are less than or equal to 59 dBA. Any excesses between 55 dBA and 59 dBA are considered to be minor, are within the discretionary range acceptable to the MOE.

5.2 Indoor Living Areas

Forced Air Ventilation

Lots 1 - 5, Lots 42 - 59, Lots 71 - 77, Lot 87, Lots 90 – 96, Blocks 97 - 98, Blocks 101 – 105, Blocks 109 – 110, Lots 131 to 133, and Lots 136 -142 have predicted nighttime sound levels that are greater than 50 dBA but less than 60 dBA. To address these excesses, the MOE guidelines recommend that these dwelling units be equipped with a forced air ventilation systems with ducts sized to accommodate the future installation of air conditioning by the occupant. Figure 3 indicates the lots which require forced air ventilation systems (single hatching).

Window or through-the-wall air conditioning units are not recommended for any residential units because of the noise they produce and because the units penetrate through the exterior wall which degrades the overall noise insulating properties of the envelope. The location, installation and sound ratings of the outdoor air conditioning devices should minimize noise impacts and comply with criteria of MOE publication NPC-216, Residential Air Conditioning Devices.

The remaining lots and blocks have no specific ventilation requirements.

5.3 Building Facade Constructions

All lots in the development will have nighttime sound levels at the 2nd storey façade that are less than 60 dBA and daytime sound levels at the 1st floor façade that are less than 65 dBA. For these lots, any exterior wall, and double glazed window construction meeting the minimum requirements of the Ontario Building Code (OBC) will provide adequate sound insulation for the dwelling units.

5.4 Warning Clauses

The MOE guidelines recommend that warning clauses be included in the property and tenancy agreements and offers of purchase and sale for dwelling units with anticipated traffic sound level excesses. Examples are provided below.

Suggested wording for future dwelling units which have sound level excesses but do not require mitigation measures is given below.

Type A:

> Purchasers/tenants are advised that sound levels due to increasing road and rail traffic may occasionally interfere with some activities of the dwelling unit occupants as the sound levels exceed the Municipality's and the Ministry of the Environment's noise criteria.

Suggested wording for future dwellings with sound levels exceeding the MOE criteria, by 6 dBA or more, for which physical mitigation has been provided is given below.

Type B:

> Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road and rail traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the criteria of the Municipality and the Ministry of the Environment.

Suitable wording for future dwellings requiring forced air ventilation systems is given below.

Type C:

> Purchasers/tenants are advised that this dwelling unit has been fitted with a forced air heating system and the ducting etc., was sized to accommodate central air conditioning. Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the Town's and the Ministry of the Environment's noise criteria. Purchasers/tenants are advised that the outdoor air cooled condenser unit itself can produce noise to interfere with outdoor recreational activities. Due consideration should be given to this noise factor when selecting the air cooled condenser units location or an alternative quieter type of unit could be selected. The condenser unit sound rating should not exceed 7.6 bels in accordance with ANSI Standard 270-84 for units 3.5 ton or less. The location and installation of the outdoor air conditioning device should be done so as to minimize the noise impacts and have due regard for compliance with criteria of MOE publication NPC-216, Residential Air Conditioning Devices.

CN's standard warning clause which is required for all residential developments located within 300 m of their mainlines is given below.

Type D:

> Warning: Canadian National Railways Company or its assigns or successors in interest has or have a rights-of-way within 300 metres from the land subject hereof. There may be alteration to or expansions of the railway facilities on such rights-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwellings. CNR will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way.

These sample clauses are provided by the MOE as examples and can be modified by the Municipality as required.

6 SUMMARY OF RECOMMENDATIONS

The following list and Table VIII summarizes the recommendations made in this report. Please refer to Figure 3 for more information regarding the locations to which these recommendations apply.

1. An acoustic barrier is required for Lot 133 and Lots 136 through 141.

2. Forced air ventilation systems with ductwork sized for the future installation of central air conditioning system will be required for dwelling Lots 1 - 5, Lots 42 - 59, Lots 71 - 77, Lot 87, Lots 90 – 96, Blocks 97 - 98, Blocks 101 – 105, Blocks 109 – 110, Lots 131 to 133, and Lots 136 -142.

3. Noise warning clauses should be placed in the property and tenancy agreements and offers of purchase and sale for the specified dwelling units.

Table VIII: Summary of Noise Control Requirements and Noise Warning Clauses

Lot/Block	Acoustic Barrier+	Ventilation Requirements *	Type of Warning Clause
1 – 5	--	Forced Air	A, C, D
42 – 57	--	Forced Air	A, C, D
58, 59	--	Forced Air	A, C, D
71 – 77	--	Forced Air	A, C, D
87	--	Forced Air	A, C, D
90 – 93	--	Forced Air	A, C, D
94 – 96	--	Forced Air	A, C, D
Blocks 97, 98	--	Forced Air	A, C, D
Blocks 101, 102, 103, 104, 105	--	Forced Air	A, C, D
Blocks 109, 110	--	Forced Air	A, C, D
131, 132	--	Forced Air	A, C, D
133, 136 – 141	✓	Forced Air	B, C, D
142	--	Forced Air	A, C, D
All lots within 300 m of the railway right of way	--	--	D

Notes:
-- no specific requirement
* The location, installation and sound rating of the air conditioning condensers must be compliant with MOE Guideline NPC-216.

6.1 Implementation

To ensure that the noise control recommendations outlined above are fully implemented, it is recommended that:

1) Prior to the issuance of building permits for this development, it is recommended that the Town's building department or a Professional Engineer qualified to perform acoustical engineering services in the Province of Ontario shall review the builder's plans to certify that the noise control measures as approved have been incorporated, and

2) Prior to the issuance of occupancy permits for this development, the City's building inspector or a Professional Engineer qualified to perform acoustical engineering services in the Province of Ontario shall certify that the noise control measures have been properly installed and constructed.

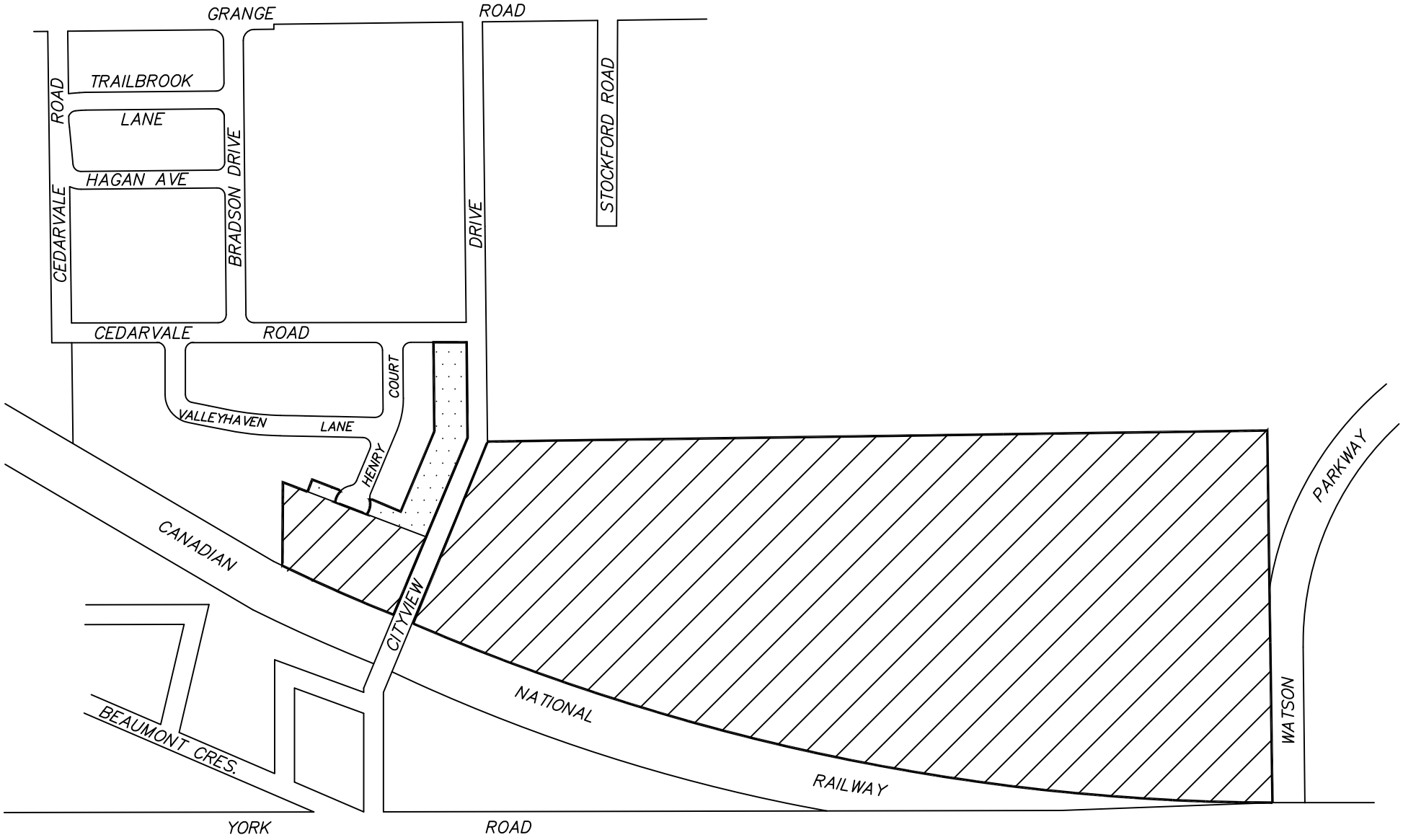


Figure 1: Key Plan

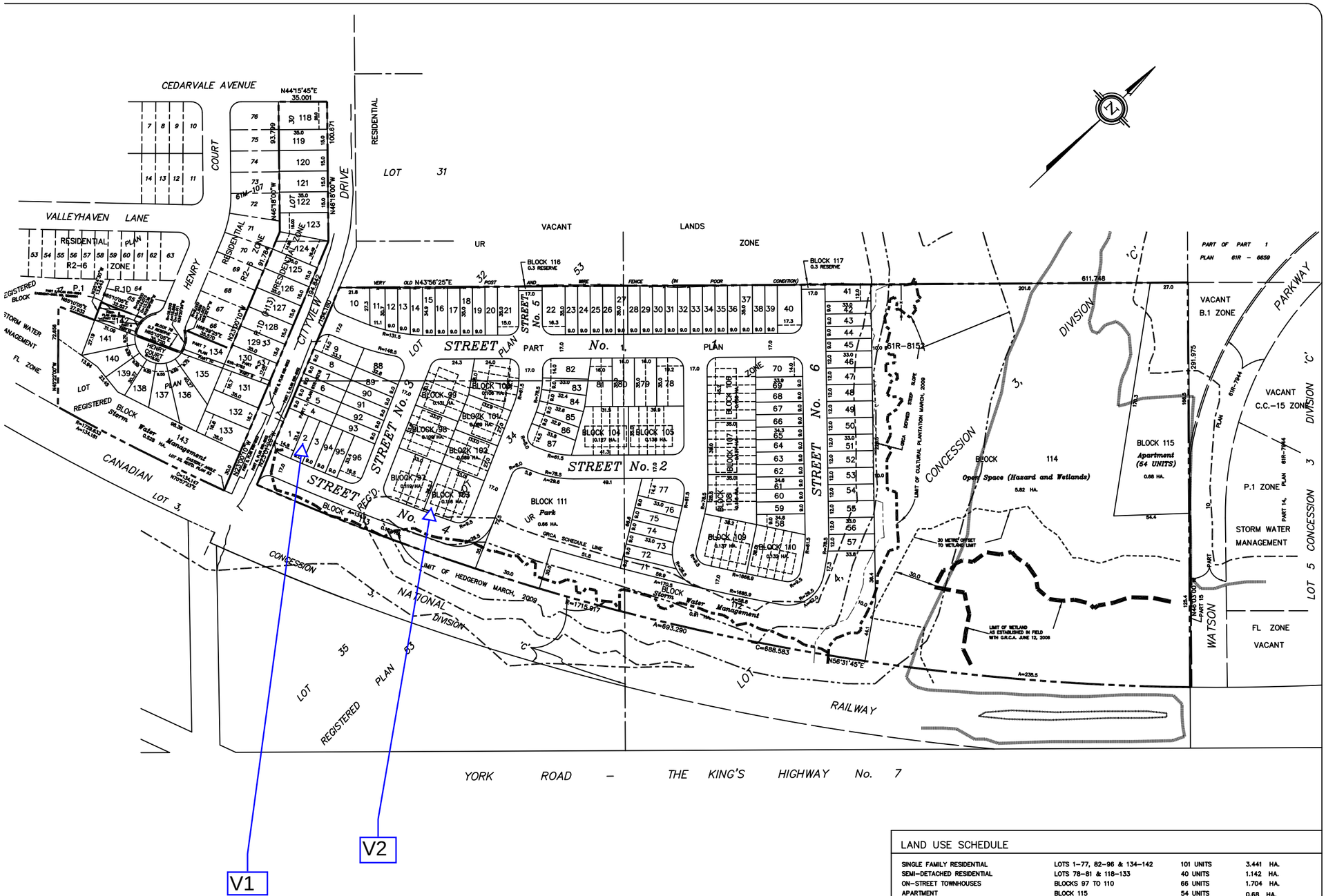
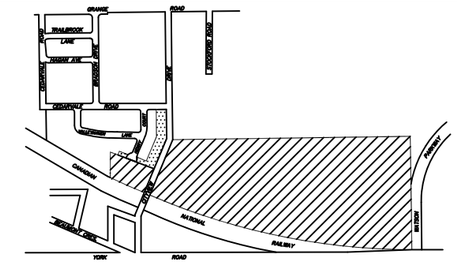


Figure 2: Draft Plan

LAND USE SCHEDULE

SINGLE FAMILY RESIDENTIAL	LOTS 1–77, 82–96 & 134–142	101 UNITS	3.441 HA.
SEMI-DETACHED RESIDENTIAL	LOTS 78–81 & 118–133	40 UNITS	1.142 HA.
ON-STREET TOWNHOUSES	BLOCKS 97 TO 110	66 UNITS	1.704 HA.
APARTMENT	BLOCK 115	54 UNITS	0.68 HA.
PARK	BLOCK 111		0.66 HA.
STORM WATER MANAGEMENT	BLOCKS 112 & 143		1.438 HA.
OPEN SPACE	BLOCKS 113 & 114		6.00 HA.
0.3 RESERVES	BLOCKS 116 & 117		0.001 HA.
STREETS			2.616 HA.
TOTAL		261 UNITS	17.682 HA.



LANDS OF CITYVIEW RIDGE DEVELOPMENTS INC.

LANDS OF CARSON REID HOMES LTD.

KEY PLAN N.T.S.

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51 (17) OF THE PLANNING ACT

51 (17) (a) – (c) AS SHOWN
(d) SEE SCHEDULE
(e) – (g) AS SHOWN
(h) MUNICIPAL WATER SUPPLY
(i) BURFORD AND GUELPH LOAM
(j) AS SHOWN
(k) MUNICIPAL STORM AND SANITARY SEWERS
(l) STORM SEWER EASEMENT AS SHOWN

OWNERS CERTIFICATE

WE HEREBY AUTHORIZE BLACK, SHOEMAKER, ROBINSON, AND DONALDSON LIMITED, ONTARIO LAND SURVEYORS, URBAN AND RURAL PLANNERS TO SUBMIT THIS DRAFT PLAN OF PROPOSED SUBDIVISION.

CITYVIEW RIDGE DEVELOPMENTS INC.
AND
CARSON REID HOMES LTD.

CARSON REID

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

KERRY F. HILLIS
ONTARIO LAND SURVEYOR

CITYVIEW RIDGE DRAFT PLAN OF SUBDIVISION

OF PART OF
LOT 4, CONCESSION 3, DIVISION 'C'
(GEOGRAPHIC TOWNSHIP OF GUELPH)
AND PART OF LOTS 30, 32^&^33
AND ALL OF LOT 34, REGISTERED PLAN 53
(DIVISION 'C' – GEOGRAPHIC TOWNSHIP OF GUELPH)

CITY OF GUELPH
COUNTY OF WELLINGTON

SCALE 1 : 1500 (0, 30, 60, 90, 120 METRES)

METRIC
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

EXISTING TREELINE ADDED MARCH 24, 2009

BLACK, SHOEMAKER, ROBINSON & DONALDSON LIMITED
BSR&D Ontario Land Surveyors Urban and Rural Planners
351 Speedvale Avenue West
Guelph, Ontario N1H 1C6
TEL: (519) 822-4031
FAX: (519) 763-9081

DATE: AUGUST 9, 2011
DRAWN BY: kh
PROJECT NO: 05-6590-22

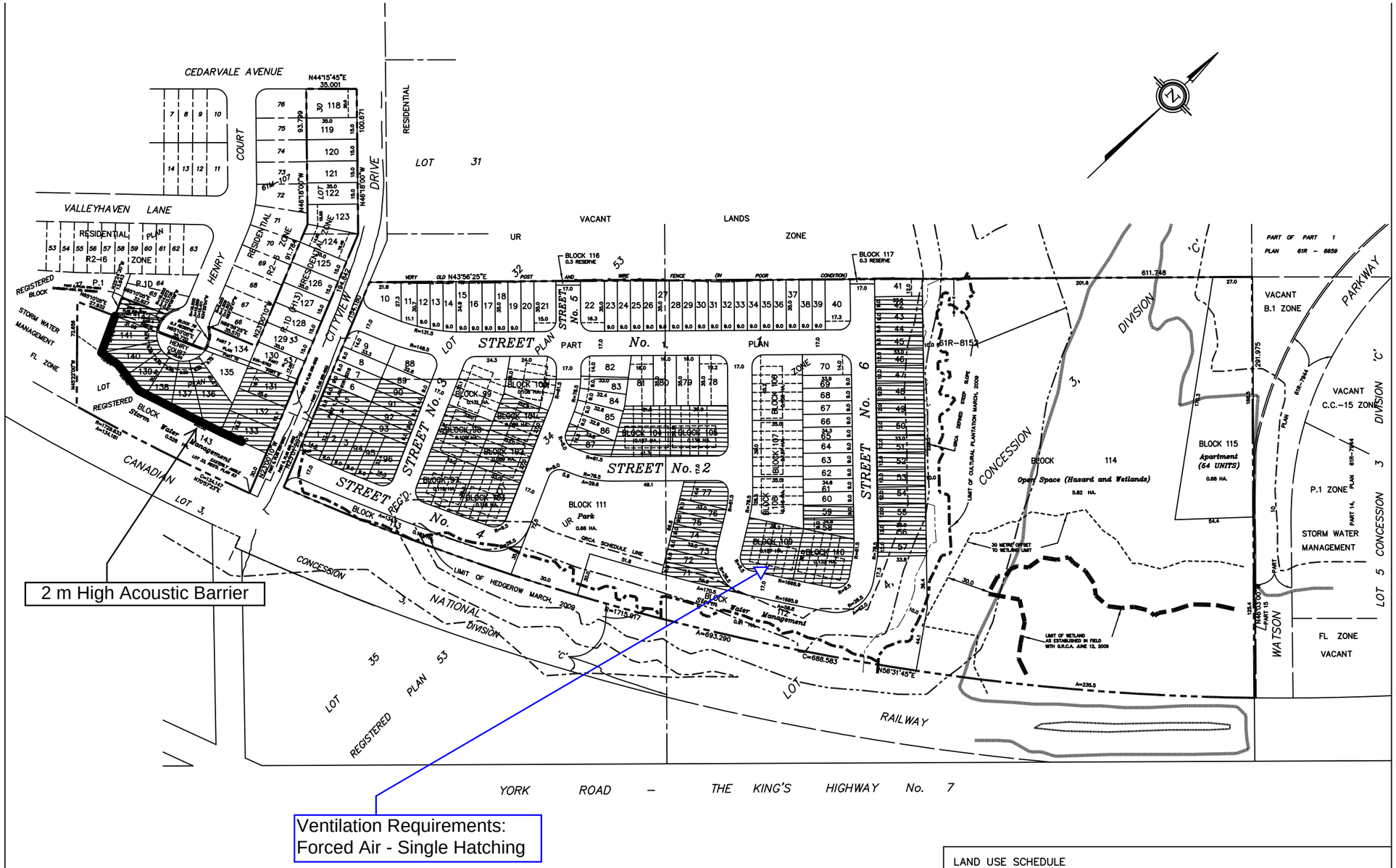


Figure 3: Draft Plan Showing Acoustic Barrier and Ventilation Requirements

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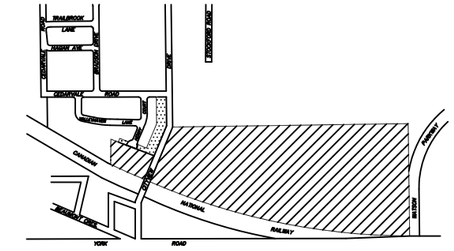

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351 Speedvale Avenue West
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TEL: (519) 822-4031
FAX: (519) 763-9081

DATE: AUGUST 9, 2011
DRAWN BY: kh
PROJECT NO: 05-6590-22

APPENDIX A

Rail Traffic Data

GODERICH-EXETER RAILWAY LIMITED

101 Shakespeare Street • 2nd • Stratford Ontario • N5A 3W5 • Phone: 519 271-4441 • Fax: 519 271-1337

Megan Munro, BASc
HGC Engineering
Howe Gastmeier Chapnik Limited
2000 Argentia Road
Plaza One, Suite 203
Mississauga, Ontario
L5N 1P7 September 6, 2011
(via email only)

Re: Rail Traffic – Guelph Subdivision – Guelph ON

As per your request, the following information is provided for the area in the vicinity of Cityview Drive in Guelph Ontario.

The typical daily rail traffic volumes are representative of a twenty four (24) hour period, but I must caution that such volumes are subject to overall economic conditions and will fluctuate with varying traffic demands, weather conditions, track maintenance programs and statutory holidays.

The Guelph Subdivision is a single track main line, considered as principal main track where within the city limits of Guelph, whistling except to prevent accident, warn persons on or about tracks is prohibited. Trains are required to whistle for crossings east of Watson Road.

At present the number of trains which are scheduled to operate between 0700 and 2300 there are five (5) passenger trains and two (2) freight trains.

Between the hours of 2300 to 0700, there is currently one (1) passenger train.

Passenger trains normally operate on average with one (1) locomotive and five (5) coaches, freight trains are normally operated with two (2) locomotives and fifty nine (59) rail cars.

Passenger trains may operate at up to a maximum speed of seventy (70) miles per hour while freight train speeds are a maximum of fifty five (55) miles per hour.

Based on current forecasts, passenger traffic may increase by six (6) trains, times of operation are unknown at this time, while freight traffic is expected to grow between five (5%) and ten (10%) per cent annually over the next three (3) years without any additional freight trains.

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In addition, it is anticipated that commuter rail service will begin operating as early as the first quarter of 2012, in which three (3) commuter train consists would operate between the hours of 0700 and 2300 hrs and one (1) commuter train would operate between the hours of 2300 and 0700 hrs. Consists of these trains would be one (1) locomotive and ten (10) high density commuter coaches.

In view of the increased use of this line, it is still anticipated that additional infrastructure improvements will be completed to allow for faster train speeds over this portion of the Guelph Subdivision.

If you have any further questions please feel free to contact me at 519 271-4441 Extension 3.

Yours truly,

Doug MacKenzie
General Manager
Goderich-Exeter Railway

Sheeba Paul

From: Adam Snow <Adam.Snow@gotransit.com>
Sent: September-30-11 2:40 PM
To: Sheeba Paul
Subject: RE: Rail Data Request - Guelph Ontario

Hello Sheeba - Further to your request, preliminary midterm (2021 +/-) weekday commuter train volumes at this location are in the order of 8 trains (6 day, 2 night). I note that these numbers are subject to change and may be influenced by passenger demand and funding availability.

Trains will be comprised of a single locomotive and up to 12 passenger cars.

In terms of train speeds, I understand that they will be in the 32 kph (20 mph) range in this area due to various slow orders in effect.

Please feel free to contact me should you have any additional questions.

Adam

Adam Snow MCIP, RPP
Transportation Planner
Metrolinx - Strategic Policy and Systems Planning
20 Bay Street, Suite 600 I Toronto, ON, CA I M5J 2W3
(T): 416-869-3600, ext. 5408 (C): 416-528-4864 (F): 416-869-1794
Adam.Snow@gotransit.com

From: Sheeba Paul [mailto:spaul@hgcengineering.com]
Sent: Thursday, September 22, 2011 2:58 PM
To: Adam Snow
Subject: FW: Rail Data Request - Guelph Ontario

Hello Adam

We are performing a road and rail noise impact study for a development in Guelph near the Goderich Exeter Railway (GEXR). The site is located to the north of the railway and on the east side of Cityview Drive. A Google map link is attached for your reference.

http://maps.google.ca/maps?q=cityview+drive,+guelph,+on&hl=en&ll=43.562015,-80.215816&spn=0.019218,0.055575&t=m&z=15&vpsrc=6

We have rail traffic data from the GEXR which is attached. The data mentions passenger and commuter train service. Can you verify that this data includes the future GO Transit service into Guelph? If the data does not include GO, can you provide the future projections for GO in this area?

Thank you.

Sheeba Paul, MEng. PEng.
HGC Engineering

Howe Gastmeier Chapnik Limited
2000 Argentia Road
Plaza One, Suite 203
Mississauga, Ontario, Canada L5N 1P7
Phone (905) 826-4044
Fax (905) 826-4940

From: Mackenzie, Douglas (GEXR) [mailto:Douglas.MacKenzie@railamerica.com]
Sent: September-06-11 3:50 PM
To: Megan Munro
Cc: Sheeba Paul; Watters, Amber (CBNS); Johanne Anstey
Subject: Rail Data Request - Guelph Ontario

As per your request, please find attached updated information for the GEXR Guelph subdivision in the vicinity of Cityview Drive in Guelph ON.

From: Megan Munro [mailto:mmunro@hgcengineering.com]
Sent: Tuesday, September 06, 2011 2:32 PM
To: Mackenzie, Douglas (GEXR)
Cc: Sheeba Paul; Watters, Amber (CBNS); Johanne Anstey
Subject: RE: Rail Data Request - Guelph Ontario

Hi Douglas,

We will arrange to have a cheque prepared and sent to your facility. We can fax a copy of the cheque to Amber in order to expedite the release of the data (this has been sufficient in the past).

Amber,

Please provide your fax number and the address we should mail the cheque.

Thanks,

Megan Munro, BASc, EIT
HGC Engineering (Howe Gastmeier Chapnik Limited)
Phone: 905.826.4044
Fax: 905.826.4940

From: Mackenzie, Douglas (GEXR) [mailto:Douglas.MacKenzie@railamerica.com]
Sent: September-06-11 2:21 PM
To: Megan Munro
Cc: Sheeba Paul; Watters, Amber (CBNS)
Subject: RE: Rail Data Request - Guelph Ontario

Megan

I would caution, while the information has not changed significantly, there has been some changes. If you require an up to date GEXR train activity report, you should arrange to provide a PO or cheque number in the amount of $290.00 plus HST to Amber Watters who will then make the necessary arrangements to release the information you have requested.

From: Megan Munro [mailto:mmunro@hgcengineering.com]
Sent: Tuesday, September 06, 2011 2:13 PM
To: Mackenzie, Douglas (GEXR)
Cc: Sheeba Paul
Subject: RE: Rail Data Request - Guelph Ontario

Hi Douglas,

As per my voicemail, we need to update the noise study for a proposed development hear Cityview Drive in Guelph fairly quickly. I will try to call you again tomorrow but if we do not hear back from you by the end of this week we will proceed with the original rail data you provided to us in August, 2008 (attached).

Thanks,

Megan Munro, BASc, EIT
HGC Engineering (Howe Gastmeier Chapnik Limited)
Phone: 905.826.4044
Fax: 905.826.4940

From: Megan Munro
Sent: August-30-11 9:53 AM
To: 'Douglas.MacKenzie@railamerica.com'
Subject: Rail Data Request - Guelph Ontario

Hi Douglas,

In 2008 you forwarded me data for Guelph, Ontario near Cityview Drive just West of Watson Parkway.

I was wondering if the data has been updated since then as we are updating our noise feasibility study.

If so, please provide me with the cost for rail data and the mailing address where we should send the payment cheque.

The information I am looking for includes:
Number of trains during the daytime (7:00am – 11:00pm)
Number of trains during the nighttime (11:00pm – 7:00am)
Number of locomotives per train
Number of cars per train
Train speed
Are there any rail crossings in the area where the trains whistle?

Thank you in advance for your assistance,

Megan Munro, BASc, EIT

HGC Engineering
Howe Gastmeier Chapnik Limited
2000 Argentia Road
Plaza One, Suite 203
Mississauga, Ontario, Canada L5N 1P7

Phone 905.826.4044

Fax 905.826.4940

mmunro@hgcengineering.com
www.hgcengineering.com

APPENDIX B

Road Traffic Data

York Rd. @ Elizabeth St.

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

Municipality: Guelph
Site #: 0000000005
Intersection: York Rd. & Elizabeth St.
TFR File #: 2
Count date: 13-Apr-2004

Weather conditions:
Overcast

Person(s) who counted:
Zibi

**** Non-Signalized Intersection ****

Major Road: York Rd. runs W/E

North Leg Total:	343
North Entering:	148
North Peds:	0
Peds Cross:	⋈

Cyclists	0	0	0
Trucks	0	16	16
Cars	2	130	132
Totals	2	146	

Cyclists	0
Trucks	13
Cars	182
Totals	195

East Leg Total:	1038
East Entering:	576
East Peds:	0
Peds Cross:	⧗

Elizabeth St.

Cyclists	Trucks	Cars	Totals
2	42	341	385

Cars	Trucks	Cyclists	Totals
180	13	0	193
339	42	2	383
519	55	2	

York Rd.

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Cyclists	Trucks	Cars	Totals
0	0	2	2
1	42	273	316
1	42	275	

York Rd.

Cars	Trucks	Cyclists	Totals
403	58	1	462

Peds Cross:	⧗
West Peds:	1
West Entering:	318
West Leg Total:	703

Comments

York Rd. @ Elizabeth St.

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 12:00:00
To: 13:00:00

Municipality: Guelph
Site #: 0000000005
Intersection: York Rd. & Elizabeth St.
TFR File #: 2
Count date: 13-Apr-2004

Weather conditions:
Overcast

Person(s) who counted:
Zibi

**** Non-Signalized Intersection ****

Major Road: York Rd. runs W/E

North Leg Total:	267
North Entering:	129
North Peds:	0
Peds Cross:	⋈

Cyclists	0	0	0
Trucks	0	13	13
Cars	6	110	116
Totals	6	123	

Cyclists	0
Trucks	12
Cars	126
Totals	138

East Leg Total:	862
East Entering:	420
East Peds:	0
Peds Cross:	⧗

Elizabeth St.

Cyclists	Trucks	Cars	Totals
0	29	264	293

Cars	Trucks	Cyclists	Totals
122	11	0	133
258	29	0	287
380	40	0	

York Rd.

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Cyclists	Trucks	Cars	Totals
0	1	4	5
0	46	273	319
0	47	277	

York Rd.

Cars	Trucks	Cyclists	Totals
383	59	0	442

Peds Cross:	⧗
West Peds:	0
West Entering:	324
West Leg Total:	617

Comments

York Rd. @ Elizabeth St.

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

Municipality: Guelph
Site #: 0000000005
Intersection: York Rd. & Elizabeth St.
TFR File #: 2
Count date: 13-Apr-2004

Weather conditions:
Overcast

Person(s) who counted:
Zibi

**** Non-Signalized Intersection ****

Major Road: York Rd. runs W/E

North Leg Total:	356
North Entering:	147
North Peds:	0
Peds Cross:	⋈

Cyclists	0	0	0
Trucks	0	9	9
Cars	4	134	138
Totals	4	143	

Cyclists	2
Trucks	9
Cars	198
Totals	209

East Leg Total:	1051
East Entering:	581
East Peds:	0
Peds Cross:	⧗

Elizabeth St.

Cyclists	Trucks	Cars	Totals
0	27	353	380

Cars	Trucks	Cyclists	Totals
194	9	2	205
349	27	0	376
543	36	2	

York Rd.

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Cyclists	Trucks	Cars	Totals
0	0	4	4
0	36	291	327
0	36	295	

York Rd.

Cars	Trucks	Cyclists	Totals
425	45	0	470

Peds Cross:	⧗
West Peds:	0
West Entering:	331
West Leg Total:	711

Comments

York Rd. @ Elizabeth St.

Total Count Diagram

Municipality: Guelph
Site #: 0000000005
Intersection: York Rd. & Elizabeth St.
TFR File #: 2
Count date: 13-Apr-2004

Weather conditions:
Overcast

Person(s) who counted:
Zibi

**** Non-Signalized Intersection ****

Major Road: York Rd. runs W/E

North Leg Total:	2268
North Entering:	1017
North Peds:	3
Peds Cross:	⋈

Cyclists	0	2	2
Trucks	1	85	86
Cars	30	899	929
Totals	31	986	

Cyclists	4
Trucks	98
Cars	1149
Totals	1251

East Leg Total:	7229
East Entering:	3778
East Peds:	1
Peds Cross:	⋈

Elizabeth St.

Cyclists	Trucks	Cars	Totals
2	292	2295	2589

Cars	Trucks	Cyclists	Totals
1121	96	3	1220
2265	291	2	2558
3386	387	5	

York Rd.

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Cyclists	Trucks	Cars	Totals
1	2	28	31
3	312	2150	2465
4	314	2178	

York Rd.

Cars	Trucks	Cyclists	Totals
3049	397	5	3451

Peds Cross:	⋈
West Peds:	3
West Entering:	2496
West Leg Total:	5085

Comments

York Rd. @ Elizabeth St.

Annual Average Daily Traffic Diagram

Total Factor = Monthly Factor(0.95) x Daily Factor(0.98) x 24 Hour Factor(1.91) = 1.778210

Municipality: Guelph
Site #: 0000000005
Intersection: York Rd. & Elizabeth St.
TFR File #: 2
Count date: 13-Apr-2004

Weather conditions:
Overcast
Person(s) who counted:
Zibi

**** Non-Signalized Intersection ****

Major Road: York Rd. runs W/E

North Leg Total:	4033
North Entering:	1808
North Peds:	5
Peds Cross:	⋈

Cyclists	0	4	4
Trucks	2	151	153
Cars	53	1599	1652
Totals	55	1753	

Cyclists	7
Trucks	174
Cars	2043
Totals	2225

East Leg Total:	12855
East Entering:	6718
East Peds:	2
Peds Cross:	⧗

Elizabeth St.

Cyclists	Trucks	Cars	Totals
4	519	4081	4604

Cars	Trucks	Cyclists	Totals
1993	171	5	2169
4028	517	4	4549
6021	688	9	

York Rd.

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Cyclists	Trucks	Cars	Totals
2	4	50	55
5	555	3823	4383
7	558	3873	

York Rd.

Cars	Trucks	Cyclists	Totals
5422	706	9	6137

Peds Cross:	⧗
West Peds:	5
West Entering:	4438
West Leg Total:	9042

Comments

York Rd. @ Watson Pkwy.

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:30:00
To: 8:30:00

Municipality: Guelph
Site #: 0000000010
Intersection: York Rd. & Watson Pkwy.
TFR File #: 1
Count date: 29-Mar-2004

Weather conditions:
Overcast

Person(s) who counted:
Zibi

**** Signalized Intersection ****

Major Road: York Rd. runs W/E

North Leg Total:	316
North Entering:	229
North Peds:	0
Peds Cross:	⋈

Cyclists	0	0	0	0
Trucks	2	6	0	8
Cars	108	65	48	221
Totals	110	71	48	

Cyclists	0
Trucks	10
Cars	77
Totals	87

East Leg Total:	729
East Entering:	384
East Peds:	0
Peds Cross:	⧗

Watson Pkwy.

Cyclists	Trucks	Cars	Totals
0	54	478	532

York Rd.

Cars	Trucks	Cyclists	Totals
13	2	0	15
322	38	0	360
6	3	0	9
341	43	0	

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Cyclists	Trucks	Cars	Totals
0	3	29	32
1	20	273	294
0	16	105	121
1	39	407	

York Rd.

Cars	Trucks	Cyclists	Totals
323	21	1	345

Watson Pkwy.

Peds Cross:	⧗
West Peds:	0
West Entering:	447
West Leg Total:	979

Cars	176
Trucks	25
Cyclists	0
Totals	201

Cars	48	35	2	85
Trucks	14	5	1	20
Cyclists	0	0	0	0
Totals	62	40	3	

Peds Cross:	⋈
South Peds:	0
South Entering:	105
South Leg Total:	306

Comments

York Rd. @ Watson Pkwy.

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 12:00:00
To: 13:00:00

Municipality: Guelph
Site #: 0000000010
Intersection: York Rd. & Watson Pkwy.
TFR File #: 1
Count date: 29-Mar-2004

Weather conditions:
Overcast

Person(s) who counted:
Zibi

**** Signalized Intersection ****

Major Road: York Rd. runs W/E

North Leg Total:	262
North Entering:	148
North Peds:	1
Peds Cross:	⋈

Cyclists	0	0	0	0
Trucks	2	10	0	12
Cars	71	52	13	136
Totals	73	62	13	

Cyclists	0
Trucks	9
Cars	105
Totals	114

East Leg Total:	569
East Entering:	288
East Peds:	0
Peds Cross:	⧗

Watson Pkwy.

Cyclists	Trucks	Cars	Totals
0	63	402	465

York Rd.

Cars	Trucks	Cyclists	Totals
16	2	0	18
237	28	0	265
2	3	0	5
255	33	0	

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Cyclists	Trucks	Cars	Totals
0	3	63	66
0	30	232	262
0	13	128	141
0	46	423	

York Rd.

Cars	Trucks	Cyclists	Totals
249	32	0	281

Watson Pkwy.

Peds Cross:	⧗
West Peds:	0
West Entering:	469
West Leg Total:	934

Cars	182
Trucks	26
Cyclists	0
Totals	208

Cars	94	26	4	124
Trucks	33	4	2	39
Cyclists	0	0	0	0
Totals	127	30	6	

Peds Cross:	⋈
South Peds:	1
South Entering:	163
South Leg Total:	371

Comments

York Rd. @ Watson Pkwy.

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:15:00
To: 17:15:00

Municipality: Guelph
Site #: 0000000010
Intersection: York Rd. & Watson Pkwy.
TFR File #: 1
Count date: 29-Mar-2004

Weather conditions:
Overcast

Person(s) who counted:
Zibi

**** Signalized Intersection ****

Major Road: York Rd. runs W/E

North Leg Total:	375
North Entering:	139
North Peds:	0
Peds Cross:	⋈

Cyclists	0	0	0	0
Trucks	2	5	1	8
Cars	70	38	23	131
Totals	72	43	24	

Cyclists	0
Trucks	3
Cars	233
Totals	236

East Leg Total:	827
East Entering:	443
East Peds:	0
Peds Cross:	⧗

Watson Pkwy.

Cyclists	Trucks	Cars	Totals
1	38	559	598

Cars	Trucks	Cyclists	Totals
53	1	0	54
360	22	1	383
5	1	0	6
418	24	1	

York Rd.

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Cyclists	Trucks	Cars	Totals
0	0	103	103
0	17	333	350
0	7	63	70
0	24	499	

York Rd.

Cars	Trucks	Cyclists	Totals
363	20	1	384

Watson Pkwy.

Peds Cross:	⧗
West Peds:	0
West Entering:	523
West Leg Total:	1121

Cars	106
Trucks	13
Cyclists	0
Totals	119

Cars	129	77	7	213
Trucks	14	2	2	18
Cyclists	0	0	1	1
Totals	143	79	10	

Peds Cross:	⋈
South Peds:	1
South Entering:	232
South Leg Total:	351

Comments

York Rd. @ Watson Pkwy.

Total Count Diagram

Municipality: Guelph
Site #: 0000000010
Intersection: York Rd. & Watson Pkwy.
TFR File #: 1
Count date: 29-Mar-2004

Weather conditions:
Overcast
Person(s) who counted:
Zibi

**** Signalized Intersection ****

Major Road: York Rd. runs W/E

North Leg Total:	2270
North Entering:	1239
North Peds:	1
Peds Cross:	⋈

Cyclists	0	0	0	0
Trucks	20	38	5	63
Cars	607	385	184	1176
Totals	627	423	189	

Cyclists	0
Trucks	63
Cars	968
Totals	1031

East Leg Total:	5043
East Entering:	2584
East Peds:	2
Peds Cross:	⧗

Watson Pkwy.

Cyclists	Trucks	Cars	Totals
5	363	3449	3817

Cars	Trucks	Cyclists	Totals
188	11	0	199
2108	197	3	2308
58	19	0	77
2354	227	3	

York Rd.

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Cyclists	Trucks	Cars	Totals
0	11	454	465
3	196	1999	2198
0	134	771	905
3	341	3224	

York Rd.

Cars	Trucks	Cyclists	Totals
2233	222	4	2459

Watson Pkwy.

Peds Cross:	⧗
West Peds:	0
West Entering:	3568
West Leg Total:	7385

Cars	1214
Trucks	191
Cyclists	0
Totals	1405

Cars	734	326	50	1110
Trucks	146	41	21	208
Cyclists	2	0	1	3
Totals	882	367	72	

Peds Cross:	⋈
South Peds:	3
South Entering:	1321
South Leg Total:	2726

Comments

York Rd. @ Watson Pkwy.

Annual Average Daily Traffic Diagram

Total Factor = Monthly Factor(0.97) x Daily Factor(1.02) x 24 Hour Factor(1.91) = 1.889754

Municipality: Guelph
Site #: 0000000010
Intersection: York Rd. & Watson Pkwy.
TFR File #: 1
Count date: 29-Mar-2004

Weather conditions:
Overcast

Person(s) who counted:
Zibi

**** Signalized Intersection ****

Major Road: York Rd. runs W/E

North Leg Total:	4290
North Entering:	2341
North Peds:	2
Peds Cross:	⋈

Cyclists	0	0	0	0
Trucks	38	72	9	119
Cars	1147	728	348	2222
Totals	1185	799	357	

Cyclists	0
Trucks	119
Cars	1829
Totals	1948

East Leg Total:	9530
East Entering:	4883
East Peds:	4
Peds Cross:	⋈

Watson Pkwy.

Cyclists	Trucks	Cars	Totals
9	686	6518	7213

Cars	Trucks	Cyclists	Totals
355	21	0	376
3984	372	6	4362
110	36	0	146
4448	429	6	

York Rd.

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Cyclists	Trucks	Cars	Totals
0	21	858	879
6	370	3778	4154
0	253	1457	1710
6	644	6093	

York Rd.

Cars	Trucks	Cyclists	Totals
4220	420	8	4647

Watson Pkwy.

Peds Cross:	⋈
West Peds:	0
West Entering:	6743
West Leg Total:	13956

Cars	2294
Trucks	361
Cyclists	0
Totals	2655

Cars	1387	616	94	2098
Trucks	276	77	40	393
Cyclists	4	0	2	6
Totals	1667	694	136	

Peds Cross:	⋈
South Peds:	6
South Entering:	2496
South Leg Total:	5151

Comments

APPENDIX C

Sample STAMSON 5.0 Output

STAMSON 5.0 NORMAL REPORT Date: 18-10-2011 09:00:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: facadea.te Time Period: Day/Night 16/8 hours
Description: ***Daytime and nighttime predicted sound levels at the South façade of Lot/Block 57***

Rail data, segment # 1: 1 (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Freight	1.5/0.0	1.5/0.0	89.0	2.0	73.0	Diesel	No
2. Commuter	2.0/1.0	2.0/1.0	113.0	1.0	10.0	Diesel	No
3. Passenger	6.0/1.5	6.0/1.5	113.0	1.0	5.0	Diesel	No
4. GO	3.0/1.0	3.0/1.0	32.0	1.0	12.0	Diesel	No

Data for Segment # 1: 1 (day/night)

```
Angle1   Angle2            : -90.00 deg   -20.00 deg
Wood depth                 :      0       (No woods.)
No of house rows           :      0 / 0
Surface                    :      1       (Absorptive ground surface)
Receiver source distance   : 103.00 / 103.00 m
Receiver height            :   1.50 / 4.50   m
Topography                 :      4       (Elevated; with barrier)
Whistle Angle              :     85 deg   Track 1
Barrier angle1             : -90.00 deg   Angle2 : -20.00 deg
Barrier height             :   6.50 m
Elevation                  :  10.50 m
Barrier receiver distance  :  90.00 / 90.00  m
Source elevation           : 328.50 m
Receiver elevation         : 339.00 m
Barrier elevation          : 328.50 m
Reference angle            :   0.00
```

Rail data, segment # 2: 2 (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Freight	1.5/0.0	1.5/0.0	89.0	2.0	73.0	Diesel	No

```
  2. Commuter    !   2.0/1.0   !   2.0/1.0   ! 113.0 !  1.0 ! 10.0
!Diesel!  No
  3. Passenger   !   6.0/1.5   !   6.0/1.5   ! 113.0 !  1.0 !  5.0
!Diesel!  No
  4. GO          !   3.0/1.0   !   3.0/1.0   !  32.0 !  1.0 ! 12.0
!Diesel!  No

Data for Segment # 2: 2 (day/night)
-----------------------------------
Angle1   Angle2           : -20.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 103.00 / 103.00 m
Receiver height           :   1.50 / 4.50   m
Topography                :      3       (Elevated; no barrier)
Whistle Angle             :     85 deg   Track 1
Elevation                 :  10.50 m
Reference angle           :   0.00

Results segment # 1: 1 (day)
----------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        5.01 !       333.51
       0.50 !        1.50 !        1.95 !       330.45

LOCOMOTIVE (0.00 + 49.83 + 0.00) = 49.83 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -90    -20   0.00  69.35  -8.37  -4.10   0.00   0.00  -7.05  49.83
-----------------------------------------------------------------------

WHEEL (0.00 + 39.78 + 0.00) = 39.78 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -90    -20   0.00  64.59  -8.37  -4.10   0.00   0.00 -12.34  39.78
-----------------------------------------------------------------------

LEFT WHISTLE (0.00 + 0.00 + 0.00) = 0.00 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
-----------------------------------------------------------------------

Segment Leq : 50.24 dBA

Results segment # 2: 2 (day)
----------------------------

LOCOMOTIVE (0.00 + 56.01 + 0.00) = 56.01 dBA
```

```
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -20     90   0.27  69.35 -10.63  -2.71   0.00   0.00   0.00  56.01
-----------------------------------------------------------------------

WHEEL (0.00 + 50.19 + 0.00) = 50.19 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -20     90   0.38  64.59 -11.51  -2.89   0.00   0.00   0.00  50.19
-----------------------------------------------------------------------

LEFT WHISTLE (0.00 + 42.53 + 0.00) = 42.53 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    82     85   0.27  74.25 -10.63 -21.09   0.00   0.00   0.00  42.53
-----------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 39.06 + 0.00) = 39.06 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    85     86   0.27  74.25 -10.63 -24.56   0.00   0.00   0.00  39.06
-----------------------------------------------------------------------

Segment Leq : 57.24 dBA

Total Leq All Segments: 58.03 dBA

Results segment # 1: 1 (night)
------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !        5.39 !       333.89
       0.50 !        4.50 !        2.33 !       330.83

LOCOMOTIVE (0.00 + 46.36 + 0.00) = 46.36 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -90    -20   0.00  65.10  -8.37  -4.10   0.00   0.00  -6.27  46.36
-----------------------------------------------------------------------

WHEEL (0.00 + 35.25 + 0.00) = 35.25 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -90    -20   0.00  59.50  -8.37  -4.10   0.00   0.00 -11.78  35.25
-----------------------------------------------------------------------

LEFT WHISTLE (0.00 + 42.53 + 0.00) = 0.00 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    82    -20   0.00  71.94   0.00 -21.09   0.00   0.00   0.00  42.53
```

```
-----------------------------------------------------------------------

Segment Leq : 46.68 dBA

Results segment # 2: 2 (night)
------------------------------

LOCOMOTIVE (0.00 + 52.69 + 0.00) = 52.69 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -20     90   0.18  65.10  -9.87  -2.54   0.00   0.00   0.00  52.69
-----------------------------------------------------------------------

WHEEL (0.00 + 46.01 + 0.00) = 46.01 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -20     90   0.28  59.50 -10.75  -2.74   0.00   0.00   0.00  46.01
-----------------------------------------------------------------------

LEFT WHISTLE (0.00 + 41.85 + 0.00) = 41.85 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    82     85   0.18  71.94  -9.87 -20.23   0.00   0.00   0.00  41.85
-----------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 38.52 + 0.00) = 38.52 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    85     86   0.18  71.94  -9.87 -23.55   0.00   0.00   0.00  38.52
-----------------------------------------------------------------------

Segment Leq : 53.95 dBA

Total Leq All Segments: 54.70 dBA

Road data, segment # 1: York (day/night)
----------------------------------------
Car traffic volume  : 13536/2389  veh/TimePeriod  *
Medium truck volume :   529/93    veh/TimePeriod  *
Heavy truck volume  :   792/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  12679
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  13.00
    Medium Truck % of Total Volume     :   3.56
    Heavy Truck  % of Total Volume     :   5.33
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 1: York (day/night)
```

```
--------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 153.00 / 153.00 m
Receiver height           :   1.50 / 4.50   m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   8.50 m
Elevation                 :  19.00 m
Barrier receiver distance : 125.00 / 125.00 m
Source elevation          : 320.00 m
Receiver elevation        : 339.00 m
Barrier elevation         : 320.00 m
Reference angle           :   0.00

Results segment # 1: York (day)
--------------------------------

Source height = 1.52 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.52 !        1.50 !        4.99 !       324.99

ROAD (0.00 + 50.41 + 0.00) = 50.41 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
--------------------------------------------------------------------------
---
   -90     90   0.00  70.03   0.00 -10.09   0.00   0.00   0.00  -9.53
50.41
--------------------------------------------------------------------------
---

Segment Leq : 50.41 dBA

Total Leq All Segments: 50.41 dBA
```

```
Results segment # 1: York (night)
---------------------------------

Source height = 1.52 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.52 !        4.50 !        5.54 !       325.54

ROAD (0.00 + 46.75 + 0.00) = 46.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
---------------------------------------------------------------------------
---
   -90     90   0.00  65.51   0.00 -10.09   0.00   0.00   0.00  -8.67
46.75
---------------------------------------------------------------------------
---

Segment Leq : 46.75 dBA

Total Leq All Segments: 46.75 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 58.72
                         (NIGHT): 55.34
```

STAMSON 5.0 NORMAL REPORT Date: 18-10-2011 09:01:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: facadeb.te Time Period: Day/Night 16/8 hours
Description: ***Daytime and nighttime predicted sound levels at the South façade of Lot/Block 41***

Rail data, segment # 1: 1 (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Freight	1.5/0.0	1.5/0.0	89.0	2.0	73.0	Diesel	No
2. Commuter	2.0/1.0	2.0/1.0	113.0	1.0	10.0	Diesel	No
3. Passenger	6.0/1.5	6.0/1.5	113.0	1.0	5.0	Diesel	No
4. Go	3.0/1.0	3.0/1.0	32.0	1.0	12.0	Diesel	No

Data for Segment # 1: 1 (day/night)

```
Angle1   Angle2            : -90.00 deg   10.00 deg
Wood depth                 :      0       (No woods.)
No of house rows           :      0 / 0
Surface                    :      1       (Absorptive ground surface)
Receiver source distance   : 288.00 / 288.00 m
Receiver height            :   1.50 / 4.50   m
Topography                 :      4       (Elevated; with barrier)
Whistle Angle              :     75 deg   Track 1
Barrier angle1             : -90.00 deg   Angle2 : 10.00 deg
Barrier height             :   7.00 m
Elevation                  :  16.00 m
Barrier receiver distance  :   0.50 / 0.50   m
Source elevation           : 328.50 m
Receiver elevation         : 344.50 m
Barrier elevation          : 344.50 m
Reference angle            :   0.00
```

Rail data, segment # 2: 2 (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Freight	1.5/0.0	1.5/0.0	89.0	2.0	73.0	Diesel	No

```
  2. Commuter    !   2.0/1.0   !   2.0/1.0   ! 113.0 !  1.0 ! 10.0
!Diesel!  No
  3. Passenger   !   6.0/1.5   !   6.0/1.5   ! 113.0 !  1.0 !  5.0
!Diesel!  No
  4. Go          !   3.0/1.0   !   3.0/1.0   !  32.0 !  1.0 ! 12.0
!Diesel!  No

Data for Segment # 2: 2 (day/night)
-----------------------------------
Angle1   Angle2           :  10.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 288.00 / 288.00 m
Receiver height           :   1.50 / 4.50   m
Topography                :      3       (Elevated; no barrier)
Whistle Angle             :     75 deg   Track 1
Elevation                 :  16.00 m
Reference angle           :   0.00

Results segment # 1: 1 (day)
----------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        1.48 !       345.98
       0.50 !        1.50 !        1.47 !       345.97

LOCOMOTIVE (0.00 + 35.82 + 0.00) = 35.82 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -90     10   0.00  69.35 -12.83  -2.55   0.00   0.00 -18.14  35.82
-----------------------------------------------------------------------

WHEEL (0.00 + 31.04 + 0.00) = 31.04 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -90     10   0.00  64.59 -12.83  -2.55   0.00   0.00 -18.16  31.04
-----------------------------------------------------------------------

LEFT WHISTLE (0.00 + 41.85 + 0.00) = 0.00 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    67     10   0.00  74.25   0.00 -20.23   0.00   0.00   0.00  41.85
-----------------------------------------------------------------------

Segment Leq : 37.07 dBA
```

```
Results segment # 2: 2 (day)
----------------------------

LOCOMOTIVE (0.00 + 51.31 + 0.00) = 51.31 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    10     90   0.10  69.35 -14.18  -3.86   0.00   0.00   0.00  51.31
-----------------------------------------------------------------------

WHEEL (0.00 + 44.90 + 0.00) = 44.90 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    10     90   0.21  64.59 -15.53  -4.16   0.00   0.00   0.00  44.90
-----------------------------------------------------------------------

LEFT WHISTLE (0.00 + 46.09 + 0.00) = 46.09 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    67     75   0.10  74.25 -14.18 -13.98   0.00   0.00   0.00  46.09
-----------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 42.80 + 0.00) = 42.80 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    75     79   0.10  74.25 -14.18 -17.27   0.00   0.00   0.00  42.80
-----------------------------------------------------------------------

Segment Leq : 53.54 dBA

Total Leq All Segments: 53.64 dBA

Results segment # 1: 1 (night)
------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !        4.47 !       348.97
       0.50 !        4.50 !        4.47 !       348.97

LOCOMOTIVE (0.00 + 33.36 + 0.00) = 33.36 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -90     10   0.00  65.10 -12.83  -2.55   0.00   0.00 -16.36  33.36
-----------------------------------------------------------------------

WHEEL (0.00 + 27.72 + 0.00) = 27.72 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -90     10   0.00  59.50 -12.83  -2.55   0.00   0.00 -16.39  27.72
-----------------------------------------------------------------------
```

```
LEFT WHISTLE (0.00 + 46.09 + 0.00) = 0.00 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    67     10   0.00  71.94   0.00 -13.98   0.00   0.00   0.00  46.09
-----------------------------------------------------------------------

Segment Leq : 34.41 dBA

Results segment # 2: 2 (night)
------------------------------

LOCOMOTIVE (0.00 + 48.51 + 0.00) = 48.51 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    10     90   0.01  65.10 -13.03  -3.57   0.00   0.00   0.00  48.51
-----------------------------------------------------------------------

WHEEL (0.00 + 41.22 + 0.00) = 41.22 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    10     90   0.12  59.50 -14.37  -3.90   0.00   0.00   0.00  41.22
-----------------------------------------------------------------------

LEFT WHISTLE (0.00 + 45.38 + 0.00) = 45.38 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    67     75   0.01  71.94 -13.03 -13.54   0.00   0.00   0.00  45.38
-----------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 42.24 + 0.00) = 42.24 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
    75     79   0.01  71.94 -13.03 -16.68   0.00   0.00   0.00  42.24
-----------------------------------------------------------------------

Segment Leq : 51.32 dBA

Total Leq All Segments: 51.41 dBA

Road data, segment # 1: York (day/night)
----------------------------------------
Car traffic volume  : 13536/2389  veh/TimePeriod  *
Medium truck volume :   529/93    veh/TimePeriod  *
Heavy truck volume  :   792/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  12679
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  13.00
    Medium Truck % of Total Volume     :   3.56
```

```
    Heavy Truck  % of Total Volume     :   5.33
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 1: York (day/night)
--------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 340.00 / 340.00 m
Receiver height           :   1.50 / 4.50   m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 0.00 deg
Barrier height            :   7.00 m
Elevation                 :  24.50 m
Barrier receiver distance :   0.50 / 0.50   m
Source elevation          : 320.00 m
Receiver elevation        : 344.50 m
Barrier elevation         : 344.50 m
Reference angle           :   0.00

Road data, segment # 2: York (day/night)
----------------------------------------
Car traffic volume  : 13536/2389  veh/TimePeriod  *
Medium truck volume :   529/93    veh/TimePeriod  *
Heavy truck volume  :   792/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  12679
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  13.00
    Medium Truck % of Total Volume     :   3.56
    Heavy Truck  % of Total Volume     :   5.33
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 2: York (day/night)
--------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 340.00 / 340.00 m
Receiver height           :   1.50 / 4.50   m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :   8.50 m
Elevation                 :  24.50 m
Barrier receiver distance : 310.00 / 310.00 m
Source elevation          : 320.00 m
Receiver elevation        : 344.50 m
```

```
Barrier elevation         : 320.00 m
Reference angle           :   0.00

Results segment # 1: York (day)
-------------------------------

Source height = 1.52 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.52 !        1.50 !        1.46 !       345.96

ROAD (0.00 + 35.45 + 0.00) = 35.45 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
--------------------------------------------------------------------------
---
   -90      0   0.00  70.03   0.00 -13.55  -3.01   0.00   0.00 -18.02
35.45
--------------------------------------------------------------------------
---

Segment Leq : 35.45 dBA

Results segment # 2: York (day)
-------------------------------

Source height = 1.52 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.52 !        1.50 !        3.68 !       323.68

ROAD (0.00 + 42.63 + 0.00) = 42.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
--------------------------------------------------------------------------
---
     0     90   0.00  70.03   0.00 -13.55  -3.01   0.00   0.00 -10.83
42.63
--------------------------------------------------------------------------
---

Segment Leq : 42.63 dBA

Total Leq All Segments: 43.39 dBA
```

```
Results segment # 1: York (night)
---------------------------------

Source height = 1.52 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.52 !        4.50 !        4.46 !       348.96

ROAD (0.00 + 32.78 + 0.00) = 32.78 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
--------------------------------------------------------------------------
---
   -90      0   0.00  65.51   0.00 -13.55  -3.01   0.00   0.00 -16.16
32.78
--------------------------------------------------------------------------
---

Segment Leq : 32.78 dBA

Results segment # 2: York (night)
---------------------------------

Source height = 1.52 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.52 !        4.50 !        3.94 !       323.94

ROAD (0.00 + 38.44 + 0.00) = 38.44 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
--------------------------------------------------------------------------
---
     0     90   0.00  65.51   0.00 -13.55  -3.01   0.00   0.00 -10.50
38.44
--------------------------------------------------------------------------
---

Segment Leq : 38.44 dBA

Total Leq All Segments: 39.48 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 54.03
                         (NIGHT): 51.68
```

STAMSON 5.0 NORMAL REPORT Date: 18-10-2011 09:01:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: facadec.te Time Period: Day/Night 16/8 hours
Description: ***Daytime and nighttime predicted sound levels at the South façade of Lot/Block 1***

Rail data, segment # 1: 1 (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Freight	1.5/0.0	1.5/0.0	89.0	2.0	73.0	Diesel	No
2. Commuter	2.0/1.0	2.0/1.0	113.0	1.0	10.0	Diesel	No
3. Passenger	6.0/1.5	6.0/1.5	113.0	1.0	5.0	Diesel	No
4. Go	3.0/1.0	3.0/1.0	32.0	1.0	12.0	Diesel	No

Data for Segment # 1: 1 (day/night)

```
Angle1   Angle2            : -90.00 deg   90.00 deg
Wood depth                 :      0       (No woods.)
No of house rows           :      0 / 0
Surface                    :      1       (Absorptive ground surface)
Receiver source distance   :  55.00 / 55.00  m
Receiver height            :   1.50 / 4.50   m
Topography                 :      3       (Elevated; no barrier)
Whistle Angle              :     90 deg   Track 1
Elevation                  :   6.00 m
Reference angle            :   0.00
```

Results segment # 1: 1 (day)

LOCOMOTIVE (0.00 + 60.43 + 0.00) = 60.43 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.41	69.35	-7.93	-0.99	0.00	0.00	0.00	60.43

WHEEL (0.00 + 54.87 + 0.00) = 54.87 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.51	64.59	-8.52	-1.19	0.00	0.00	0.00	54.87

LEFT WHISTLE (0.00 + 45.38 + 0.00) = 0.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
90	90	0.00	74.25	0.00	-13.54	0.00	0.00	0.00	45.38

Segment Leq : 61.50 dBA

Total Leq All Segments: 61.50 dBA

Results segment # 1: 1 (night)

LOCOMOTIVE (0.00 + 56.88 + 0.00) = 56.88 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.31	65.10	-7.42	-0.80	0.00	0.00	0.00	56.88

WHEEL (0.00 + 50.46 + 0.00) = 50.46 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.42	59.50	-8.01	-1.02	0.00	0.00	0.00	50.46

LEFT WHISTLE (0.00 + 45.38 + 0.00) = 0.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
90	90	0.00	71.94	0.00	-13.54	0.00	0.00	0.00	45.38

Segment Leq : 57.77 dBA

Total Leq All Segments: 57.77 dBA

Road data, segment # 1: York (day/night)

```
Car traffic volume  : 13536/2389  veh/TimePeriod  *
Medium truck volume :   529/93    veh/TimePeriod  *
Heavy truck volume  :   792/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)
```

* Refers to calculated road volumes based on the following input:

```
24 hr Traffic Volume (AADT or SADT):  12679
Percentage of Annual Growth        :   2.50
Number of Years of Growth          :  13.00
Medium Truck % of Total Volume     :   3.56
Heavy Truck  % of Total Volume     :   5.33
Day (16 hrs) % of Total Volume     :  85.00
```

Data for Segment # 1: York (day/night)

```
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 220.00 / 220.00 m
Receiver height           :   1.50 / 4.50   m
Topography                :      3       (Elevated; no barrier)
Elevation                 :  13.00 m
Reference angle           :   0.00

Results segment # 1: York (day)
-------------------------------

Source height = 1.52 m

ROAD (0.00 + 54.52 + 0.00) = 54.52 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
--------------------------------------------------------------------------
---
   -90     90   0.27  70.03   0.00 -14.81  -0.70   0.00   0.00   0.00
54.52
--------------------------------------------------------------------------
---

Segment Leq : 54.52 dBA

Total Leq All Segments: 54.52 dBA

Results segment # 1: York (night)
---------------------------------

Source height = 1.52 m

ROAD (0.00 + 51.27 + 0.00) = 51.27 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
--------------------------------------------------------------------------
---
   -90     90   0.18  65.51   0.00 -13.76  -0.49   0.00   0.00   0.00
51.27
--------------------------------------------------------------------------
---

Segment Leq : 51.27 dBA

Total Leq All Segments: 51.27 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 62.29
                         (NIGHT): 58.65
```

APPENDIX D

Vibration Plots from March 31, 2003 Noise Report

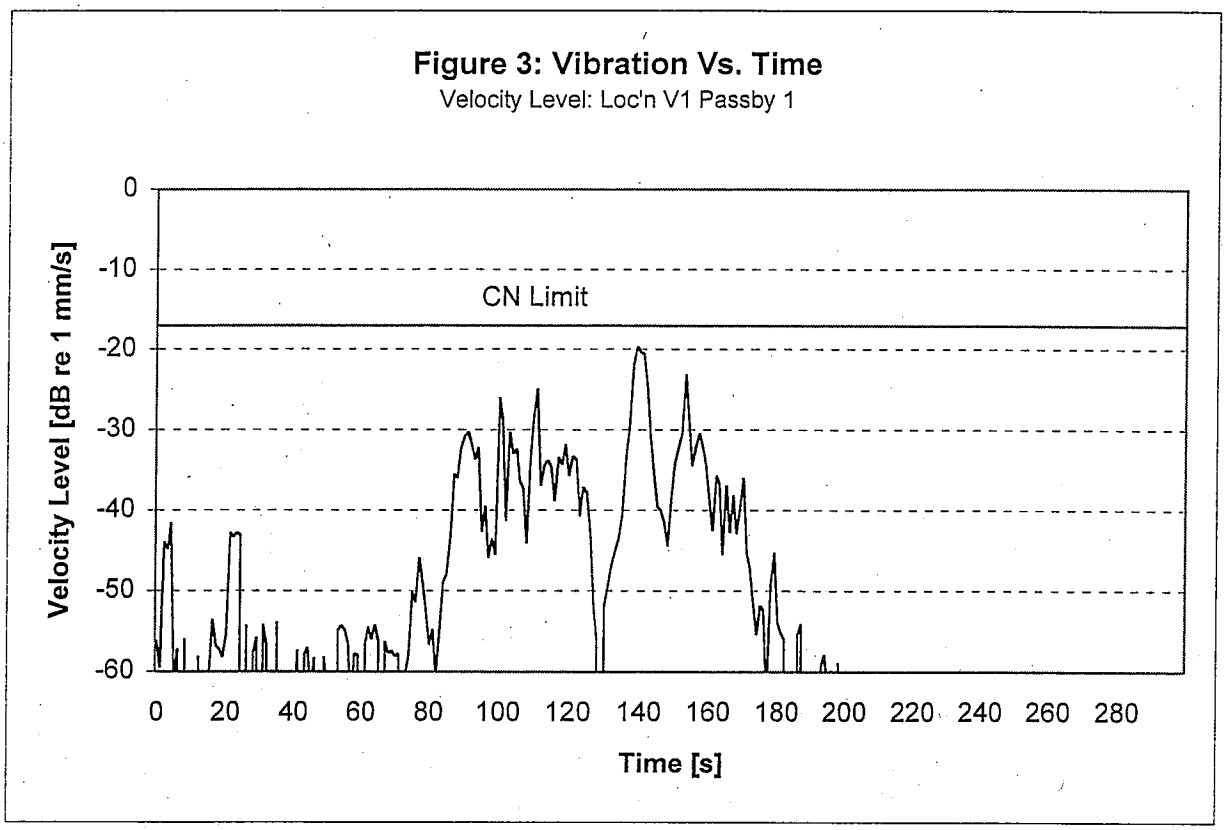


Figure 3: Vibration Vs. Time
Velocity Level: Loc'n V1 Passby 1
CN Limit
Velocity Level [dB re 1 mm/s]
0
-10
-20
-30
-40
-50
-60
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280
Time [s]

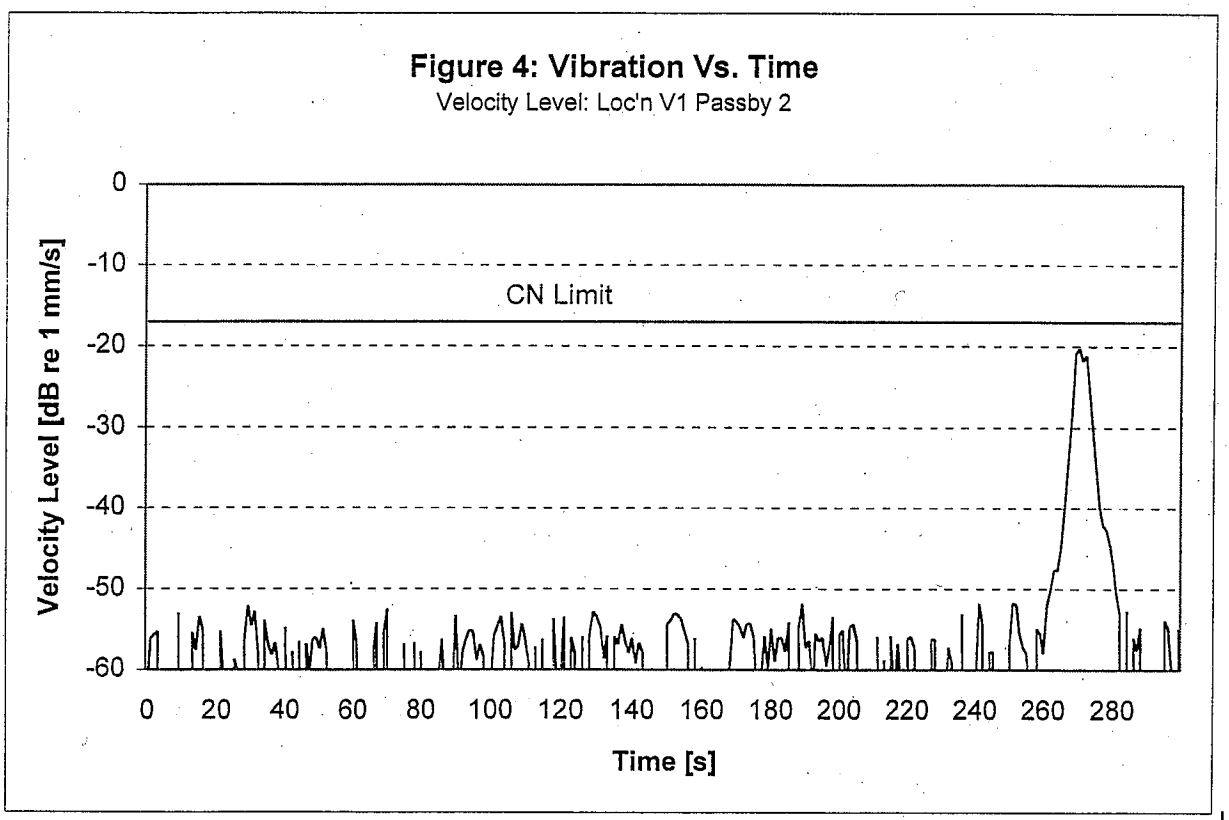


Figure 4: Vibration Vs. Time
Velocity Level: Loc'n V1 Passby 2
CN Limit
Velocity Level [dB re 1 mm/s]
0
-10
-20
-30
-40
-50
-60
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280
Time [s]

Figure 5: Vibration Vs. Time

Velocity Level: Loc'n V2 Passby 2

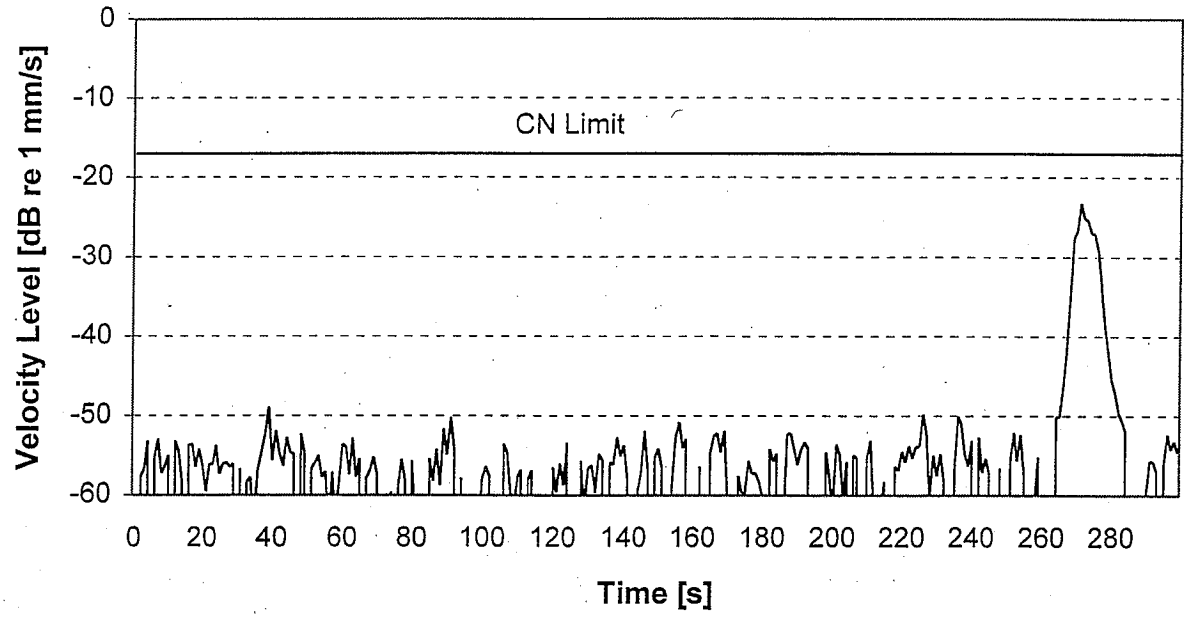
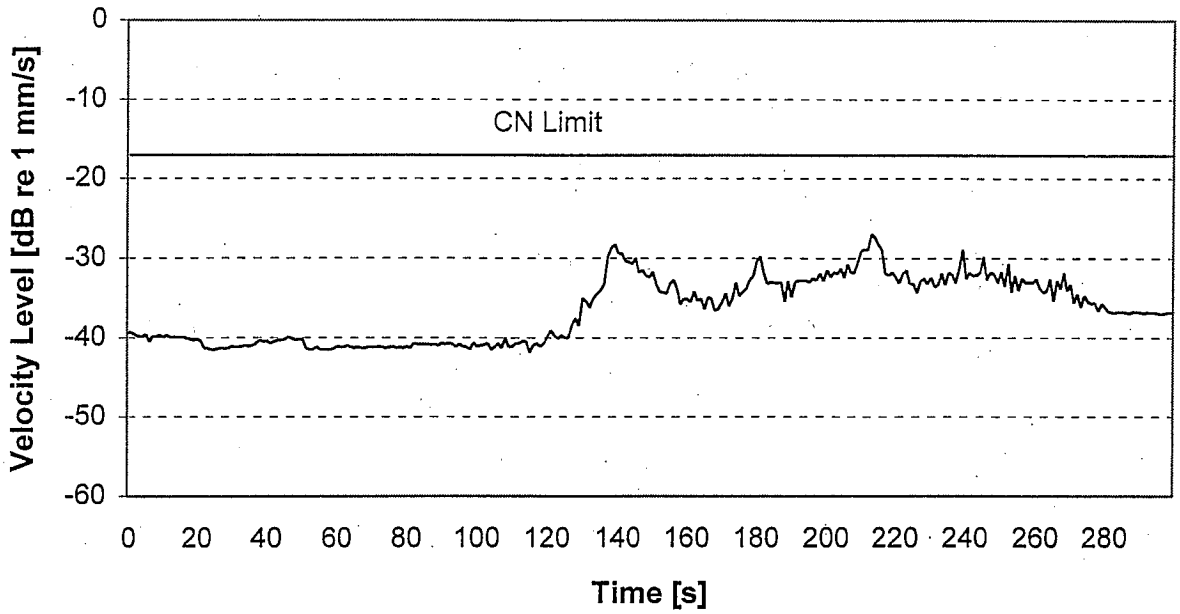


Figure 6: Vibration Vs. Time

Velocity Level: Loc'n V1 Passby 3



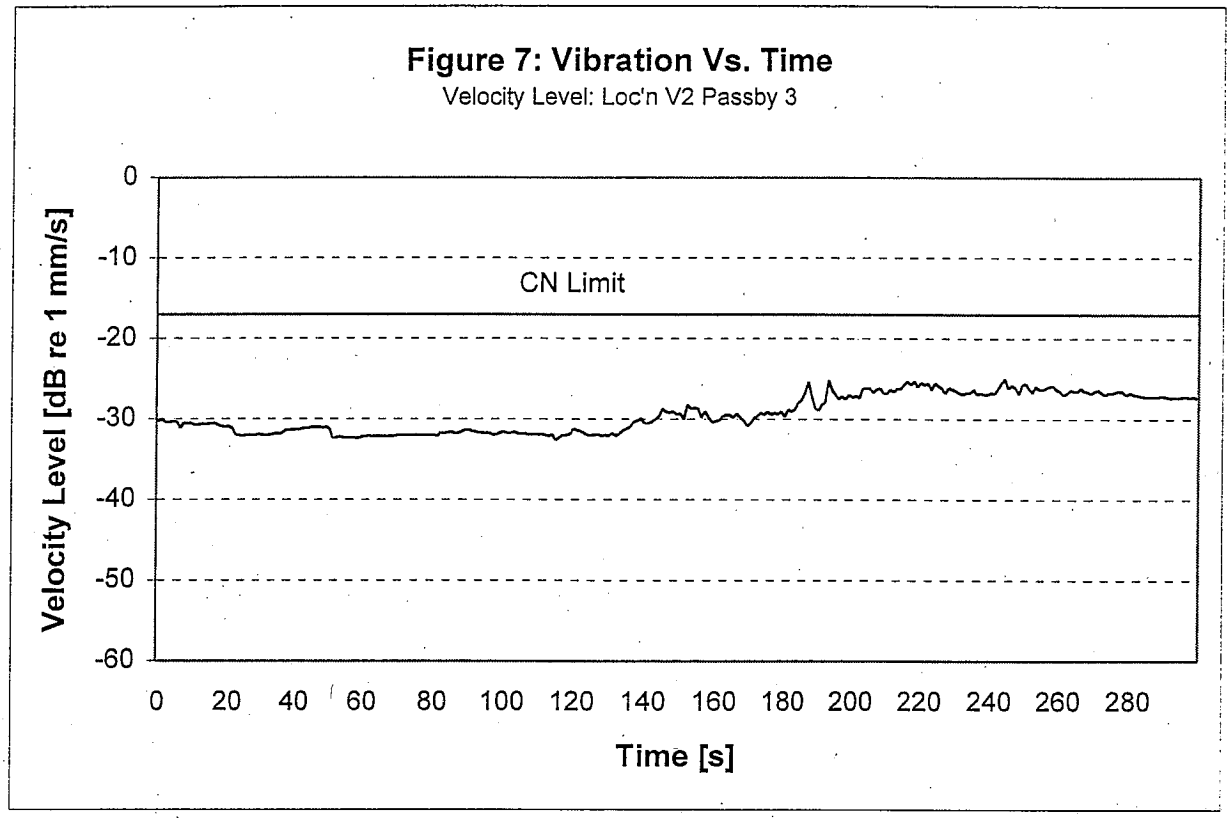


Figure 7: Vibration Vs. Time
Velocity Level: Loc'n V2 Passby 3
Velocity Level [dB re 1 mm/s]
0
-10
-20
-30
-40
-50
-60
CN Limit
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280
Time [s]

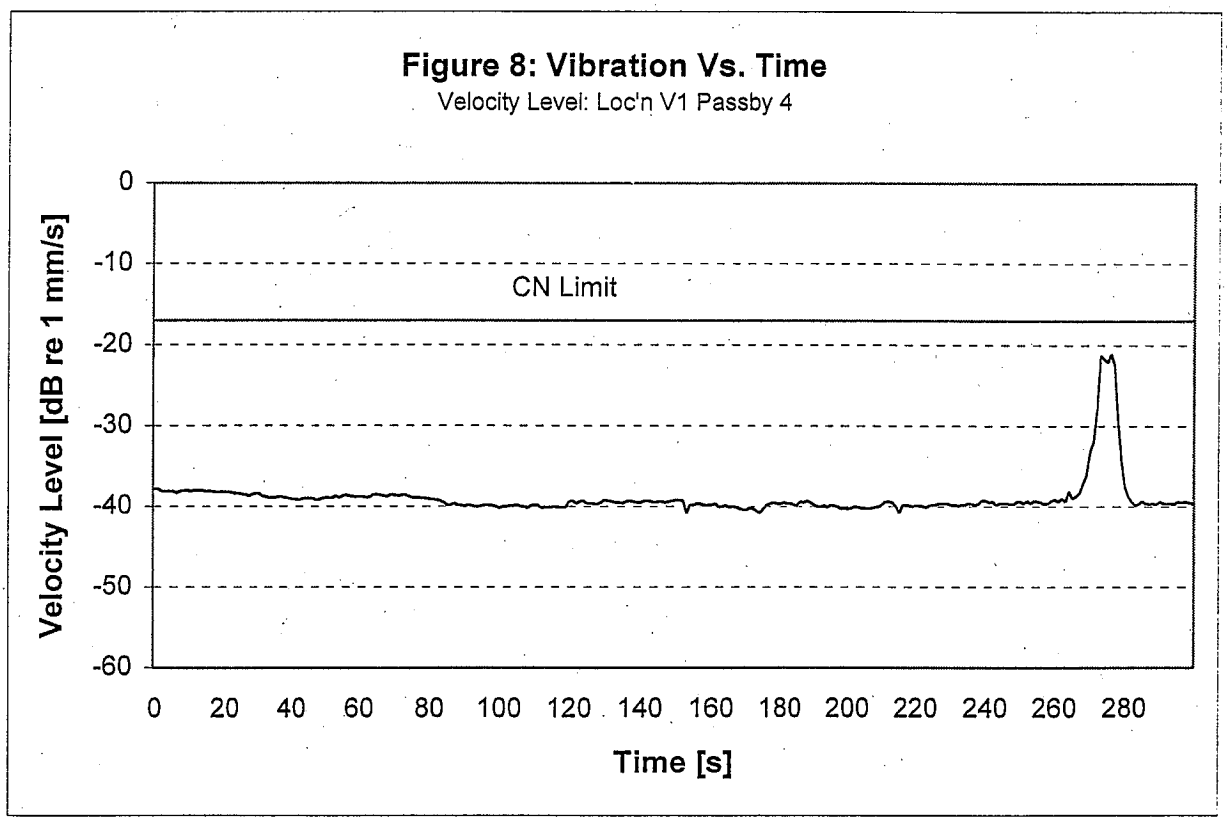


Figure 8: Vibration Vs. Time
Velocity Level: Loc'n V1 Passby 4
Velocity Level [dB re 1 mm/s]
0
-10
-20
-30
-40
-50
-60
CN Limit
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280
Time [s]

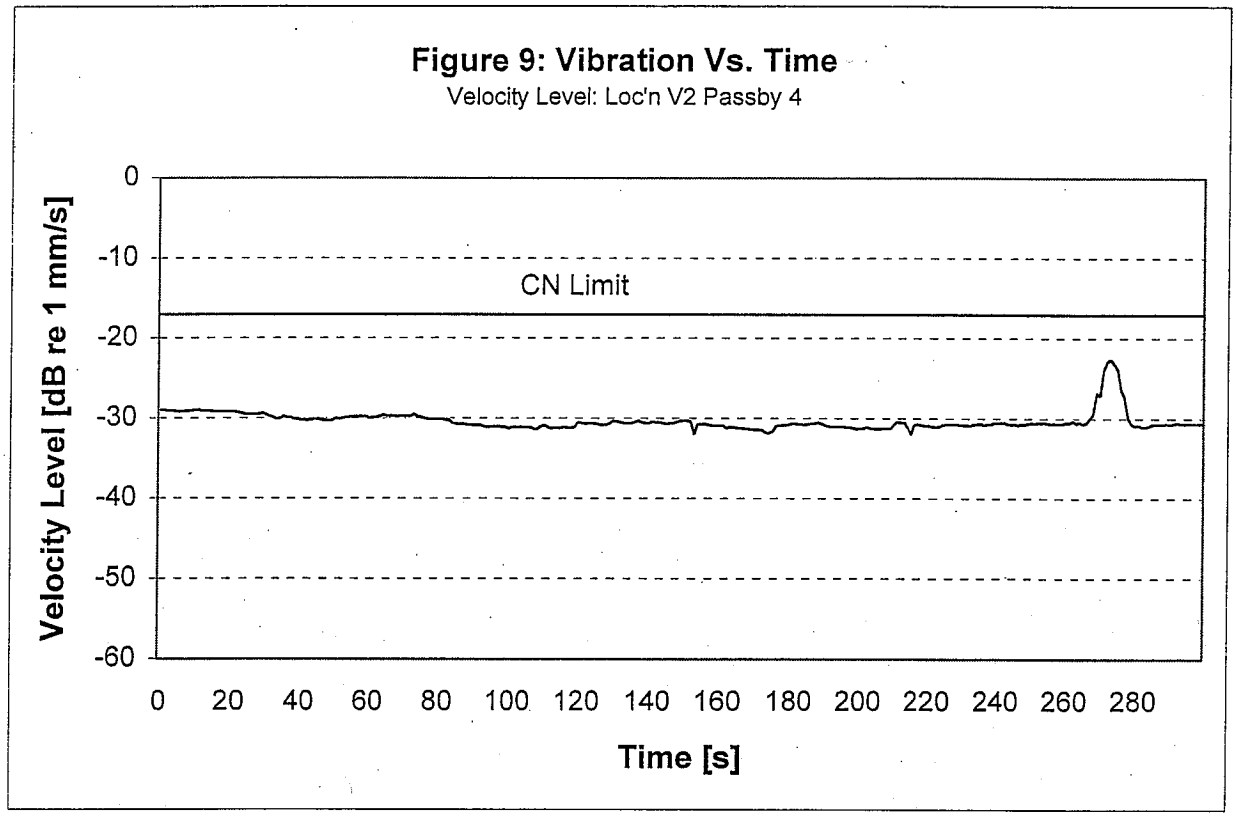


Figure 9: Vibration Vs. Time
Velocity Level: Loc'n V2 Passby 4
Velocity Level [dB re 1 mm/s]
0
-10
-20
-30
-40
-50
-60
CN Limit
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280
Time [s]

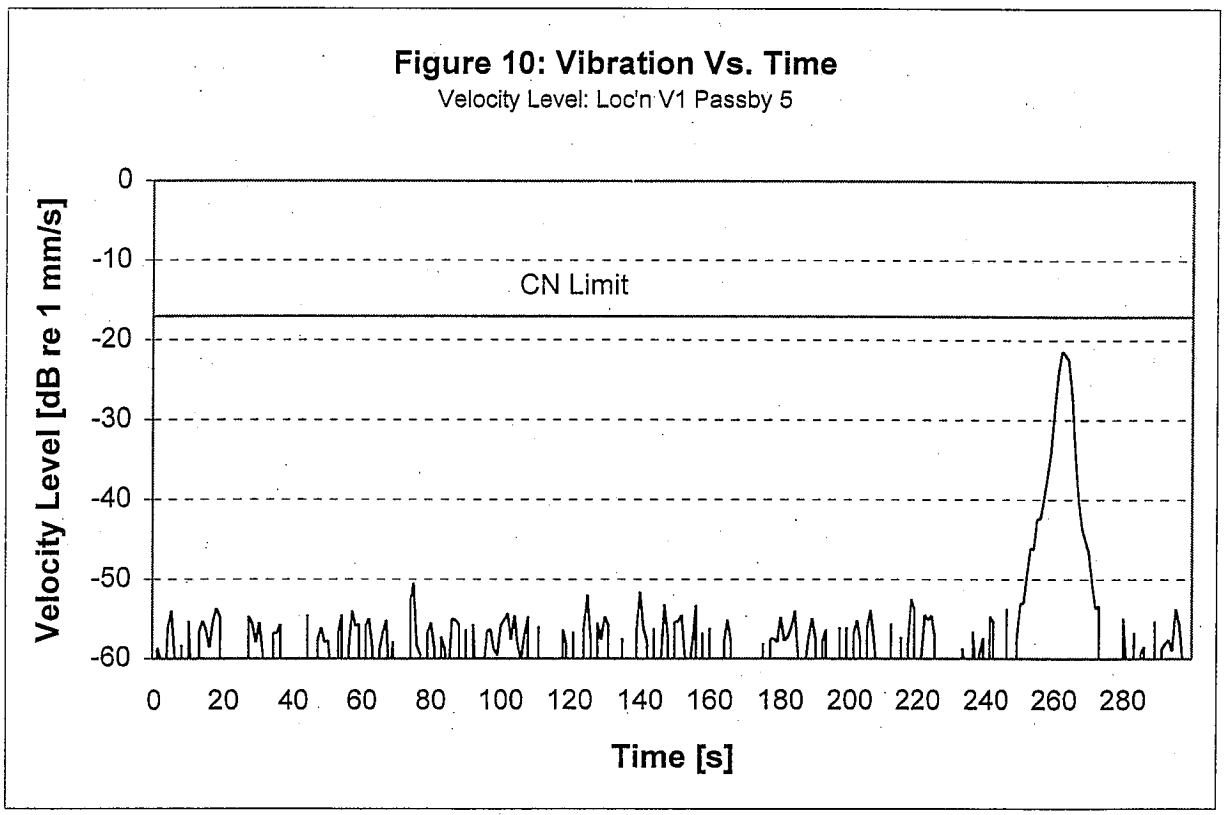


Figure 10: Vibration Vs. Time
Velocity Level: Loc'n V1 Passby 5
Velocity Level [dB re 1 mm/s]
0
-10
-20
-30
-40
-50
-60
CN Limit
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280
Time [s]

Figure 11: Vibration Vs. Time

Velocity Level: Loc'n V2 Passby 5

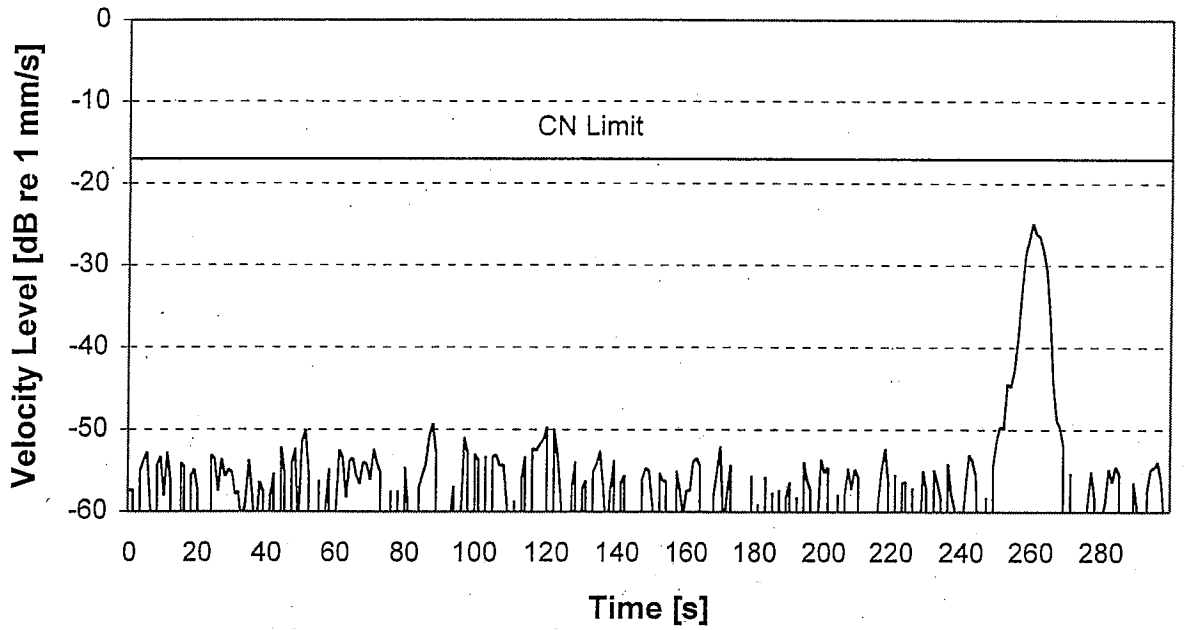
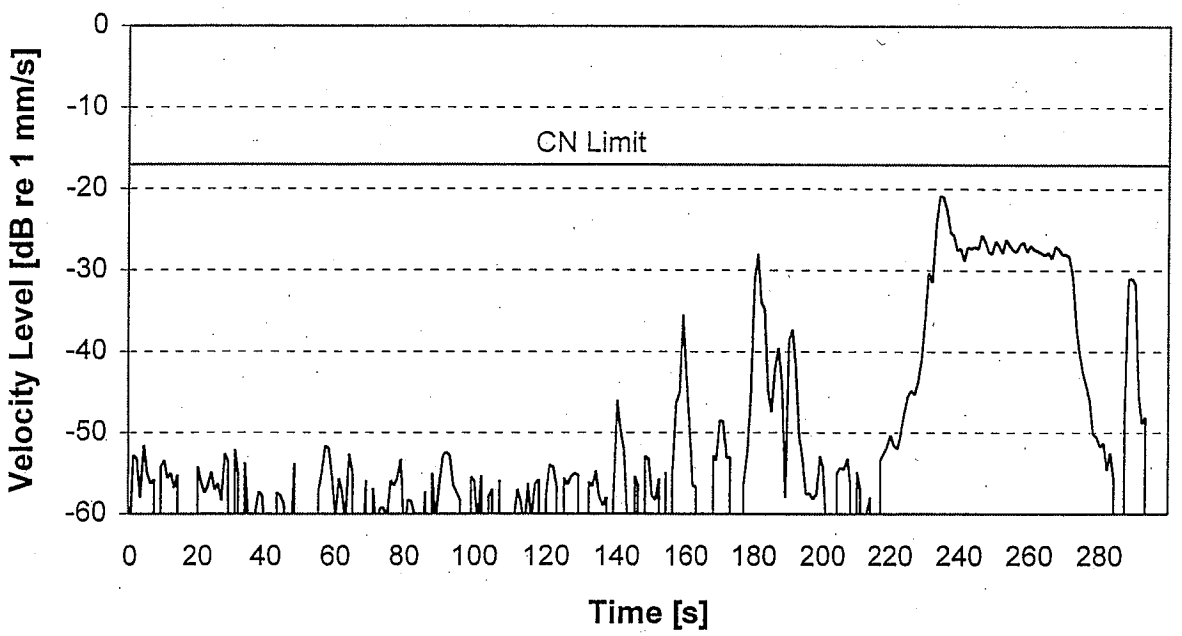


Figure 12: Vibration Vs. Time

Velocity Level: Loc'n V1 Passby 6



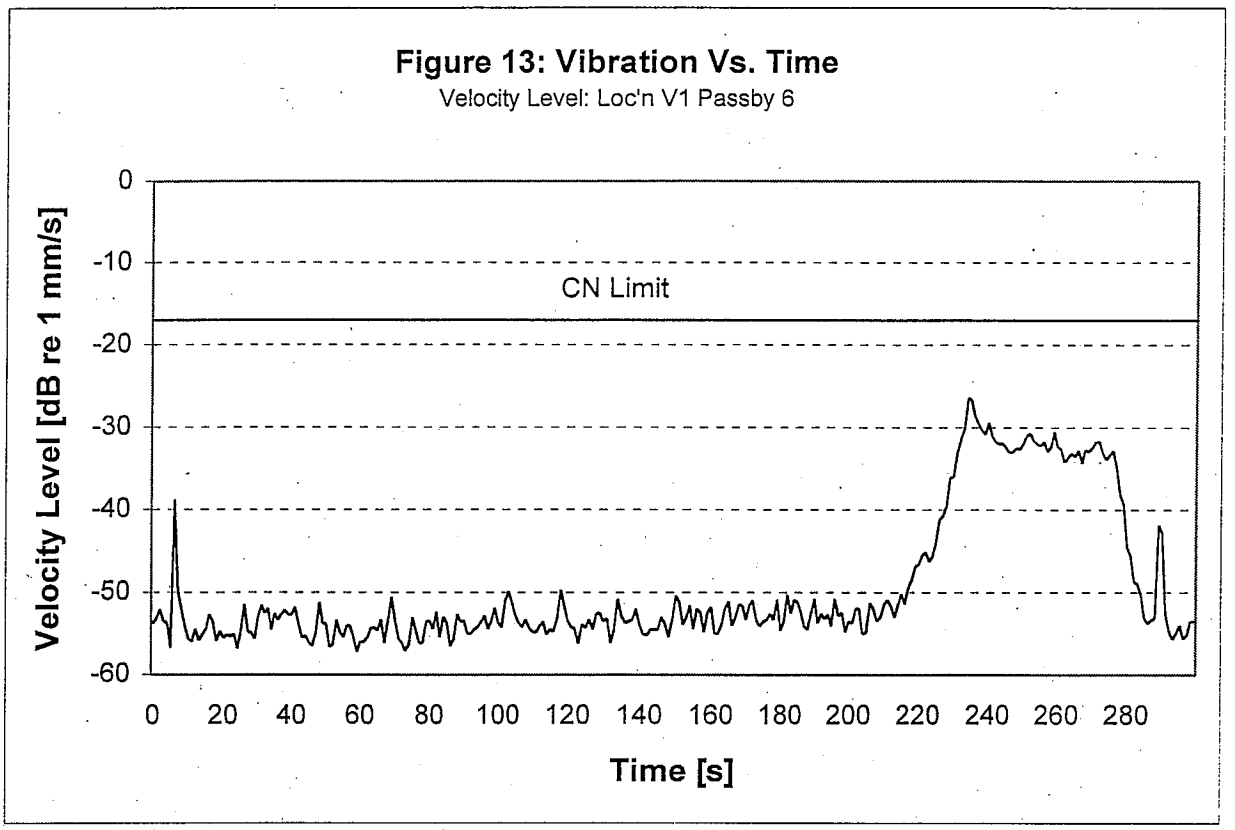


Figure 13: Vibration Vs. Time
Velocity Level: Loc'n V1 Passby 6
Velocity Level [dB re 1 mm/s]
0
-10
-20
-30
-40
-50
-60
CN Limit
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280
Time [s]

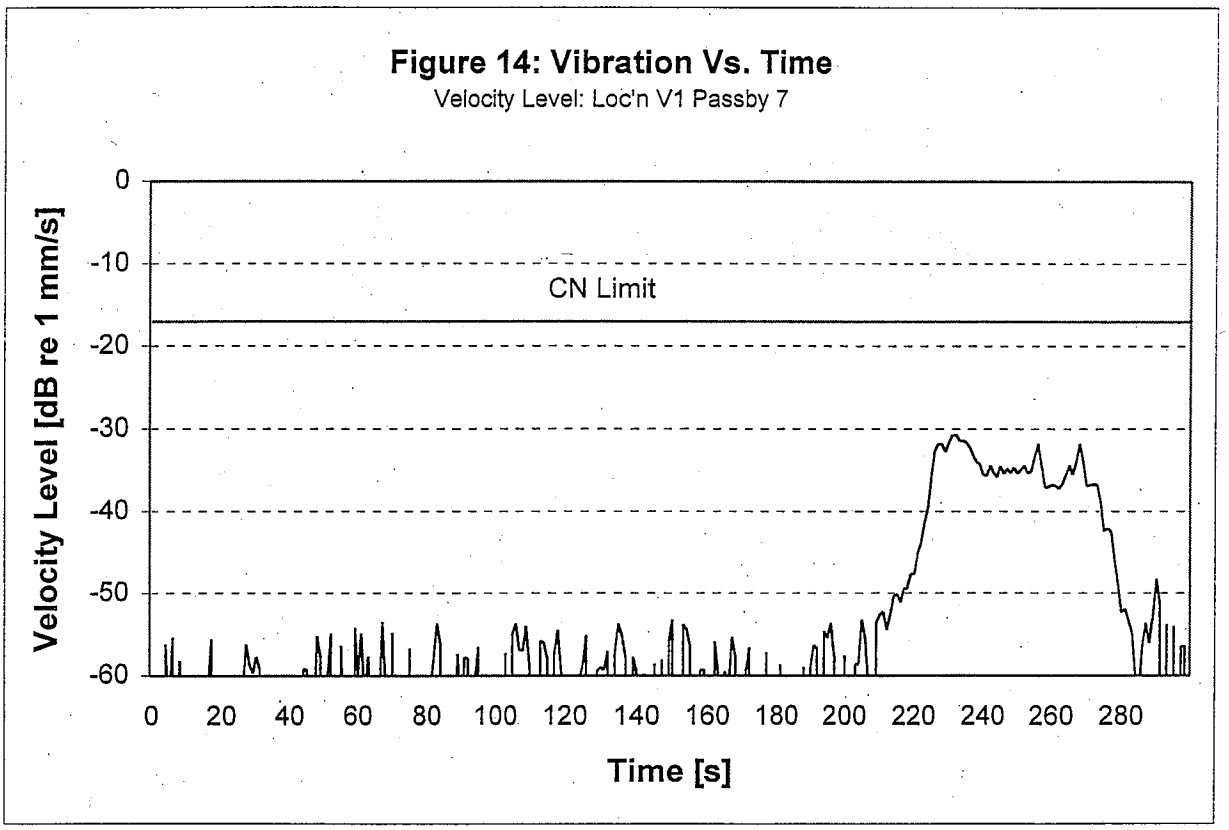


Figure 14: Vibration Vs. Time
Velocity Level: Loc'n V1 Passby 7
Velocity Level [dB re 1 mm/s]
0
-10
-20
-30
-40
-50
-60
CN Limit
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280
Time [s]

Figure 14: Vibration Vs. Time

Velocity Level: Loc'n V2 Passby 7

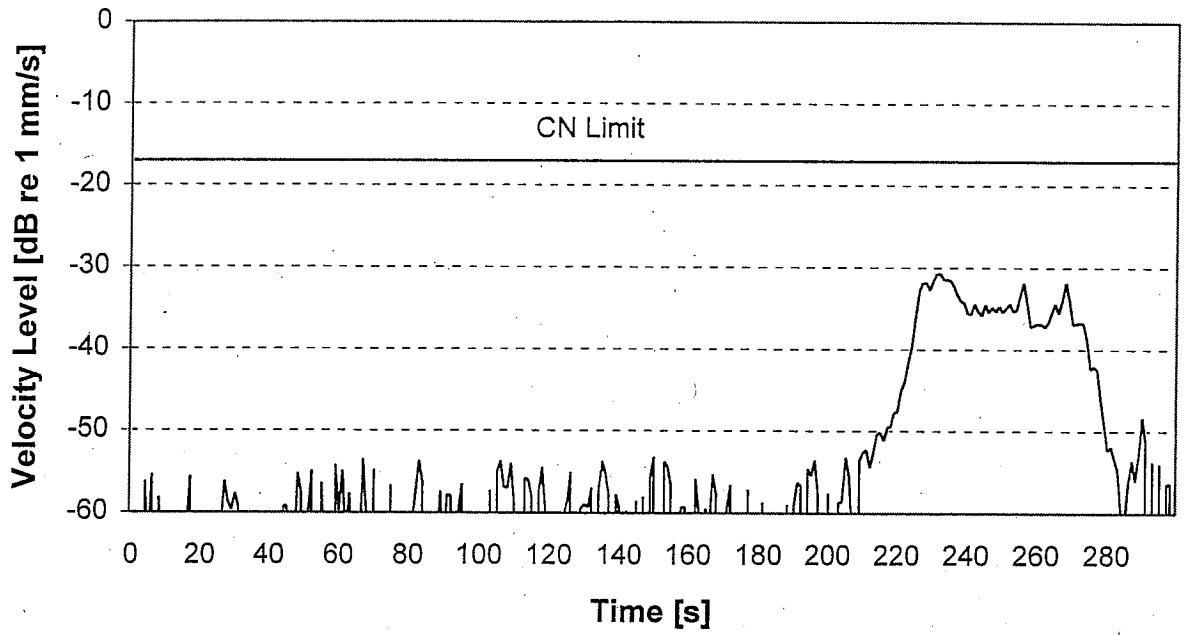
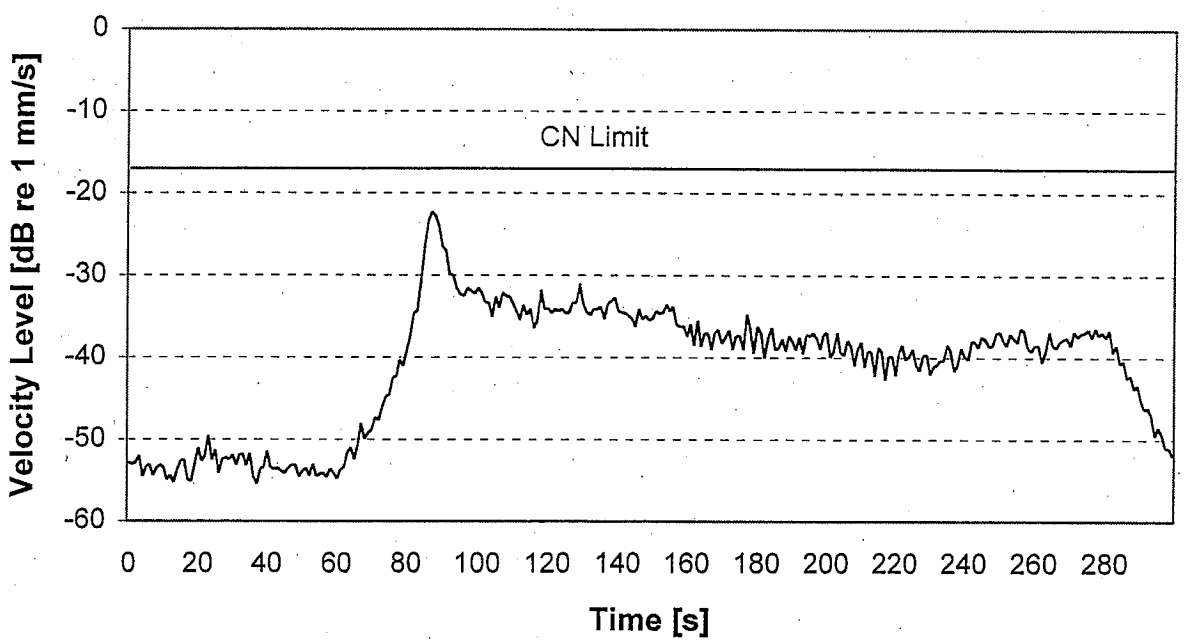


Figure 15: Vibration Vs. Time

Velocity Level: Loc'n V1 Passby 8



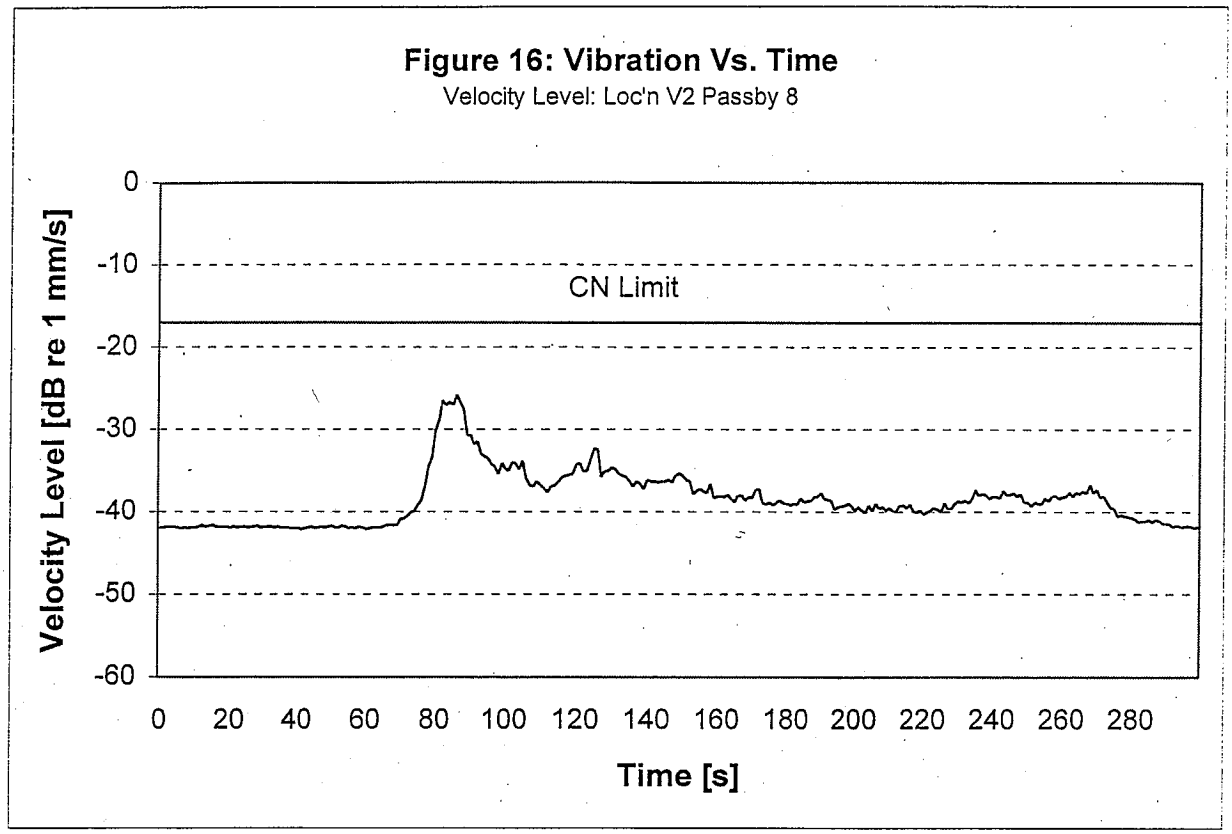


Figure 16: Vibration Vs. Time
Velocity Level: Loc'n V2 Passby 8
Velocity Level [dB re 1 mm/s]
0
-10
-20
-30
-40
-50
-60
CN Limit
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280
Time [s]