aci Acoustical Consultants Inc.
5031-210 Street
Edmonton, Alberta, Canada T6M 0A8
Phone: (780) 414-6373, Fax: (780) 414-6376
www.aciacoustical.com

Environmental Noise Study

For

Southwest Anthony Henday Drive in Edmonton, AB

Prepared for:
AECOM

Prepared by:
S. Bilawchuk, M.Sc., P.Eng.
aci Acoustical Consultants Inc.
Edmonton, Alberta
APEGGA Permit to Practice #P7735

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Executive Summary

aci Acoustical Consultants Inc., of Edmonton AB, was retained by AECOM to conduct an environmental noise assessment for the Southwest section of Anthony Henday Drive (SWAHD) in Edmonton, Alberta. The purpose of the work was to conduct 24-hour environmental noise monitorings at various locations adjacent to the roadway and generate a computer noise model with current and future traffic conditions and compare the results to the Alberta Transportation noise guidelines. The information contained within this report details the results of the 24-hour noise monitorings conducted at 14 locations along SWAHD and provides a comparison to the results obtained from noise monitorings conducted in 2007 at the same locations. The data was also to be used as a calibration tool for a computer noise model of the study area. The site work was conducted for aci from August to October, 2013 by S. Bilawchuk, M.Sc., P.Eng.

Noise Monitoring

The noise monitoring results indicate an increase in the $L_{eq}24$[1] noise levels from 2007 to 2013 ranging from +1.6 to +6.8 dBA at all locations. The relative increases are logical given the various factors that have changed from 2007 to 2013, including:

- Increase in traffic volumes ranging from 2x to 3x;
- Increased posted speed limit from 90 km/hr (with 70 km/hr zones) to 100 km/hr throughout;
- Modifications to the road surface (i.e. milling of concrete and re-paving of some asphalt sections);
- Additional lanes between Lessard Road and Whitemud Drive; and
- Changes to existing interchanges, additions of new interchanges.

The 1/3 octave band frequency data show the typical trend of low frequency noise (near 63 – 80 Hz) resulting from engines and exhaust, as well as mid-high frequency noise (near 1,000 Hz) resulting from tire noise.

Finally, the results from the 2013 noise monitoring indicated that the noise level contributions associated with the concrete surface are essentially identical to those associated with the asphalt surface.

[1] The term L_{eq} represents the energy equivalent sound level. This is a measure of the equivalent sound level for a specified period of time accounting for fluctuations.

This is a slight change from the 2007 noise monitoring results which indicated that the noise contributions from the concrete surface was approximately 1 dBA louder than from the asphalt surface.

Noise Modeling

The noise modeling results for Current Conditions matched well with the noise measurement results. The Current modeled noise levels were below the limit of 65 dBA L_{eq}24 at all of the residential outdoor receptor locations.

The noise modeling results for the Future Conditions (with projected traffic volumes for the Year 2024) indicated noise levels which were still below the limit of 65 dBA L_{eq}24 at all but one location. The location is northeast of the interchange at SWAHD and Rabbit Hill Road. The noise model indicated that the dominant noise source at this receptor is Rabbit Hill Road by at least a 10 dBA margin relative to SWAHD.

A sensitivity analysis of the future traffic volumes, traffic speeds, and % heavy trucks on SWAHD indicated that significant individual increases to each parameter or significant increases to all three combined, would result in a few additional locations with noise levels at or above 65 dBA L_{eq}24. These include the following:

- Receptors to the southwest of the interchange at SWAHD and Whitemud Drive. These receptors currently have no solid fences to act as noise barriers;
- The receptor northeast of the interchange at SWAHD and Rabbit Hill Road at which Rabbit Hill Road is the dominant source; and
- A receptor southwest of the interchange at SWAHD and Calgary Trail at which Calgary Trail and the associated interchange ramps are the dominant noise sources.

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1.0 Introduction

aci Acoustical Consultants Inc., of Edmonton AB, was retained by AECOM to conduct an environmental noise assessment for the Southwest section of Anthony Henday Drive (SWAHD) in Edmonton, Alberta. The purpose of the work was to conduct 24-hour environmental noise monitorings at various locations adjacent to the roadway and generate a computer noise model with current and future traffic conditions and compare the results to the Alberta Transportation noise guidelines. The information contained within this report details the results of the 24-hour noise monitorings conducted at 14 locations along SWAHD and provides a comparison to the results obtained from noise monitorings conducted in 2007[1] at the same locations. The data was also to be used as a calibration tool for a computer noise model of the study area. The site work was conducted for aci from August to October, 2013 by S. Bilawchuk, M.Sc., P.Eng.

2.0 Location Description

2.1. Roadways

The study area for SWAHD spans from south of Stony Plain Road in the northwest end of the City to Calgary Trail / Gateway Boulevard in the southeast end of the City, as indicated in Figures 1a - 1e. Throughout the entire span (approximately 20 km), SWAHD is a twinned road with at least 2-lanes in each direction. From Stony Plain Road to Lessard Road, the road surface is comprised of conventional asphalt pavement (ACP). Starting at Lessard Road, the material used is Portland Cement Concrete Pavement (PCCP). This concrete has a screeded surface with the grooves oriented parallel to the direction of traffic flow. With the exception of the bridges (with asphalt surfaces) along the way, the road surface is PCCP until the interchange at Calgary Trail / Gateway Boulevard. Part of the purpose of the study was to evaluate the noise from the concrete relative to conventional asphalt. The posted speed limit throughout is 100 km/hr. Currently, there are grade separated interchanges at the following locations:

- Stony Plain Road (grade separated interchange, new since 2007)
- 87 Avenue (grade separated interchange, updated since 2007)
- Whitemud Drive (grade separated interchange)
- Callingwood Road / 62 Avenue (grade separated interchange, new since 2007)
- Lessard Road (grade separated interchange, new since 2007)

[1] Data available in the report entitled *"Environmental Noise Survey and Computer Modeling for Southwest Anthony Henday Drive in Edmonton, Alberta"*, prepared for UMA Engineering Ltd., by aci Acoustical Consultants Inc., October 2007

- Cameron Heights Drive (grade separated interchange, new since 2007)
- Terwillegar Drive (grade separated interchange, 1st Stage completed)
- 156 Street / Rabbit Hill Road (grade separated interchange, new since 2007)
- 111 Street (grade separated interchange)
- Calgary Trail / Gateway Boulevard (grade separated interchange, completed since 2007)

Currently, there is limited (right-turn only) access between SWAHD and 127 Street.

For the future case noise modeling scenario the following interchanges have been upgraded to their final design or added as new locations:

- Terwillegar Drive (completion of 2nd Stage interchange by adding second bridge structure and realignment of roadways)
- 127 Street (new grade separated interchange)

2.2. Adjacent Development

Starting from the northwest portion of the study area, the adjacent development between Stony Plain Road and Lessard Road consists largely of single family detached residential development on both sides of SWAHD which back directly onto the Transportation and Utility Corridor (TUC) and SWAHD. There is multi-family development with 4-storey buildings, large individual commercial structures such as churches and commercial shopping developments interspersed on the east and west sides of SWAHD. A majority of the residential areas that back onto SWAHD have direct line-of-sight to SWAHD (over top of the fences) due to a relatively flat topography in between the houses and SWAHD.

South of Lessard Road and west of SWAHD is open field with small acreage style residential lots further to the southwest. Northeast of SWAHD is single family detached residential development which backs directly onto the TUC and the roadway, extending to the east side of Cameron Heights Drive. Further east is the North Saskatchewan River Valley. Some portions of the residential development south of Lessard Road (east of SWAHD) have direct line-of-sight to SWAHD (over top of the fences), while other portions do not because of the topography and trees in between. For residents in Cameron Heights, west of Cameron Heights Drive, there is a masonry noise wall which has been constructed at the rear property line for those who back onto SWAHD. Thus, these residents do not have direct line-of-sight from their backyards to SWAHD. East of Cameron Heights drive, there is a 1.83 m (6 ft) solid screen wood fence as well as some significant earth berms resulting from the interchange ramps. Thus, most of the residential receptors do not have direct line-of-sight to SWAHD.

Single family detached residential development backing onto the TUC and SWAHD, on both sides of SWAHD, continue on the east/south side of the River Valley. Due to the topography and vegetation, residential areas on the west side of SWAHD and those further north on the east side of SWAHD do not have direct line-of-sight to SWAHD. Furth south (closer to Terwillegar Drive), the residents on the east and west sides of SWAHD have direct line-of-sight to the interchange between Terwillegar Drive and SWAHD.

East of Terwillegar Drive and north of SWAHD is residential development comprised of single family detached houses and multi-family condominium 4-storey structures which back onto the TUC and SWAHD. The majority of these developments have direct line-of-sight to SWAHD (over top of the fences). To the south/west of SWAHD and south of Terwillegar Drive is commercial development with large "box" stores. There is a small portion of single family detached residential development to the east of the commercial development and further residential development further to the south. There is also a single acreage-style residential location west of 156 Street and south of SWAHD. All of these areas have direct line-of-sight to SWAHD (over top of fences)

East of Rabbit Hill Road and north of SWAHD is residential development comprised of single family detached houses. Immediately east of Rabbit Hill Road, the development backs directly onto the TUC and SWAHD with direct line-of-sight (over top of fences). Further east, the residential development is limited to the north of the Whitemud Creek Ravine which is further north of the TUC boundary. Most of these locations do not have direct line-of-sight to SWAHD due to the topography and vegetation. South of SWAHD and east of Rabbit Hill Road is industrial development operated by the City of Edmonton including a transit maintenance facility, a winter snow storage facility, and an ECO waste and recycling station. Further east is the University of Alberta south farm area.

Between 127 Street and Calgary Trail / Gateway Boulevard the adjacent development consists largely of single family detached residential development on both sides of SWAHD which back directly onto the TUC and SWAHD. There are also some developments of multi-family structures with 4-storey buildings. Most of the residential areas have direct line-of-sight to SWAHD (over top of fences) while some portions do not have line-of-sight due to topographical features and vegetation in between.

2.3. Topography

Topographically, the land surrounding the SWAHD between Stony Plain Road and Lessard Road is generally flat with only small hills between the roadway and the residential structures. The ground is covered with field grasses and small patches of trees and bushes. South of Lessard Road, is the Wedgewood Ravine which is a small ravine filled with tall trees and bushes. This provides a moderate level of sound absorption for the houses nearby. Further to the southeast, within the River Valley, the road reduces in elevation where it crosses the river with two separate bridges then increases in elevation on the southeast side. Within this area, the ground is covered with trees, bushes, and field grasses.

Beyond the River Valley to the southeast, the land is generally flat and covered with field grasses and small patches of trees and bushes. This continues until the Whitemud Creek Ravine, which is again a small ravine filled with trees and bushes. Further east, the land is again generally flat and covered with field grasses until the Blackmud Creek Ravine where there is a small band of trees and bushes. Beyond this continuing east, the land is flat and covered with field grasses until the interchange at Calgary Trail / Gateway Boulevard.

3.0 Measurement & Modeling Methods

3.1. Environmental Noise Monitoring

As part of the study a total of fourteen (14) 24-hour environmental noise monitorings were conducted throughout the study area. The noise monitoring locations, as indicated in Figures 1a - 1e, were selected based on their proximity to SWAHD and adjacent interchanges as well as adjacent residential receptors. All fourteen locations were identical to those used in 2007. A detailed description of each location is provided below. The measurements were conducted collecting broadband A-weighted as well as 1/3-octave band sound levels. This enabled a detailed analysis of the noise climate. The noise monitorings were conducted on weekdays under "typical" traffic conditions. In particular, measurements avoided any holidays, major construction activity that would re-route traffic nearby, and other occurrences which would affect the normal traffic on the road. In addition, the monitorings were conducted in summer-like conditions (i.e. no snow cover) with dry road surfaces, no precipitation, and low wind-speeds. The monitorings were accompanied by a 24-hour digital audio recording for more detailed post process analysis. Finally, a portable weather monitor was used within the area to obtain local weather conditions. Refer to Appendix I for a detailed description of the measurement equipment used, Appendix II for a description of the acoustical terminology, and Appendix III for a list of common noise sources. All noise measurement instrumentation was calibrated at the start of each measurement and then checked afterwards to ensure that there had been negligible calibration drift over the duration of the measurement period.

Noise Monitor 1

Noise Monitor 1 was located approximately 400 m north of 87 Avenue and 440 m east of SWAHD (northbound lanes) as shown in Figure 1a and Figure 2. This put the noise monitor approximately 15 m west of the rear property line for the residence at 9004–190 Street. At this location, there was direct line-of-sight to SWAHD, 87 Avenue, and the interchange between the two. The 2007 noise monitor was started at 08:00 on Monday May 14, 2007 and ran for 24-hours until 08:00 on Tuesday May 15, 2007. The 2013 noise monitor was started at 03:00 on Tuesday September 10, 2013 and ran for 24-hours until 03:00 on Wednesday, September 11, 2013.

Noise Monitor 2

Noise Monitor 2 was located approximately 165 m north of Whitemud Drive and 400 m west of SWAHD (southbound lanes) as shown in Figure 1a and Figure 3. This put the noise monitor approximately 3 m southeast of the rear property line for the residence at 348 Pearson Crescent (Lewis Estates). At this location, there was direct line-of-sight to SWAHD, Whitemud Drive, and the interchange between the two. The 2007 noise monitor was started at 08:30 on Monday May 14, 2007 and ran for 24-hours until 08:30 on Tuesday May 15, 2007. The 2013 noise monitor was started at 04:00 on Wednesday October 23, 2013 and ran for 24-hours until 04:00 on Thursday October 24, 2013.

Noise Monitor 3

noise Monitor 3 was located approximately 300 m south of Whitemud Drive and 400 m east of SWAHD (northbound lanes) as shown in Figure 1b and Figure 4. This put the noise monitor on top of a small hill approximately 50 m west of the residence at 7419–190A Street (across the street). At this location, there was direct line-of-sight to SWAHD, and the interchange between SWAHD and Whitemud Drive as well as partial line-of-sight to Whitemud Drive. The 2007 noise monitor was started at 09:00 on Monday May 14, 2007 and ran for 24-hours until 09:00 on Tuesday May 15, 2007. The 2013 noise monitor was started at 03:00 on Tuesday September 10, 2013 and ran for 24-hours until 03:00 on Wednesday, September 11, 2013.

Noise Monitor 4

Noise Monitor 4 was located approximately 550 m north of 62 Avenue and 240 m east of SWAHD (northbound lanes) as shown in Figure 1b and Figure 5. This put the noise monitor adjacent to the TUC fence and approximately 7 m west of the rear fence of the residence at 1255 Ormsby Lane. At this location, there was direct line-of-sight to SWAHD. The 2007 noise monitor was started at 09:30 on Monday May 14, 2007 and ran for 24-hours until 09:30 on Tuesday May 15, 2007. The 2013 noise monitor was started at 03:00 on Tuesday September 10, 2013 and ran for 24-hours until 03:00 on Wednesday, September 11, 2013.

Noise Monitor 5

Noise Monitor 5 was located approximately 400 m north of Lessard Road and 225 m east of SWAHD (northbound lanes) as shown in Figure 1b and Figure 6. This put the noise monitor approximately 10 m west of the rear fence of the residence at 19055–49 Avenue. At this location, there was direct line-of-sight to SWAHD and partial line-of-sight to Lessard Road. The 2007 noise monitor was started at 10:00 on Monday May 14, 2007 and ran for 24-hours until 10:00 on Tuesday May 15, 2007. The 2013 noise monitor was started at 18:00 on Wednesday August 14, 2013 and ran for 24-hours until 18:00 on Thursday August 15, 2013.

Noise Monitor 6

Noise Monitor 6 was located approximately 810 m south of Lessard Road and 100 m northeast of (perpendicular to) SWAHD (northbound lanes) as shown in Figure 1c and Figure 7. This put the noise monitor approximately 40 m west of the rear fence of the residence at 1644 Welbourn Cove (Wedgewood Heights). At this location, there was partial line-of-sight to SWAHD through a row of trees. The 2007 noise monitor was started at 11:00 on Tuesday May 15, 2007 and ran for 24-hours until 11:00 on Wednesday May 16, 2007. The 2013 noise monitor was started at 06:00 on Tuesday August 13, 2013 and ran for 24-hours until 06:00 on Wednesday August 14, 2013.

Noise Monitor 7

Noise Monitor 7 was located approximately 370 m west of Cameron Heights Drive and 50 m north of (perpendicular to) SWAHD (northbound lanes) as shown in Figure 1c and Figure 8. This put the noise monitor approximately 12 m south of the rear fence of the residence at 151 Caldwell Way (Cameron Heights). At this location, there was direct line-of-sight to SWAHD. The 2007 noise monitor was started at 12:00 on Tuesday May 15, 2007 and ran for 24-hours until 12:00 on Wednesday May 16, 2007. The 2013 noise monitor was started at 06:00 on Tuesday August 13, 2013 and ran for 24-hours until 06:00 on Wednesday August 14, 2013.

Noise Monitor 8

Noise Monitor 8 was located approximately 800 m north of Terwillegar Drive and 240 m northeast of (perpendicular to) SWAHD (northbound lanes) as shown as shown in Figure 1c and Figure 9. This put the noise monitor approximately 5 m west of the rear fence-line of the residence at 1622 Haswell Court (Haddow). At this location, there was no line-of-sight to SWAHD due to the small hill/berm to the west of the noise monitor. The 2007 noise monitor was started at 12:30 on Tuesday May 15, 2007 and ran for 24-hours until 12:30 on Wednesday May 16, 2007. The 2013 noise monitor was started at 00:00 on Wednesday October 30, 2013 and ran for 24-hours until 00:00 on Thursday October 31, 2013.

Noise Monitor 9

Noise Monitor 9 was located approximately 750 m west of the bridge over Whitemud Creek Ravine midway between the east and west bound lanes for SWAHD as shown in Figure 1d and Figure 10. This put the monitor exactly 14 m from the yellow-line in each direction with obvious line-of-sight to each direction. The road surface at this location was Concrete. The 2007 noise monitor was started at 13:30 on Tuesday May 15, 2007 and ran for 24-hours until 13:30 on Wednesday May 16, 2007. The 2013 noise monitor was started at 06:00 on Tuesday August 13, 2013 and ran for 24-hours until 06:00 on Wednesday August 14, 2013.

Noise Monitor 10

Noise Monitor 10 was located approximately 170 m west of the bridge over Whitemud Creek Ravine midway between the east and west bound lanes for SWAHD as shown in Figure 1d and Figure 11. This put the monitor exactly 14 m from the yellow-line in each direction with obvious line-of-sight to both eastbound and westbound traffic. The road surface at this location was conventional Asphalt. The 2007 noise monitor was started at 13:30 on Tuesday May 15, 2007 and ran for 24-hours until 13:30 on Wednesday May 16, 2007. The 2013 noise monitor was started at 06:00 on Tuesday August 13, 2013 and ran for 24-hours until 06:00 on Wednesday August 14, 2013.

Noise Monitor 11

Noise Monitor 11 was located approximately 200 m north of SWAHD (westbound lanes) and 900 m west of 111 Street, as shown in Figure 1d and Figure 12. This put the noise monitor approximately 8 m south of the rear fence-line of the residence at 803 – 115A Street (Twin Brooks). At this location, there was direct line-of-sight to SWAHD with just a small hill/berm to the south of the noise monitor (negligible effect on the sound propagation between SWAHD and the monitor). The 2007 noise monitor was started at 11:00 on Wednesday May 30, 2007 and ran for 24-hours until 11:00 on Thursday May 31, 2007. The 2013 noise monitor was started at 06:00 on Tuesday August 13, 2013 and ran for 24-hours until 06:00 on Wednesday August 14, 2013.

Noise Monitor 12

Noise Monitor 12 was located approximately 240 m south of SWAHD (eastbound lanes) and 160 m west of 111 Street, as shown in Figure 1d and Figure 13. This put the noise monitor approximately 50 m north of the multi-family building on MacEwan Road. At this location, there was direct line-of-sight to SWAHD (west of the on-ramp), to 111 Street, and to the ramp from SWAHD eastbound to 111 Street. The 2007 noise monitor was started at 13:30 on Thursday May 31, 2007 and ran for 24-hours until 13:30 on Friday June 1, 2007. The 2013 noise monitor was started at 10:00 on Wednesday August 28, 2013 and ran for 24-hours until 10:00 on Thursday August 29, 2013.

Noise Monitor 13

Noise Monitor 13 was located approximately 550 m south of AHD (eastbound lanes) and 90 m west of Calgary Trail, as shown in Figure 1e and Figure 14. This put the noise monitor directly adjacent to the rear fence-line of the residence at 363 Blackburn Drive East. The noise monitor was elevated approximately 0.2 m above the fence height to eliminate reflections. At this location, there was direct line-of-sight to Calgary Trail but none to SWAHD due to the topography associated with the interchange. The 2007 noise monitor was started at 11:30 on Wednesday May 30, 2007 and ran for 24-hours until 11:30 on Thursday May 31, 2007. The 2013 noise monitor was started at 10:00 on Wednesday August 28, 2013 and ran for 24-hours until 10:00 on Thursday August 29, 2013.

Noise Monitor 14

Noise Monitor 14 was located approximately 320 m north of SWAHD (eastbound lanes) and 340 m west of Calgary Trail, as shown in Figure 1e and Figure 15. This put the noise monitor approximately 8.0 m south of the rear fence-line of the residence at 10459 – 105 Street. At this location, there was direct line-of-sight to Calgary Trail, to the interchange, and to sections of SWAHD east of the interchange. The 2007 noise monitor was started at 12:00 on Wednesday May 30, 2007 and ran for 24-hours until 12:00 on Thursday May 31, 2007. The 2013 noise monitor was started at 06:00 on Tuesday August 13, 2013 and ran for 24-hours until 06:00 on Wednesday August 14, 2013.

3.2. Computer Noise Modeling

The computer noise modeling was conducted using the CADNA/A (version 4.3.143) software package. CADNA/A allows for the modeling of various noise sources such as road, rail, and various stationary sources. In addition, topographical features such as land contours, vegetation, and bodies of water can be included. Finally, meteorological conditions such as temperature, relative humidity, wind-speed and wind-direction can be included in the calculations.

The default calculation method for traffic noise in CADNA/A follows the German Standard RLS-90. It is aci's experience that this calculation method is accurate under the conditions present for this study, with a tendency to slightly over-predict potential noise levels (i.e. resulting in conservative values). The calculation method used for noise propagation follows the ISO standard 9613-2. All receiver locations were assumed as being downwind from the source(s). In particular, as stated in Section 5 of the ISO document:

> *"Downwind propagation conditions for the method specified in this part of IS0 9613 are as specified in 5.4.3.3 of IS0 1996-2:1987, namely*
> - *wind direction within an angle of ± 45^0 of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region, with the wind blowing from source to receiver, and*
> - *wind speed between approximately 1 m/s and 5 m/s, measured at a height of 3 m to 11 m above the ground.*
>
> *The equations for calculating the average downwind sound pressure level LAT(DW) in this part of IS0 9613, including the equations for attenuation given in clause 7, are the average for meteorological conditions within these limits. The term average here means the average over a short time interval, as defined in 3.1.*
> *These equations also hold, equivalently, for average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights".*

Throughout the study area, the ground was given an absorption coefficient of 0.5. Field grasses were added where appropriate to match existing conditions in addition to providing a calibration of the modeled results compared to the measured results at the various noise monitoring locations. Therefore, all sound level propagation calculations are considered conservatively representative of summertime conditions for all surrounding residents.

Note that not every commercial building and house in the area was modeled. Only the first row of buildings (in relation to the major roadways) were included, since these are the ones which will have the highest sound levels and will result in the greatest impact and level of shielding for structures further in.

As part of the study, various scenarios were modeled including:

1) Current conditions: This included existing road configurations and traffic volumes present during the noise monitoring (2013). The noise monitoring data was used as a calibration method for the model.
2) Future conditions: This included road configurations and interchanges with projected traffic volumes for the year 2024.
3) Future conditions (as in Item #2) with a sensitivity analysis: This involved modification of various traffic parameters (listed below) to determine their effect on noise levels.
    a. Traffic counts
    b. Traffic speeds

c. Traffic composition (i.e. % heavy vehicles)
d. All of (a), (b), and (c) combined

The computer noise modeling results were calculated in two ways. First, sound levels were calculated at specific receiver locations. This included the noise monitor locations as well as numerous representative residential locations. Next, the sound levels were calculated using a 5 m x 5 m grid over the entire study area for the Current and Future conditions. This provided color noise contours for easier visualization of the results.

Refer to Appendix IV for a list of the computer noise modeling parameters.

4.0 Permissible Sound Levels

Environmental noise levels from road traffic are commonly described in terms of equivalent sound levels or L_{eq}. This is the level of a steady sound having the same acoustic energy, over a given time period, as the fluctuating sound. In addition, this energy averaged level is A–weighted to account for the reduced sensitivity of average human hearing to low frequency sounds. These L_{eq} in dBA, which are the most common environmental noise measure, are often given for day-time (07:00 to 22:00) L_{eq}Day and night-time (22:00 to 07:00) L_{eq}Night while other criteria use the entire 24-hour period as L_{eq}24.

The criterion used to evaluate the road noise in the study area is based on the document entitled *"Noise Attenuation Guidelines for Provincial Highways Under Provincial Jurisdiction Within Cities and Urban Areas"* by Alberta Transportation. The document specifies:

> "For construction or improvements of highways through cities and other urban areas, Alberta Transportation will adopt a noise level of 65 dBA L_{eq}24 measured 1.2 m above ground level and 2 meters inside the property line (outside the highway right-of-way). The measurements should be adjusted to the 10-year planning horizon, as a threshold to consider noise mitigation measures"

As such, the criterion used to assess the noise levels in the computer noise model will be **65 dBA L_{eq}24** for all current dwellings at a height of 1.2 m above grade. For typical residential lots that back or "side" onto the provincial roadway, the assessment will be taken at 2 m inside the residential property line in the back-yard amenity space. For typical residential lots that "front" onto the provincial highway, noise levels will be assessed at 2 m inside the residential property line in the front yard. Note also that the criteria state that a 10-year planning horizon (year 2023) should be used for the *future* conditions. The closest information available from Alberta Transportation was for year 2024, which is slightly conservative relative to 2023.

5.0 Noise Monitoring Results

5.1. Noise Monitor Results

The results obtained from the environmental noise monitorings are shown in Table 1 and Figures 16 – 43 (broadband A-weighted L_{eq} sound levels and 1/3 octave band L_{eq} sound levels provided). It should be noted that the data have been adjusted by the removal of non-typical noise events such as loud aircraft flyovers (the noise modeling does not account for aircraft), pedestrians, dogs making noise nearby, abnormally loud vehicle passages, etc. At all locations, the resultant 1/3 octave band L_{eq} sound levels were very similar. All locations show the typical trend of low frequency noise (near 63 – 80 Hz) resulting from engines and exhaust, as well as mid-high frequency noise (near 1,000 Hz) resulting from tire noise. These results confirm that the noise levels being measured by the noise monitors were largely attributed to SWAHD in addition to the other major roadways. Some locations also show elevated peaks near 5 - 8 kHz which are related to bird chirping nearby. Subjectively, there were some locations at which the adjacent City of Edmonton roads were the dominant noise sources due to the relative distances from the noise monitor to the City roads and to SWAHD.

Table 1 shows the data obtained during both the 2013 and the 2007 noise monitoring periods as well as the relative difference between the two for all 14 noise monitoring locations. The results for both noise monitoring periods are also provided in the 1/3 octave band L_{eq} sound levels in Figures 16 - 43.

Table 1. 2013 Noise Monitoring Results

Monitor	2007 L_{eq}24 (dBA)	2013 L_{eq}24 (dBA)	L_{eq}24 Difference (dBA)		2007 L_{eq}Day (dBA)	2013 L_{eq}Day (dBA)	L_{eq}Day Difference (dBA)		2007 L_{eq}Night (dBA)	2013 L_{eq}Night (dBA)	L_{eq}Night Difference (dBA)
M1	53.5	59.8	6.3		53.3	60.4	7.2		54.0	58.7	4.7
M2	54.9	60.6	5.7		54.7	61.8	7.2		55.3	57.2	1.9
M3	53.0	59.4	6.4		53.6	59.9	6.3		51.8	58.4	6.6
M4	56.6	62.0	5.5		56.6	62.7	6.1		56.5	60.4	4.0
M5	55.5	59.4	3.9		55.0	60.3	5.2		56.1	57.2	1.1
M6	57.2	60.5	3.3		58.1	61.5	3.4		55.1	58.0	2.9
M7	65.7	70.6	4.9		66.8	71.8	5.0		62.8	67.1	4.3
M8	52.1	55.6	3.5		52.5	56.0	3.5		51.2	54.8	3.6
M9	73.8	77.3	3.5		75.0	78.6	3.6		70.4	73.4	3.0
M10	72.8	77.0	4.2		74.0	78.3	4.2		69.3	73.3	4.0
M11	56.4	58.0	1.6		57.0	58.4	1.4		55.1	57.3	2.2
M12	50.7	57.5	6.8		51.7	58.1	6.4		48.2	56.3	8.1
M13	60.7	63.7	3.0		61.4	64.8	3.4		59.0	60.8	1.9
M14	55.3	57.1	1.8		55.7	57.5	1.8		54.5	56.2	1.7

The noise monitoring results indicate an increase in the L_{eq}24 noise levels from 2007 to 2013 ranging from +1.6 to +6.8 dBA at all locations. The relative increases are logical given the various factors that have changed from 2007 to 2013, including:

- Increase in traffic volumes ranging from 2x to 3x;
- Increased posted speed limit from 90 km/hr (with 70 km/hr zones) to 100 km/hr throughout;
- Modifications to the road surface (i.e. milling of concrete and re-paving of some asphalt sections);
- Additional lanes between Lessard Road and Whitemud Drive; and
- Changes to existing interchanges, additions of new interchanges.

In addition to the noise monitoring results at the various locations near residential areas, two of the locations (M9 & M10) were directly between the eastbound and westbound lanes of AHD. M9 was adjacent to a section of the road surfaced with concrete and M10 was adjacent to a section of the road surfaced with asphalt. There were no on/off ramps between these two sections, meaning that the traffic volumes and speeds were identical between the two. The results in Table 1 indicate that the noise levels between the two road surfaces are essentially identical. Further, Figure 44 shows the 1/3 octave band sound levels between the two road surfaces. Again, there is no fundamental difference between the two. Particularly, the differences are generally much less than what would be discernible to most people[1]. In 2007, the same study indicated that the noise contributions from the concrete road surface was approximately 1 dBA louder within all of the middle-high frequency bands. Over time, with milling on the concrete surface and wear on both road surfaces, the gap between the two has narrowed.

[1] In general, a difference of 1 – 2 dB is the threshold for humans to notice that there has been a change in sound level.

5.2. Weather Conditions

The weather conditions for Noise Monitor 2 (October 23 – 24, 2013) had a wind from the east/southeast/south for the entire time with low wind speeds from 04:00 until approximately 22:00. After 22:00, the wind increased but not enough to cause significant wind-noise at the microphone. The wind conditions were favourable for the adjacent section of SWAHD and Whitemud Drive towards the noise monitor.

The weather conditions for noise monitors 1, 3, & 4 (September 10 – 11, 2013) had a westerly wind for the entire noise monitoring period. For most of the noise monitoring period, the wind speeds were relatively low. However, there was a period between approximately 12:00 - 18:00 where the wind peaked near approximately 25 km/hr. For noise monitors 1 & 4, the higher wind speeds had no significant impact on the noise monitoring results. For noise monitor 3, however, there was a brief period of 6-minutes where the data were removed because of excessive wind generated noise. In general, the wind conditions were favourable for the adjacent sections of SWAHD towards the noise monitors.

The weather conditions for noise monitor 5 (August 14 – 15, 2013) had a generally southerly wind with low wind speeds from 18:00 - 10:00. After 10:00, the wind increased and shifted to the west and then to the north by approximately 14:00 with a peak wind speed of approximately 23 km/hr by 13:00. The peak at 13:00 had no impact on the noise monitoring results. In general, the wind conditions were favourable for the adjacent sections of SWAHD towards the noise monitor.

The weather conditions for noise monitors 6, 7, 9, 10, 11, & 14 (August 13 – 14, 2013) had a generally southerly wind with low wind speeds (less than 10 km/hr) for the duration of the noise monitoring period. The wind conditions were favourable from the adjacent sections of SWAHD towards the noise monitors.

The weather conditions for noise monitor 8 (October 30 – 31, 2013) had a generally southwest or west wind with low wind speeds (5 - 15 km/hr) for the duration of the noise monitoring period. The wind conditions were favourable for the adjacent sections of SWAHD towards the noise monitor.

The weather conditions for noise monitors 12 & 13 (August 28 – 29, 2013) had a generally easterly wind with low wind speeds from 10:00 - 17:00. After 17:00, the wind shifted to the north for the remainder of the noise monitoring period. The wind conditions were favourable for the adjacent sections of SWAHD towards the noise monitors.

Weather data for the duration of the environmental noise monitorings is presented in Appendix V.

6.0 Noise Modelling Results

6.1. Current Conditions

The results of the noise modeling under current conditions at the noise monitoring locations are presented in Table 2. The $L_{eq}24$, L_{eq}Day and L_{eq}Night sound levels are presented as well as the difference in the $L_{eq}24$ sound levels relative to the monitor results at each location. It can be seen that the modeled sound levels compare very well with the monitored results at each location. Most locations resulted in a slightly higher $L_{eq}24$ result in the noise model relative to the measured data, which is conservative. The largest difference between modeled and measured results was only 0.4 dBA which is very accurate.

Table 2. Noise Modeling Results Under Current Conditions at Monitor Locations

Monitor	$L_{eq}24$ (dBA)	Difference Relative to Monitor Results $L_{eq}24$ (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
M1	59.5	-0.3	61.0	55.1
M2	61.0	0.4	62.5	56.6
M3	59.7	0.3	61.1	55.2
M4	61.9	-0.1	63.3	57.5
M5	59.5	0.1	60.9	55.1
M6	60.8	0.3	62.2	56.4
M7	70.5	-0.1	71.9	66.2
M8	55.2	-0.4	56.6	50.8
M9	77.3	0.0	78.7	72.9
M10	77.0	0.0	78.4	72.6
M11	58.1	0.1	59.5	53.7
M12	57.6	0.1	59.0	53.2
M13	64.0	0.3	65.4	59.6
M14	57.4	0.4	58.8	53.0

The results of the Current Conditions noise modeling at the various residential property locations are presented in Tables 3a - 3h. The study area was divided into 8 separate sections, with roadway interchanges generally as the dividers for each section. In addition to the information presented in Tables 3a - 3h, the $L_{eq}24$ color noise contours for the entire study area are shown in Figures 45a – 45i. The color contours provide a very good representation of where the "hot" spots are (in terms of elevated noise levels) and the relative contribution from each of the nearby roadways for the various receptor locations. In the event of a discrepancy between the results indicated in the color contours and the Tables, the Tables will be considered as correct because the calculation locations in the Tables are at exact coordinates while the color contours are calculated on a 5m x 5m grid and the results elsewhere are interpolated.

The current noise levels at residential property locations are under the limit of 65 dBA $L_{eq}24$ at all locations.

Table 3a. Noise Modeling Results With Current Conditions for Region 1

Receptor	$L_{eq}24$ (dBA)	$L_{eq}Day$ (dBA)	$L_{eq}Night$ (dBA)		Receptor	$L_{eq}24$ (dBA)	$L_{eq}Day$ (dBA)	$L_{eq}Night$ (dBA)
R_001	57.9	59.3	53.5		R_027	62.0	63.4	57.6
R_002	58.4	59.9	54.1		R_028	61.5	62.9	57.2
R_003	57.7	59.1	53.3		R_029	61.5	62.9	57.1
R_004	57.1	58.5	52.7		R_030	58.4	59.8	54.1
R_005	59.8	61.2	55.5		R_031	58.3	59.7	53.9
R_006	57.0	58.4	52.6		R_032	58.1	59.5	53.8
R_007	56.4	57.8	52.0		R_033	57.5	58.9	53.1
R_008	59.3	60.7	54.9		R_034	57.1	58.5	52.7
R_009	59.4	60.8	54.9		R_035	56.0	57.4	51.6
R_010	59.2	60.6	54.8		R_036	55.7	57.2	51.3
R_011	59.1	60.6	54.8		R_037	55.9	57.4	51.4
R_012	59.1	60.5	54.7		R_038	56.4	57.9	51.9
R_013	59.2	60.6	54.8		R_039	58.5	60.0	54.0
R_014	59.2	60.6	54.8		R_040	59.2	60.6	54.8
R_015	58.0	59.4	53.6		R_041	60.4	61.8	56.0
R_016	57.3	58.7	52.9		R_042	58.7	60.1	54.3
R_017	57.7	59.1	53.3		R_043	57.8	59.2	53.4
R_018	60.5	61.9	56.1		R_044	59.9	61.3	55.5
R_019	59.8	61.2	55.4		R_045	58.4	59.8	54.0
R_020	59.7	61.1	55.3		R_046	58.1	59.5	53.7
R_021	59.7	61.1	55.3		R_047	58.0	59.4	53.6
R_022	59.8	61.2	55.4		R_048	58.3	59.7	53.8
R_023	59.9	61.3	55.5		R_049	57.8	59.2	53.3
R_024	60.1	61.5	55.7		R_050	57.4	58.8	53.0
R_025	60.4	61.8	56.0		R_051	57.4	58.8	52.9
R_026	61.1	62.5	56.7		R_052	57.2	58.6	52.7

Table 3b. Noise Modeling Results With Current Conditions for Region 2

Receptor	L_{eq}24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)		Receptor	L_{eq}24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
R_053	56.9	58.3	52.5		R_087	58.1	59.5	53.7
R_054	56.3	57.7	51.9		R_088	58.1	59.5	53.7
R_055	58.9	60.3	54.5		R_089	58.8	60.2	54.4
R_056	59.1	60.5	54.7		R_090	61.9	63.3	57.5
R_057	59.4	60.8	55.0		R_091	62.7	64.1	58.4
R_058	57.9	59.3	53.5		R_092	63.1	64.5	58.8
R_059	58.5	59.9	54.1		R_093	59.7	61.2	55.1
R_060	59.5	60.9	55.1		R_094	58.4	59.9	53.5
R_061	60.3	61.7	55.9		R_095	58.7	60.1	53.8
R_062	61.0	62.4	56.7		R_096	58.4	59.9	53.6
R_063	61.2	62.6	56.8		R_097	58.8	60.3	53.9
R_064	61.3	62.7	56.9		R_098	63.4	64.8	59.0
R_065	61.5	62.9	57.1		R_099	63.6	65.0	59.2
R_066	60.3	61.7	55.8		R_100	58.6	60.0	54.0
R_067	58.6	60.0	54.2		R_101	58.6	60.0	54.0
R_068	58.3	59.7	53.8		R_102	58.7	60.1	54.1
R_069	57.8	59.2	53.3		R_103	58.4	59.9	53.8
R_070	58.0	59.4	53.6		R_104	57.9	59.3	53.3
R_071	59.1	60.5	54.7		R_105	59.7	61.2	54.8
R_072	58.3	59.7	53.9		R_106	60.6	62.0	56.2
R_073	59.0	60.4	54.6		R_107	61.0	62.4	56.6
R_074	59.4	60.8	54.9		R_108	61.3	62.7	56.9
R_075	58.8	60.2	54.3		R_109	57.1	58.6	52.5
R_076	58.5	60.0	54.1		R_110	58.0	59.4	53.4
R_077	58.7	60.1	54.3		R_111	57.5	59.0	52.8
R_078	57.9	59.3	53.5		R_112	57.9	59.4	52.8
R_079	58.8	60.2	54.4		R_113	55.3	56.7	50.3
R_080	57.4	58.8	53.0		R_114	58.2	59.7	53.3
R_081	54.4	55.8	50.0		R_115	54.7	56.2	49.8
R_082	58.9	60.3	54.5		R_116	56.7	58.1	52.2
R_083	56.8	58.2	52.4		R_117	62.9	64.4	57.8
R_084	57.3	58.7	52.9		R_118	57.9	59.4	53.1
R_085	57.0	58.4	52.6		R_119	58.5	60.0	53.8
R_086	58.0	59.4	53.6					

Table 3c. Noise Modeling Results With Current Conditions for Region 3

Receptor	L_{eq}24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
R_120	57.6	59.0	53.2
R_121	54.8	56.2	50.4
R_122	55.0	56.4	50.6
R_123	55.3	56.7	50.9
R_124	55.6	57.0	51.2
R_125	55.9	57.3	51.5
R_126	56.1	57.5	51.7
R_127	56.4	57.9	52.0
R_128	56.8	58.2	52.4
R_129	56.6	58.0	52.2
R_130	56.3	57.7	51.9
R_131	56.7	58.1	52.2
R_132	56.6	58.0	52.1
R_133	56.6	58.0	52.2
R_134	56.6	58.1	52.2
R_135	56.6	58.0	52.1
R_136	56.6	58.1	52.2
R_137	56.2	57.6	51.7
R_138	55.8	57.3	51.3
R_139	63.0	64.4	58.6
R_140	61.5	63.0	56.5
R_141	60.3	61.8	55.3
R_142	60.5	62.0	55.5
R_143	61.2	62.7	56.1
R_144	61.2	62.7	56.1
R_145	62.0	63.5	56.8
R_146	62.2	63.7	57.0
R_147	61.1	62.6	56.0
R_148	59.6	61.1	54.5
R_149	57.7	59.1	52.9
R_150	56.0	57.5	51.5
R_151	56.3	57.8	51.7
R_152	54.7	56.1	50.1
R_153	55.5	56.9	50.9
R_154	55.4	56.8	50.8
R_155	55.6	57.0	50.9
R_156	57.0	58.4	52.3
R_157	57.5	59.0	52.5
R_158	57.0	58.5	52.0
R_159	55.6	57.0	51.2
R_160	56.1	57.5	51.7
R_161	53.0	54.4	48.6
R_162	53.6	55.0	49.2
R_163	56.7	58.1	52.3
R_164	56.9	58.3	52.5
R_165	55.9	57.3	51.4

Table 3d. Noise Modeling Results With Current Conditions for Region 4

Receptor	L_{eq}24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
R_166	56.6	58.0	52.2
R_167	57.4	58.8	53.0
R_168	55.3	56.7	50.8
R_169	51.7	53.1	47.1
R_170	50.8	52.2	46.2
R_171	51.8	53.2	47.3
R_172	53.2	54.6	48.7
R_173	53.5	54.9	49.1
R_174	53.9	55.3	49.5
R_175	54.3	55.7	49.9
R_176	55.3	56.7	50.9
R_177	58.4	59.8	54.0
R_178	58.9	60.3	54.5
R_179	58.4	59.8	54.0
R_180	58.0	59.4	53.7
R_181	58.2	59.6	53.8
R_182	55.6	57.0	51.2
R_183	53.9	55.3	49.5
R_184	56.5	57.9	52.1
R_185	58.3	59.7	53.9
R_186	55.6	57.0	51.2
R_187	55.3	56.7	51.0
R_188	56.1	57.5	51.7
R_189	55.5	56.9	51.1
R_190	56.4	57.8	52.0
R_191	56.3	57.8	52.0
R_192	56.9	58.3	52.5
R_193	56.8	58.2	52.4
R_194	56.5	57.9	52.1
R_195	57.0	58.4	52.6
R_196	57.4	58.8	53.0
R_197	56.1	57.6	51.7
R_198	56.7	58.1	52.3
R_199	50.4	51.8	45.9
R_200	52.4	53.8	47.9
R_201	57.3	58.7	52.8
R_202	55.2	56.7	50.7
R_203	53.0	54.4	48.4
R_204	57.2	58.7	52.8
R_205	52.8	54.2	48.4
R_206	53.9	55.3	49.5
R_207	53.9	55.3	49.5
R_208	52.6	54.0	48.2
R_209	51.5	52.9	47.1
R_210	42.2	43.6	37.8

Table 3e. Noise Modeling Results With Current Conditions for Region 5

Receptor	L_{eq}24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)		Receptor	L_{eq}24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
R_211	51.5	52.9	47.1		R_243	54.7	56.1	50.3
R_212	50.7	52.1	46.2		R_244	54.7	56.1	50.2
R_213	49.6	51.1	45.2		R_245	54.5	55.9	50.0
R_214	50.3	51.8	45.8		R_246	54.9	56.3	50.4
R_215	50.4	51.9	45.9		R_247	54.6	56.0	50.1
R_216	53.0	54.4	48.6		R_248	53.9	55.4	49.4
R_217	53.1	54.5	48.7		R_249	57.0	58.4	52.5
R_218	54.3	55.7	50.0		R_250	51.4	52.9	46.8
R_219	55.9	57.3	51.5		R_251	53.6	55.0	49.1
R_220	55.8	57.2	51.4		R_252	55.3	56.7	50.8
R_221	56.0	57.4	51.6		R_253	56.0	57.4	51.5
R_222	54.9	56.3	50.5		R_254	55.1	56.5	50.6
R_223	54.1	55.5	49.7		R_255	54.6	56.0	50.1
R_224	53.6	55.0	49.2		R_256	54.5	55.9	50.1
R_225	52.5	53.9	48.1		R_257	54.7	56.1	50.3
R_226	54.4	55.8	50.0		R_258	54.9	56.3	50.5
R_227	53.6	55.0	49.2		R_259	55.3	56.7	50.8
R_228	53.6	55.0	49.2		R_260	55.4	56.8	51.0
R_229	53.7	55.1	49.3		R_261	55.8	57.2	51.4
R_230	53.8	55.2	49.4		R_262	56.0	57.4	51.5
R_231	54.1	55.5	49.6		R_263	56.2	57.6	51.8
R_232	54.0	55.4	49.6		R_264	56.3	57.7	51.9
R_233	54.2	55.6	49.8		R_265	56.3	57.7	51.8
R_234	54.5	55.9	50.1		R_266	56.0	57.4	51.6
R_235	54.6	56.0	50.2		R_267	56.2	57.6	51.8
R_236	55.0	56.4	50.6		R_268	56.6	58.0	52.2
R_237	53.2	54.6	48.8		R_269	57.7	59.1	53.3
R_238	55.0	56.4	50.6		R_270	58.1	59.5	53.7
R_239	54.5	55.9	50.1		R_271	58.1	59.5	53.7
R_240	53.9	55.3	49.4		R_272	56.4	57.8	52.0
R_241	53.4	54.8	48.9		R_273	56.9	58.3	52.5
R_242	53.0	54.5	48.6					

Table 3f. Noise Modeling Results With Current Conditions for Region 6

Receptor	L_{eq}24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)		Receptor	L_{eq}24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
R_274	58.5	59.9	54.0		R_303	57.1	58.6	52.4
R_275	58.5	59.9	54.1		R_304	58.2	59.7	53.5
R_276	57.4	58.8	53.0		R_305	58.0	59.5	53.3
R_277	56.5	57.9	52.1		R_306	57.1	58.5	52.7
R_278	55.7	57.1	51.3		R_307	58.0	59.5	53.6
R_279	53.8	55.3	49.3		R_308	62.6	64.0	58.2
R_280	53.4	54.8	48.8		R_309	56.2	57.6	51.6
R_281	52.4	53.8	48.0		R_310	54.9	56.3	50.3
R_282	52.9	54.3	48.3		R_311	55.0	56.4	50.5
R_283	53.5	54.9	49.1		R_312	57.3	58.7	52.9
R_284	53.2	54.6	48.8		R_313	54.7	56.1	50.2
R_285	53.9	55.3	49.4		R_314	57.8	59.2	53.4
R_286	55.6	57.0	51.2		R_315	57.4	58.8	53.0
R_287	55.4	56.8	51.0		R_316	56.3	57.7	51.8
R_288	57.9	59.3	53.5		R_317	56.1	57.6	51.5
R_289	58.0	59.4	53.6		R_318	53.0	54.5	48.0
R_290	58.4	59.8	53.9		R_319	50.9	52.4	46.1
R_291	58.3	59.7	53.9		R_320	54.8	56.2	50.4
R_292	57.7	59.1	53.3		R_321	54.5	55.9	50.0
R_293	57.8	59.2	53.4		R_322	54.2	55.6	49.7
R_294	57.5	58.9	53.1		R_323	53.7	55.1	49.1
R_295	57.7	59.2	53.3		R_324	53.4	54.8	48.8
R_296	55.9	57.3	51.5		R_325	53.4	54.8	48.7
R_297	55.5	56.9	51.1		R_326	53.3	54.8	48.6
R_298	55.1	56.5	50.6		R_327	53.2	54.6	48.4
R_299	54.7	56.1	50.3		R_328	53.0	54.4	48.4
R_300	54.4	55.8	50.0		R_329	53.5	54.9	49.0
R_301	54.3	55.7	49.9		R_330	52.8	54.2	48.2
R_302	59.2	60.6	54.8		R_331	52.5	54.0	47.8

Table 3g. Noise Modeling Results With Current Conditions for Region 7

Receptor	$L_{eq}24$ (dBA)	$L_{eq}Day$ (dBA)	$L_{eq}Night$ (dBA)		Receptor	$L_{eq}24$ (dBA)	$L_{eq}Day$ (dBA)	$L_{eq}Night$ (dBA)
R_332	52.1	53.5	47.7		R_363	57.5	59.0	53.0
R_333	53.1	54.5	48.7		R_364	58.1	59.5	53.4
R_334	53.1	54.5	48.7		R_365	52.4	53.8	47.8
R_335	56.8	58.2	52.4		R_366	52.8	54.2	48.4
R_336	56.7	58.1	52.3		R_367	54.7	56.2	50.3
R_337	55.0	56.4	50.6		R_368	54.6	56.0	50.2
R_338	53.9	55.3	49.4		R_369	56.2	57.7	51.9
R_339	55.8	57.2	51.4		R_370	56.2	57.6	51.8
R_340	54.9	56.3	50.5		R_371	57.4	58.8	53.0
R_341	54.7	56.1	50.3		R_372	54.9	56.3	50.5
R_342	55.0	56.4	50.6		R_373	56.0	57.4	51.6
R_343	55.0	56.4	50.6		R_374	56.6	58.0	52.1
R_344	54.7	56.1	50.3		R_375	57.0	58.4	52.6
R_345	54.2	55.6	49.7		R_376	57.3	58.7	52.9
R_346	54.5	55.9	50.1		R_377	58.0	59.4	53.6
R_347	54.4	55.8	50.0		R_378	55.9	57.3	51.5
R_348	54.4	55.8	49.9		R_379	56.7	58.1	52.3
R_349	55.2	56.6	50.7		R_380	54.0	55.4	49.6
R_350	55.0	56.4	50.5		R_381	55.4	56.8	51.0
R_351	55.3	56.7	50.9		R_382	56.1	57.5	51.7
R_352	54.7	56.1	50.3		R_383	55.6	57.0	51.2
R_353	54.3	55.8	49.9		R_384	54.7	56.1	50.3
R_354	54.9	56.3	50.5		R_385	55.6	57.0	51.2
R_355	55.3	56.7	50.8		R_386	53.8	55.2	49.4
R_356	55.5	57.0	51.1		R_387	53.6	55.0	49.2
R_357	54.9	56.4	50.4		R_388	54.2	55.6	49.8
R_358	54.8	56.2	50.3		R_389	55.3	56.7	50.9
R_359	54.4	55.8	49.9		R_390	57.2	58.6	52.8
R_360	55.0	56.4	50.4		R_391	58.2	59.6	53.8
R_361	55.8	57.2	51.3		R_392	58.5	59.9	54.1
R_362	56.9	58.3	52.3					

Table 3h. Noise Modeling Results With Current Conditions for Region 8

Receptor	L_{eq}24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)		Receptor	L_{eq}24 (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
R_393	55.5	56.9	50.8		R_427	57.0	58.4	52.6
R_394	54.4	55.8	49.9		R_428	54.4	55.8	49.7
R_395	53.2	54.6	48.7		R_429	55.7	57.1	51.2
R_396	53.1	54.5	48.7		R_430	55.2	56.7	50.9
R_397	54.0	55.4	49.6		R_431	55.7	57.1	51.3
R_398	54.0	55.4	49.6		R_432	55.6	57.0	51.2
R_399	51.4	52.8	47.0		R_433	55.6	57.0	51.2
R_400	51.4	52.8	47.0		R_434	56.3	57.7	51.9
R_401	48.5	49.9	44.0		R_435	56.2	57.6	51.8
R_402	48.1	49.5	43.5		R_436	56.5	57.9	52.1
R_403	48.5	49.9	43.9		R_437	55.7	57.1	51.2
R_404	49.9	51.4	45.3		R_438	55.2	56.6	50.7
R_405	51.7	53.1	47.2		R_439	55.6	57.0	51.1
R_406	51.8	53.2	47.3		R_440	55.2	56.7	50.8
R_407	52.2	53.7	47.8		R_441	55.4	56.8	51.0
R_408	53.4	54.9	49.0		R_442	56.0	57.4	51.5
R_409	53.9	55.3	49.5		R_443	56.3	57.7	51.9
R_410	53.8	55.3	49.4		R_444	56.9	58.3	52.5
R_411	54.2	55.6	49.8		R_445	57.2	58.6	52.8
R_412	54.8	56.2	50.4		R_446	58.8	60.2	54.4
R_413	55.0	56.4	50.6		R_447	59.7	61.2	55.3
R_414	56.5	57.9	52.1		R_448	60.7	62.1	56.3
R_415	57.3	58.7	52.9		R_449	61.4	62.8	57.0
R_416	58.3	59.7	53.9		R_450	62.1	63.5	57.7
R_417	58.5	59.9	54.1		R_451	62.8	64.2	58.4
R_418	56.6	58.0	52.2		R_452	63.0	64.4	58.6
R_419	55.9	57.3	51.4		R_453	59.1	60.5	54.6
R_420	53.5	54.9	49.1		R_454	60.0	61.4	55.6
R_421	52.3	53.7	47.9		R_455	61.1	62.5	56.7
R_422	51.2	52.6	46.7		R_456	62.6	64.0	58.2
R_423	54.8	56.3	49.9		R_457	62.0	63.4	57.6
R_424	55.0	56.5	50.6		R_458	61.4	62.8	57.0
R_425	54.4	55.8	49.9		R_459	61.1	62.5	56.7
R_426	56.2	57.6	51.8					

6.2. Future Conditions

The results of the noise modeling under future conditions (Year 2024) at the residential receptor locations are presented in Tables 4a - 4h and shown in Figures 46a – 46i. The $L_{eq}24$, L_{eq}Day and L_{eq}Night sound levels are presented in the Tables along with the relative increase in the $L_{eq}24$ compared to current conditions. As with the Current Conditions, in the event of a discrepancy between the results indicated in the color contours and the Tables, the Tables will be considered as correct. Below each Table is a summary discussion of the results for that particular Region.

Table 4a. Noise Modeling Results With Future Conditions for Region 1

Receptor	L_{eq}24 (dBA)	L_{eq}24 Increase Relative to Current Conditions (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)	Receptor	L_{eq}24 (dBA)	L_{eq}24 Increase Relative to Current Conditions (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
R_001	59.1	1.2	60.5	54.7	R_027	63.6	1.6	65.0	59.2
R_002	59.7	1.3	61.1	55.3	R_028	63.1	1.6	64.5	58.7
R_003	59.0	1.3	60.4	54.6	R_029	63.1	1.6	64.5	58.7
R_004	58.4	1.3	59.8	54.0	R_030	59.8	1.4	61.2	55.4
R_005	61.2	1.4	62.6	56.8	R_031	59.6	1.3	61.0	55.2
R_006	58.3	1.3	59.7	53.9	R_032	59.4	1.3	60.8	55.1
R_007	57.7	1.3	59.1	53.3	R_033	58.8	1.3	60.2	54.4
R_008	60.6	1.3	62.0	56.2	R_034	58.4	1.3	59.8	54.0
R_009	60.6	1.2	62.0	56.2	R_035	57.3	1.3	58.7	52.9
R_010	60.5	1.3	61.9	56.1	R_036	57.0	1.3	58.4	52.5
R_011	60.4	1.3	61.8	56.0	R_037	57.1	1.2	58.6	52.6
R_012	60.4	1.3	61.8	56.0	R_038	57.6	1.2	59.1	53.1
R_013	60.4	1.2	61.8	56.0	R_039	60.0	1.5	61.5	55.6
R_014	60.5	1.3	61.9	56.1	R_040	60.4	1.2	61.8	56.0
R_015	59.2	1.2	60.6	54.8	R_041	61.7	1.3	63.1	57.3
R_016	58.6	1.3	60.0	54.2	R_042	60.0	1.3	61.4	55.6
R_017	59.0	1.3	60.4	54.6	R_043	59.0	1.2	60.4	54.6
R_018	61.9	1.4	63.3	57.5	R_044	61.2	1.3	62.6	56.8
R_019	61.1	1.3	62.5	56.7	R_045	59.7	1.3	61.1	55.3
R_020	61.0	1.3	62.4	56.6	R_046	59.3	1.2	60.7	54.9
R_021	61.0	1.3	62.4	56.7	R_047	59.2	1.2	60.6	54.8
R_022	61.1	1.3	62.5	56.7	R_048	59.5	1.2	60.9	55.1
R_023	61.2	1.3	62.6	56.9	R_049	59.0	1.2	60.4	54.6
R_024	61.4	1.3	62.9	57.1	R_050	58.6	1.2	60.0	54.2
R_025	61.8	1.4	63.2	57.5	R_051	58.6	1.2	60.0	54.1
R_026	62.6	1.5	64.0	58.2	R_052	58.4	1.2	59.8	53.9

The Future Conditions noise modeling for Region 1 indicated noise levels below 65 dBA L_{eq}24 at all locations. The increases relative to the Current Conditions for Region 1 ranged from +1.2 to +1.6 dBA which were due to the projected increases in traffic volumes on SWAHD and adjacent City Roads.

Table 4b. Noise Modeling Results With Future Conditions for Region 2

Receptor	L_{eq}24 (dBA)	L_{eq}24 Increase Relative to Current Conditions (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)		Receptor	L_{eq}24 (dBA)	L_{eq}24 Increase Relative to Current Conditions (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
R_053	58.3	1.4	59.7	53.9		R_087	59.4	1.3	60.8	55.0
R_054	57.7	1.4	59.1	53.3		R_088	59.4	1.3	60.8	55.0
R_055	60.2	1.3	61.6	55.8		R_089	60.1	1.3	61.5	55.7
R_056	60.4	1.3	61.8	56.0		R_090	63.2	1.3	64.6	58.8
R_057	60.7	1.3	62.1	56.3		R_091	64.0	1.3	65.4	59.6
R_058	59.1	1.2	60.6	54.8		R_092	64.3	1.2	65.7	60.0
R_059	59.7	1.2	61.1	55.3		R_093	60.7	1.0	62.1	56.1
R_060	60.7	1.2	62.1	56.4		R_094	59.1	0.7	60.6	54.2
R_061	61.5	1.2	62.9	57.1		R_095	59.4	0.7	60.9	54.7
R_062	62.2	1.2	63.6	57.8		R_096	59.2	0.8	60.6	54.4
R_063	62.3	1.1	63.7	57.9		R_097	59.5	0.7	61.0	54.7
R_064	62.4	1.1	63.8	58.0		R_098	64.5	1.1	65.9	60.2
R_065	62.6	1.1	64.0	58.2		R_099	64.8	1.2	66.2	60.4
R_066	61.4	1.1	62.8	57.0		R_100	59.6	1.0	61.0	55.0
R_067	59.7	1.1	61.1	55.3		R_101	59.6	1.0	61.0	55.0
R_068	59.4	1.1	60.8	54.9		R_102	59.7	1.0	61.1	55.2
R_069	58.9	1.1	60.3	54.4		R_103	59.4	1.0	60.8	54.9
R_070	59.1	1.1	60.5	54.7		R_104	58.9	1.0	60.3	54.4
R_071	60.2	1.1	61.6	55.8		R_105	60.4	0.7	61.9	55.6
R_072	59.4	1.1	60.8	55.0		R_106	61.7	1.1	63.1	57.3
R_073	60.1	1.1	61.5	55.7		R_107	62.1	1.1	63.6	57.8
R_074	60.4	1.0	61.8	56.0		R_108	62.4	1.1	63.8	58.0
R_075	59.9	1.1	61.3	55.4		R_109	58.1	1.0	59.5	53.5
R_076	59.6	1.1	61.0	55.1		R_110	58.9	0.9	60.4	54.4
R_077	59.8	1.1	61.2	55.4		R_111	58.4	0.9	59.8	53.7
R_078	59.0	1.1	60.4	54.6		R_112	58.5	0.6	60.0	53.5
R_079	60.0	1.2	61.4	55.6		R_113	55.9	0.6	57.4	51.0
R_080	58.6	1.2	60.0	54.2		R_114	58.9	0.7	60.4	54.0
R_081	55.6	1.2	57.0	51.2		R_115	55.4	0.7	56.9	50.6
R_082	60.2	1.3	61.6	55.8		R_116	57.7	1.0	59.1	53.2
R_083	58.1	1.3	59.5	53.7		R_117	63.5	0.6	65.0	58.5
R_084	58.6	1.3	60.0	54.2		R_118	58.7	0.8	60.2	54.0
R_085	58.3	1.3	59.7	53.9		R_119	59.4	0.9	60.8	54.7
R_086	59.3	1.3	60.7	54.9						

The Future Conditions noise modeling for Region 2 indicated noise levels below 65 dBA L_{eq}24 at all locations. The increases relative to the Current Conditions for Region 2 ranged from +0.6 to +1.4 dBA which were due to the projected increases in traffic volumes on SWAHD and adjacent City Roads.

Table 4c. Noise Modeling Results With Future Conditions for Region 3

Receptor	L_{eq}24 (dBA)	L_{eq}24 Increase Relative to Current Conditions (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
R_120	58.8	1.2	60.2	54.4
R_121	56.0	1.2	57.4	51.6
R_122	56.2	1.2	57.6	51.8
R_123	56.5	1.2	57.9	52.1
R_124	56.8	1.2	58.2	52.4
R_125	57.1	1.2	58.5	52.7
R_126	57.3	1.2	58.7	52.9
R_127	57.6	1.2	59.0	53.2
R_128	57.9	1.1	59.3	53.5
R_129	57.7	1.1	59.1	53.3
R_130	57.4	1.1	58.8	53.0
R_131	57.8	1.1	59.2	53.3
R_132	57.7	1.1	59.1	53.3
R_133	57.7	1.1	59.1	53.3
R_134	57.8	1.2	59.2	53.4
R_135	57.7	1.1	59.1	53.3
R_136	57.8	1.2	59.2	53.4
R_137	57.3	1.1	58.7	52.9
R_138	57.0	1.2	58.4	52.5
R_139	64.1	1.1	65.5	59.6
R_140	62.1	0.6	63.6	57.2
R_141	60.9	0.6	62.4	56.0
R_142	61.1	0.6	62.6	56.2
R_143	61.7	0.5	63.2	56.7
R_144	61.8	0.6	63.3	56.8
R_145	62.4	0.4	64.0	57.4
R_146	62.7	0.5	64.2	57.5
R_147	61.6	0.5	63.1	56.6
R_148	60.1	0.5	61.6	55.1
R_149	58.5	0.8	60.0	53.9
R_150	57.1	1.1	58.5	52.5
R_151	57.3	1.0	58.7	52.8
R_152	55.7	1.0	57.2	51.2
R_153	56.5	1.0	58.0	52.0
R_154	56.4	1.0	57.8	51.9
R_155	56.6	1.0	58.0	52.0
R_156	57.9	0.9	59.3	53.2
R_157	58.2	0.7	59.6	53.2
R_158	57.6	0.6	59.1	52.7
R_159	56.8	1.2	58.2	52.3
R_160	57.3	1.2	58.7	52.9
R_161	54.3	1.3	55.7	49.8
R_162	54.9	1.3	56.3	50.5
R_163	58.1	1.4	59.5	53.7
R_164	58.6	1.7	60.0	54.2
R_165	58.0	2.1	59.4	53.6

The Future Conditions noise modeling for Region 3 indicated noise levels below 65 dBA L_{eq}24 at all locations. The increases relative to the Current Conditions for Region 3 ranged from +0.4 to +2.1 dBA which were due to the projected increases in traffic volumes on SWAHD and adjacent City Roads.

Table 4d. Noise Modeling Results With Future Conditions for Region 4

Receptor	L_{eq}24 (dBA)	L_{eq}24 Increase Relative to Current Conditions (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
R_166	57.9	1.3	59.3	53.4
R_167	58.6	1.2	60.0	54.2
R_168	56.5	1.2	57.9	52.1
R_169	52.8	1.1	54.2	48.2
R_170	51.8	1.0	53.2	47.3
R_171	52.9	1.1	54.3	48.4
R_172	54.3	1.1	55.7	49.9
R_173	54.6	1.1	56.0	50.2
R_174	55.0	1.1	56.4	50.6
R_175	55.4	1.1	56.8	51.1
R_176	56.4	1.1	57.8	52.0
R_177	59.5	1.1	60.9	55.1
R_178	60.0	1.1	61.4	55.7
R_179	59.5	1.1	60.9	55.1
R_180	59.1	1.1	60.5	54.8
R_181	59.3	1.1	60.7	54.9
R_182	56.7	1.1	58.1	52.3
R_183	55.0	1.1	56.4	50.6
R_184	57.6	1.1	59.0	53.2
R_185	59.4	1.1	60.8	55.0
R_186	56.7	1.1	58.1	52.3
R_187	56.5	1.2	57.9	52.1
R_188	57.2	1.1	58.6	52.8
R_189	56.6	1.1	58.0	52.2
R_190	57.5	1.1	58.9	53.1
R_191	57.5	1.2	58.9	53.1
R_192	58.0	1.1	59.4	53.6
R_193	57.9	1.1	59.3	53.5
R_194	57.6	1.1	59.0	53.2
R_195	58.1	1.1	59.5	53.7
R_196	58.5	1.1	59.9	54.1
R_197	57.3	1.2	58.7	52.9
R_198	57.9	1.2	59.3	53.5
R_199	51.6	1.2	53.0	47.2
R_200	54.0	1.6	55.4	49.5
R_201	59.3	2.0	60.7	54.9
R_202	56.6	1.4	58.1	52.1
R_203	54.3	1.3	55.7	49.7
R_204	58.7	1.5	60.1	54.3
R_205	54.2	1.4	55.6	49.8
R_206	55.3	1.4	56.7	50.9
R_207	55.2	1.3	56.6	50.8
R_208	53.9	1.3	55.3	49.4
R_209	52.7	1.2	54.2	48.3
R_210	43.4	1.2	44.8	39.0

The Future Conditions noise modeling for Region 4 indicated noise levels below 65 dBA L_{eq}24 at all locations. The increases relative to the Current Conditions for Region 4 ranged from +1.0 to +2.0 dBA which were due to the projected increases in traffic volumes on SWAHD and adjacent City Roads.

Table 4e. Noise Modeling Results With Future Conditions for Region 5

Receptor	L_{eq}24 (dBA)	L_{eq}24 Increase Relative to Current Conditions (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)		Receptor	L_{eq}24 (dBA)	L_{eq}24 Increase Relative to Current Conditions (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
R_211	52.7	1.2	54.1	48.3		R_243	55.9	1.2	57.3	51.4
R_212	51.8	1.1	53.3	47.4		R_244	55.8	1.1	57.2	51.4
R_213	50.8	1.2	52.2	46.3		R_245	55.7	1.2	57.1	51.2
R_214	51.4	1.1	52.8	46.9		R_246	56.2	1.3	57.6	51.7
R_215	51.5	1.1	52.9	47.0		R_247	55.9	1.3	57.4	51.5
R_216	54.2	1.2	55.6	49.8		R_248	55.3	1.4	56.7	50.8
R_217	54.3	1.2	55.7	49.9		R_249	58.4	1.4	59.8	53.9
R_218	55.5	1.2	56.9	51.2		R_250	52.5	1.1	53.9	47.9
R_219	57.1	1.2	58.5	52.7		R_251	54.8	1.2	56.2	50.3
R_220	57.0	1.2	58.4	52.6		R_252	56.4	1.1	57.8	51.9
R_221	57.2	1.2	58.6	52.8		R_253	57.1	1.1	58.6	52.7
R_222	56.1	1.2	57.5	51.8		R_254	56.2	1.1	57.7	51.8
R_223	55.3	1.2	56.7	50.9		R_255	55.8	1.2	57.2	51.3
R_224	54.8	1.2	56.2	50.4		R_256	55.7	1.2	57.1	51.2
R_225	53.7	1.2	55.1	49.3		R_257	55.9	1.2	57.3	51.5
R_226	55.6	1.2	57.0	51.2		R_258	56.1	1.2	57.5	51.6
R_227	54.8	1.2	56.2	50.4		R_259	56.4	1.1	57.8	52.0
R_228	54.8	1.2	56.2	50.4		R_260	56.6	1.2	58.0	52.1
R_229	54.9	1.2	56.3	50.5		R_261	57.0	1.2	58.4	52.6
R_230	55.0	1.2	56.4	50.6		R_262	57.1	1.1	58.5	52.7
R_231	55.3	1.2	56.7	50.9		R_263	57.3	1.1	58.7	52.9
R_232	55.2	1.2	56.7	50.9		R_264	57.4	1.1	58.8	53.0
R_233	55.4	1.2	56.8	51.0		R_265	57.3	1.0	58.8	52.9
R_234	55.7	1.2	57.1	51.3		R_266	57.0	1.0	58.4	52.6
R_235	55.8	1.2	57.2	51.4		R_267	57.1	0.9	58.5	52.7
R_236	56.2	1.2	57.6	51.8		R_268	57.4	0.8	58.8	53.0
R_237	54.3	1.1	55.7	49.9		R_269	58.2	0.5	59.7	53.8
R_238	56.2	1.2	57.6	51.8		R_270	58.4	0.3	59.8	54.0
R_239	55.7	1.2	57.1	51.3		R_271	58.2	0.1	59.6	53.8
R_240	55.0	1.1	56.4	50.6		R_272	56.8	0.4	58.2	52.3
R_241	54.5	1.1	55.9	50.1		R_273	57.2	0.3	58.6	52.8
R_242	54.2	1.2	55.6	49.7						

The Future Conditions noise modeling for Region 5 indicated noise levels below 65 dBA L_{eq}24 at all locations. The increases relative to the Current Conditions for Region 5 ranged from +0.1 to +1.4 dBA which were due to the projected increases in traffic volumes on SWAHD and adjacent City Roads.

Table 4f. Noise Modeling Results With Future Conditions for Region 6

Receptor	L_{eq}24 (dBA)	L_{eq}24 Increase Relative to Current Conditions (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)		Receptor	L_{eq}24 (dBA)	L_{eq}24 Increase Relative to Current Conditions (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
R_274	60.3	1.8	61.7	55.8		R_303	57.9	0.8	59.4	53.3
R_275	60.6	2.1	62.0	56.1		R_304	59.1	0.9	60.5	54.5
R_276	59.4	2.0	60.8	55.0		R_305	58.9	0.9	60.3	54.3
R_277	58.5	2.0	59.9	54.1		R_306	58.2	1.1	59.6	53.8
R_278	57.7	2.0	59.1	53.2		R_307	59.9	1.9	61.3	55.4
R_279	55.5	1.7	56.9	51.0		R_308	65.0	2.4	66.4	60.6
R_280	54.8	1.4	56.2	50.2		R_309	57.8	1.6	59.2	53.2
R_281	53.9	1.5	55.3	49.5		R_310	56.2	1.3	57.6	51.7
R_282	54.3	1.4	55.7	49.8		R_311	56.2	1.2	57.6	51.7
R_283	55.0	1.5	56.4	50.6		R_312	58.4	1.1	59.9	54.1
R_284	54.6	1.4	56.0	50.2		R_313	55.8	1.1	57.2	51.4
R_285	55.2	1.3	56.6	50.7		R_314	58.8	1.0	60.2	54.4
R_286	56.8	1.2	58.2	52.4		R_315	58.4	1.0	59.8	54.0
R_287	56.5	1.1	57.9	52.1		R_316	57.3	1.0	58.7	52.9
R_288	59.0	1.1	60.4	54.6		R_317	57.1	1.0	58.6	52.6
R_289	59.1	1.1	60.5	54.7		R_318	53.9	0.9	55.4	49.0
R_290	59.4	1.0	60.9	55.0		R_319	52.0	1.1	53.5	47.3
R_291	59.4	1.1	60.8	55.0		R_320	55.8	1.0	57.2	51.4
R_292	58.9	1.2	60.3	54.5		R_321	55.5	1.0	57.0	51.1
R_293	59.0	1.2	60.4	54.6		R_322	55.3	1.1	56.7	50.8
R_294	58.7	1.2	60.1	54.3		R_323	54.7	1.0	56.1	50.2
R_295	58.9	1.2	60.3	54.5		R_324	54.3	0.9	55.8	49.8
R_296	57.2	1.3	58.6	52.8		R_325	54.3	0.9	55.7	49.6
R_297	56.8	1.3	58.2	52.4		R_326	54.2	0.9	55.6	49.5
R_298	56.4	1.3	57.9	52.0		R_327	53.9	0.7	55.4	49.3
R_299	56.1	1.4	57.5	51.7		R_328	53.8	0.8	55.2	49.2
R_300	55.9	1.5	57.3	51.6		R_329	54.3	0.8	55.8	49.9
R_301	55.9	1.6	57.3	51.5		R_330	53.6	0.8	55.0	49.1
R_302	61.4	2.2	62.8	57.0		R_331	53.2	0.7	54.7	48.5

The Future Conditions noise modeling for Region 6 indicated noise levels below 65 dBA L_{eq}24 at all locations with the exception of Receptor R_308. The dominant noise source for Receptor R_308 is Rabbit Hill Road (City of Edmonton road) by at least a 10 dBA margin relative to SWAHD. The increases relative to the Current Conditions for Region 6 ranged from +0.7 to +2.4 dBA which were due to the projected increases in traffic volumes on SWAHD and adjacent City Roads.

Table 4g. Noise Modeling Results With Future Conditions for Region 7

Receptor	L_{eq}24 (dBA)	L_{eq}24 Increase Relative to Current Conditions (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)		Receptor	L_{eq}24 (dBA)	L_{eq}24 Increase Relative to Current Conditions (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
R_332	52.5	0.4	53.9	48.1		R_363	58.6	1.1	60.0	54.1
R_333	53.1	0.0	54.5	48.7		R_364	59.0	0.9	60.4	54.4
R_334	53.8	0.7	55.2	49.4		R_365	52.6	0.2	54.0	48.0
R_335	56.6	-0.2	58.0	52.2		R_366	52.9	0.1	54.4	48.5
R_336	55.7	-1.0	57.1	51.3		R_367	55.1	0.4	56.6	50.7
R_337	55.3	0.3	56.7	50.9		R_368	54.9	0.3	56.3	50.5
R_338	52.5	-1.4	53.9	48.0		R_369	56.4	0.2	57.8	52.0
R_339	54.7	-1.1	56.1	50.3		R_370	56.5	0.3	57.9	52.1
R_340	54.3	-0.6	55.7	49.9		R_371	58.4	1.0	59.8	54.0
R_341	54.2	-0.5	55.6	49.8		R_372	55.9	1.0	57.3	51.4
R_342	54.6	-0.4	56.0	50.2		R_373	56.8	0.8	58.3	52.4
R_343	54.8	-0.2	56.2	50.4		R_374	57.4	0.8	58.8	52.9
R_344	54.7	0.0	56.1	50.3		R_375	57.9	0.9	59.3	53.5
R_345	54.6	0.4	56.1	50.2		R_376	58.2	0.9	59.6	53.8
R_346	55.0	0.5	56.4	50.5		R_377	58.9	0.9	60.3	54.5
R_347	54.9	0.5	56.3	50.5		R_378	56.8	0.9	58.2	52.4
R_348	55.0	0.6	56.4	50.6		R_379	57.6	0.9	59.0	53.2
R_349	55.9	0.7	57.3	51.5		R_380	54.9	0.9	56.3	50.5
R_350	55.7	0.7	57.1	51.3		R_381	56.4	1.0	57.8	52.0
R_351	56.2	0.9	57.6	51.7		R_382	57.1	1.0	58.5	52.7
R_352	55.5	0.8	57.0	51.1		R_383	56.6	1.0	58.0	52.2
R_353	55.2	0.9	56.6	50.7		R_384	55.7	1.0	57.1	51.3
R_354	55.8	0.9	57.2	51.3		R_385	56.6	1.0	58.0	52.2
R_355	56.2	0.9	57.6	51.8		R_386	54.8	1.0	56.2	50.4
R_356	56.5	1.0	57.9	52.0		R_387	54.7	1.1	56.1	50.3
R_357	55.9	1.0	57.3	51.4		R_388	55.3	1.1	56.7	50.9
R_358	55.7	0.9	57.1	51.2		R_389	56.5	1.2	57.9	52.1
R_359	55.3	0.9	56.7	50.8		R_390	58.4	1.2	59.8	54.0
R_360	55.9	0.9	57.3	51.4		R_391	59.4	1.2	60.8	55.0
R_361	56.8	1.0	58.2	52.3		R_392	59.7	1.2	61.1	55.3
R_362	57.9	1.0	59.3	53.4						

The Future Conditions noise modeling for Region 7 indicated noise levels below 65 dBA L_{eq}24 at all locations. The changes relative to the Current Conditions for Region 7 ranged from -1.4 to +1.2 dBA. The increases are largely due to the projected increases in traffic volumes on SWAHD and adjacent City Roads. The decreases are due to the shielding from SWAHD provided by the earth structure for the bridge for the proposed interchange at 127 Street.

Table 4h. Noise Modeling Results With Future Conditions for Region 8

Receptor	$L_{eq}24$ (dBA)	$L_{eq}24$ Increase Relative to Current Conditions (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)		Receptor	$L_{eq}24$ (dBA)	$L_{eq}24$ Increase Relative to Current Conditions (dBA)	L_{eq}Day (dBA)	L_{eq}Night (dBA)
R_393	56.4	0.9	57.8	51.8		R_427	58.1	1.1	59.5	53.7
R_394	55.4	1.0	56.8	50.9		R_428	55.2	0.8	56.7	50.7
R_395	54.2	1.0	55.7	49.8		R_429	56.7	1.0	58.2	52.3
R_396	54.2	1.1	55.6	49.8		R_430	56.4	1.2	57.8	52.0
R_397	55.1	1.1	56.5	50.7		R_431	56.8	1.1	58.2	52.4
R_398	55.1	1.1	56.5	50.7		R_432	56.7	1.1	58.1	52.3
R_399	52.5	1.1	53.9	48.1		R_433	56.8	1.2	58.2	52.5
R_400	52.5	1.1	53.9	48.1		R_434	57.6	1.3	59.0	53.2
R_401	49.7	1.2	51.1	45.3		R_435	57.5	1.3	58.9	53.1
R_402	49.2	1.1	50.6	44.7		R_436	57.7	1.2	59.1	53.3
R_403	49.5	1.0	50.9	45.0		R_437	56.9	1.2	58.3	52.4
R_404	50.9	1.0	52.3	46.3		R_438	56.5	1.3	57.9	52.0
R_405	52.9	1.2	54.3	48.4		R_439	57.0	1.4	58.4	52.6
R_406	53.1	1.3	54.5	48.6		R_440	56.8	1.6	58.2	52.3
R_407	53.5	1.3	54.9	49.1		R_441	57.0	1.6	58.4	52.6
R_408	54.8	1.4	56.2	50.3		R_442	57.5	1.5	59.0	53.1
R_409	55.3	1.4	56.7	50.9		R_443	58.0	1.7	59.4	53.6
R_410	55.2	1.4	56.6	50.8		R_444	58.6	1.7	60.0	54.2
R_411	55.6	1.4	57.0	51.2		R_445	59.1	1.9	60.5	54.7
R_412	56.3	1.5	57.7	51.9		R_446	60.7	1.9	62.1	56.3
R_413	56.4	1.4	57.8	52.0		R_447	61.5	1.8	63.0	57.2
R_414	57.9	1.4	59.3	53.5		R_448	62.4	1.7	63.8	58.0
R_415	58.7	1.4	60.1	54.3		R_449	63.0	1.6	64.4	58.6
R_416	59.8	1.5	61.2	55.4		R_450	63.7	1.6	65.1	59.3
R_417	60.0	1.5	61.4	55.6		R_451	64.2	1.4	65.6	59.8
R_418	57.8	1.2	59.2	53.3		R_452	64.4	1.4	65.8	60.0
R_419	57.0	1.1	58.4	52.6		R_453	60.3	1.2	61.7	55.9
R_420	54.6	1.1	56.0	50.2		R_454	61.2	1.2	62.6	56.8
R_421	53.4	1.1	54.8	49.0		R_455	62.2	1.1	63.6	57.8
R_422	52.2	1.0	53.6	47.8		R_456	63.8	1.2	65.2	59.4
R_423	55.4	0.6	56.9	50.6		R_457	63.2	1.2	64.6	58.9
R_424	56.1	1.1	57.5	51.6		R_458	62.6	1.2	64.0	58.2
R_425	55.3	0.9	56.8	50.9		R_459	62.2	1.1	63.6	57.8
R_426	57.2	1.0	58.6	52.8						

The Future Conditions noise modeling for Region 8 indicated noise levels below 65 dBA $L_{eq}24$ at all locations. The increases relative to the Current Conditions for Region 8 ranged from +0.6 to +1.9 dBA which were due to the projected increases in traffic volumes on SWAHD and adjacent City Roads.

6.3. Future Conditions Sensitivity Analysis

As part of the study, a sensitivity analysis was performed for the main future (2024) traffic parameters associated with SWAHD. These included the overall traffic volumes, the traffic speeds, and the % heavy trucks. Each was evaluated with an increase and a decrease relative to the future conditions modeled. In addition, the cumulative impact of an increase and a decrease in all three variables was assessed.

6.3.1. Traffic Volume Analysis

As with any noise source, the relative change in noise level with changing quantity is a simple logarithmic function as indicated below:

$$\Delta SPL = 10\log_{10}\left(\textit{relative change}\right)$$

This means that if the traffic volumes, for example, are doubled, there will be a 3.0 dBA increase. **If there is a relative increase in traffic volumes of 25% (possible error in long term planning horizon), there will be a relative maximum 1.0 dBA increase for locations in which the noise climate is entirely dominated by SWAHD (i.e. relative to other City Roadways). Conversely, there is a maximum relative decrease of -1.3 dBA for a relative reduction in traffic volumes of 25%.** At locations in which the noise climate has a greater influence by City Roadways, changes in traffic volumes on SWAHD will have less of an impact. Tables 5a – 5h show the L_{eq}24 results for the ± 25% vehicles per day conditions as well as the relative change in noise levels at all modeled receptor locations. The relative increase in noise levels from a relative increase of 25% in traffic volumes on SWAHD would result in a small number of additional receptor locations having noise levels at or above 65 dBA L_{eq}24 (highlighted in yellow in Tables 5a – 5h) . These include receptors to the southwest of the interchange at SWAHD and Whitemud Drive (currently no solid fences), a receptor northeast of the interchange at SWAHD and Rabbit Hill Road (Rabbit Hill Road is the dominant source at this location) and a receptor southwest of the interchange at SWAHD and Calgary Trail (Calgary Trail and associated ramps dominate).

As an aside, typical traffic volumes on typical urban roads only vary a few percent from day-to-day. This means that changes in noise levels from day-to-day are almost entirely dictated by environmental and meteorological conditions, and not by varying traffic volumes.

Table 5a. Effects of Changing AHD Traffic Volumes for Region 1

Receptor	L_{eq}24 with +25% Vehicles Per Day (dBA)	Increase Relative to Future Vehicles Per Day (dBA)		L_{eq}24 with -25% Vehicles Per Day (dBA)	Decrease Relative to Future Vehicles Per Day (dBA)		Receptor	L_{eq}24 with +25% Vehicles Per Day (dBA)	Increase Relative to Future Vehicles Per Day (dBA)		L_{eq}24 with -25% Vehicles Per Day (dBA)	Decrease Relative to Future Vehicles Per Day (dBA)
R_001	59.5	0.4		58.7	-0.4		R_027	63.9	0.3		63.2	-0.4
R_002	60.2	0.5		59.2	-0.5		R_028	63.4	0.3		62.8	-0.3
R_003	59.6	0.6		58.3	-0.7		R_029	63.3	0.2		62.9	-0.2
R_004	59.0	0.6		57.7	-0.7		R_030	60.6	0.8		58.7	-1.1
R_005	62.0	0.8		60.3	-0.9		R_031	60.4	0.8		58.5	-1.1
R_006	59.1	0.8		57.3	-1.0		R_032	60.3	0.9		58.3	-1.1
R_007	58.6	0.9		56.7	-1.0		R_033	59.6	0.8		57.7	-1.1
R_008	61.4	0.8		59.5	-1.1		R_034	59.3	0.9		57.3	-1.1
R_009	61.5	0.9		59.5	-1.1		R_035	58.1	0.8		56.3	-1.0
R_010	61.4	0.9		59.4	-1.1		R_036	57.8	0.8		56.0	-1.0
R_011	61.3	0.9		59.3	-1.1		R_037	57.9	0.8		56.3	-0.8
R_012	61.3	0.9		59.3	-1.1		R_038	58.3	0.7		56.9	-0.7
R_013	61.3	0.9		59.3	-1.1		R_039	60.4	0.4		59.7	-0.3
R_014	61.3	0.8		59.4	-1.1		R_040	61.3	0.9		59.4	-1.0
R_015	60.1	0.9		58.2	-1.0		R_041	62.5	0.8		60.6	-1.1
R_016	59.4	0.8		57.7	-0.9		R_042	60.8	0.8		58.9	-1.1
R_017	59.7	0.7		58.1	-0.9		R_043	59.9	0.9		58.0	-1.0
R_018	62.3	0.4		61.5	-0.4		R_044	62.0	0.8		60.2	-1.0
R_019	61.9	0.8		60.2	-0.9		R_045	60.4	0.7		58.7	-1.0
R_020	61.8	0.8		60.1	-0.9		R_046	60.0	0.7		58.4	-0.9
R_021	61.8	0.8		60.1	-0.9		R_047	59.9	0.7		58.4	-0.8
R_022	61.8	0.7		60.2	-0.9		R_048	60.2	0.7		58.6	-0.9
R_023	61.9	0.7		60.4	-0.8		R_049	59.6	0.6		58.3	-0.7
R_024	62.1	0.7		60.7	-0.7		R_050	59.2	0.6		58.0	-0.6
R_025	62.4	0.6		61.2	-0.6		R_051	59.0	0.4		58.1	-0.5
R_026	63.1	0.5		62.0	-0.6		R_052	58.7	0.3		58.0	-0.4

Table 5b. Effects of Changing AHD Traffic Volumes for Region 2

Receptor	L_{eq}24 with +25% Vehicles Per Day (dBA)	Increase Relative to Future Vehicles Per Day (dBA)	L_{eq}24 with -25% Vehicles Per Day (dBA)	Decrease Relative to Future Vehicles Per Day (dBA)	Receptor	L_{eq}24 with +25% Vehicles Per Day (dBA)	Increase Relative to Future Vehicles Per Day (dBA)	L_{eq}24 with -25% Vehicles Per Day (dBA)	Decrease Relative to Future Vehicles Per Day (dBA)
R_053	58.6	0.3	58.0	-0.3	R_087	60.0	0.6	58.6	-0.8
R_054	58.1	0.4	57.2	-0.5	R_088	60.1	0.7	58.6	-0.8
R_055	60.8	0.6	59.5	-0.7	R_089	60.8	0.7	59.2	-0.9
R_056	61.0	0.6	59.6	-0.8	R_090	63.9	0.7	62.3	-0.9
R_057	61.3	0.6	59.9	-0.8	R_091	64.8	0.8	63.0	-1.0
R_058	59.9	0.8	58.2	-0.9	R_092	65.2	0.9	63.3	-1.0
R_059	60.5	0.8	58.7	-1.0	R_093	61.4	0.7	59.8	-0.9
R_060	61.6	0.9	59.7	-1.0	R_094	59.6	0.5	58.5	-0.6
R_061	62.3	0.8	60.5	-1.0	R_095	60.1	0.7	58.7	-0.7
R_062	63.1	0.9	61.1	-1.1	R_096	59.8	0.6	58.4	-0.8
R_063	63.2	0.9	61.2	-1.1	R_097	60.1	0.6	58.8	-0.7
R_064	63.3	0.9	61.3	-1.1	R_098	65.5	1.0	63.4	-1.1
R_065	63.5	0.9	61.5	-1.1	R_099	65.7	0.9	63.6	-1.2
R_066	62.3	0.9	60.3	-1.1	R_100	60.4	0.8	58.6	-1.0
R_067	60.6	0.9	58.7	-1.0	R_101	60.4	0.8	58.6	-1.0
R_068	60.2	0.8	58.3	-1.1	R_102	60.5	0.8	58.7	-1.0
R_069	59.7	0.8	57.7	-1.2	R_103	60.2	0.8	58.4	-1.0
R_070	60.0	0.9	58.0	-1.1	R_104	59.7	0.8	57.9	-1.0
R_071	61.1	0.9	59.0	-1.2	R_105	61.0	0.6	59.7	-0.7
R_072	60.3	0.9	58.3	-1.1	R_106	62.6	0.9	60.5	-1.2
R_073	61.0	0.9	59.0	-1.1	R_107	63.1	1.0	61.0	-1.1
R_074	61.3	0.9	59.3	-1.1	R_108	63.3	0.9	61.2	-1.2
R_075	60.7	0.8	58.8	-1.1	R_109	58.8	0.7	57.1	-1.0
R_076	60.4	0.8	58.6	-1.0	R_110	59.8	0.9	58.0	-0.9
R_077	60.7	0.9	58.7	-1.1	R_111	59.1	0.7	57.5	-0.9
R_078	59.9	0.9	58.0	-1.0	R_112	58.9	0.4	58.0	-0.5
R_079	60.8	0.8	58.9	-1.1	R_113	56.5	0.6	55.3	-0.6
R_080	59.4	0.8	57.6	-1.0	R_114	59.4	0.5	58.3	-0.6
R_081	56.3	0.7	54.8	-0.8	R_115	56.0	0.6	54.8	-0.6
R_082	60.4	0.2	59.9	-0.3	R_116	58.5	0.8	56.7	-1.0
R_083	58.4	0.3	57.7	-0.4	R_117	63.9	0.4	62.9	-0.6
R_084	59.1	0.5	58.1	-0.5	R_118	59.4	0.7	58.0	-0.7
R_085	58.9	0.6	57.7	-0.6	R_119	60.0	0.6	58.6	-0.8
R_086	59.9	0.6	58.6	-0.7					

Note: SWAHD is the dominant noise source at Receptors R_092, R_098, R_099. However, these locations do not currently have any solid wood fences to act as noise barriers.

Table 5c. Effects of Changing AHD Traffic Volumes for Region 3

Receptor	L_{eq}24 with +25% Vehicles Per Day (dBA)	Increase Relative to Future Vehicles Per Day (dBA)		L_{eq}24 with -25% Vehicles Per Day (dBA)	Decrease Relative to Future Vehicles Per Day (dBA)
R_120	59.2	0.4		58.4	-0.4
R_121	56.7	0.7		55.1	-0.9
R_122	57.0	0.8		55.4	-0.8
R_123	57.3	0.8		55.5	-1.0
R_124	57.6	0.8		55.8	-1.0
R_125	57.9	0.8		56.1	-1.0
R_126	58.1	0.8		56.2	-1.1
R_127	58.5	0.9		56.5	-1.1
R_128	58.8	0.9		56.8	-1.1
R_129	58.6	0.9		56.6	-1.1
R_130	58.3	0.9		56.4	-1.0
R_131	58.6	0.8		56.7	-1.1
R_132	58.6	0.9		56.6	-1.1
R_133	58.6	0.9		56.7	-1.0
R_134	58.7	0.9		56.7	-1.1
R_135	58.6	0.9		56.6	-1.1
R_136	58.6	0.8		56.8	-1.0
R_137	58.1	0.8		56.3	-1.0
R_138	57.7	0.7		56.1	-0.9
R_139	64.2	0.1		63.9	-0.2
R_140	62.4	0.3		61.8	-0.3
R_141	61.4	0.5		60.4	-0.5
R_142	61.6	0.5		60.6	-0.5
R_143	62.2	0.5		61.2	-0.5
R_144	62.3	0.5		61.2	-0.6
R_145	62.9	0.5		62.0	-0.4
R_146	63.1	0.4		62.2	-0.5
R_147	62.1	0.5		61.1	-0.5
R_148	60.6	0.5		59.6	-0.5
R_149	59.3	0.8		57.7	-0.8
R_150	57.9	0.8		56.1	-1.0
R_151	58.1	0.8		56.4	-0.9
R_152	56.6	0.9		54.7	-1.0
R_153	57.3	0.8		55.6	-0.9
R_154	57.2	0.8		55.4	-1.0
R_155	57.3	0.7		55.7	-0.9
R_156	58.6	0.7		57.0	-0.9
R_157	58.7	0.5		57.6	-0.6
R_158	58.2	0.6		57.0	-0.6
R_159	57.6	0.8		55.8	-1.0
R_160	58.2	0.9		56.3	-1.0
R_161	55.0	0.7		53.3	-1.0
R_162	55.7	0.8		53.9	-1.0
R_163	58.8	0.7		57.3	-0.8
R_164	59.1	0.5		58.0	-0.6
R_165	58.1	0.1		57.9	-0.1

Table 5d. Effects of Changing AHD Traffic Volumes for Region 4

Receptor	L_{eq}24 with +25% Vehicles Per Day (dBA)	Increase Relative to Future Vehicles Per Day (dBA)		L_{eq}24 with -25% Vehicles Per Day (dBA)	Decrease Relative to Future Vehicles Per Day (dBA)
R_166	58.3	0.4		57.4	-0.5
R_167	59.1	0.5		58.2	-0.4
R_168	56.8	0.3		56.2	-0.3
R_169	53.2	0.4		52.3	-0.5
R_170	52.5	0.7		51.1	-0.7
R_171	53.7	0.8		51.9	-1.0
R_172	55.1	0.8		53.3	-1.0
R_173	55.5	0.9		53.6	-1.0
R_174	55.9	0.9		53.9	-1.1
R_175	56.3	0.9		54.3	-1.1
R_176	57.3	0.9		55.2	-1.2
R_177	60.4	0.9		58.3	-1.2
R_178	61.0	1.0		58.8	-1.2
R_179	60.5	1.0		58.3	-1.2
R_180	60.1	1.0		57.9	-1.2
R_181	60.3	1.0		58.1	-1.2
R_182	57.6	0.9		55.4	-1.3
R_183	55.9	0.9		53.8	-1.2
R_184	58.5	0.9		56.4	-1.2
R_185	60.3	0.9		58.2	-1.2
R_186	57.7	1.0		55.5	-1.2
R_187	57.4	0.9		55.3	-1.2
R_188	58.1	0.9		56.0	-1.2
R_189	57.6	1.0		55.4	-1.2
R_190	58.4	0.9		56.3	-1.2
R_191	58.4	0.9		56.3	-1.2
R_192	59.0	1.0		56.8	-1.2
R_193	58.8	0.9		56.8	-1.1
R_194	58.5	0.9		56.4	-1.2
R_195	59.0	0.9		56.9	-1.2
R_196	59.4	0.9		57.3	-1.2
R_197	58.2	0.9		56.1	-1.2
R_198	58.8	0.9		56.7	-1.2
R_199	52.4	0.8		50.7	-0.9
R_200	54.4	0.4		53.5	-0.5
R_201	59.4	0.1		59.2	-0.1
R_202	57.2	0.6		56.0	-0.6
R_203	54.9	0.6		53.5	-0.8
R_204	59.5	0.8		57.7	-1.0
R_205	55.0	0.8		53.2	-1.0
R_206	56.2	0.9		54.2	-1.1
R_207	56.0	0.8		54.1	-1.1
R_208	54.7	0.8		52.7	-1.2
R_209	53.6	0.9		51.6	-1.1
R_210	44.3	0.9		42.2	-1.2

Table 5e. Effects of Changing AHD Traffic Volumes for Region 5

Receptor	L_{eq}24 with +25% Vehicles Per Day (dBA)	Increase Relative to Future Vehicles Per Day (dBA)	L_{eq}24 with -25% Vehicles Per Day (dBA)	Decrease Relative to Future Vehicles Per Day (dBA)	Receptor	L_{eq}24 with +25% Vehicles Per Day (dBA)	Increase Relative to Future Vehicles Per Day (dBA)	L_{eq}24 with -25% Vehicles Per Day (dBA)	Decrease Relative to Future Vehicles Per Day (dBA)
R_211	53.6	0.9	51.5	-1.2	R_243	56.4	0.5	55.3	-0.6
R_212	52.8	1.0	50.7	-1.1	R_244	56.2	0.4	55.4	-0.4
R_213	51.7	0.9	49.7	-1.1	R_245	56.0	0.3	55.3	-0.4
R_214	52.2	0.8	50.4	-1.0	R_246	56.4	0.2	56.0	-0.2
R_215	52.3	0.8	50.5	-1.0	R_247	56.1	0.2	55.8	-0.1
R_216	55.2	1.0	53.0	-1.2	R_248	55.4	0.1	55.1	-0.2
R_217	55.2	0.9	53.1	-1.2	R_249	58.5	0.1	58.3	-0.1
R_218	56.5	1.0	54.3	-1.2	R_250	53.3	0.8	51.5	-1.0
R_219	58.1	1.0	55.9	-1.2	R_251	55.6	0.8	53.6	-1.2
R_220	58.0	1.0	55.8	-1.2	R_252	57.3	0.9	55.3	-1.1
R_221	58.1	0.9	56.0	-1.2	R_253	58.1	1.0	56.0	-1.1
R_222	57.1	1.0	54.9	-1.2	R_254	57.1	0.9	55.1	-1.1
R_223	56.2	0.9	54.1	-1.2	R_255	56.6	0.8	54.7	-1.1
R_224	55.7	0.9	53.6	-1.2	R_256	56.5	0.8	54.6	-1.1
R_225	54.6	0.9	52.5	-1.2	R_257	56.7	0.8	54.8	-1.1
R_226	56.5	0.9	54.4	-1.2	R_258	56.9	0.8	55.0	-1.1
R_227	55.7	0.9	53.7	-1.1	R_259	57.3	0.9	55.4	-1.0
R_228	55.7	0.9	53.7	-1.1	R_260	57.4	0.8	55.5	-1.1
R_229	55.8	0.9	53.8	-1.1	R_261	57.8	0.8	56.0	-1.0
R_230	55.9	0.9	53.9	-1.1	R_262	57.9	0.8	56.1	-1.0
R_231	56.1	0.8	54.2	-1.1	R_263	58.1	0.8	56.3	-1.0
R_232	56.1	0.9	54.1	-1.1	R_264	58.2	0.8	56.5	-0.9
R_233	56.3	0.9	54.3	-1.1	R_265	58.1	0.8	56.4	-0.9
R_234	56.6	0.9	54.6	-1.1	R_266	57.7	0.7	56.2	-0.8
R_235	56.6	0.8	54.7	-1.1	R_267	57.8	0.7	56.4	-0.7
R_236	57.0	0.8	55.1	-1.1	R_268	58.0	0.6	56.7	-0.7
R_237	55.1	0.8	53.4	-0.9	R_269	58.8	0.6	57.7	-0.5
R_238	57.0	0.8	55.2	-1.0	R_270	58.8	0.4	58.0	-0.4
R_239	56.4	0.7	54.8	-0.9	R_271	58.5	0.3	57.9	-0.3
R_240	55.7	0.7	54.2	-0.8	R_272	57.2	0.4	56.3	-0.5
R_241	55.2	0.7	53.7	-0.8	R_273	57.5	0.3	56.8	-0.4
R_242	54.8	0.6	53.4	-0.8					

Table 5f. Effects of Changing AHD Traffic Volumes for Region 6

Receptor	L_{eq}24 with +25% Vehicles Per Day (dBA)	Increase Relative to Future Vehicles Per Day (dBA)		L_{eq}24 with -25% Vehicles Per Day (dBA)	Decrease Relative to Future Vehicles Per Day (dBA)		Receptor	L_{eq}24 with +25% Vehicles Per Day (dBA)	Increase Relative to Future Vehicles Per Day (dBA)		L_{eq}24 with -25% Vehicles Per Day (dBA)	Decrease Relative to Future Vehicles Per Day (dBA)
R_274	60.3	0.0		60.2	-0.1		R_303	58.6	0.7		57.2	-0.7
R_275	60.6	0.0		60.5	-0.1		R_304	59.8	0.7		58.2	-0.9
R_276	59.5	0.1		59.3	-0.1		R_305	59.6	0.7		58.0	-0.9
R_277	58.6	0.1		58.3	-0.2		R_306	59.0	0.8		57.1	-1.1
R_278	57.9	0.2		57.4	-0.3		R_307	60.5	0.6		59.1	-0.8
R_279	55.7	0.2		55.2	-0.3		R_308	65.1	0.1		65.0	0.0
R_280	55.2	0.4		54.3	-0.5		R_309	58.1	0.3		57.4	-0.4
R_281	54.5	0.6		53.3	-0.6		R_310	56.7	0.5		55.6	-0.6
R_282	54.8	0.5		53.6	-0.7		R_311	56.8	0.6		55.4	-0.8
R_283	55.7	0.7		54.2	-0.8		R_312	59.3	0.9		57.4	-1.0
R_284	55.3	0.7		53.8	-0.8		R_313	56.6	0.8		54.8	-1.0
R_285	55.9	0.7		54.3	-0.9		R_314	59.7	0.9		57.7	-1.1
R_286	57.6	0.8		55.8	-1.0		R_315	59.3	0.9		57.3	-1.1
R_287	57.3	0.8		55.5	-1.0		R_316	58.1	0.8		56.3	-1.0
R_288	59.8	0.8		58.0	-1.0		R_317	57.8	0.7		56.3	-0.8
R_289	59.9	0.8		58.0	-1.1		R_318	54.2	0.3		53.6	-0.3
R_290	60.3	0.9		58.4	-1.0		R_319	52.4	0.4		51.6	-0.4
R_291	60.3	0.9		58.4	-1.0		R_320	56.7	0.9		54.7	-1.1
R_292	59.7	0.8		57.8	-1.1		R_321	56.3	0.8		54.7	-0.8
R_293	59.8	0.8		57.9	-1.1		R_322	56.0	0.7		54.4	-0.9
R_294	59.5	0.8		57.6	-1.1		R_323	55.4	0.7		53.8	-0.9
R_295	59.8	0.9		57.9	-1.0		R_324	55.0	0.7		53.5	-0.8
R_296	58.0	0.8		56.3	-0.9		R_325	54.9	0.6		53.5	-0.8
R_297	57.6	0.8		55.8	-1.0		R_326	54.8	0.6		53.4	-0.8
R_298	57.2	0.8		55.6	-0.8		R_327	54.6	0.7		53.2	-0.7
R_299	56.8	0.7		55.2	-0.9		R_328	54.5	0.7		52.9	-0.9
R_300	56.6	0.7		55.1	-0.8		R_329	55.2	0.9		53.3	-1.0
R_301	56.5	0.6		55.1	-0.8		R_330	54.4	0.8		52.6	-1.0
R_302	61.6	0.2		61.2	-0.2		R_331	53.9	0.7		52.5	-0.7

Note: The dominant noise source for Receptor R_308 is Rabbit Hill Road by at least a 10 dBA margin relative to SWAHD. This is evidenced by the insignificant changes in the noise levels at this receptor resulting from the changes in the traffic conditions on SWAHD.

Table 5g. Effects of Changing AHD Traffic Volumes for Region 7

Receptor	L_{eq}24 with +25% Vehicles Per Day (dBA)	Increase Relative to Future Vehicles Per Day (dBA)		L_{eq}24 with -25% Vehicles Per Day (dBA)	Decrease Relative to Future Vehicles Per Day (dBA)		Receptor	L_{eq}24 with +25% Vehicles Per Day (dBA)	Increase Relative to Future Vehicles Per Day (dBA)		L_{eq}24 with -25% Vehicles Per Day (dBA)	Decrease Relative to Future Vehicles Per Day (dBA)
R_332	53.4	0.9		51.4	-1.1		R_363	58.9	0.3		58.2	-0.4
R_333	54.0	0.9		52.1	-1.0		R_364	59.3	0.3		58.7	-0.3
R_334	54.7	0.9		52.7	-1.1		R_365	53.2	0.6		51.8	-0.8
R_335	57.5	0.9		55.5	-1.1		R_366	53.7	0.8		52.0	-0.9
R_336	56.6	0.9		54.7	-1.0		R_367	56.0	0.9		54.1	-1.0
R_337	56.1	0.8		54.3	-1.0		R_368	55.8	0.9		53.9	-1.0
R_338	53.2	0.7		51.6	-0.9		R_369	57.2	0.8		55.3	-1.1
R_339	55.5	0.8		53.7	-1.0		R_370	57.4	0.9		55.4	-1.1
R_340	55.1	0.8		53.2	-1.1		R_371	59.3	0.9		57.3	-1.1
R_341	55.0	0.8		53.1	-1.1		R_372	56.7	0.8		54.8	-1.1
R_342	55.4	0.8		53.5	-1.1		R_373	57.7	0.9		55.7	-1.1
R_343	55.7	0.9		53.8	-1.0		R_374	58.2	0.8		56.3	-1.1
R_344	55.6	0.9		53.6	-1.1		R_375	58.7	0.8		56.8	-1.1
R_345	55.5	0.9		53.6	-1.0		R_376	59.1	0.9		57.1	-1.1
R_346	55.8	0.8		53.9	-1.1		R_377	59.7	0.8		57.7	-1.2
R_347	55.7	0.8		53.8	-1.1		R_378	57.6	0.8		55.7	-1.1
R_348	55.8	0.8		53.9	-1.1		R_379	58.5	0.9		56.6	-1.0
R_349	56.7	0.8		54.9	-1.0		R_380	55.7	0.8		53.9	-1.0
R_350	56.6	0.9		54.7	-1.0		R_381	57.2	0.8		55.4	-1.0
R_351	57.0	0.8		55.2	-1.0		R_382	57.9	0.8		56.1	-1.0
R_352	56.3	0.8		54.6	-0.9		R_383	57.4	0.8		55.6	-1.0
R_353	55.9	0.7		54.2	-1.0		R_384	56.4	0.7		54.7	-1.0
R_354	56.5	0.7		54.9	-0.9		R_385	57.3	0.7		55.8	-0.8
R_355	57.0	0.8		55.4	-0.8		R_386	55.5	0.7		54.0	-0.8
R_356	57.2	0.7		55.7	-0.8		R_387	55.4	0.7		53.8	-0.9
R_357	56.5	0.6		55.1	-0.8		R_388	55.9	0.6		54.7	-0.6
R_358	56.3	0.6		55.0	-0.7		R_389	56.9	0.4		56.1	-0.4
R_359	55.8	0.5		54.7	-0.6		R_390	58.6	0.2		58.2	-0.2
R_360	56.4	0.5		55.4	-0.5		R_391	59.5	0.1		59.3	-0.1
R_361	57.1	0.3		56.4	-0.4		R_392	59.8	0.1		59.5	-0.2
R_362	58.2	0.3		57.6	-0.3							

Table 5h. Effects of Changing AHD Traffic Volumes for Region 8

Receptor	L_{eq}24 with +25% Vehicles Per Day (dBA)	Increase Relative to Future Vehicles Per Day (dBA)		L_{eq}24 with -25% Vehicles Per Day (dBA)	Decrease Relative to Future Vehicles Per Day (dBA)		Receptor	L_{eq}24 with +25% Vehicles Per Day (dBA)	Increase Relative to Future Vehicles Per Day (dBA)		L_{eq}24 with -25% Vehicles Per Day (dBA)	Decrease Relative to Future Vehicles Per Day (dBA)
R_393	56.8	0.4		55.9	-0.5		R_427	58.8	0.7		57.2	-0.9
R_394	55.9	0.5		54.9	-0.5		R_428	55.8	0.6		54.6	-0.6
R_395	54.8	0.6		53.6	-0.6		R_429	57.4	0.7		56.0	-0.7
R_396	54.8	0.6		53.5	-0.7		R_430	57.1	0.7		55.6	-0.8
R_397	55.8	0.7		54.4	-0.7		R_431	57.5	0.7		56.0	-0.8
R_398	55.7	0.6		54.3	-0.8		R_432	57.4	0.7		56.0	-0.7
R_399	53.2	0.7		51.7	-0.8		R_433	57.5	0.7		56.1	-0.7
R_400	53.1	0.6		51.7	-0.8		R_434	58.2	0.6		56.8	-0.8
R_401	50.1	0.4		49.3	-0.4		R_435	58.1	0.6		56.8	-0.7
R_402	49.5	0.3		48.8	-0.4		R_436	58.3	0.6		57.1	-0.6
R_403	49.7	0.2		49.3	-0.2		R_437	57.4	0.5		56.3	-0.6
R_404	51.1	0.2		50.7	-0.2		R_438	56.9	0.4		56.0	-0.5
R_405	53.3	0.4		52.5	-0.4		R_439	57.5	0.5		56.4	-0.6
R_406	53.4	0.3		52.7	-0.4		R_440	57.2	0.4		56.2	-0.6
R_407	53.8	0.3		53.2	-0.3		R_441	57.4	0.4		56.5	-0.5
R_408	55.1	0.3		54.4	-0.4		R_442	58.0	0.5		57.1	-0.4
R_409	55.7	0.4		54.9	-0.4		R_443	58.4	0.4		57.6	-0.4
R_410	55.6	0.4		54.8	-0.4		R_444	59.0	0.4		58.2	-0.4
R_411	56.0	0.4		55.2	-0.4		R_445	59.4	0.3		58.8	-0.3
R_412	56.7	0.4		55.9	-0.4		R_446	61.0	0.3		60.4	-0.3
R_413	56.7	0.3		56.1	-0.3		R_447	61.9	0.4		61.2	-0.3
R_414	58.2	0.3		57.6	-0.3		R_448	62.8	0.4		62.0	-0.4
R_415	59.0	0.3		58.4	-0.3		R_449	63.5	0.5		62.6	-0.4
R_416	60.0	0.2		59.5	-0.3		R_450	64.1	0.4		63.1	-0.6
R_417	60.2	0.2		59.7	-0.3		R_451	64.7	0.5		63.6	-0.6
R_418	58.0	0.2		57.5	-0.3		R_452	65.0	0.6		63.8	-0.6
R_419	57.4	0.4		56.7	-0.3		R_453	60.9	0.6		59.5	-0.8
R_420	55.1	0.5		54.0	-0.6		R_454	61.9	0.7		60.5	-0.7
R_421	54.0	0.6		52.7	-0.7		R_455	62.9	0.7		61.4	-0.8
R_422	52.8	0.6		51.5	-0.7		R_456	64.5	0.7		63.1	-0.7
R_423	55.9	0.5		55.0	-0.4		R_457	63.9	0.7		62.5	-0.7
R_424	56.7	0.6		55.2	-0.9		R_458	63.2	0.6		61.8	-0.8
R_425	56.0	0.7		54.5	-0.8		R_459	62.9	0.7		61.4	-0.8
R_426	57.9	0.7		56.3	-0.9							

Note: The dominant noise source for Receptor R_452 is Calgary Trail and the associated ramps.

6.3.2. Traffic Speed Analysis

In order to determine the effect of different traffic speeds, two scenarios were modeled. The future conditions case included a speed of 100 km/hr on SWAHD throughout the entire study area. This speed was increased to 110 km/hr and then decreased to 90 km/hr to determine the relative change compared to 100 km/hr. It is unlikely that the posted traffic speeds will fall outside of this range. Tables 6a – 6h show the L_{eq}24 results for both the 110 km/hr and 90 km/hr conditions as well as the change in noise levels (relative to 100 km/hr) at all modeled receptor locations. **When increasing the speed to 110 km/hr, the noise levels increased by 0.0 – 0.6 dBA. When reducing the speed to 90 km/hr, the noise levels decreased by 0.0 – 0.6 dBA.** As with the traffic volumes assessment, the largest changes were at locations where the noise climate was completely dominated by the noise from SWAHD. The locations with the lowest changes were those where the noise climate was dominated by City Roads. The relative increase in noise levels from a speed increase to 110 km/hr on SWAHD would result in a small number of additional receptor locations having noise levels at or above 65 dBA L_{eq}24 (highlighted in yellow in Tables 6a – 6h). These include receptors to the southwest of the interchange at SWAHD and Whitemud Drive (currently no solid fences), and a receptor northeast of the interchange at SWAHD and Rabbit Hill Road (Rabbit Hill Road is the dominant source at this location. Given that a minimum 2.0 – 3.0 dBA change is required before most people start to notice a change, changing the traffic speeds will not significantly impact the perceived noise climate.

Table 6a. Effects of Changing AHD Traffic Speed for Region 1

Receptor	L_{eq}24 with 110 km/hr on AHD (dBA)	Increase Compared to 100 km/hr (dBA)	L_{eq}24 with 90 km/hr on AHD (dBA)	Decrease Compared to 100 km/hr (dBA)	Receptor	L_{eq}24 with 110 km/hr on AHD (dBA)	Increase Compared to 100 km/hr (dBA)	L_{eq}24 with 90 km/hr on AHD (dBA)	Decrease Compared to 100 km/hr (dBA)
R_001	59.4	0.3	59.0	-0.1	R_027	63.8	0.2	63.4	-0.2
R_002	60.0	0.3	59.5	-0.2	R_028	63.3	0.2	63.0	-0.1
R_003	59.3	0.3	58.7	-0.3	R_029	63.2	0.1	63.0	-0.1
R_004	58.8	0.4	58.1	-0.3	R_030	60.3	0.5	59.3	-0.5
R_005	61.7	0.5	60.8	-0.4	R_031	60.1	0.5	59.1	-0.5
R_006	58.8	0.5	57.9	-0.4	R_032	60.0	0.6	58.9	-0.5
R_007	58.2	0.5	57.2	-0.5	R_033	59.3	0.5	58.3	-0.5
R_008	61.1	0.5	60.1	-0.5	R_034	58.9	0.5	57.9	-0.5
R_009	61.1	0.5	60.1	-0.5	R_035	57.8	0.5	56.8	-0.5
R_010	61.0	0.5	60.0	-0.5	R_036	57.4	0.4	56.6	-0.4
R_011	61.0	0.6	59.9	-0.5	R_037	57.6	0.5	56.8	-0.3
R_012	60.9	0.5	59.9	-0.5	R_038	58.0	0.4	57.3	-0.3
R_013	60.9	0.5	59.9	-0.5	R_039	60.2	0.2	59.9	-0.1
R_014	61.0	0.5	60.0	-0.5	R_040	60.9	0.5	60.0	-0.4
R_015	59.7	0.5	58.8	-0.4	R_041	62.2	0.5	61.2	-0.5
R_016	59.0	0.4	58.2	-0.4	R_042	60.5	0.5	59.5	-0.5
R_017	59.4	0.4	58.6	-0.4	R_043	59.5	0.5	58.6	-0.4
R_018	62.1	0.2	61.7	-0.2	R_044	61.7	0.5	60.7	-0.5
R_019	61.5	0.4	60.8	-0.3	R_045	60.1	0.4	59.3	-0.4
R_020	61.5	0.5	60.6	-0.4	R_046	59.7	0.4	58.9	-0.4
R_021	61.5	0.5	60.7	-0.3	R_047	59.6	0.4	58.9	-0.3
R_022	61.5	0.4	60.7	-0.4	R_048	59.9	0.4	59.1	-0.4
R_023	61.6	0.4	60.9	-0.3	R_049	59.4	0.4	58.7	-0.3
R_024	61.8	0.4	61.1	-0.3	R_050	58.9	0.3	58.3	-0.3
R_025	62.2	0.4	61.5	-0.3	R_051	58.8	0.2	58.3	-0.3
R_026	62.9	0.3	62.3	-0.3	R_052	58.6	0.2	58.2	-0.2

Table 6b. Effects of Changing AHD Traffic Speed for Region 2

Receptor	L_{eq}24 with 110 km/hr on AHD (dBA)	Increase Compared to 100 km/hr (dBA)		L_{eq}24 with 90 km/hr on AHD (dBA)	Decrease Compared to 100 km/hr (dBA)		Receptor	L_{eq}24 with 110 km/hr on AHD (dBA)	Increase Compared to 100 km/hr (dBA)		L_{eq}24 with 90 km/hr on AHD (dBA)	Decrease Compared to 100 km/hr (dBA)
R_053	58.5	0.2		58.2	-0.1		R_087	59.7	0.3		59.0	-0.4
R_054	57.9	0.2		57.4	-0.3		R_088	59.8	0.4		59.0	-0.4
R_055	60.6	0.4		59.9	-0.3		R_089	60.5	0.4		59.6	-0.5
R_056	60.8	0.4		60.0	-0.4		R_090	63.6	0.4		62.7	-0.5
R_057	61.1	0.4		60.3	-0.4		R_091	64.5	0.5		63.5	-0.5
R_058	59.6	0.5		58.7	-0.4		R_092	64.9	0.6		63.8	-0.5
R_059	60.2	0.5		59.2	-0.5		R_093	61.2	0.5		60.3	-0.4
R_060	61.3	0.6		60.3	-0.4		R_094	59.4	0.3		58.8	-0.3
R_061	62.0	0.5		61.0	-0.5		R_095	59.8	0.4		59.1	-0.3
R_062	62.8	0.6		61.7	-0.5		R_096	59.6	0.4		58.8	-0.4
R_063	62.9	0.6		61.8	-0.5		R_097	59.9	0.4		59.2	-0.3
R_064	63.0	0.6		61.9	-0.5		R_098	65.1	0.6		64.0	-0.5
R_065	63.2	0.6		62.1	-0.5		R_099	65.4	0.6		64.2	-0.6
R_066	62.0	0.6		60.8	-0.6		R_100	60.1	0.5		59.1	-0.5
R_067	60.3	0.6		59.2	-0.5		R_101	60.1	0.5		59.1	-0.5
R_068	59.9	0.5		58.9	-0.5		R_102	60.2	0.5		59.2	-0.5
R_069	59.4	0.5		58.3	-0.6		R_103	59.9	0.5		58.9	-0.5
R_070	59.7	0.6		58.6	-0.5		R_104	59.4	0.5		58.4	-0.5
R_071	60.8	0.6		59.6	-0.6		R_105	60.8	0.4		60.1	-0.3
R_072	60.0	0.6		58.9	-0.5		R_106	62.3	0.6		61.1	-0.6
R_073	60.7	0.6		59.6	-0.5		R_107	62.7	0.6		61.6	-0.5
R_074	61.0	0.6		59.9	-0.5		R_108	63.0	0.6		61.9	-0.5
R_075	60.4	0.5		59.4	-0.5		R_109	58.5	0.4		57.6	-0.5
R_076	60.1	0.5		59.1	-0.5		R_110	59.5	0.6		58.5	-0.4
R_077	60.4	0.6		59.3	-0.5		R_111	58.9	0.5		58.0	-0.4
R_078	59.6	0.6		58.5	-0.5		R_112	58.8	0.3		58.2	-0.3
R_079	60.5	0.5		59.5	-0.5		R_113	56.3	0.4		55.6	-0.3
R_080	59.1	0.5		58.2	-0.4		R_114	59.2	0.3		58.6	-0.3
R_081	56.0	0.4		55.2	-0.4		R_115	55.8	0.4		55.1	-0.3
R_082	60.3	0.1		60.1	-0.1		R_116	58.2	0.5		57.2	-0.5
R_083	58.3	0.2		57.9	-0.2		R_117	63.8	0.3		63.2	-0.3
R_084	58.9	0.3		58.4	-0.2		R_118	59.1	0.4		58.4	-0.3
R_085	58.7	0.4		58.1	-0.2		R_119	59.8	0.4		59.0	-0.4
R_086	59.6	0.3		58.9	-0.4							

Note: SWAHD is the dominant noise source at Receptors R_098, R_099. However, these locations do not currently have any solid wood fences to act as noise barriers.

Table 6c. Effects of Changing AHD Traffic Speed for Region 3

Receptor	L_{eq}24 with 110 km/hr on AHD (dBA)	Increase Compared to 100 km/hr (dBA)		L_{eq}24 with 90 km/hr on AHD (dBA)	Decrease Compared to 100 km/hr (dBA)
R_120	59.0	0.2		58.6	-0.2
R_121	56.4	0.4		55.6	-0.4
R_122	56.7	0.5		55.8	-0.4
R_123	56.9	0.4		56.1	-0.4
R_124	57.2	0.4		56.4	-0.4
R_125	57.6	0.5		56.7	-0.4
R_126	57.7	0.4		56.8	-0.5
R_127	58.1	0.5		57.2	-0.4
R_128	58.4	0.5		57.5	-0.4
R_129	58.2	0.5		57.3	-0.4
R_130	57.9	0.5		57.0	-0.4
R_131	58.2	0.4		57.3	-0.5
R_132	58.2	0.5		57.3	-0.4
R_133	58.2	0.5		57.3	-0.4
R_134	58.3	0.5		57.4	-0.4
R_135	58.2	0.5		57.3	-0.4
R_136	58.3	0.5		57.4	-0.4
R_137	57.8	0.5		56.9	-0.4
R_138	57.3	0.3		56.6	-0.4
R_139	64.1	0.0		64.0	-0.1
R_140	62.3	0.2		61.9	-0.2
R_141	61.2	0.3		60.7	-0.2
R_142	61.4	0.3		60.9	-0.2
R_143	62.0	0.3		61.5	-0.2
R_144	62.0	0.2		61.6	-0.2
R_145	62.7	0.3		62.3	-0.1
R_146	62.9	0.2		62.5	-0.2
R_147	61.9	0.3		61.4	-0.2
R_148	60.4	0.3		59.9	-0.2
R_149	58.9	0.4		58.2	-0.3
R_150	57.5	0.4		56.7	-0.4
R_151	57.7	0.4		56.9	-0.4
R_152	56.2	0.5		55.3	-0.4
R_153	57.0	0.5		56.1	-0.4
R_154	56.8	0.4		56.0	-0.4
R_155	57.0	0.4		56.2	-0.4
R_156	58.3	0.4		57.5	-0.4
R_157	58.4	0.2		57.9	-0.3
R_158	57.9	0.3		57.4	-0.2
R_159	57.2	0.4		56.4	-0.4
R_160	57.8	0.5		56.9	-0.4
R_161	54.7	0.4		53.9	-0.4
R_162	55.3	0.4		54.5	-0.4
R_163	58.5	0.4		57.8	-0.3
R_164	58.9	0.3		58.3	-0.3
R_165	58.0	0.0		57.9	-0.1

Table 6d. Effects of Changing AHD Traffic Speed for Region 4

Receptor	L_{eq}24 with 110 km/hr on AHD (dBA)	Increase Compared to 100 km/hr (dBA)		L_{eq}24 with 90 km/hr on AHD (dBA)	Decrease Compared to 100 km/hr (dBA)
R_166	58.1	0.2		57.7	-0.2
R_167	58.9	0.3		58.5	-0.1
R_168	56.7	0.2		56.4	-0.1
R_169	53.0	0.2		52.6	-0.2
R_170	52.2	0.4		51.5	-0.3
R_171	53.3	0.4		52.5	-0.4
R_172	54.8	0.5		53.9	-0.4
R_173	55.1	0.5		54.2	-0.4
R_174	55.5	0.5		54.6	-0.4
R_175	55.9	0.5		55.0	-0.4
R_176	56.9	0.5		55.9	-0.5
R_177	60.0	0.5		59.0	-0.5
R_178	60.6	0.6		59.5	-0.5
R_179	60.0	0.5		59.0	-0.5
R_180	59.7	0.6		58.6	-0.5
R_181	59.9	0.6		58.8	-0.5
R_182	57.2	0.5		56.2	-0.5
R_183	55.5	0.5		54.5	-0.5
R_184	58.1	0.5		57.1	-0.5
R_185	59.9	0.5		58.9	-0.5
R_186	57.2	0.5		56.2	-0.5
R_187	57.0	0.5		56.0	-0.5
R_188	57.7	0.5		56.7	-0.5
R_189	57.2	0.6		56.1	-0.5
R_190	58.0	0.5		57.0	-0.5
R_191	58.0	0.5		57.0	-0.5
R_192	58.5	0.5		57.5	-0.5
R_193	58.4	0.5		57.4	-0.5
R_194	58.1	0.5		57.1	-0.5
R_195	58.6	0.5		57.6	-0.5
R_196	59.0	0.5		58.0	-0.5
R_197	57.8	0.5		56.8	-0.5
R_198	58.4	0.5		57.4	-0.5
R_199	52.1	0.5		51.2	-0.4
R_200	54.2	0.2		53.8	-0.2
R_201	59.4	0.1		59.3	0.0
R_202	56.9	0.3		56.4	-0.2
R_203	54.6	0.3		54.0	-0.3
R_204	59.1	0.4		58.3	-0.4
R_205	54.7	0.5		53.8	-0.4
R_206	55.8	0.5		54.8	-0.5
R_207	55.7	0.5		54.7	-0.5
R_208	54.4	0.5		53.4	-0.5
R_209	53.3	0.6		52.3	-0.4
R_210	43.9	0.5		42.9	-0.5

Table 6e. Effects of Changing AHD Traffic Speed for Region 5

Receptor	L_{eq}24 with 110 km/hr on AHD (dBA)	Increase Compared to 100 km/hr (dBA)		L_{eq}24 with 90 km/hr on AHD (dBA)	Decrease Compared to 100 km/hr (dBA)		Receptor	L_{eq}24 with 110 km/hr on AHD (dBA)	Increase Compared to 100 km/hr (dBA)		L_{eq}24 with 90 km/hr on AHD (dBA)	Decrease Compared to 100 km/hr (dBA)
R_211	53.2	0.5		52.2	-0.5		R_243	56.2	0.3		55.6	-0.3
R_212	52.4	0.6		51.4	-0.4		R_244	56.0	0.2		55.7	-0.1
R_213	51.3	0.5		50.3	-0.5		R_245	55.8	0.1		55.5	-0.2
R_214	51.9	0.5		51.0	-0.4		R_246	56.3	0.1		56.1	-0.1
R_215	52.0	0.5		51.1	-0.4		R_247	56.0	0.1		55.9	0.0
R_216	54.8	0.6		53.7	-0.5		R_248	55.4	0.1		55.2	-0.1
R_217	54.8	0.5		53.8	-0.5		R_249	58.5	0.1		58.3	-0.1
R_218	56.1	0.6		55.0	-0.5		R_250	52.9	0.4		52.1	-0.4
R_219	57.7	0.6		56.6	-0.5		R_251	55.3	0.5		54.3	-0.5
R_220	57.6	0.6		56.5	-0.5		R_252	56.9	0.5		55.9	-0.5
R_221	57.7	0.5		56.7	-0.5		R_253	57.7	0.6		56.7	-0.4
R_222	56.7	0.6		55.6	-0.5		R_254	56.8	0.6		55.8	-0.4
R_223	55.8	0.5		54.8	-0.5		R_255	56.3	0.5		55.3	-0.5
R_224	55.3	0.5		54.3	-0.5		R_256	56.2	0.5		55.2	-0.5
R_225	54.2	0.5		53.2	-0.5		R_257	56.4	0.5		55.4	-0.5
R_226	56.1	0.5		55.1	-0.5		R_258	56.6	0.5		55.6	-0.5
R_227	55.3	0.5		54.3	-0.5		R_259	56.9	0.5		56.0	-0.4
R_228	55.3	0.5		54.3	-0.5		R_260	57.0	0.4		56.1	-0.5
R_229	55.4	0.5		54.4	-0.5		R_261	57.5	0.5		56.6	-0.4
R_230	55.5	0.5		54.5	-0.5		R_262	57.6	0.5		56.7	-0.4
R_231	55.8	0.5		54.8	-0.5		R_263	57.8	0.5		56.9	-0.4
R_232	55.8	0.6		54.8	-0.4		R_264	57.8	0.4		57.0	-0.4
R_233	55.9	0.5		55.0	-0.4		R_265	57.8	0.5		57.0	-0.3
R_234	56.2	0.5		55.2	-0.5		R_266	57.4	0.4		56.7	-0.3
R_235	56.3	0.5		55.3	-0.5		R_267	57.5	0.4		56.8	-0.3
R_236	56.7	0.5		55.7	-0.5		R_268	57.7	0.3		57.1	-0.3
R_237	54.8	0.5		53.9	-0.4		R_269	58.5	0.3		58.0	-0.2
R_238	56.6	0.4		55.8	-0.4		R_270	58.6	0.2		58.2	-0.2
R_239	56.1	0.4		55.3	-0.4		R_271	58.4	0.2		58.1	-0.1
R_240	55.4	0.4		54.6	-0.4		R_272	57.0	0.2		56.6	-0.2
R_241	54.9	0.4		54.2	-0.3		R_273	57.4	0.2		57.0	-0.2
R_242	54.5	0.3		53.8	-0.4							

Table 6f. Effects of Changing AHD Traffic Speed for Region 6

Receptor	L_{eq}24 with 110 km/hr on AHD (dBA)	Increase Compared to 100 km/hr (dBA)		L_{eq}24 with 90 km/hr on AHD (dBA)	Decrease Compared to 100 km/hr (dBA)		Receptor	L_{eq}24 with 110 km/hr on AHD (dBA)	Increase Compared to 100 km/hr (dBA)		L_{eq}24 with 90 km/hr on AHD (dBA)	Decrease Compared to 100 km/hr (dBA)
R_274	60.3	0.0		60.2	-0.1		R_303	58.3	0.4		57.6	-0.3
R_275	60.6	0.0		60.5	-0.1		R_304	59.5	0.4		58.7	-0.4
R_276	59.5	0.1		59.4	0.0		R_305	59.3	0.4		58.5	-0.4
R_277	58.6	0.1		58.4	-0.1		R_306	58.7	0.5		57.7	-0.5
R_278	57.8	0.1		57.6	-0.1		R_307	60.2	0.3		59.5	-0.4
R_279	55.6	0.1		55.4	-0.1		R_308	65.0	0.0		65.0	0.0
R_280	55.0	0.2		54.6	-0.2		R_309	58.0	0.2		57.6	-0.2
R_281	54.2	0.3		53.6	-0.3		R_310	56.5	0.3		55.9	-0.3
R_282	54.6	0.3		54.0	-0.3		R_311	56.6	0.4		55.9	-0.3
R_283	55.4	0.4		54.7	-0.3		R_312	59.0	0.6		58.0	-0.4
R_284	55.0	0.4		54.3	-0.3		R_313	56.3	0.5		55.4	-0.4
R_285	55.6	0.4		54.8	-0.4		R_314	59.4	0.6		58.4	-0.4
R_286	57.3	0.5		56.4	-0.4		R_315	58.9	0.5		57.9	-0.5
R_287	57.0	0.5		56.1	-0.4		R_316	57.8	0.5		56.9	-0.4
R_288	59.5	0.5		58.5	-0.5		R_317	57.6	0.5		56.8	-0.3
R_289	59.6	0.5		58.6	-0.5		R_318	54.1	0.2		53.7	-0.2
R_290	59.9	0.5		59.0	-0.4		R_319	52.2	0.2		51.8	-0.2
R_291	59.9	0.5		59.0	-0.4		R_320	56.3	0.5		55.3	-0.5
R_292	59.4	0.5		58.4	-0.5		R_321	56.0	0.5		55.1	-0.4
R_293	59.5	0.5		58.5	-0.5		R_322	55.7	0.4		54.8	-0.5
R_294	59.2	0.5		58.2	-0.5		R_323	55.1	0.4		54.3	-0.4
R_295	59.4	0.5		58.5	-0.4		R_324	54.8	0.5		54.0	-0.3
R_296	57.7	0.5		56.8	-0.4		R_325	54.6	0.3		53.9	-0.4
R_297	57.3	0.5		56.4	-0.4		R_326	54.5	0.3		53.8	-0.4
R_298	56.9	0.5		56.1	-0.3		R_327	54.3	0.4		53.6	-0.3
R_299	56.5	0.4		55.7	-0.4		R_328	54.2	0.4		53.4	-0.4
R_300	56.3	0.4		55.6	-0.3		R_329	54.8	0.5		53.9	-0.4
R_301	56.3	0.4		55.5	-0.4		R_330	54.1	0.5		53.2	-0.4
R_302	61.5	0.1		61.3	-0.1		R_331	53.6	0.4		52.9	-0.3

Note: The dominant noise source for Receptor R_308 is Rabbit Hill Road by at least a 10 dBA margin relative to SWAHD. This is evidenced by the insignificant changes in the noise levels at this receptor resulting from the changes in the traffic conditions on SWAHD.

Table 6g. Effects of Changing AHD Traffic Speed for Region 7

Receptor	L_{eq}24 with 110 km/hr on AHD (dBA)	Increase Compared to 100 km/hr (dBA)		L_{eq}24 with 90 km/hr on AHD (dBA)	Decrease Compared to 100 km/hr (dBA)		Receptor	L_{eq}24 with 110 km/hr on AHD (dBA)	Increase Compared to 100 km/hr (dBA)		L_{eq}24 with 90 km/hr on AHD (dBA)	Decrease Compared to 100 km/hr (dBA)
R_332	53.0	0.5		52.0	-0.5		R_363	58.8	0.2		58.4	-0.2
R_333	53.7	0.6		52.7	-0.4		R_364	59.2	0.2		58.9	-0.1
R_334	54.3	0.5		53.3	-0.5		R_365	53.0	0.4		52.3	-0.3
R_335	57.1	0.5		56.1	-0.5		R_366	53.4	0.5		52.5	-0.4
R_336	56.2	0.5		55.3	-0.4		R_367	55.7	0.6		54.7	-0.4
R_337	55.8	0.5		54.8	-0.5		R_368	55.4	0.5		54.5	-0.4
R_338	52.9	0.4		52.1	-0.4		R_369	56.9	0.5		55.9	-0.5
R_339	55.2	0.5		54.2	-0.5		R_370	57.0	0.5		56.0	-0.5
R_340	54.8	0.5		53.8	-0.5		R_371	58.9	0.5		57.9	-0.5
R_341	54.7	0.5		53.7	-0.5		R_372	56.4	0.5		55.4	-0.5
R_342	55.1	0.5		54.1	-0.5		R_373	57.4	0.6		56.4	-0.4
R_343	55.4	0.6		54.4	-0.4		R_374	57.9	0.5		56.9	-0.5
R_344	55.2	0.5		54.2	-0.5		R_375	58.4	0.5		57.4	-0.5
R_345	55.2	0.6		54.2	-0.4		R_376	58.7	0.5		57.7	-0.5
R_346	55.5	0.5		54.5	-0.5		R_377	59.4	0.5		58.4	-0.5
R_347	55.4	0.5		54.4	-0.5		R_378	57.3	0.5		56.3	-0.5
R_348	55.5	0.5		54.5	-0.5		R_379	58.1	0.5		57.2	-0.4
R_349	56.4	0.5		55.4	-0.5		R_380	55.4	0.5		54.5	-0.4
R_350	56.2	0.5		55.3	-0.4		R_381	56.9	0.5		55.9	-0.5
R_351	56.7	0.5		55.7	-0.5		R_382	57.6	0.5		56.6	-0.5
R_352	56.0	0.5		55.1	-0.4		R_383	57.1	0.5		56.2	-0.4
R_353	55.6	0.4		54.8	-0.4		R_384	56.1	0.4		55.3	-0.4
R_354	56.2	0.4		55.4	-0.4		R_385	57.1	0.5		56.2	-0.4
R_355	56.7	0.5		55.8	-0.4		R_386	55.2	0.4		54.4	-0.4
R_356	56.9	0.4		56.1	-0.4		R_387	55.1	0.4		54.3	-0.4
R_357	56.3	0.4		55.5	-0.4		R_388	55.6	0.3		55.1	-0.2
R_358	56.1	0.4		55.4	-0.3		R_389	56.8	0.3		56.3	-0.2
R_359	55.6	0.3		55.0	-0.3		R_390	58.5	0.1		58.3	-0.1
R_360	56.2	0.3		55.7	-0.2		R_391	59.5	0.1		59.4	0.0
R_361	57.0	0.2		56.6	-0.2		R_392	59.8	0.1		59.6	-0.1
R_362	58.1	0.2		57.8	-0.1							

Table 6h. Effects of Changing AHD Traffic Speed for Region 8

Receptor	L_{eq}24 with 110 km/hr on AHD (dBA)	Increase Compared to 100 km/hr (dBA)	L_{eq}24 with 90 km/hr on AHD (dBA)	Decrease Compared to 100 km/hr (dBA)	Receptor	L_{eq}24 with 110 km/hr on AHD (dBA)	Increase Compared to 100 km/hr (dBA)	L_{eq}24 with 90 km/hr on AHD (dBA)	Decrease Compared to 100 km/hr (dBA)
R_393	56.6	0.2	56.2	-0.2	R_427	58.5	0.4	57.6	-0.5
R_394	55.7	0.3	55.2	-0.2	R_428	55.6	0.4	54.9	-0.3
R_395	54.6	0.4	53.9	-0.3	R_429	57.1	0.4	56.4	-0.3
R_396	54.6	0.4	53.9	-0.3	R_430	56.8	0.4	56.0	-0.4
R_397	55.5	0.4	54.8	-0.3	R_431	57.2	0.4	56.4	-0.4
R_398	55.5	0.4	54.7	-0.4	R_432	57.1	0.4	56.4	-0.3
R_399	52.9	0.4	52.1	-0.4	R_433	57.2	0.4	56.5	-0.3
R_400	52.9	0.4	52.1	-0.4	R_434	57.9	0.3	57.2	-0.4
R_401	50.0	0.3	49.5	-0.2	R_435	57.8	0.3	57.2	-0.3
R_402	49.3	0.1	49.0	-0.2	R_436	58.1	0.4	57.4	-0.3
R_403	49.6	0.1	49.4	-0.1	R_437	57.2	0.3	56.6	-0.3
R_404	51.0	0.1	50.8	-0.1	R_438	56.8	0.3	56.2	-0.3
R_405	53.1	0.2	52.7	-0.2	R_439	57.3	0.3	56.7	-0.3
R_406	53.3	0.2	52.9	-0.2	R_440	57.0	0.2	56.5	-0.3
R_407	53.7	0.2	53.4	-0.1	R_441	57.2	0.2	56.7	-0.3
R_408	55.0	0.2	54.6	-0.2	R_442	57.8	0.3	57.3	-0.2
R_409	55.5	0.2	55.1	-0.2	R_443	58.3	0.3	57.8	-0.2
R_410	55.4	0.2	55.1	-0.1	R_444	58.8	0.2	58.5	-0.1
R_411	55.8	0.2	55.4	-0.2	R_445	59.3	0.2	58.9	-0.2
R_412	56.5	0.2	56.1	-0.2	R_446	60.9	0.2	60.6	-0.1
R_413	56.6	0.2	56.3	-0.1	R_447	61.7	0.2	61.4	-0.1
R_414	58.1	0.2	57.7	-0.2	R_448	62.6	0.2	62.2	-0.2
R_415	58.9	0.2	58.5	-0.2	R_449	63.3	0.3	62.8	-0.2
R_416	59.9	0.1	59.6	-0.2	R_450	63.9	0.2	63.4	-0.3
R_417	60.1	0.1	59.8	-0.2	R_451	64.5	0.3	63.9	-0.3
R_418	57.9	0.1	57.7	-0.1	R_452	64.8	0.4	64.1	-0.3
R_419	57.2	0.2	56.9	-0.1	R_453	60.6	0.3	59.9	-0.4
R_420	54.9	0.3	54.3	-0.3	R_454	61.6	0.4	60.9	-0.3
R_421	53.8	0.4	53.1	-0.3	R_455	62.6	0.4	61.9	-0.3
R_422	52.6	0.4	51.9	-0.3	R_456	64.2	0.4	63.5	-0.3
R_423	55.7	0.3	55.2	-0.2	R_457	63.6	0.4	62.9	-0.3
R_424	56.5	0.4	55.7	-0.4	R_458	63.0	0.4	62.2	-0.4
R_425	55.8	0.5	55.0	-0.3	R_459	62.6	0.4	61.9	-0.3
R_426	57.6	0.4	56.8	-0.4					

6.3.3. % Heavy Trucks Analysis

In order to determine the effect of varying % heavy trucks, two scenarios were modeled. The future conditions were increased by 5% and then decreased by 5% to determine a relative range of values. It is unlikely that the % heavy trucks will fall outside of this range. The results are shown in Tables 7a – 7h. It can be seen that **the relative sound level increase with a relative increase of 5% heavy trucks is approximately 0.0 – 0.9 dBA. The relative sound level decrease with a relative decrease of 5% heavy trucks is approximately 0.0 – 1.2 dBA.** As with the traffic volumes and traffic speeds assessments, the largest changes were at locations where the noise climate was completely dominated by the noise from SWAHD. The locations with the lowest changes were those where the noise climate was dominated by City Roads. The relative increase in noise levels with a relative increase of 5% heavy trucks on SWAHD would result in a small number of additional locations having noise levels at or above 65 dBA L_{eq}24 (highlighted in yellow in Tables 7a – 7h). These include receptors to the southwest of the interchange at SWAHD and Whitemud Drive (currently no solid fences), and a receptor northeast of the interchange at SWAHD and Rabbit Hill Road (Rabbit Hill Road is the dominant source at this location. Again, given that a minimum 2.0 – 3.0 dBA change is required before most people start to notice a change, it will take a significant change to the % heavy trucks before most people will notice the difference.

In general, the effect of changing the % heavy trucks is inversely logarithmic. For example, the difference between 0% and 1% is significant (approximately 0.7 dBA) while the difference between 10% and 11% is much less (approximately 0.2 dBA). Since the % heavy trucks is at least 9% along the entire SWAHD, small % changes in heavy trucks will not have a significant impact.

Table 7a. Effects of Changing AHD % Heavy Trucks for Region 1

Receptor	L_{eq}24 with 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)	L_{eq}24 with 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)	Receptor	L_{eq}24 with 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)	L_{eq}24 with 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_001	59.5	0.4	58.8	-0.3	R_027	63.9	0.3	63.2	-0.4
R_002	60.1	0.4	59.3	-0.4	R_028	63.4	0.3	62.9	-0.2
R_003	59.5	0.5	58.4	-0.6	R_029	63.3	0.2	63.0	-0.1
R_004	59.0	0.6	57.8	-0.6	R_030	60.5	0.7	58.8	-1.0
R_005	61.9	0.7	60.4	-0.8	R_031	60.4	0.8	58.6	-1.0
R_006	59.0	0.7	57.4	-0.9	R_032	60.2	0.8	58.5	-0.9
R_007	58.5	0.8	56.8	-0.9	R_033	59.6	0.8	57.8	-1.0
R_008	61.4	0.8	59.6	-1.0	R_034	59.2	0.8	57.4	-1.0
R_009	61.4	0.8	59.6	-1.0	R_035	58.1	0.8	56.4	-0.9
R_010	61.3	0.8	59.5	-1.0	R_036	57.7	0.7	56.1	-0.9
R_011	61.2	0.8	59.4	-1.0	R_037	57.8	0.7	56.4	-0.7
R_012	61.2	0.8	59.4	-1.0	R_038	58.2	0.6	57.0	-0.6
R_013	61.2	0.8	59.5	-0.9	R_039	60.3	0.3	59.7	-0.3
R_014	61.2	0.7	59.5	-1.0	R_040	61.1	0.7	59.5	-0.9
R_015	60.0	0.8	58.3	-0.9	R_041	62.4	0.7	60.8	-0.9
R_016	59.3	0.7	57.8	-0.8	R_042	60.7	0.7	59.1	-0.9
R_017	59.6	0.6	58.2	-0.8	R_043	59.8	0.8	58.2	-0.8
R_018	62.2	0.3	61.5	-0.4	R_044	61.9	0.7	60.3	-0.9
R_019	61.8	0.7	60.4	-0.7	R_045	60.4	0.7	58.9	-0.8
R_020	61.7	0.7	60.3	-0.7	R_046	60.0	0.7	58.5	-0.8
R_021	61.7	0.7	60.3	-0.7	R_047	59.9	0.7	58.5	-0.7
R_022	61.7	0.6	60.4	-0.7	R_048	60.1	0.6	58.8	-0.7
R_023	61.8	0.6	60.5	-0.7	R_049	59.6	0.6	58.4	-0.6
R_024	62.0	0.6	60.8	-0.6	R_050	59.1	0.5	58.1	-0.5
R_025	62.4	0.6	61.3	-0.5	R_051	59.0	0.4	58.1	-0.5
R_026	63.0	0.4	62.1	-0.5	R_052	58.7	0.3	58.0	-0.4

Table 7b. Effects of Changing AHD % Heavy Trucks for Region 2

Receptor	L_{eq}24 with 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)		Receptor	L_{eq}24 with 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_053	58.6	0.3		58.0	-0.3		R_087	59.9	0.5		58.7	-0.7
R_054	58.0	0.3		57.3	-0.4		R_088	60.0	0.6		58.7	-0.7
R_055	60.8	0.6		59.6	-0.6		R_089	60.7	0.6		59.3	-0.8
R_056	61.0	0.6		59.7	-0.7		R_090	63.9	0.7		62.3	-0.9
R_057	61.3	0.6		59.9	-0.8		R_091	64.8	0.8		63.0	-1.0
R_058	59.9	0.8		58.3	-0.8		R_092	65.2	0.9		63.3	-1.0
R_059	60.4	0.7		58.7	-1.0		R_093	61.4	0.7		59.9	-0.8
R_060	61.5	0.8		59.8	-0.9		R_094	59.6	0.5		58.5	-0.6
R_061	62.3	0.8		60.5	-1.0		R_095	60.0	0.6		58.7	-0.7
R_062	63.0	0.8		61.2	-1.0		R_096	59.8	0.6		58.5	-0.7
R_063	63.2	0.9		61.3	-1.0		R_097	60.1	0.6		58.9	-0.6
R_064	63.3	0.9		61.4	-1.0		R_098	65.4	0.9		63.4	-1.1
R_065	63.4	0.8		61.5	-1.1		R_099	65.6	0.8		63.6	-1.2
R_066	62.2	0.8		60.3	-1.1		R_100	60.3	0.7		58.7	-0.9
R_067	60.5	0.8		58.7	-1.0		R_101	60.3	0.7		58.6	-1.0
R_068	60.2	0.8		58.4	-1.0		R_102	60.5	0.8		58.8	-0.9
R_069	59.7	0.8		57.8	-1.1		R_103	60.2	0.8		58.5	-0.9
R_070	60.0	0.9		58.0	-1.1		R_104	59.7	0.8		58.0	-0.9
R_071	61.1	0.9		59.1	-1.1		R_105	61.0	0.6		59.8	-0.6
R_072	60.3	0.9		58.4	-1.0		R_106	62.6	0.9		60.6	-1.1
R_073	61.0	0.9		59.1	-1.0		R_107	63.0	0.9		61.0	-1.1
R_074	61.3	0.9		59.4	-1.0		R_108	63.3	0.9		61.3	-1.1
R_075	60.7	0.8		58.9	-1.0		R_109	58.8	0.7		57.2	-0.9
R_076	60.4	0.8		58.6	-1.0		R_110	59.7	0.8		58.0	-0.9
R_077	60.6	0.8		58.8	-1.0		R_111	59.1	0.7		57.5	-0.9
R_078	59.9	0.9		58.0	-1.0		R_112	58.9	0.4		58.0	-0.5
R_079	60.7	0.7		59.0	-1.0		R_113	56.4	0.5		55.4	-0.5
R_080	59.3	0.7		57.7	-0.9		R_114	59.4	0.5		58.3	-0.6
R_081	56.2	0.6		54.9	-0.7		R_115	55.9	0.5		54.9	-0.5
R_082	60.4	0.2		59.9	-0.3		R_116	58.5	0.8		56.7	-1.0
R_083	58.4	0.3		57.8	-0.3		R_117	63.9	0.4		63.0	-0.5
R_084	59.0	0.4		58.2	-0.4		R_118	59.3	0.6		58.1	-0.6
R_085	58.8	0.5		57.8	-0.5		R_119	60.0	0.6		58.7	-0.7
R_086	59.8	0.5		58.6	-0.7							

Note: SWAHD is the dominant noise source at Receptors R_092, R_098, R_099. However, these locations do not currently have any solid wood fences to act as noise barriers.

Table 7c. Effects of Changing AHD % Heavy Trucks for Region 3

Receptor	L_{eq}24 with 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_120	59.1	0.3		58.4	-0.4
R_121	56.6	0.6		55.2	-0.8
R_122	56.9	0.7		55.5	-0.7
R_123	57.2	0.7		55.7	-0.8
R_124	57.5	0.7		56.0	-0.8
R_125	57.8	0.7		56.2	-0.9
R_126	58.0	0.7		56.4	-0.9
R_127	58.3	0.7		56.7	-0.9
R_128	58.7	0.8		57.0	-0.9
R_129	58.5	0.8		56.8	-0.9
R_130	58.1	0.7		56.6	-0.8
R_131	58.5	0.7		56.9	-0.9
R_132	58.4	0.7		56.8	-0.9
R_133	58.5	0.8		56.9	-0.8
R_134	58.5	0.7		56.9	-0.9
R_135	58.4	0.7		56.9	-0.8
R_136	58.5	0.7		57.0	-0.8
R_137	58.0	0.7		56.5	-0.8
R_138	57.5	0.5		56.3	-0.7
R_139	64.2	0.1		63.9	-0.2
R_140	62.4	0.3		61.8	-0.3
R_141	61.3	0.4		60.5	-0.4
R_142	61.5	0.4		60.7	-0.4
R_143	62.1	0.4		61.3	-0.4
R_144	62.2	0.4		61.3	-0.5
R_145	62.8	0.4		62.1	-0.3
R_146	63.0	0.3		62.3	-0.4
R_147	62.0	0.4		61.2	-0.4
R_148	60.5	0.4		59.7	-0.4
R_149	59.1	0.6		57.9	-0.6
R_150	57.7	0.6		56.3	-0.8
R_151	58.0	0.7		56.5	-0.8
R_152	56.4	0.7		54.9	-0.8
R_153	57.2	0.7		55.7	-0.8
R_154	57.0	0.6		55.6	-0.8
R_155	57.2	0.6		55.8	-0.8
R_156	58.5	0.6		57.2	-0.7
R_157	58.6	0.4		57.7	-0.5
R_158	58.1	0.5		57.1	-0.5
R_159	57.5	0.7		56.0	-0.8
R_160	58.0	0.7		56.5	-0.8
R_161	54.9	0.6		53.5	-0.8
R_162	55.5	0.6		54.1	-0.8
R_163	58.7	0.6		57.4	-0.7
R_164	59.0	0.4		58.1	-0.5
R_165	58.1	0.1		57.9	-0.1

Table 7d. Effects of Changing AHD % Heavy Trucks for Region 4

Receptor	L_{eq}24 with 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_166	58.2	0.3		57.5	-0.4
R_167	59.0	0.4		58.3	-0.3
R_168	56.8	0.3		56.2	-0.3
R_169	53.1	0.3		52.4	-0.4
R_170	52.4	0.6		51.2	-0.6
R_171	53.5	0.6		52.1	-0.8
R_172	55.0	0.7		53.5	-0.8
R_173	55.4	0.8		53.8	-0.8
R_174	55.8	0.8		54.1	-0.9
R_175	56.2	0.8		54.5	-0.9
R_176	57.2	0.8		55.4	-1.0
R_177	60.3	0.8		58.5	-1.0
R_178	60.8	0.8		59.0	-1.0
R_179	60.3	0.8		58.5	-1.0
R_180	60.0	0.9		58.1	-1.0
R_181	60.1	0.8		58.3	-1.0
R_182	57.5	0.8		55.7	-1.0
R_183	55.8	0.8		54.0	-1.0
R_184	58.4	0.8		56.6	-1.0
R_185	60.2	0.8		58.4	-1.0
R_186	57.5	0.8		55.7	-1.0
R_187	57.3	0.8		55.5	-1.0
R_188	58.0	0.8		56.2	-1.0
R_189	57.4	0.8		55.6	-1.0
R_190	58.3	0.8		56.5	-1.0
R_191	58.3	0.8		56.5	-1.0
R_192	58.8	0.8		57.0	-1.0
R_193	58.7	0.8		57.0	-0.9
R_194	58.4	0.8		56.6	-1.0
R_195	58.9	0.8		57.1	-1.0
R_196	59.3	0.8		57.5	-1.0
R_197	58.1	0.8		56.3	-1.0
R_198	58.7	0.8		56.9	-1.0
R_199	52.3	0.7		50.8	-0.8
R_200	54.3	0.3		53.6	-0.4
R_201	59.4	0.1		59.2	-0.1
R_202	57.1	0.5		56.1	-0.5
R_203	54.8	0.5		53.7	-0.6
R_204	59.4	0.7		57.9	-0.8
R_205	54.9	0.7		53.4	-0.8
R_206	56.0	0.7		54.3	-1.0
R_207	55.9	0.7		54.2	-1.0
R_208	54.6	0.7		52.9	-1.0
R_209	53.5	0.8		51.8	-0.9
R_210	44.2	0.8		42.4	-1.0

Table 7e. Effects of Changing AHD % Heavy Trucks for Region 5

Receptor	L_{eq}24 with 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)		Receptor	L_{eq}24 with 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_211	53.5	0.8		51.7	-1.0		R_243	56.3	0.4		55.4	-0.5
R_212	52.6	0.8		50.9	-0.9		R_244	56.1	0.3		55.5	-0.3
R_213	51.6	0.8		49.9	-0.9		R_245	55.9	0.2		55.4	-0.3
R_214	52.1	0.7		50.6	-0.8		R_246	56.3	0.1		56.0	-0.2
R_215	52.2	0.7		50.6	-0.9		R_247	56.1	0.2		55.8	-0.1
R_216	55.0	0.8		53.2	-1.0		R_248	55.4	0.1		55.1	-0.2
R_217	55.1	0.8		53.2	-1.1		R_249	58.5	0.1		58.3	-0.1
R_218	56.4	0.9		54.5	-1.0		R_250	53.2	0.7		51.7	-0.8
R_219	58.0	0.9		56.1	-1.0		R_251	55.5	0.7		53.8	-1.0
R_220	57.8	0.8		56.0	-1.0		R_252	57.2	0.8		55.5	-0.9
R_221	58.0	0.8		56.2	-1.0		R_253	57.9	0.8		56.2	-0.9
R_222	57.0	0.9		55.1	-1.0		R_254	57.0	0.8		55.3	-0.9
R_223	56.1	0.8		54.3	-1.0		R_255	56.5	0.7		54.8	-1.0
R_224	55.6	0.8		53.8	-1.0		R_256	56.4	0.7		54.8	-0.9
R_225	54.5	0.8		52.7	-1.0		R_257	56.6	0.7		55.0	-0.9
R_226	56.4	0.8		54.6	-1.0		R_258	56.8	0.7		55.2	-0.9
R_227	55.6	0.8		53.8	-1.0		R_259	57.2	0.8		55.5	-0.9
R_228	55.6	0.8		53.9	-0.9		R_260	57.3	0.7		55.7	-0.9
R_229	55.7	0.8		53.9	-1.0		R_261	57.7	0.7		56.1	-0.9
R_230	55.8	0.8		54.1	-0.9		R_262	57.8	0.7		56.3	-0.8
R_231	56.0	0.7		54.4	-0.9		R_263	58.0	0.7		56.5	-0.8
R_232	56.0	0.8		54.3	-0.9		R_264	58.1	0.7		56.6	-0.8
R_233	56.2	0.8		54.5	-0.9		R_265	58.0	0.7		56.6	-0.7
R_234	56.4	0.7		54.8	-0.9		R_266	57.6	0.6		56.3	-0.7
R_235	56.5	0.7		54.9	-0.9		R_267	57.7	0.6		56.5	-0.6
R_236	56.9	0.7		55.3	-0.9		R_268	57.9	0.5		56.8	-0.6
R_237	55.0	0.7		53.5	-0.8		R_269	58.7	0.5		57.8	-0.4
R_238	56.9	0.7		55.4	-0.8		R_270	58.7	0.3		58.0	-0.4
R_239	56.3	0.6		54.9	-0.8		R_271	58.5	0.3		57.9	-0.3
R_240	55.6	0.6		54.3	-0.7		R_272	57.1	0.3		56.4	-0.4
R_241	55.1	0.6		53.8	-0.7		R_273	57.5	0.3		56.9	-0.3
R_242	54.7	0.5		53.5	-0.7							

Table 7f. Effects of Changing AHD % Heavy Trucks for Region 6

Receptor	L_{eq}24 with 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)	L_{eq}24 with 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)	Receptor	L_{eq}24 with 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)	L_{eq}24 with 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_274	60.3	0.0	60.2	-0.1	R_303	58.5	0.6	57.3	-0.6
R_275	60.6	0.0	60.5	-0.1	R_304	59.7	0.6	58.3	-0.8
R_276	59.5	0.1	59.3	-0.1	R_305	59.5	0.6	58.2	-0.7
R_277	58.6	0.1	58.3	-0.2	R_306	58.9	0.7	57.3	-0.9
R_278	57.8	0.1	57.5	-0.2	R_307	60.4	0.5	59.2	-0.7
R_279	55.7	0.2	55.3	-0.2	R_308	65.1	0.1	65.0	0.0
R_280	55.1	0.3	54.4	-0.4	R_309	58.1	0.3	57.4	-0.4
R_281	54.4	0.5	53.4	-0.5	R_310	56.7	0.5	55.7	-0.5
R_282	54.7	0.4	53.7	-0.6	R_311	56.8	0.6	55.5	-0.7
R_283	55.6	0.6	54.3	-0.7	R_312	59.2	0.8	57.5	-0.9
R_284	55.2	0.6	53.9	-0.7	R_313	56.5	0.7	54.9	-0.9
R_285	55.8	0.6	54.4	-0.8	R_314	59.6	0.8	57.9	-0.9
R_286	57.5	0.7	56.0	-0.8	R_315	59.2	0.8	57.4	-1.0
R_287	57.2	0.7	55.6	-0.9	R_316	58.0	0.7	56.4	-0.9
R_288	59.7	0.7	58.1	-0.9	R_317	57.8	0.7	56.4	-0.7
R_289	59.8	0.7	58.2	-0.9	R_318	54.2	0.3	53.6	-0.3
R_290	60.2	0.8	58.6	-0.8	R_319	52.3	0.3	51.6	-0.4
R_291	60.2	0.8	58.5	-0.9	R_320	56.6	0.8	54.8	-1.0
R_292	59.6	0.7	57.9	-1.0	R_321	56.2	0.7	54.8	-0.7
R_293	59.7	0.7	58.0	-1.0	R_322	55.9	0.6	54.5	-0.8
R_294	59.4	0.7	57.7	-1.0	R_323	55.3	0.6	53.9	-0.8
R_295	59.7	0.8	58.0	-0.9	R_324	55.0	0.7	53.6	-0.7
R_296	57.9	0.7	56.4	-0.8	R_325	54.8	0.5	53.6	-0.7
R_297	57.5	0.7	56.0	-0.8	R_326	54.7	0.5	53.5	-0.7
R_298	57.1	0.7	55.7	-0.7	R_327	54.5	0.6	53.3	-0.6
R_299	56.8	0.7	55.4	-0.7	R_328	54.5	0.7	53.0	-0.8
R_300	56.6	0.7	55.2	-0.7	R_329	55.1	0.8	53.4	-0.9
R_301	56.5	0.6	55.2	-0.7	R_330	54.3	0.7	52.7	-0.9
R_302	61.6	0.2	61.2	-0.2	R_331	53.8	0.6	52.6	-0.6

Note: The dominant noise source for Receptor R_308 is Rabbit Hill Road by at least a 10 dBA margin relative to SWAHD. This is evidenced by the insignificant changes in the noise levels at this receptor resulting from the changes in the traffic conditions on SWAHD.

Table 7g. Effects of Changing AHD % Heavy Trucks for Region 7

Receptor	L_{eq}24 with 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)		Receptor	L_{eq}24 with 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_332	53.3	0.8		51.6	-0.9		R_363	58.9	0.3		58.3	-0.3
R_333	53.9	0.8		52.2	-0.9		R_364	59.2	0.2		58.8	-0.2
R_334	54.6	0.8		52.8	-1.0		R_365	53.2	0.6		51.9	-0.7
R_335	57.4	0.8		55.6	-1.0		R_366	53.7	0.8		52.1	-0.8
R_336	56.5	0.8		54.8	-0.9		R_367	55.9	0.8		54.2	-0.9
R_337	56.0	0.7		54.4	-0.9		R_368	55.7	0.8		54.0	-0.9
R_338	53.1	0.6		51.7	-0.8		R_369	57.1	0.7		55.4	-1.0
R_339	55.4	0.7		53.8	-0.9		R_370	57.3	0.8		55.5	-1.0
R_340	55.0	0.7		53.3	-1.0		R_371	59.2	0.8		57.4	-1.0
R_341	54.9	0.7		53.2	-1.0		R_372	56.6	0.7		54.9	-1.0
R_342	55.3	0.7		53.6	-1.0		R_373	57.6	0.8		55.9	-0.9
R_343	55.6	0.8		53.9	-0.9		R_374	58.1	0.7		56.5	-0.9
R_344	55.5	0.8		53.8	-0.9		R_375	58.7	0.8		56.9	-1.0
R_345	55.4	0.8		53.7	-0.9		R_376	59.0	0.8		57.2	-1.0
R_346	55.7	0.7		54.0	-1.0		R_377	59.7	0.8		57.9	-1.0
R_347	55.7	0.8		54.0	-0.9		R_378	57.5	0.7		55.8	-1.0
R_348	55.7	0.7		54.1	-0.9		R_379	58.4	0.8		56.7	-0.9
R_349	56.7	0.8		55.0	-0.9		R_380	55.7	0.8		54.0	-0.9
R_350	56.5	0.8		54.8	-0.9		R_381	57.1	0.7		55.5	-0.9
R_351	56.9	0.7		55.3	-0.9		R_382	57.8	0.7		56.2	-0.9
R_352	56.3	0.8		54.7	-0.8		R_383	57.3	0.7		55.8	-0.8
R_353	55.9	0.7		54.4	-0.8		R_384	56.4	0.7		54.8	-0.9
R_354	56.5	0.7		55.0	-0.8		R_385	57.3	0.7		55.9	-0.7
R_355	56.9	0.7		55.5	-0.7		R_386	55.4	0.6		54.1	-0.7
R_356	57.1	0.6		55.7	-0.8		R_387	55.3	0.6		53.9	-0.8
R_357	56.5	0.6		55.2	-0.7		R_388	55.8	0.5		54.8	-0.5
R_358	56.3	0.6		55.1	-0.6		R_389	56.9	0.4		56.1	-0.4
R_359	55.8	0.5		54.8	-0.5		R_390	58.6	0.2		58.3	-0.1
R_360	56.3	0.4		55.4	-0.5		R_391	59.5	0.1		59.3	-0.1
R_361	57.1	0.3		56.4	-0.4		R_392	59.8	0.1		59.6	-0.1
R_362	58.2	0.3		57.6	-0.3							

Table 7h. Effects of Changing AHD % Heavy Trucks for Region 8

Receptor	L_{eq}24 with 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)		Receptor	L_{eq}24 with 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_393	56.8	0.4		56.0	-0.4		R_427	58.7	0.6		57.3	-0.8
R_394	55.9	0.5		54.9	-0.5		R_428	55.8	0.6		54.6	-0.6
R_395	54.8	0.6		53.7	-0.5		R_429	57.3	0.6		56.0	-0.7
R_396	54.8	0.6		53.6	-0.6		R_430	57.0	0.6		55.6	-0.8
R_397	55.7	0.6		54.5	-0.6		R_431	57.4	0.6		56.1	-0.7
R_398	55.7	0.6		54.3	-0.8		R_432	57.3	0.6		56.0	-0.7
R_399	53.1	0.6		51.8	-0.7		R_433	57.4	0.6		56.2	-0.6
R_400	53.1	0.6		51.8	-0.7		R_434	58.1	0.5		56.9	-0.7
R_401	50.1	0.4		49.3	-0.4		R_435	58.0	0.5		56.9	-0.6
R_402	49.4	0.2		48.9	-0.3		R_436	58.3	0.6		57.1	-0.6
R_403	49.7	0.2		49.3	-0.2		R_437	57.4	0.5		56.3	-0.6
R_404	51.1	0.2		50.7	-0.2		R_438	56.9	0.4		56.0	-0.5
R_405	53.2	0.3		52.5	-0.4		R_439	57.4	0.4		56.5	-0.5
R_406	53.4	0.3		52.8	-0.3		R_440	57.2	0.4		56.3	-0.5
R_407	53.8	0.3		53.2	-0.3		R_441	57.4	0.4		56.5	-0.5
R_408	55.1	0.3		54.4	-0.4		R_442	57.9	0.4		57.1	-0.4
R_409	55.6	0.3		54.9	-0.4		R_443	58.4	0.4		57.6	-0.4
R_410	55.5	0.3		54.9	-0.3		R_444	58.9	0.3		58.3	-0.3
R_411	55.9	0.3		55.3	-0.3		R_445	59.3	0.2		58.8	-0.3
R_412	56.7	0.4		56.0	-0.3		R_446	60.9	0.2		60.4	-0.3
R_413	56.7	0.3		56.1	-0.3		R_447	61.9	0.4		61.2	-0.3
R_414	58.2	0.3		57.6	-0.3		R_448	62.8	0.4		62.0	-0.4
R_415	59.0	0.3		58.4	-0.3		R_449	63.4	0.4		62.6	-0.4
R_416	60.0	0.2		59.5	-0.3		R_450	64.1	0.4		63.2	-0.5
R_417	60.2	0.2		59.7	-0.3		R_451	64.7	0.5		63.7	-0.5
R_418	58.0	0.2		57.6	-0.2		R_452	64.9	0.5		63.9	-0.5
R_419	57.3	0.3		56.7	-0.3		R_453	60.8	0.5		59.6	-0.7
R_420	55.1	0.5		54.1	-0.5		R_454	61.8	0.6		60.6	-0.6
R_421	54.0	0.6		52.7	-0.7		R_455	62.8	0.6		61.5	-0.7
R_422	52.8	0.6		51.6	-0.6		R_456	64.4	0.6		63.1	-0.7
R_423	55.8	0.4		55.0	-0.4		R_457	63.8	0.6		62.6	-0.6
R_424	56.7	0.6		55.3	-0.8		R_458	63.2	0.6		61.9	-0.7
R_425	56.0	0.7		54.6	-0.7		R_459	62.8	0.6		61.5	-0.7
R_426	57.9	0.7		56.4	-0.8							

6.3.4. Cumulative Sensitivity Analysis

With the information provided by the sensitivity analysis for each of the three main traffic parameters, it is possible to determine a cumulative effect if all three are taken into account simultaneously. The results are presented in Tables 8a – 8h. It can be seen that **the relative sound level increase with 25% more traffic on SWAHD, a speed of 110 km/hr, and a relative increase of 5% heavy trucks is approximately 0.1 – 2.3 dBA. The relative sound level decrease with 25% less traffic, a speed of 90 km/hr, and a relative decrease of 5% heavy trucks is approximately 0.1 – 3.1 dBA.** At locations in which the noise climate is most directly impacted by City roadways, the increases are as low as 0.1 dBA. The relative increase in noise levels associated with a relative increase of 25% traffic volumes, 5% heavy trucks and a speed of 110 km/hr on SWAHD would result in a small number of additional locations having noise levels at or above 65 dBA L_{eq}24 (highlighted in yellow in Tables 8a – 8h). These include receptors to the southwest of the interchange at SWAHD and Whitemud Drive (currently no solid fences), a receptor northeast of the interchange at SWAHD and Rabbit Hill Road (Rabbit Hill Road is the dominant source at this location) and a receptor southwest of the interchange at SWAHD and Calgary Trail (Calgary Trail and associated ramps dominate).

Table 8a. Effects of Cumulative Effects on Noise Levels For Region 1

Receptor	L_{eq}24 with 25% Additional Vehicles, Speed of 110 km/hr, 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)	L_{eq}24 with 25% Fewer Vehicles, Speed of 90 km/hr, 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)	Receptor	L_{eq}24 with 25% Additional Vehicles, Speed of 110 km/hr, 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)	L_{eq}24 with 25% Fewer Vehicles, Speed of 90 km/hr, 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_001	60.1	1.0	58.3	-0.8	R_027	64.4	0.8	62.8	-0.8
R_002	60.9	1.2	58.6	-1.1	R_028	63.8	0.7	62.5	-0.6
R_003	60.5	1.5	57.4	-1.6	R_029	63.6	0.5	62.7	-0.4
R_004	59.9	1.5	56.8	-1.6	R_030	61.8	2.0	57.3	-2.5
R_005	63.1	1.9	59.0	-2.2	R_031	61.7	2.1	57.0	-2.6
R_006	60.3	2.0	56.0	-2.3	R_032	61.5	2.1	56.8	-2.6
R_007	59.8	2.1	55.2	-2.5	R_033	60.9	2.1	56.1	-2.7
R_008	62.7	2.1	57.9	-2.7	R_034	60.5	2.1	55.8	-2.6
R_009	62.7	2.1	58.0	-2.6	R_035	59.3	2.0	54.9	-2.4
R_010	62.6	2.1	57.7	-2.8	R_036	58.9	1.9	54.7	-2.3
R_011	62.6	2.2	57.7	-2.7	R_037	58.9	1.8	55.1	-2.0
R_012	62.5	2.1	57.7	-2.7	R_038	59.2	1.6	56.0	-1.6
R_013	62.5	2.1	57.8	-2.6	R_039	60.9	0.9	59.3	-0.7
R_014	62.5	2.0	57.9	-2.6	R_040	62.4	2.0	58.0	-2.4
R_015	61.2	2.0	56.8	-2.4	R_041	63.7	2.0	59.2	-2.5
R_016	60.5	1.9	56.4	-2.2	R_042	62.0	2.0	57.5	-2.5
R_017	60.7	1.7	57.0	-2.0	R_043	61.0	2.0	56.7	-2.3
R_018	62.9	1.0	61.0	-0.9	R_044	63.1	1.9	58.8	-2.4
R_019	62.9	1.8	59.1	-2.0	R_045	61.5	1.8	57.5	-2.2
R_020	62.8	1.8	59.0	-2.0	R_046	61.1	1.8	57.3	-2.0
R_021	62.8	1.8	59.0	-2.0	R_047	61.0	1.8	57.3	-1.9
R_022	62.9	1.8	59.1	-2.0	R_048	61.2	1.7	57.6	-1.9
R_023	62.9	1.7	59.4	-1.8	R_049	60.6	1.6	57.3	-1.7
R_024	63.1	1.7	59.7	-1.7	R_050	60.0	1.4	57.2	-1.4
R_025	63.3	1.5	60.3	-1.5	R_051	59.7	1.1	57.5	-1.1
R_026	63.8	1.2	61.4	-1.2	R_052	59.3	0.9	57.5	-0.9

Table 8b. Effects of Cumulative Effects on Noise Levels For Region 2

Receptor	L_{eq}24 with 25% Additional Vehicles, Speed of 110 km/hr, 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 25% Fewer Vehicles, Speed of 90 km/hr, 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)		Receptor	L_{eq}24 with 25% Additional Vehicles, Speed of 110 km/hr, 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 25% Fewer Vehicles, Speed of 90 km/hr, 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_053	59.1	0.8		57.7	-0.6		R_087	61.0	1.6		57.6	-1.8
R_054	58.7	1.0		56.7	-1.0		R_088	61.1	1.7		57.6	-1.8
R_055	61.8	1.6		58.6	-1.6		R_089	61.9	1.8		58.0	-2.1
R_056	62.1	1.7		58.5	-1.9		R_090	65.1	1.9		61.0	-2.2
R_057	62.3	1.6		58.8	-1.9		R_091	66.0	2.0		61.5	-2.5
R_058	61.1	2.0		56.8	-2.3		R_092	66.5	2.2		61.7	-2.6
R_059	61.7	2.0		57.2	-2.5		R_093	62.5	1.8		58.6	-2.1
R_060	62.8	2.1		58.2	-2.5		R_094	60.5	1.4		57.6	-1.5
R_061	63.6	2.1		58.9	-2.6		R_095	61.1	1.7		57.7	-1.7
R_062	64.4	2.2		59.5	-2.7		R_096	60.8	1.6		57.4	-1.8
R_063	64.5	2.2		59.5	-2.8		R_097	61.0	1.5		57.9	-1.6
R_064	64.6	2.2		59.6	-2.8		R_098	66.8	2.3		61.5	-3.0
R_065	64.8	2.2		59.7	-2.9		R_099	67.0	2.2		61.7	-3.1
R_066	63.6	2.2		58.5	-2.9		R_100	61.6	2.0		57.2	-2.4
R_067	61.8	2.1		57.1	-2.6		R_101	61.6	2.0		57.2	-2.4
R_068	61.5	2.1		56.7	-2.7		R_102	61.7	2.0		57.3	-2.4
R_069	61.0	2.1		56.1	-2.8		R_103	61.4	2.0		57.0	-2.4
R_070	61.4	2.3		56.2	-2.9		R_104	60.9	2.0		56.4	-2.5
R_071	62.4	2.2		57.2	-3.0		R_105	62.0	1.6		58.8	-1.6
R_072	61.6	2.2		56.5	-2.9		R_106	64.0	2.3		58.7	-3.0
R_073	62.3	2.2		57.3	-2.8		R_107	64.4	2.3		59.1	-3.0
R_074	62.6	2.2		57.7	-2.7		R_108	64.7	2.3		59.4	-3.0
R_075	61.9	2.0		57.3	-2.6		R_109	60.0	1.9		55.8	-2.3
R_076	61.7	2.1		57.0	-2.6		R_110	61.0	2.1		56.5	-2.4
R_077	62.0	2.2		57.0	-2.8		R_111	60.3	1.9		56.2	-2.2
R_078	61.2	2.2		56.3	-2.7		R_112	59.7	1.2		57.3	-1.2
R_079	62.0	2.0		57.4	-2.6		R_113	57.3	1.4		54.6	-1.3
R_080	60.6	2.0		56.3	-2.3		R_114	60.3	1.4		57.5	-1.4
R_081	57.3	1.7		53.8	-1.8		R_115	56.8	1.4		54.0	-1.4
R_082	60.8	0.6		59.6	-0.6		R_116	59.8	2.1		55.1	-2.6
R_083	59.0	0.9		57.3	-0.8		R_117	64.7	1.2		62.3	-1.2
R_084	59.7	1.1		57.6	-1.0		R_118	60.3	1.6		57.0	-1.7
R_085	59.7	1.4		57.0	-1.3		R_119	61.0	1.6		57.6	-1.8
R_086	60.8	1.5		57.7	-1.6							

Note: SWAHD is the dominant noise source at Receptors R_090, R_091, R_092, R_098, R_099. However, these locations do not currently have any solid wood fences to act as noise barriers.

Table 8c. Effects of Cumulative Effects on Noise Levels For Region 3

Receptor	L_{eq}24 with 25% Additional Vehicles, Speed of 110 km/hr, 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 25% Fewer Vehicles, Speed of 90 km/hr, 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_120	59.8	1.0		57.9	-0.9
R_121	57.7	1.7		54.0	-2.0
R_122	58.0	1.8		54.2	-2.0
R_123	58.3	1.8		54.3	-2.2
R_124	58.7	1.9		54.5	-2.3
R_125	59.0	1.9		54.7	-2.4
R_126	59.2	1.9		54.8	-2.5
R_127	59.6	2.0		55.1	-2.5
R_128	60.0	2.1		55.4	-2.5
R_129	59.7	2.0		55.2	-2.5
R_130	59.4	2.0		55.0	-2.4
R_131	59.7	1.9		55.4	-2.4
R_132	59.7	2.0		55.3	-2.4
R_133	59.7	2.0		55.3	-2.4
R_134	59.8	2.0		55.3	-2.5
R_135	59.7	2.0		55.3	-2.4
R_136	59.7	1.9		55.5	-2.3
R_137	59.2	1.9		55.1	-2.2
R_138	58.6	1.6		55.2	-1.8
R_139	64.4	0.3		63.7	-0.4
R_140	63.0	0.9		61.3	-0.8
R_141	62.0	1.1		59.9	-1.0
R_142	62.3	1.2		60.0	-1.1
R_143	62.9	1.2		60.7	-1.0
R_144	63.0	1.2		60.6	-1.2
R_145	63.5	1.1		61.5	-0.9
R_146	63.7	1.0		61.7	-1.0
R_147	62.8	1.2		60.4	-1.2
R_148	61.3	1.2		58.9	-1.2
R_149	60.2	1.7		56.7	-1.8
R_150	58.9	1.8		54.9	-2.2
R_151	59.1	1.8		55.2	-2.1
R_152	57.6	1.9		53.5	-2.2
R_153	58.4	1.9		54.4	-2.1
R_154	58.2	1.8		54.3	-2.1
R_155	58.3	1.7		54.6	-2.0
R_156	59.6	1.7		56.0	-1.9
R_157	59.4	1.2		56.9	-1.3
R_158	58.9	1.3		56.4	-1.2
R_159	58.7	1.9		54.5	-2.3
R_160	59.3	2.0		55.0	-2.3
R_161	56.1	1.8		52.2	-2.1
R_162	56.7	1.8		52.8	-2.1
R_163	59.8	1.7		56.3	-1.8
R_164	59.8	1.2		57.4	-1.2
R_165	58.2	0.2		57.8	-0.2

Table 8d. Effects of Cumulative Effects on Noise Levels For Region 4

Receptor	L_{eq}24 with 25% Additional Vehicles, Speed of 110 km/hr, 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 25% Fewer Vehicles, Speed of 90 km/hr, 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_166	58.9	1.0		56.9	-1.0
R_167	59.7	1.1		57.7	-0.9
R_168	57.3	0.8		55.8	-0.7
R_169	53.8	1.0		51.8	-1.0
R_170	53.4	1.6		50.2	-1.6
R_171	54.7	1.8		50.7	-2.2
R_172	56.3	2.0		51.9	-2.4
R_173	56.6	2.0		52.2	-2.4
R_174	57.1	2.1		52.5	-2.5
R_175	57.5	2.1		52.8	-2.6
R_176	58.5	2.1		53.7	-2.7
R_177	61.6	2.1		56.7	-2.8
R_178	62.2	2.2		57.2	-2.8
R_179	61.7	2.2		56.6	-2.9
R_180	61.3	2.2		56.2	-2.9
R_181	61.5	2.2		56.4	-2.9
R_182	58.8	2.1		53.8	-2.9
R_183	57.2	2.2		52.2	-2.8
R_184	59.7	2.1		54.7	-2.9
R_185	61.6	2.2		56.5	-2.9
R_186	58.9	2.2		53.9	-2.8
R_187	58.6	2.1		53.7	-2.8
R_188	59.4	2.2		54.4	-2.8
R_189	58.8	2.2		53.8	-2.8
R_190	59.7	2.2		54.7	-2.8
R_191	59.6	2.1		54.7	-2.8
R_192	60.2	2.2		55.2	-2.8
R_193	60.1	2.2		55.2	-2.7
R_194	59.7	2.1		54.9	-2.7
R_195	60.2	2.1		55.3	-2.8
R_196	60.6	2.1		55.7	-2.8
R_197	59.4	2.1		54.5	-2.8
R_198	60.0	2.1		55.1	-2.8
R_199	53.5	1.9		49.5	-2.1
R_200	55.0	1.0		53.0	-1.0
R_201	59.6	0.3		59.1	-0.2
R_202	58.0	1.4		55.3	-1.3
R_203	55.7	1.4		52.7	-1.6
R_204	60.6	1.9		56.5	-2.2
R_205	56.1	1.9		51.9	-2.3
R_206	57.3	2.0		52.7	-2.6
R_207	57.2	2.0		52.6	-2.6
R_208	55.9	2.0		51.2	-2.7
R_209	54.8	2.1		50.1	-2.6
R_210	45.6	2.2		40.6	-2.8

Table 8e. Effects of Cumulative Effects on Noise Levels For Region 5

Receptor	L_{eq}24 with 25% Additional Vehicles, Speed of 110 km/hr, 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 25% Fewer Vehicles, Speed of 90 km/hr, 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)		Receptor	L_{eq}24 with 25% Additional Vehicles, Speed of 110 km/hr, 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 25% Fewer Vehicles, Speed of 90 km/hr, 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_211	54.9	2.2		49.9	-2.8		R_243	57.2	1.3		54.6	-1.3
R_212	54.0	2.2		49.1	-2.7		R_244	56.7	0.9		55.0	-0.8
R_213	52.9	2.1		48.2	-2.6		R_245	56.5	0.8		55.0	-0.7
R_214	53.4	2.0		49.1	-2.3		R_246	56.7	0.5		55.7	-0.5
R_215	53.5	2.0		49.2	-2.3		R_247	56.4	0.5		55.6	-0.3
R_216	56.4	2.2		51.4	-2.8		R_248	55.7	0.4		54.9	-0.4
R_217	56.5	2.2		51.3	-3.0		R_249	58.7	0.3		58.1	-0.3
R_218	57.8	2.3		52.6	-2.9		R_250	54.3	1.8		50.3	-2.2
R_219	59.3	2.2		54.2	-2.9		R_251	56.8	2.0		52.2	-2.6
R_220	59.2	2.2		54.1	-2.9		R_252	58.5	2.1		53.8	-2.6
R_221	59.4	2.2		54.3	-2.9		R_253	59.3	2.2		54.4	-2.7
R_222	58.3	2.2		53.3	-2.8		R_254	58.3	2.1		53.6	-2.6
R_223	57.4	2.1		52.5	-2.8		R_255	57.8	2.0		53.2	-2.6
R_224	57.0	2.2		52.0	-2.8		R_256	57.7	2.0		53.2	-2.5
R_225	55.9	2.2		50.8	-2.9		R_257	57.9	2.0		53.4	-2.5
R_226	57.7	2.1		52.8	-2.8		R_258	58.1	2.0		53.6	-2.5
R_227	56.9	2.1		52.1	-2.7		R_259	58.4	2.0		54.0	-2.4
R_228	56.9	2.1		52.1	-2.7		R_260	58.5	1.9		54.2	-2.4
R_229	57.0	2.1		52.2	-2.7		R_261	59.0	2.0		54.6	-2.4
R_230	57.1	2.1		52.4	-2.6		R_262	59.1	2.0		54.8	-2.3
R_231	57.3	2.0		52.8	-2.5		R_263	59.2	1.9		55.1	-2.2
R_232	57.3	2.1		52.7	-2.5		R_264	59.2	1.8		55.3	-2.1
R_233	57.5	2.1		52.9	-2.5		R_265	59.1	1.8		55.3	-2.0
R_234	57.7	2.0		53.2	-2.5		R_266	58.7	1.7		55.2	-1.8
R_235	57.8	2.0		53.3	-2.5		R_267	58.7	1.6		55.4	-1.7
R_236	58.2	2.0		53.7	-2.5		R_268	58.9	1.5		55.9	-1.5
R_237	56.2	1.9		52.1	-2.2		R_269	59.5	1.3		57.0	-1.2
R_238	58.1	1.9		54.0	-2.2		R_270	59.4	1.0		57.5	-0.9
R_239	57.5	1.8		53.6	-2.1		R_271	59.0	0.8		57.5	-0.7
R_240	56.7	1.7		53.1	-1.9		R_272	57.7	0.9		55.9	-0.9
R_241	56.2	1.7		52.7	-1.8		R_273	58.1	0.9		56.4	-0.8
R_242	55.7	1.5		52.5	-1.7							

Table 8f. Effects of Cumulative Effects on Noise Levels For Region 6

Receptor	L_{eq}24 with 25% Additional Vehicles, Speed of 110 km/hr, 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)	L_{eq}24 with 25% Fewer Vehicles, Speed of 90 km/hr, 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_274	60.5	0.2	60.1	-0.2
R_275	60.8	0.2	60.4	-0.2
R_276	59.8	0.4	59.1	-0.3
R_277	58.9	0.4	58.1	-0.4
R_278	58.2	0.5	57.2	-0.5
R_279	56.1	0.6	54.9	-0.6
R_280	55.8	1.0	53.8	-1.0
R_281	55.3	1.4	52.5	-1.4
R_282	55.6	1.3	52.9	-1.4
R_283	56.7	1.7	53.2	-1.8
R_284	56.2	1.6	52.9	-1.7
R_285	56.9	1.7	53.2	-2.0
R_286	58.7	1.9	54.6	-2.2
R_287	58.5	2.0	54.2	-2.3
R_288	60.9	1.9	56.6	-2.4
R_289	61.1	2.0	56.6	-2.5
R_290	61.4	2.0	57.0	-2.4
R_291	61.5	2.1	56.9	-2.5
R_292	60.9	2.0	56.3	-2.6
R_293	61.0	2.0	56.4	-2.6
R_294	60.7	2.0	56.1	-2.6
R_295	60.9	2.0	56.5	-2.4
R_296	59.1	1.9	55.0	-2.2
R_297	58.8	2.0	54.5	-2.3
R_298	58.3	1.9	54.4	-2.0
R_299	57.9	1.8	54.1	-2.0
R_300	57.6	1.7	54.1	-1.8
R_301	57.5	1.6	54.1	-1.8
R_302	62.0	0.6	61.0	-0.4
R_303	59.6	1.7	56.2	-1.7
R_304	60.8	1.7	57.1	-2.0
R_305	60.6	1.7	57.0	-1.9
R_306	60.2	2.0	55.7	-2.5
R_307	61.4	1.5	58.2	-1.7
R_308	65.1	0.1	64.9	-0.1
R_309	58.7	0.9	56.9	-0.9
R_310	57.5	1.3	54.9	-1.3
R_311	57.8	1.6	54.5	-1.7
R_312	60.5	2.1	55.9	-2.5
R_313	57.7	1.9	53.5	-2.3
R_314	60.9	2.1	56.2	-2.6
R_315	60.5	2.1	55.8	-2.6
R_316	59.3	2.0	54.9	-2.4
R_317	58.9	1.8	55.3	-1.8
R_318	54.7	0.8	53.2	-0.7
R_319	53.0	1.0	51.1	-0.9
R_320	57.9	2.1	53.1	-2.7
R_321	57.4	1.9	53.5	-2.0
R_322	57.1	1.8	53.1	-2.2
R_323	56.5	1.8	52.7	-2.0
R_324	56.1	1.8	52.5	-1.8
R_325	55.8	1.5	52.6	-1.7
R_326	55.7	1.5	52.5	-1.7
R_327	55.6	1.7	52.2	-1.7
R_328	55.6	1.8	51.6	-2.2
R_329	56.4	2.1	51.8	-2.5
R_330	55.6	2.0	51.3	-2.3
R_331	54.8	1.6	51.5	-1.7

Note: The dominant noise source for Receptor R_308 is Rabbit Hill Road by at least a 10 dBA margin relative to SWAHD. This is evidenced by the insignificant changes in the noise levels at this receptor resulting from the changes in the traffic conditions on SWAHD.

Table 8g. Effects of Cumulative Effects on Noise Levels For Region 7

Receptor	L_{eq}24 with 25% Additional Vehicles, Speed of 110 km/hr, 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)	L_{eq}24 with 25% Fewer Vehicles, Speed of 90 km/hr, 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)	Receptor	L_{eq}24 with 25% Additional Vehicles, Speed of 110 km/hr, 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)	L_{eq}24 with 25% Fewer Vehicles, Speed of 90 km/hr, 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_332	54.6	2.1	49.9	-2.6	R_363	59.4	0.8	57.9	-0.7
R_333	55.3	2.2	50.5	-2.6	R_364	59.7	0.7	58.4	-0.6
R_334	55.9	2.1	51.1	-2.7	R_365	54.2	1.6	50.9	-1.7
R_335	58.7	2.1	53.9	-2.7	R_366	54.9	2.0	50.6	-2.3
R_336	57.8	2.1	53.2	-2.5	R_367	57.2	2.1	52.7	-2.4
R_337	57.3	2.0	52.9	-2.4	R_368	57.0	2.1	52.4	-2.5
R_338	54.3	1.8	50.4	-2.1	R_369	58.5	2.1	53.7	-2.7
R_339	56.7	2.0	52.3	-2.4	R_370	58.6	2.1	53.9	-2.6
R_340	56.3	2.0	51.8	-2.5	R_371	60.5	2.1	55.7	-2.7
R_341	56.3	2.1	51.6	-2.6	R_372	57.9	2.0	53.4	-2.5
R_342	56.7	2.1	52.0	-2.6	R_373	59.0	2.2	54.2	-2.6
R_343	56.9	2.1	52.2	-2.6	R_374	59.4	2.0	54.9	-2.5
R_344	56.8	2.1	52.1	-2.6	R_375	60.0	2.1	55.3	-2.6
R_345	56.7	2.1	52.1	-2.5	R_376	60.3	2.1	55.5	-2.7
R_346	57.0	2.0	52.4	-2.6	R_377	61.0	2.1	56.1	-2.8
R_347	56.9	2.0	52.4	-2.5	R_378	58.8	2.0	54.2	-2.6
R_348	57.0	2.0	52.5	-2.5	R_379	59.7	2.1	55.1	-2.5
R_349	57.9	2.0	53.4	-2.5	R_380	56.9	2.0	52.5	-2.4
R_350	57.7	2.0	53.3	-2.4	R_381	58.3	1.9	54.0	-2.4
R_351	58.1	1.9	53.8	-2.4	R_382	59.1	2.0	54.7	-2.4
R_352	57.5	2.0	53.3	-2.2	R_383	58.5	1.9	54.3	-2.3
R_353	57.0	1.8	53.0	-2.2	R_384	57.5	1.8	53.5	-2.2
R_354	57.6	1.8	53.7	-2.1	R_385	58.4	1.8	54.6	-2.0
R_355	58.0	1.8	54.2	-2.0	R_386	56.5	1.7	52.9	-1.9
R_356	58.2	1.7	54.6	-1.9	R_387	56.4	1.7	52.8	-1.9
R_357	57.5	1.6	54.2	-1.7	R_388	56.7	1.4	54.0	-1.3
R_358	57.2	1.5	54.1	-1.6	R_389	57.6	1.1	55.6	-0.9
R_359	56.7	1.4	54.0	-1.3	R_390	58.9	0.5	58.0	-0.4
R_360	57.1	1.2	54.8	-1.1	R_391	59.7	0.3	59.2	-0.2
R_361	57.7	0.9	55.9	-0.9	R_392	60.1	0.4	59.4	-0.3
R_362	58.7	0.8	57.3	-0.6					

Table 8h. Effects of Cumulative Effects on Noise Levels For Region 8

Receptor	L_{eq}24 with 25% Additional Vehicles, Speed of 110 km/hr, 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 25% Fewer Vehicles, Speed of 90 km/hr, 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)		Receptor	L_{eq}24 with 25% Additional Vehicles, Speed of 110 km/hr, 5% Greater Heavy Trucks on AHD (dBA)	Increase Compared to Future Conditions (dBA)		L_{eq}24 with 25% Fewer Vehicles, Speed of 90 km/hr, 5% Fewer Heavy Trucks on AHD (dBA)	Decrease Compared to Future Conditions (dBA)
R_393	57.5	1.1		55.4	-1.0		R_427	59.9	1.8		56.0	-2.1
R_394	56.7	1.3		54.2	-1.2		R_428	56.7	1.5		53.7	-1.5
R_395	55.7	1.5		52.8	-1.4		R_429	58.4	1.7		55.0	-1.7
R_396	55.7	1.5		52.7	-1.5		R_430	58.1	1.7		54.5	-1.9
R_397	56.7	1.6		53.5	-1.6		R_431	58.5	1.7		54.9	-1.9
R_398	56.8	1.7		53.2	-1.9		R_432	58.4	1.7		54.9	-1.8
R_399	54.2	1.7		50.6	-1.9		R_433	58.5	1.7		55.1	-1.7
R_400	54.1	1.6		50.7	-1.8		R_434	59.1	1.5		55.9	-1.7
R_401	50.8	1.1		48.7	-1.0		R_435	59.0	1.5		55.9	-1.6
R_402	50.0	0.8		48.5	-0.7		R_436	59.2	1.5		56.2	-1.5
R_403	50.1	0.6		49.0	-0.5		R_437	58.3	1.4		55.5	-1.4
R_404	51.4	0.5		50.4	-0.5		R_438	57.7	1.2		55.4	-1.1
R_405	53.8	0.9		52.1	-0.8		R_439	58.2	1.2		55.8	-1.2
R_406	53.9	0.8		52.3	-0.8		R_440	57.9	1.1		55.6	-1.2
R_407	54.3	0.8		52.8	-0.7		R_441	58.1	1.1		55.9	-1.1
R_408	55.7	0.9		54.0	-0.8		R_442	58.7	1.2		56.5	-1.0
R_409	56.3	1.0		54.4	-0.9		R_443	59.0	1.0		57.1	-0.9
R_410	56.2	1.0		54.4	-0.8		R_444	59.6	1.0		57.8	-0.8
R_411	56.5	0.9		54.8	-0.8		R_445	59.9	0.8		58.4	-0.7
R_412	57.3	1.0		55.5	-0.8		R_446	61.4	0.7		60.1	-0.6
R_413	57.2	0.8		55.7	-0.7		R_447	62.4	0.9		60.8	-0.7
R_414	58.8	0.9		57.2	-0.7		R_448	63.4	1.0		61.4	-1.0
R_415	59.5	0.8		58.0	-0.7		R_449	64.1	1.1		62.0	-1.0
R_416	60.4	0.6		59.2	-0.6		R_450	64.9	1.2		62.5	-1.2
R_417	60.6	0.6		59.4	-0.6		R_451	65.6	1.4		62.9	-1.3
R_418	58.3	0.5		57.3	-0.5		R_452	65.8	1.4		63.0	-1.4
R_419	57.9	0.9		56.3	-0.7		R_453	61.8	1.5		58.6	-1.7
R_420	56.0	1.4		53.3	-1.3		R_454	62.8	1.6		59.5	-1.7
R_421	55.0	1.6		51.7	-1.7		R_455	63.9	1.7		60.4	-1.8
R_422	53.8	1.6		50.6	-1.6		R_456	65.4	1.6		62.1	-1.7
R_423	56.5	1.1		54.4	-1.0		R_457	64.9	1.7		61.5	-1.7
R_424	57.8	1.7		54.2	-1.9		R_458	64.2	1.6		60.8	-1.8
R_425	57.1	1.8		53.5	-1.8		R_459	63.9	1.7		60.4	-1.8
R_426	59.0	1.8		55.1	-2.1							

Note: The dominant noise source for Receptors R_451 & R_452 is Calgary Trail and the associated ramps.

7.0 Conclusion

Noise Monitoring

The noise monitoring results indicate an increase in the $L_{eq}24$ noise levels from 2007 to 2013 ranging from +1.6 to +6.8 dBA at all locations. The relative increases are logical given the various factors that have changed from 2007 to 2013, including:

- Increase in traffic volumes ranging from 2x to 3x;
- Increased posted speed limit from 90 km/hr (with 70 km/hr zones) to 100 km/hr throughout;
- Modifications to the road surface (i.e. milling of concrete and re-paving of some asphalt sections);
- Additional lanes between Lessard Road and Whitemud Drive; and
- Changes to existing interchanges, additions of new interchanges.

The 1/3 octave band frequency data show the typical trend of low frequency noise (near 63 – 80 Hz) resulting from engines and exhaust, as well as mid-high frequency noise (near 1,000 Hz) resulting from tire noise.

Finally, the results from the 2013 noise monitoring indicated that the noise level contributions associated with the concrete surface are essentially identical to those associated with the asphalt surface. This is a slight change from the 2007 noise monitoring results which indicated that the noise contributions from the concrete surface was approximately 1 dBA louder than from the asphalt surface.

Noise Modeling

The noise modeling results for Current Conditions matched well with the noise measurement results. The Current modeled noise levels were below the limit of 65 dBA $L_{eq}24$ at all of the residential outdoor receptor locations.

The noise modeling results for the Future Conditions (with projected traffic volumes for the Year 2024) indicated noise levels which were still below the limit of 65 dBA $L_{eq}24$ at all but one location. The location is northeast of the interchange at SWAHD and Rabbit Hill Road. The noise model indicated that the dominant noise source at this receptor is Rabbit Hill Road by at least a 10 dBA margin relative to SWAHD.

A sensitivity analysis of the future traffic volumes, traffic speeds, and % heavy trucks on SWAHD indicated that significant individual increases to each parameter or significant increases to all three combined, would result in a few additional locations with noise levels at or above 65 dBA L_{eq}24. These include the following:

- Receptors to the southwest of the interchange at SWAHD and Whitemud Drive. These receptors currently have no solid fences to act as noise barriers;
- The receptor northeast of the interchange at SWAHD and Rabbit Hill Road at which Rabbit Hill Road is the dominant source; and
- A receptor southwest of the interchange at SWAHD and Calgary Trail at which Calgary Trail and the associated interchange ramps are the dominant noise sources.

8.0 References

- *"Noise Attenuation Guidelines for Provincial Highways Under Provincial Jurisdiction Within Cities and Urban Areas"*, by Alberta Transportation. October, 2002.
- *Environmental Noise Survey and Computer Modeling for Southwest Anthony Henday Drive in Edmonton, Alberta*, prepared for UMA Engineering Ltd., by aci Acoustical Consultants Inc., October 2007.
- City of Edmonton Urban Traffic Noise Policy (C506), 2004
- International Organization for Standardization (ISO), *Standard 1996-1, Acoustics – Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures, 2003*, Geneva Switzerland.
- International Organization for Standardization (ISO), *Standard 9613-1, Acoustics – Attenuation of sound during propagation outdoors – Part 1: Calculation of absorption of sound by the atmosphere, 1993*, Geneva Switzerland.
- International Organization for Standardization (ISO), *Standard 9613-2, Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation, 1996*, Geneva Switzerland.

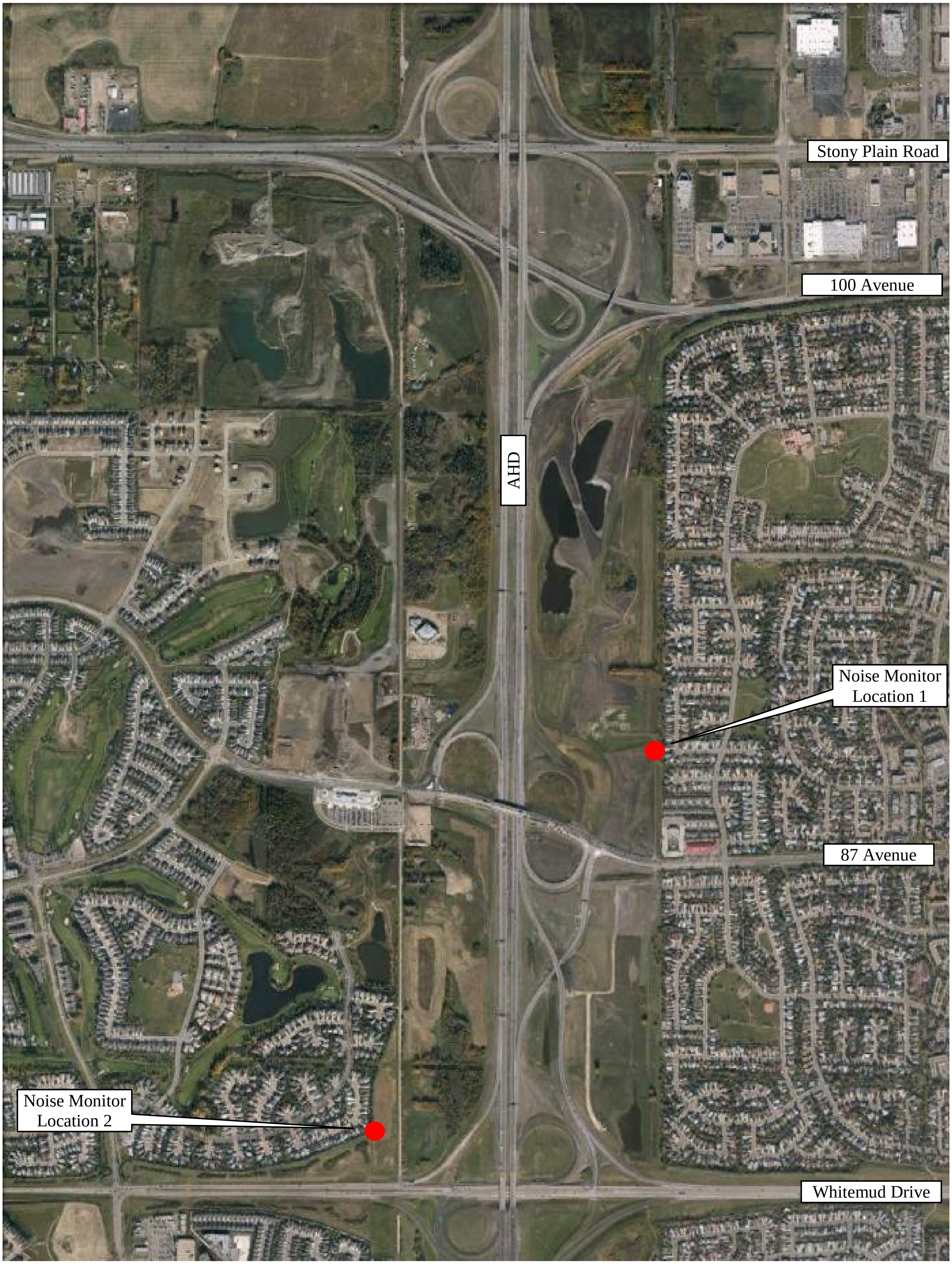

Figure 1a. Study Area From Stony Plain Road to Whitemud Drive

Figure 1b. Study Area From Whitemud Drive to Lessard Road

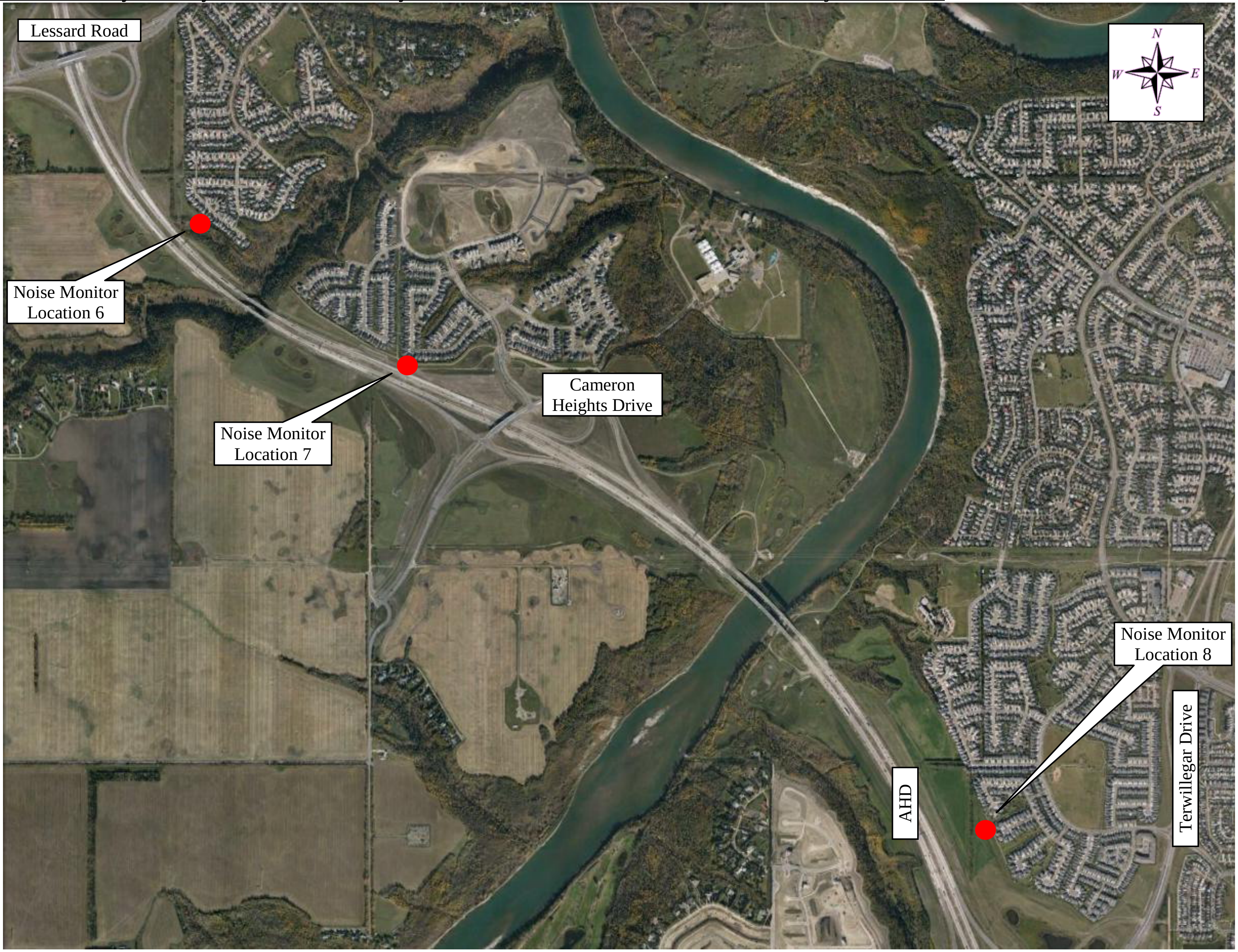

Figure 1c. Study Area From Lessard Road to Terwillegar Drive

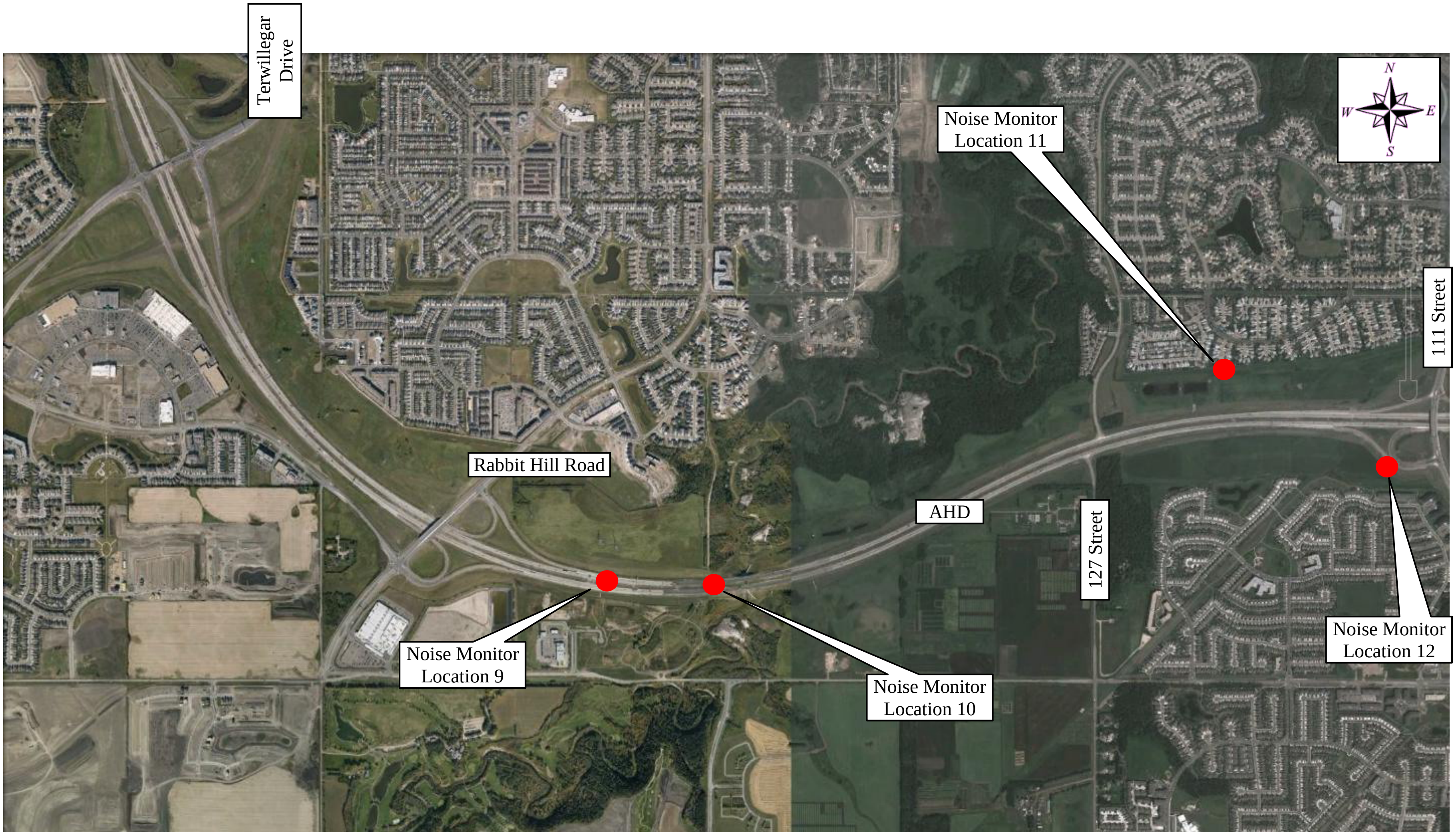

Figure 1d. Study Area From Terwillegar Drive to 111 Street

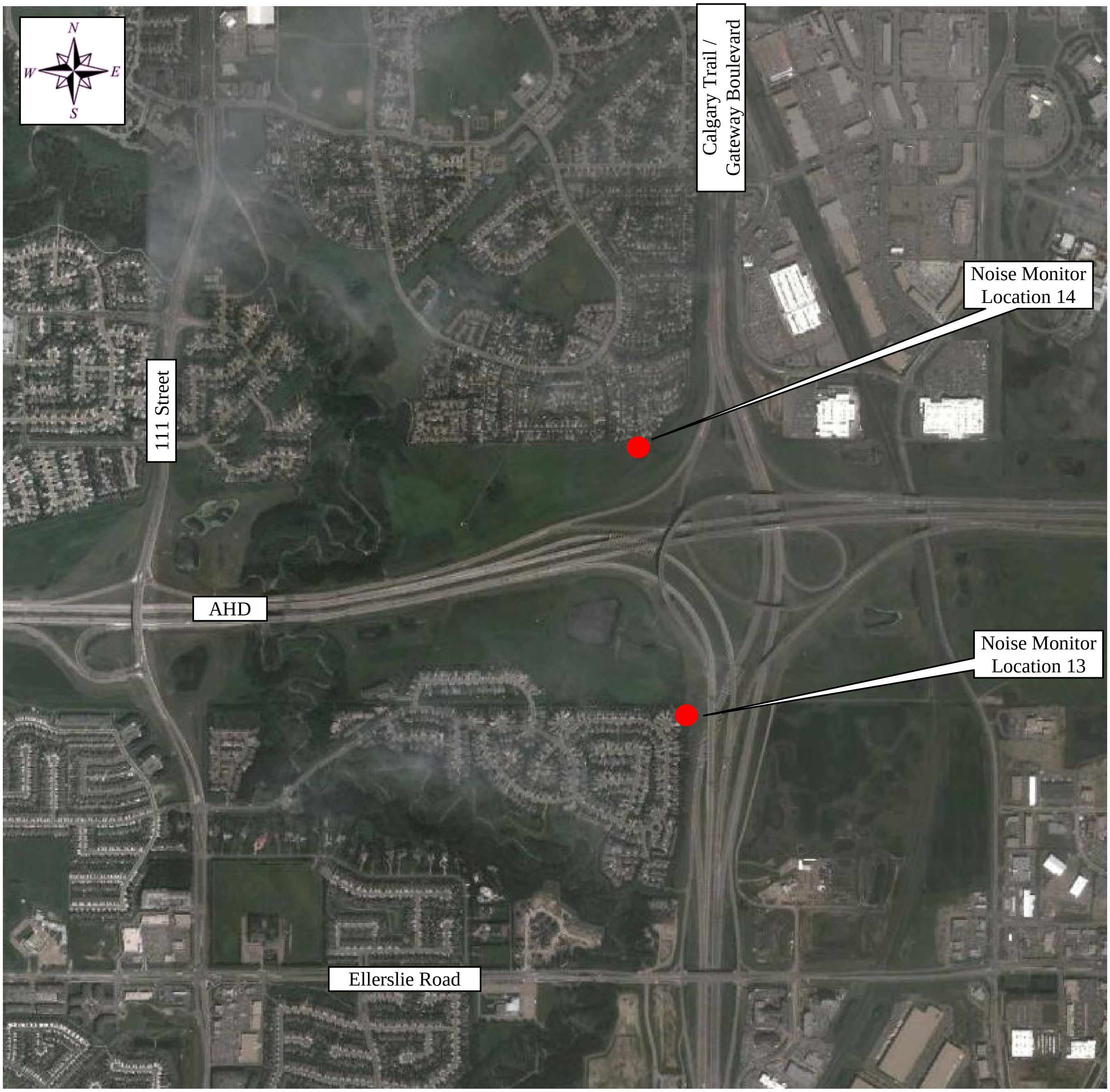

Figure 1e. Study Area From 111 Street to Gateway Boulevard

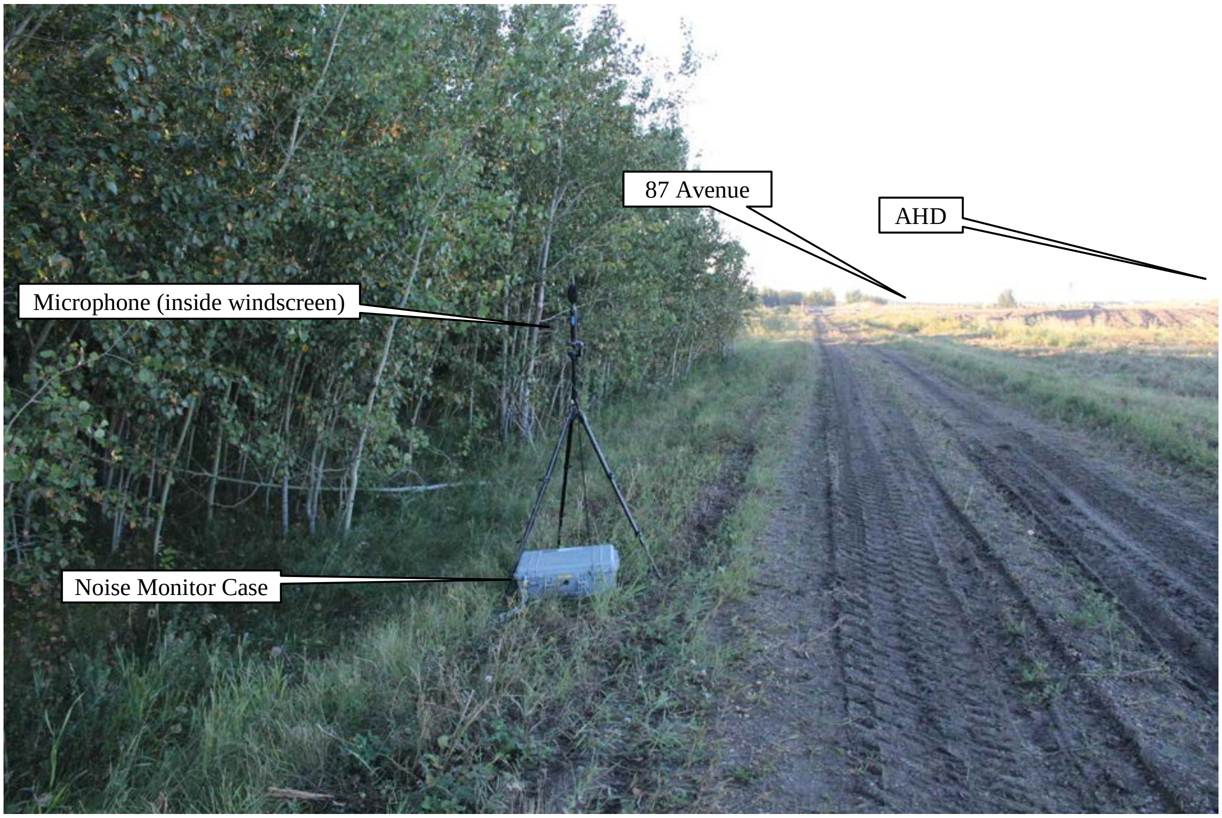

Figure 2. Noise Monitor at Location 1

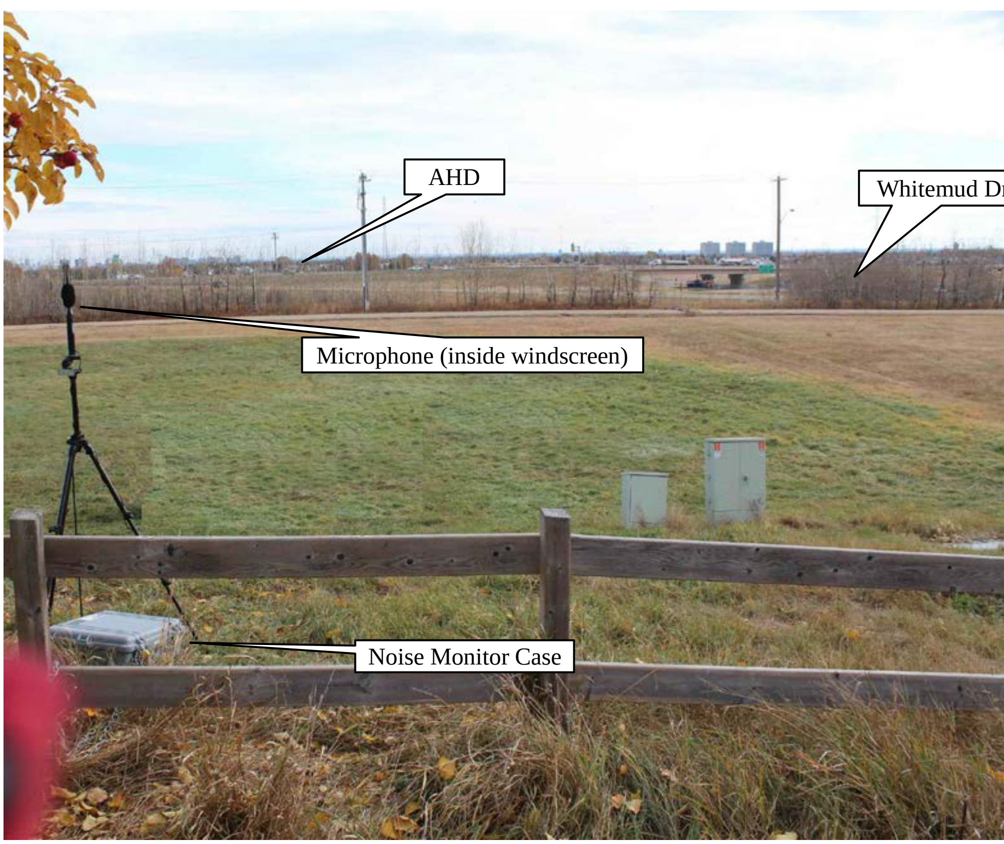

Figure 3. Noise Monitor at Location 2

Figure 4. Noise Monitor at Location 3

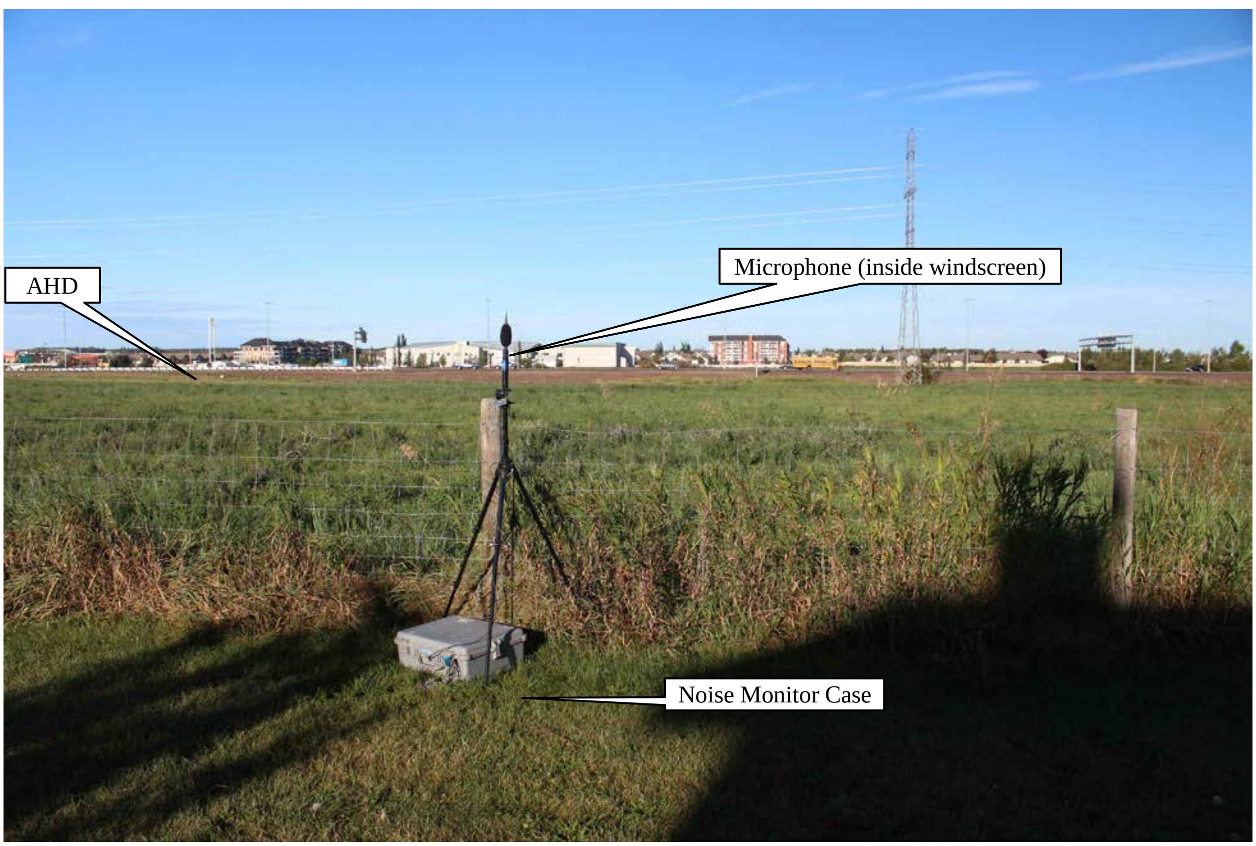

Figure 5. Noise Monitor at Location 4

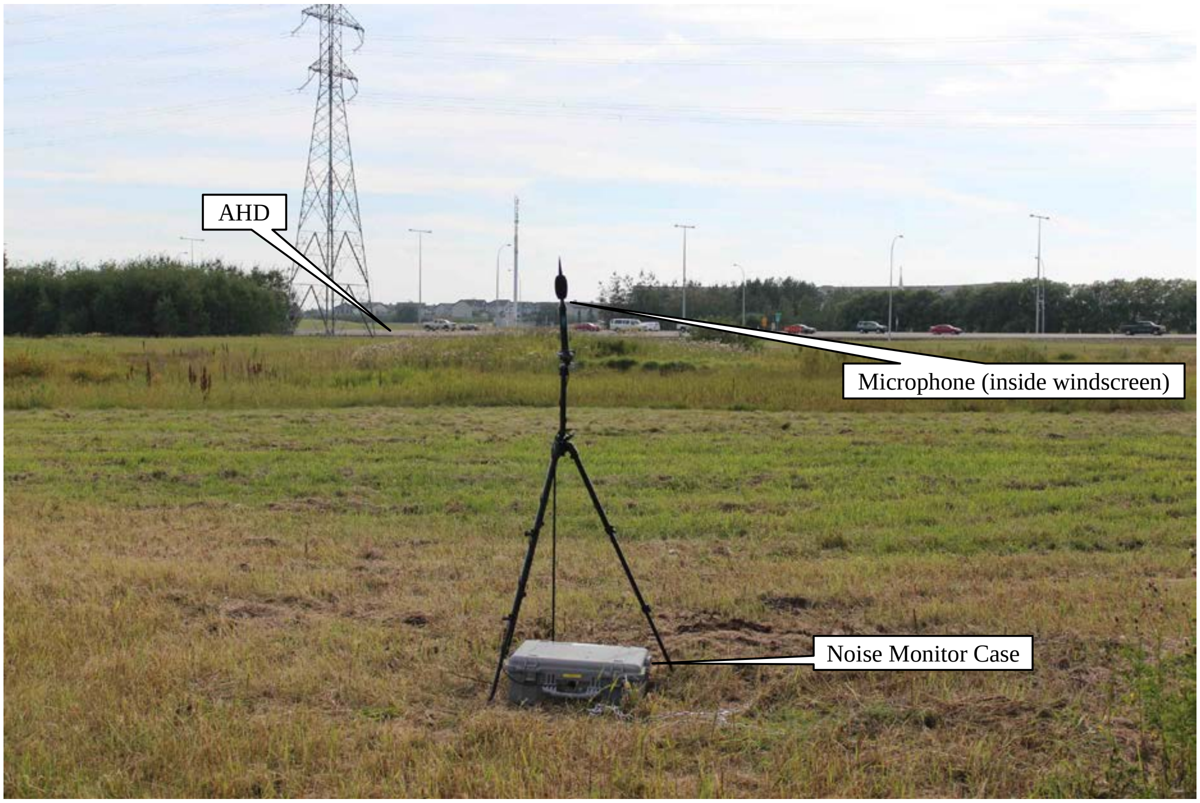

Figure 6. Noise Monitor at Location 5

Figure 7. Noise Monitor at Location 6

Figure 8. Noise Monitor at Location 7

Figure 9. Noise Monitor at Location 8

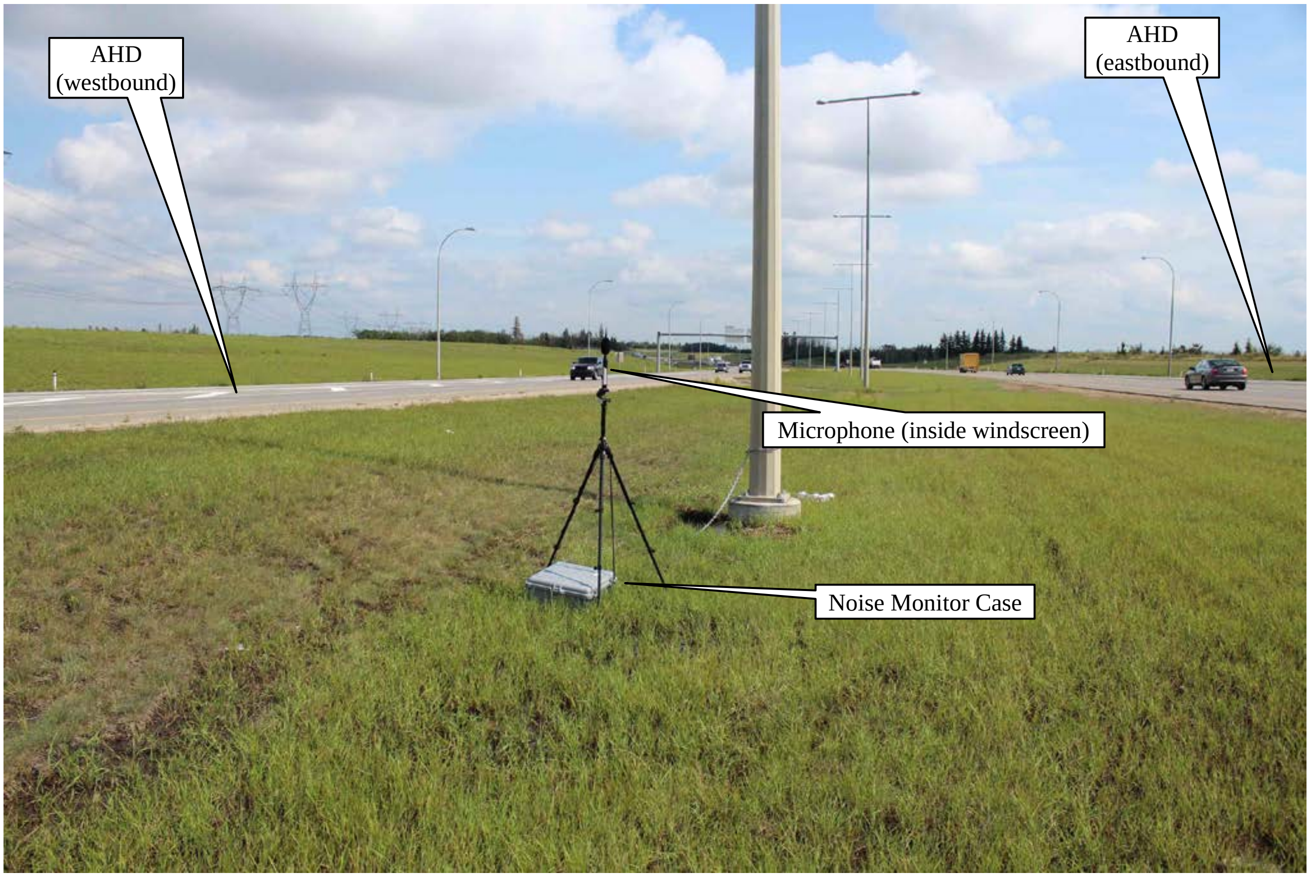

Figure 10. Noise Monitor at Location 9

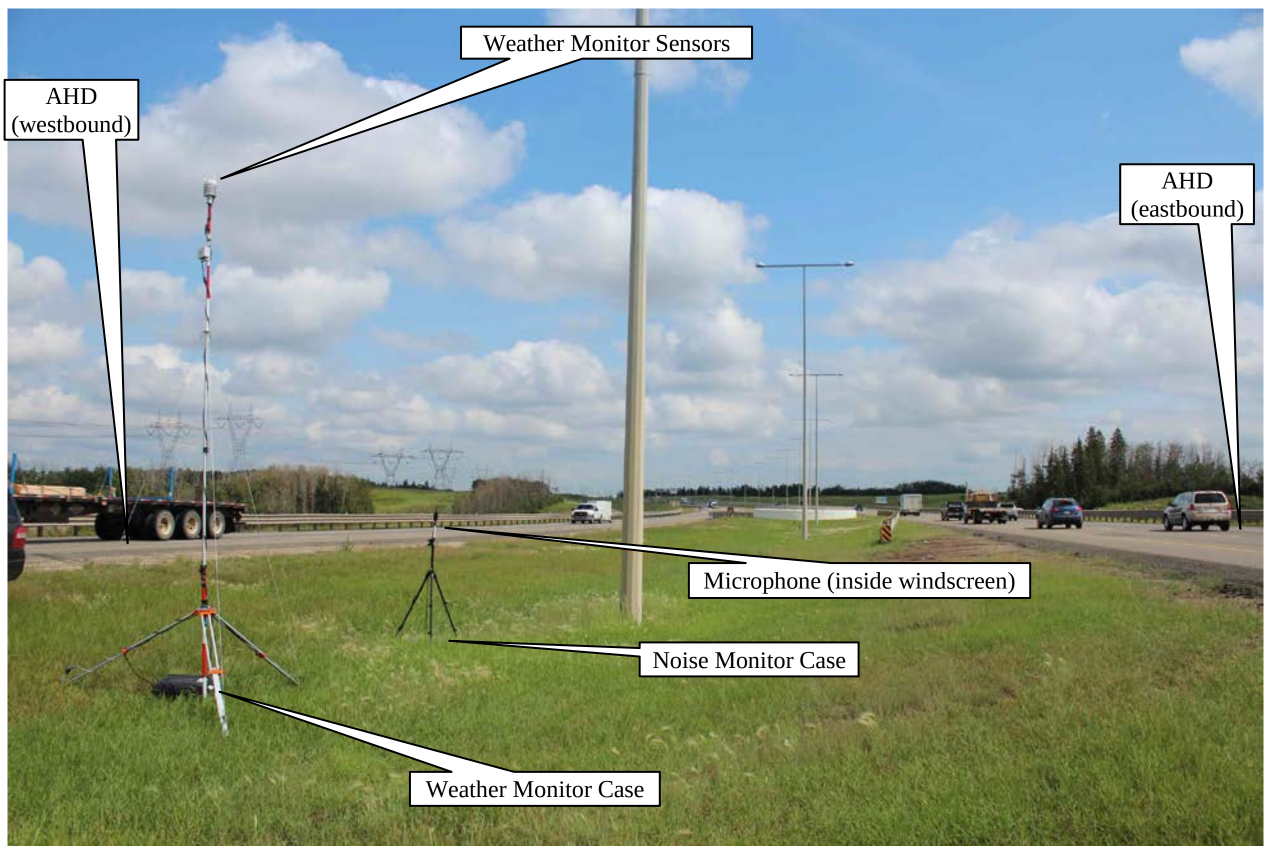

Figure 11. Noise Monitor at Location 10

Figure 12. Noise Monitor at Location 11

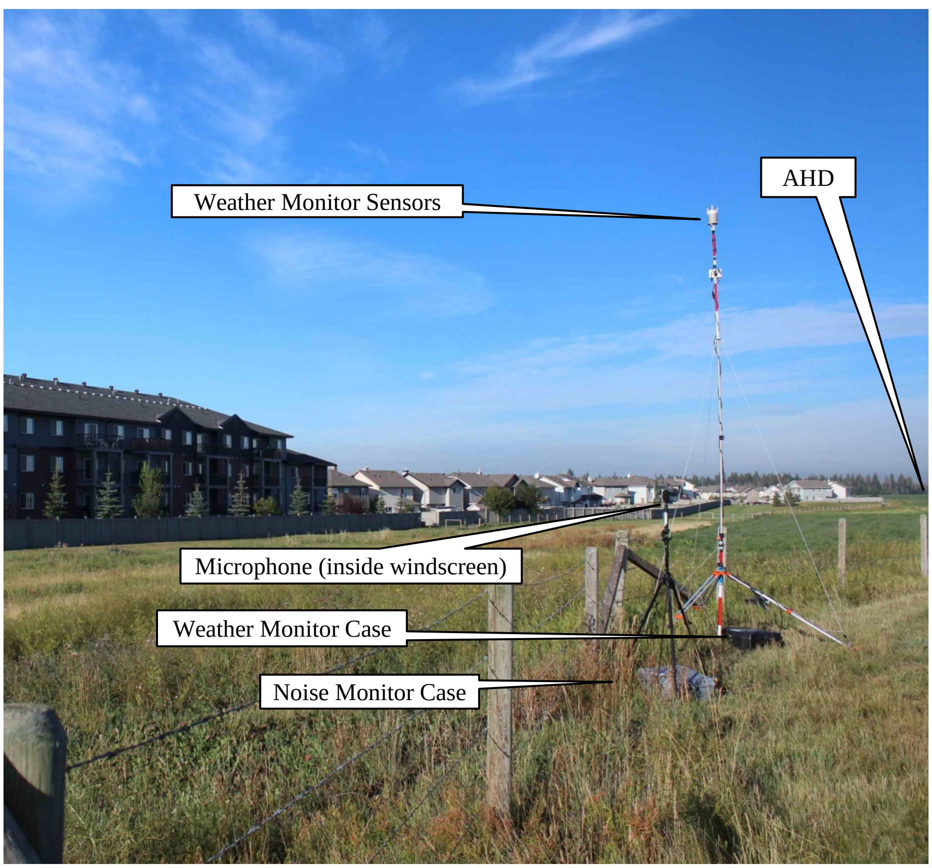

Figure 13. Noise Monitor at Location 12

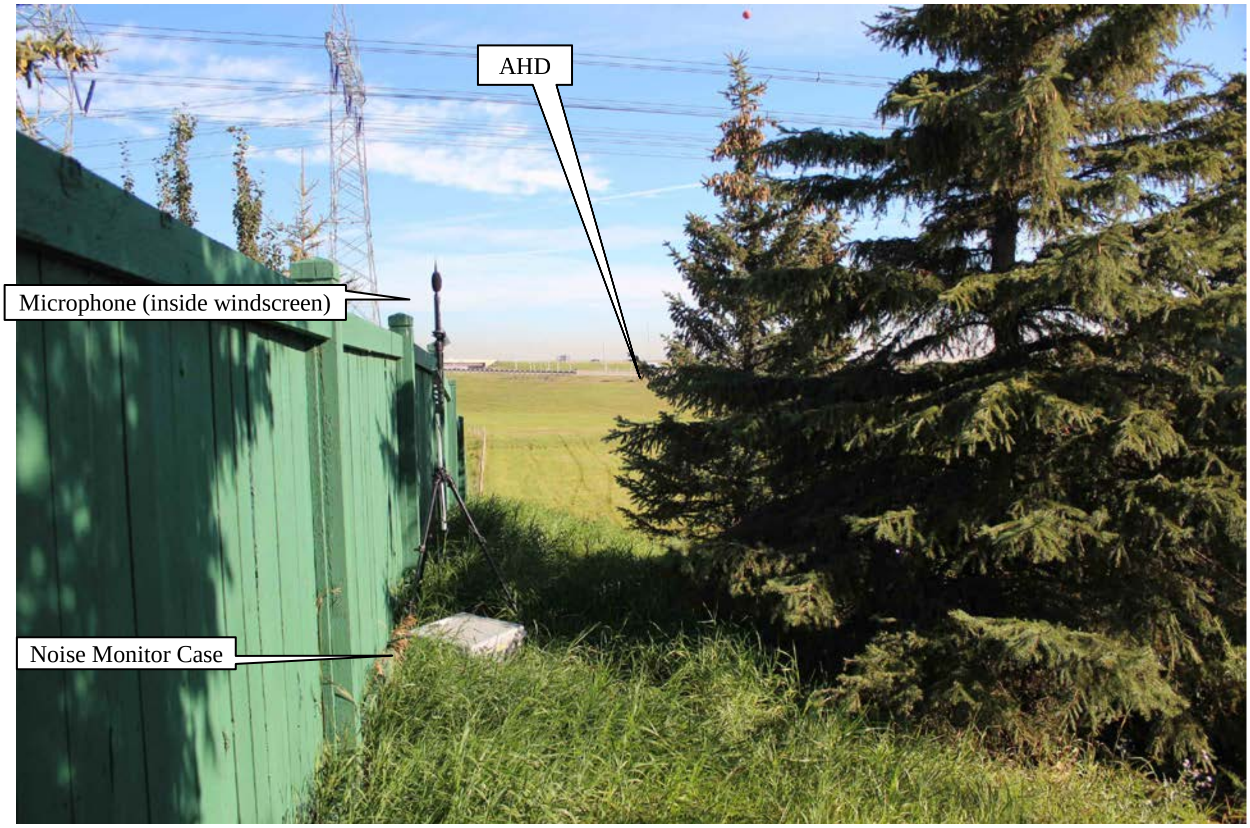

Figure 14. Noise Monitor at Location 13

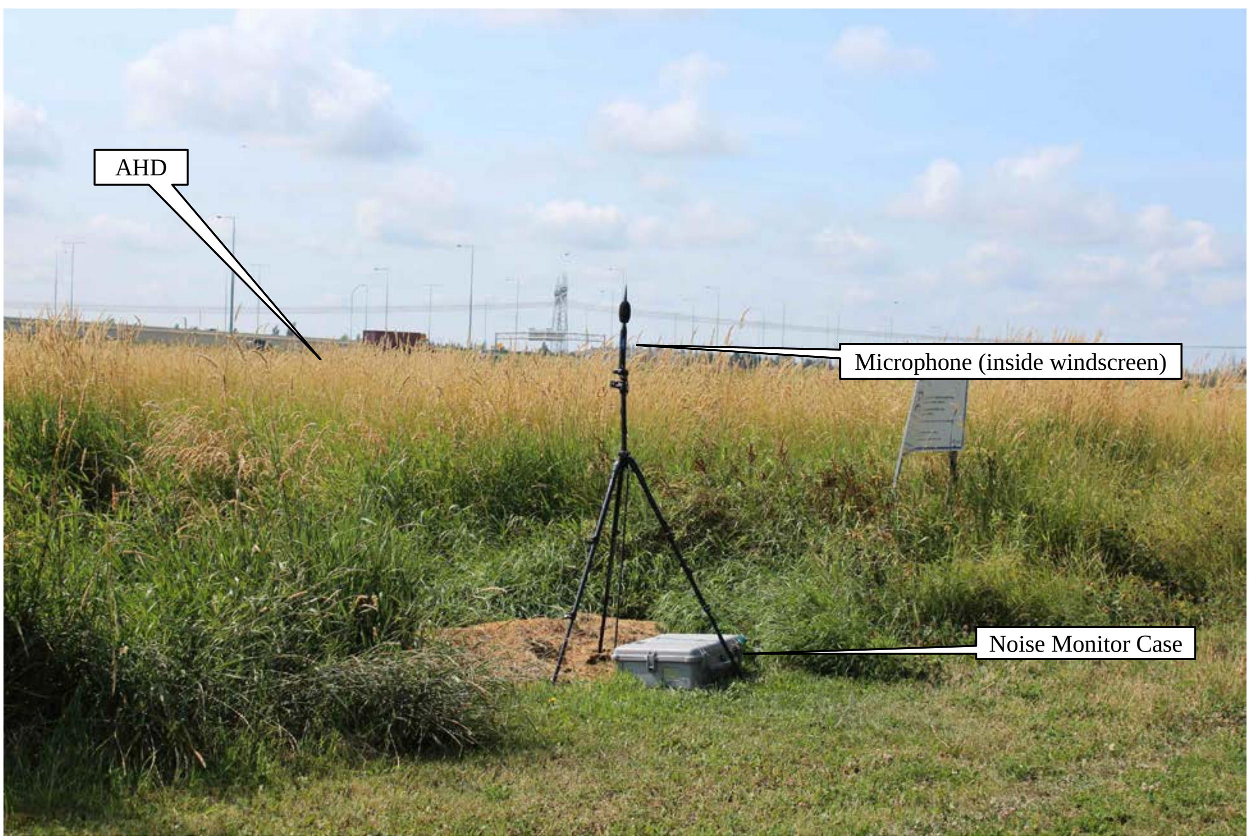

Figure 15. Noise Monitor at Location 14

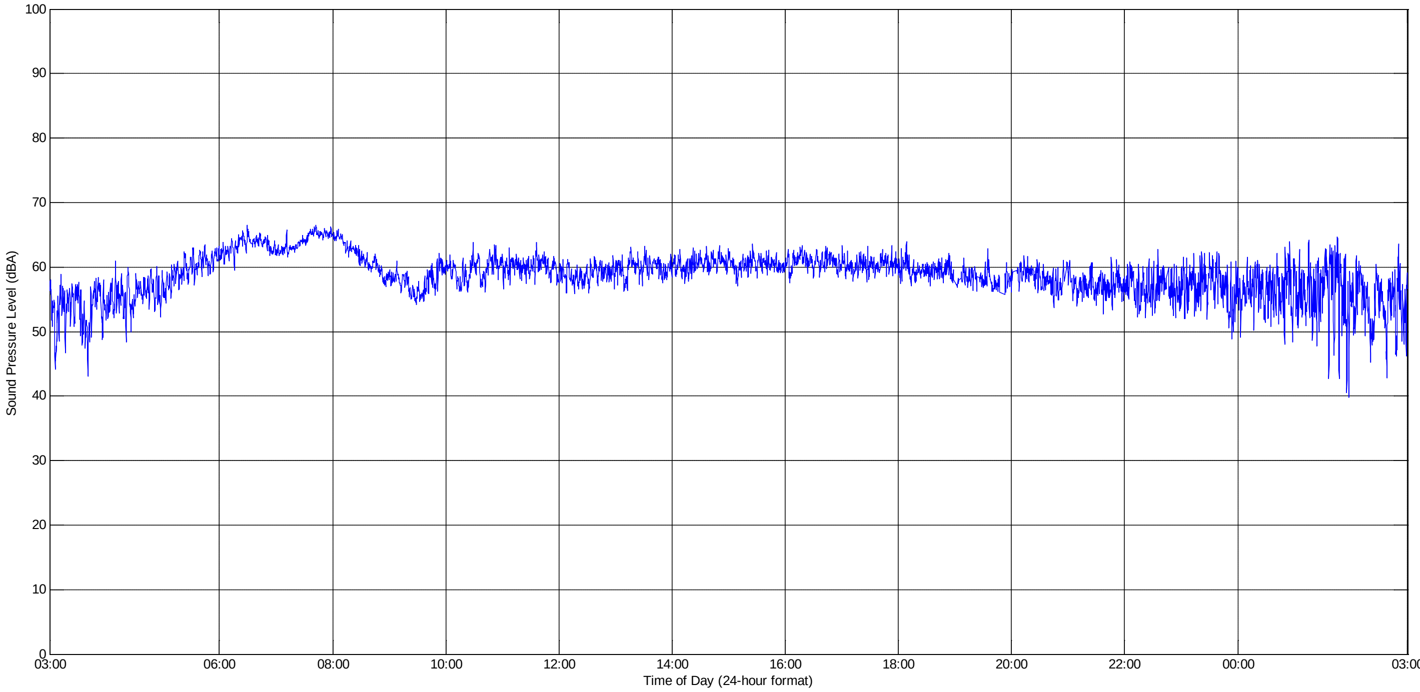

Figure 16. 24-Hour Broadband A-Weighted L_{eq} Sound Levels at Monitor Location 1

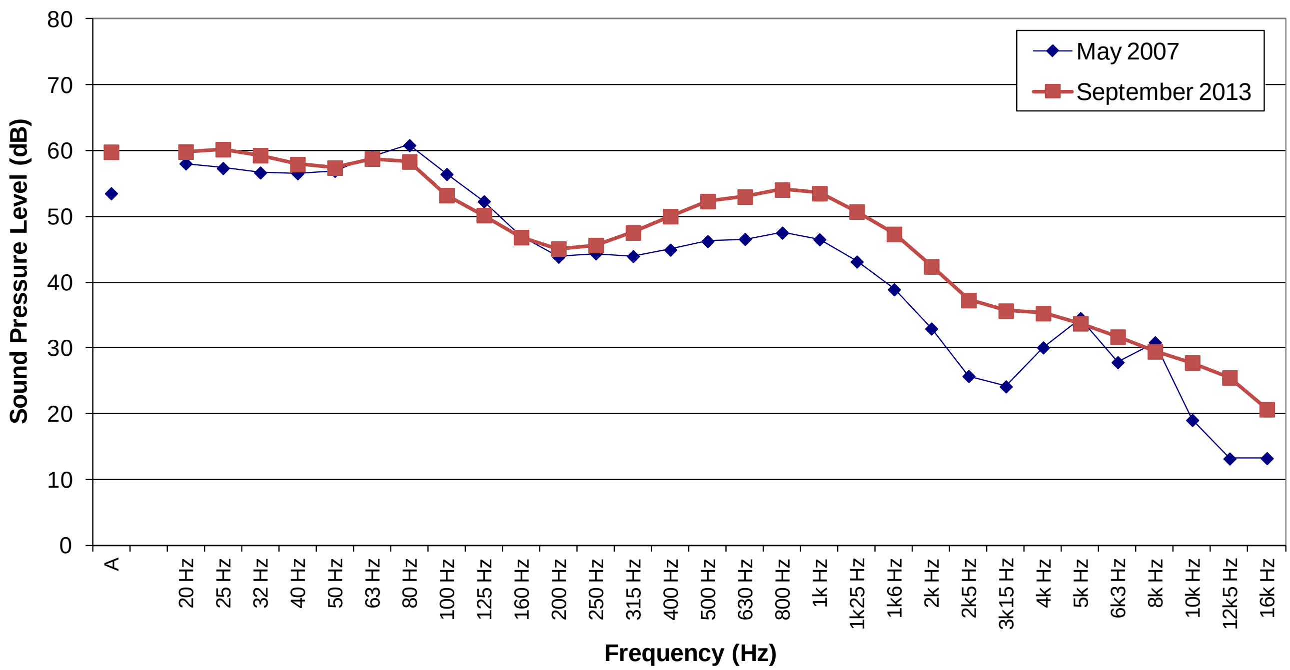

Figure 17. 24-Hour 1/3 Octave Band L_{eq} Sound Levels at Monitor Location 1

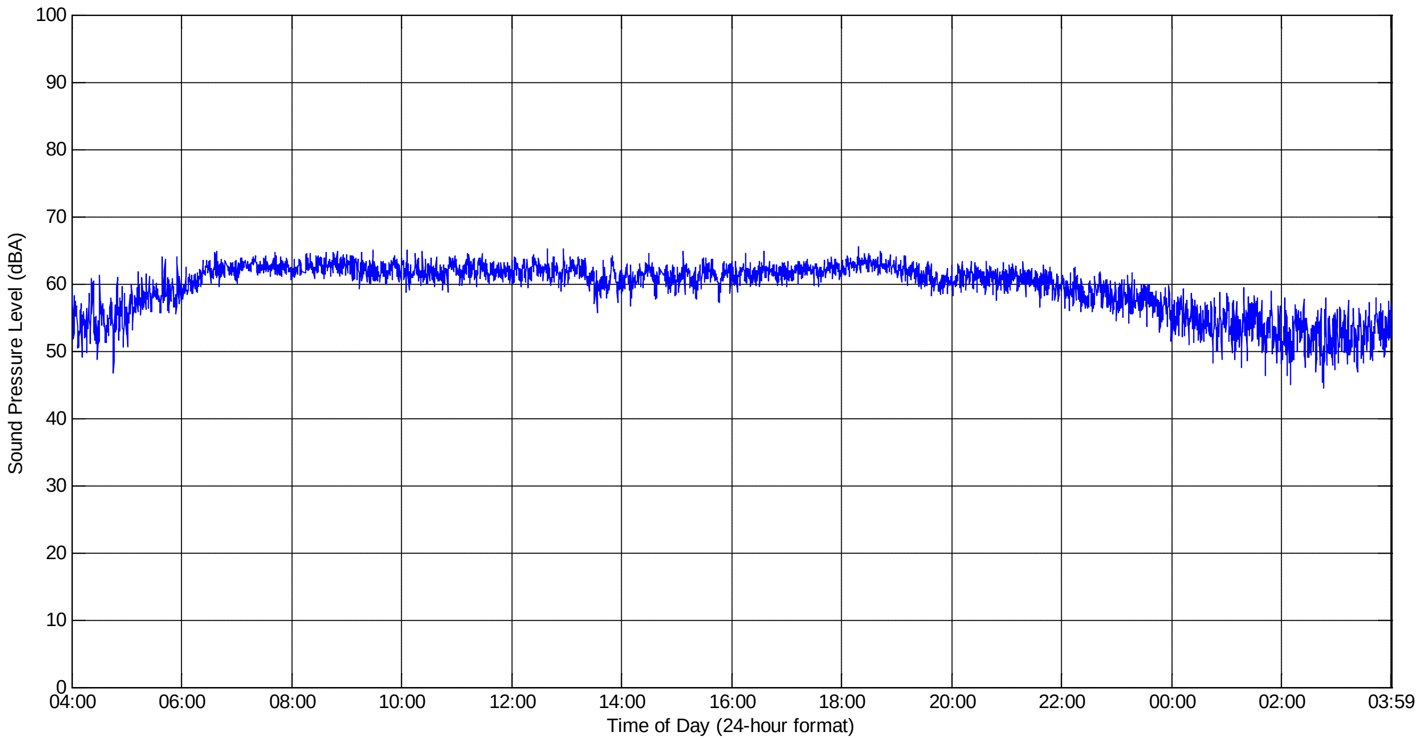

Figure 18. 24-Hour Broadband A-Weighted L_{eq} Sound Levels at Monitor Location 2

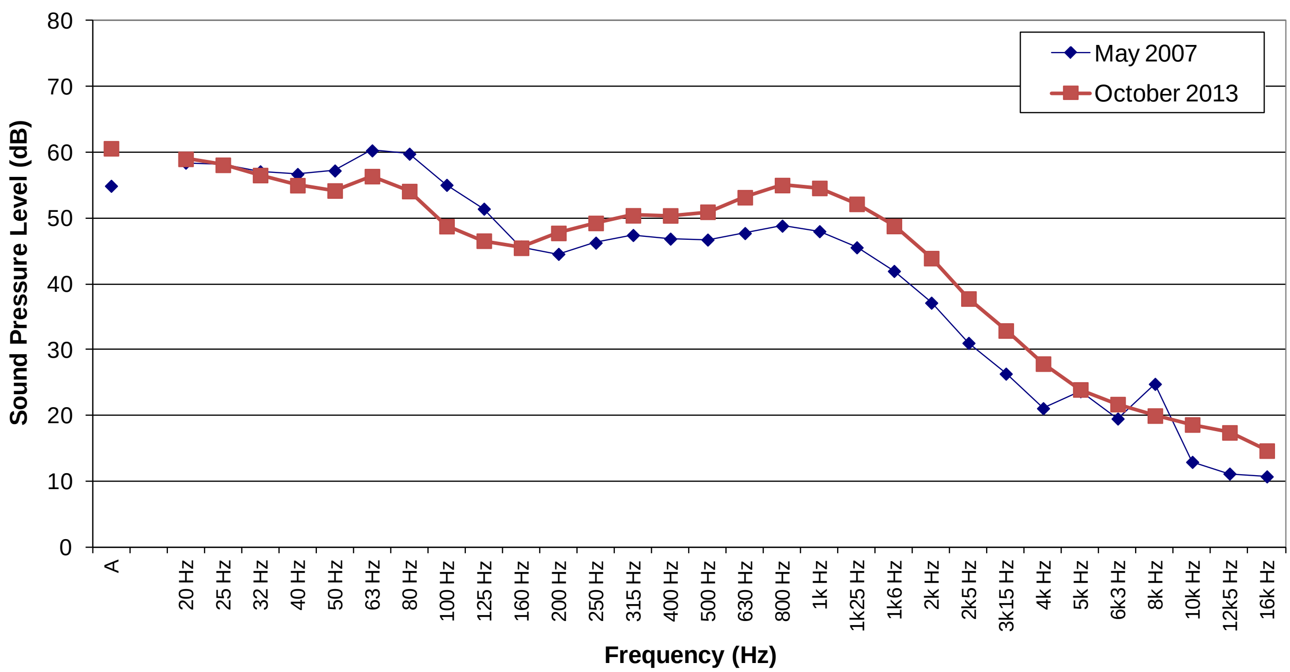

Figure 19. 24-Hour 1/3 Octave Band L_{eq} Sound Levels at Monitor Location 2

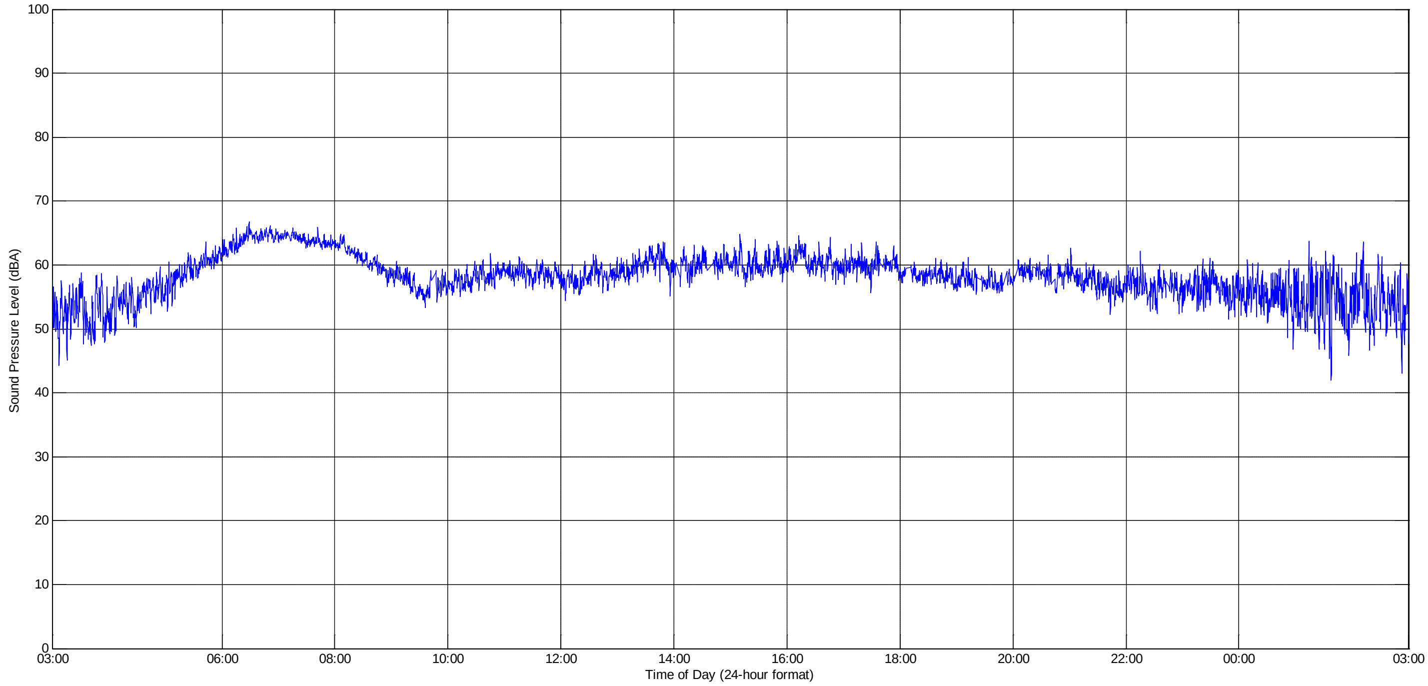

Figure 20. 24-Hour Broadband A-Weighted L_{eq} Sound Levels at Monitor Location 3

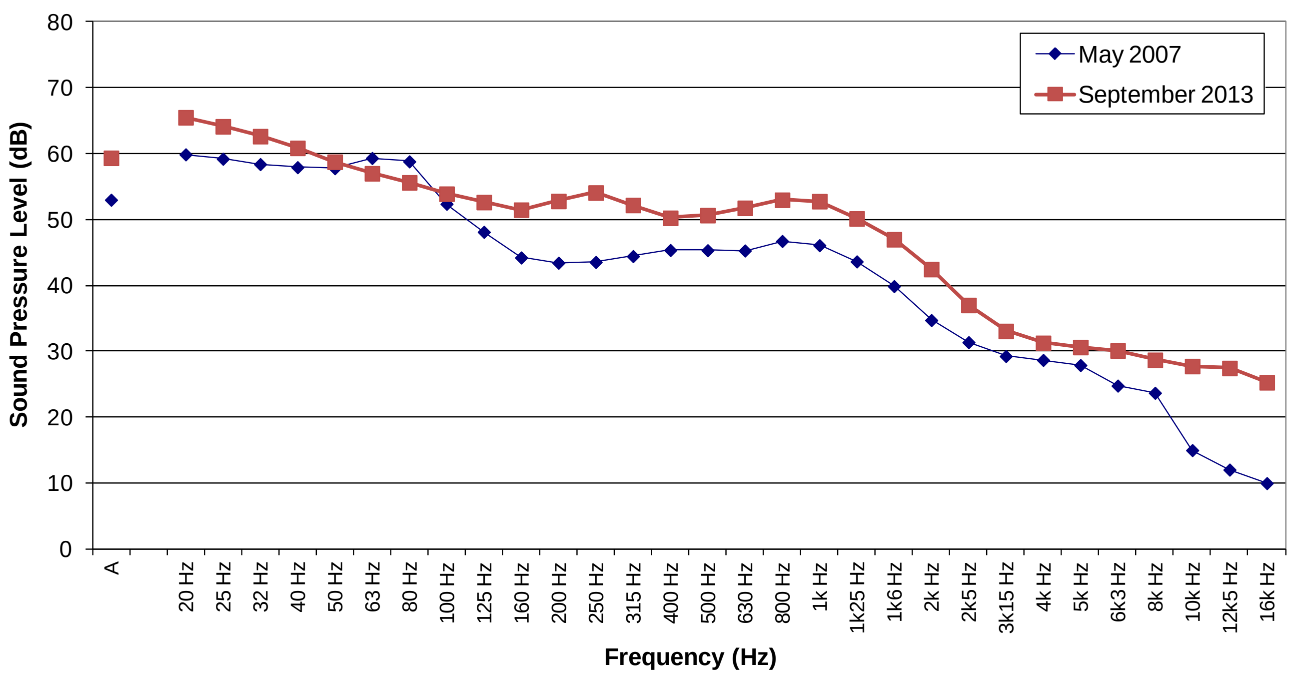

Figure 21. 24-Hour 1/3 Octave Band L_{eq} Sound Levels at Monitor Location 3

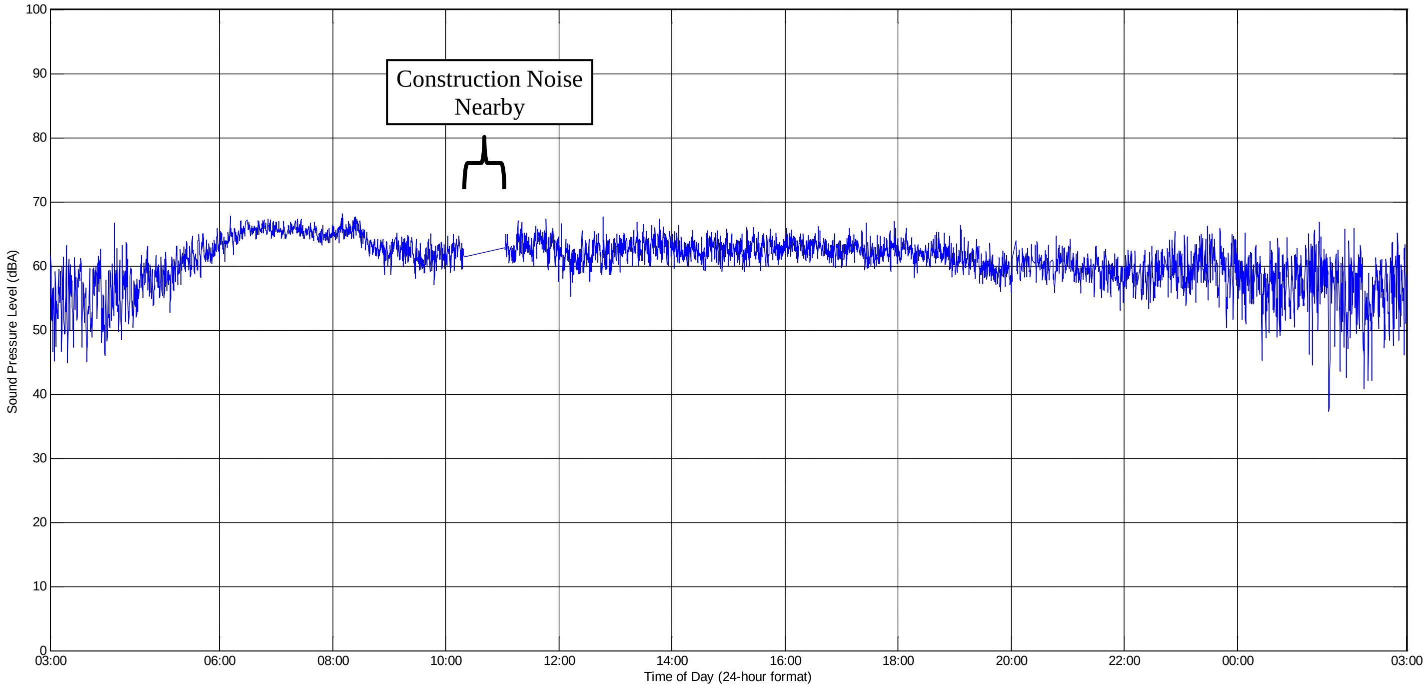

Figure 22. 24-Hour Broadband A-Weighted L_{eq} Sound Levels at Monitor Location 4

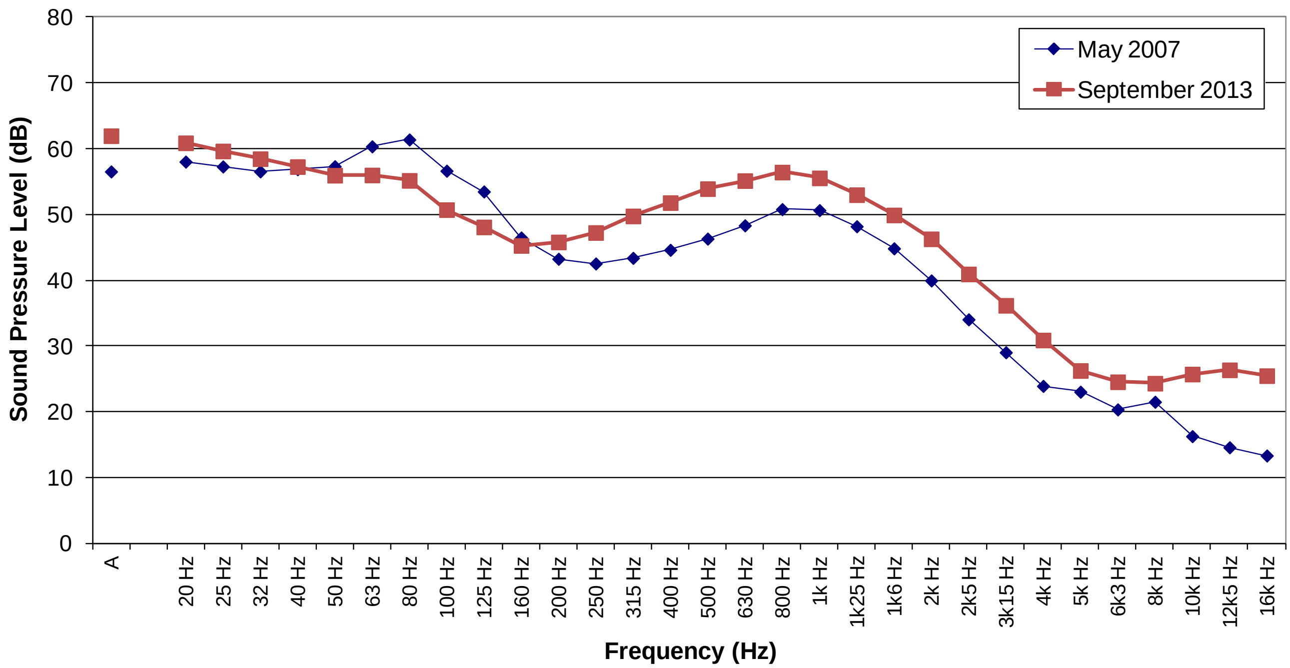

Figure 23. 24-Hour 1/3 Octave Band L_{eq} Sound Levels at Monitor Location 4

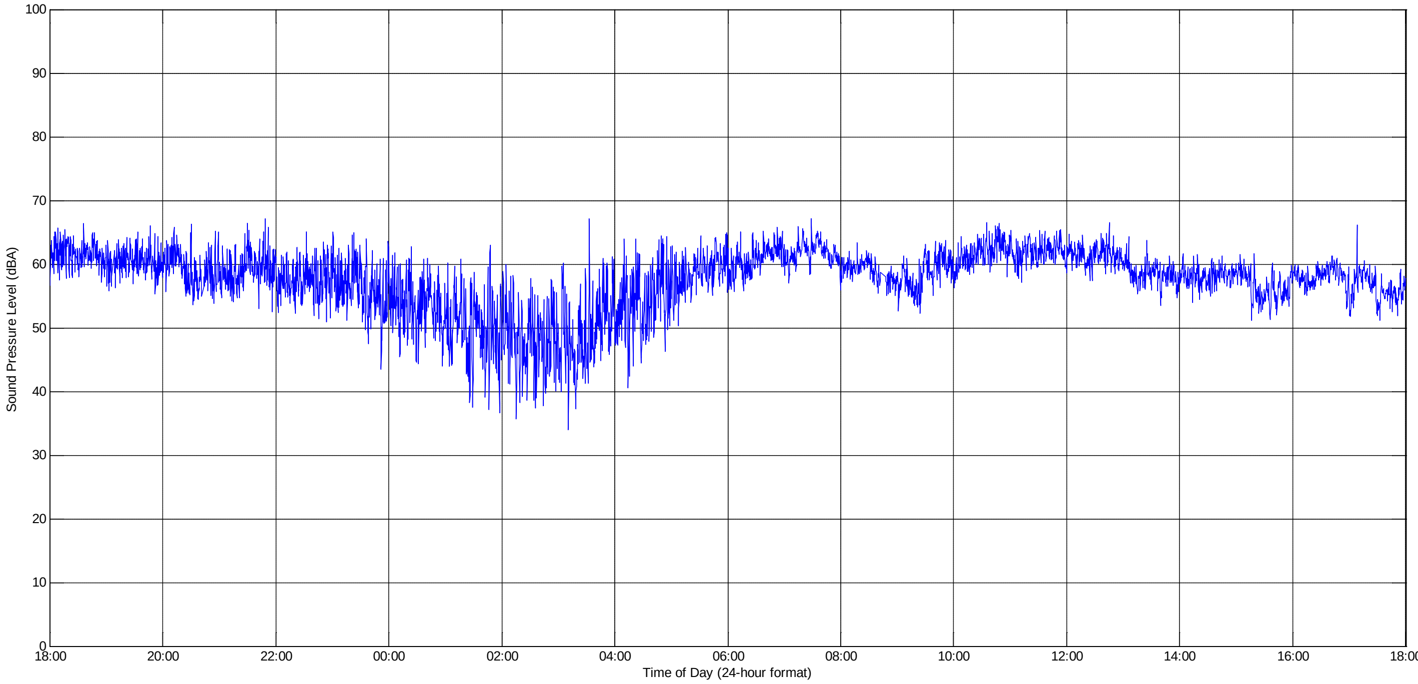

Figure 24. 24-Hour Broadband A-Weighted L_{eq} Sound Levels at Monitor Location 5

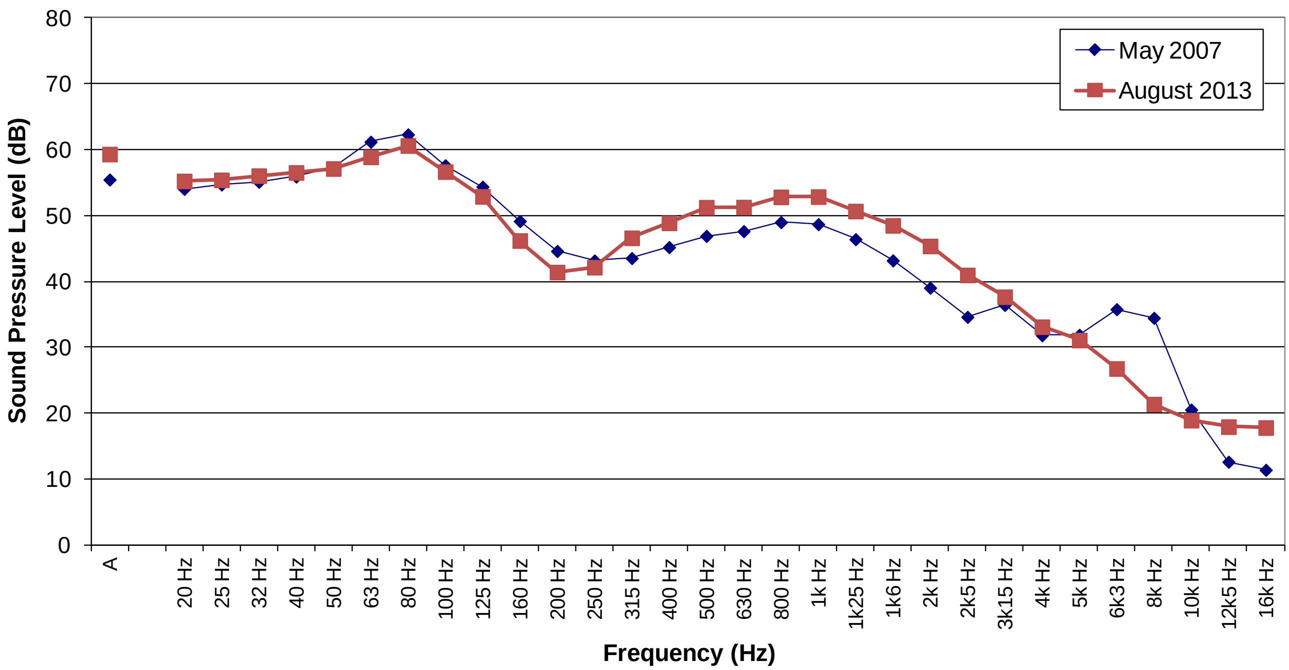

Figure 25. 24-Hour 1/3 Octave Band L_{eq} Sound Levels at Monitor Location 5

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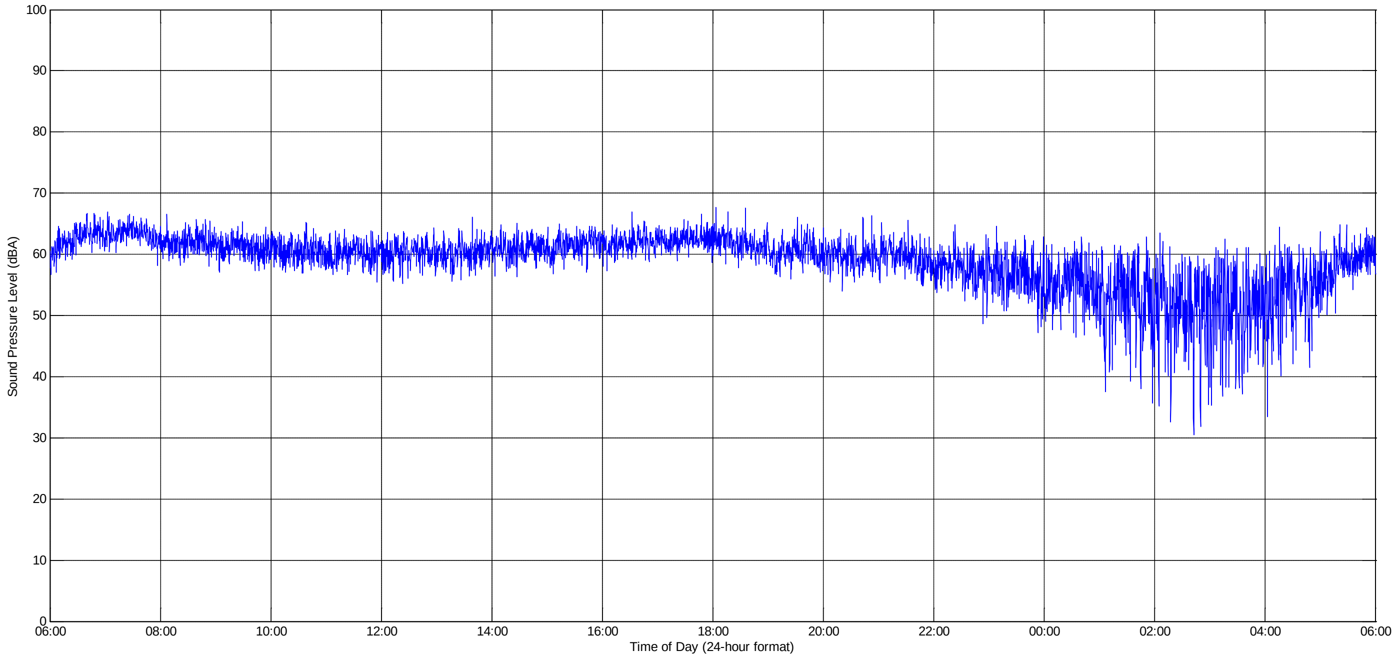

Figure 26. 24-Hour Broadband A-Weighted L_{eq} Sound Levels at Monitor Location 6

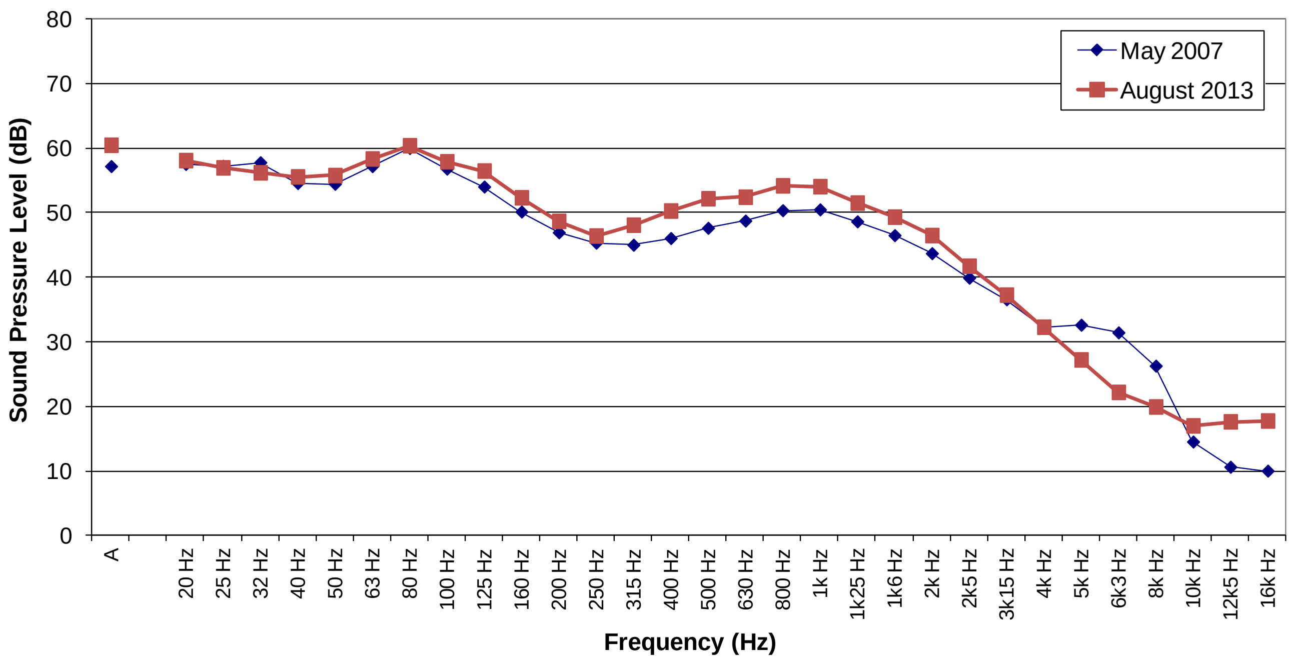

Figure 27. 24-Hour 1/3 Octave Band L_{eq} Sound Levels at Monitor Location 6

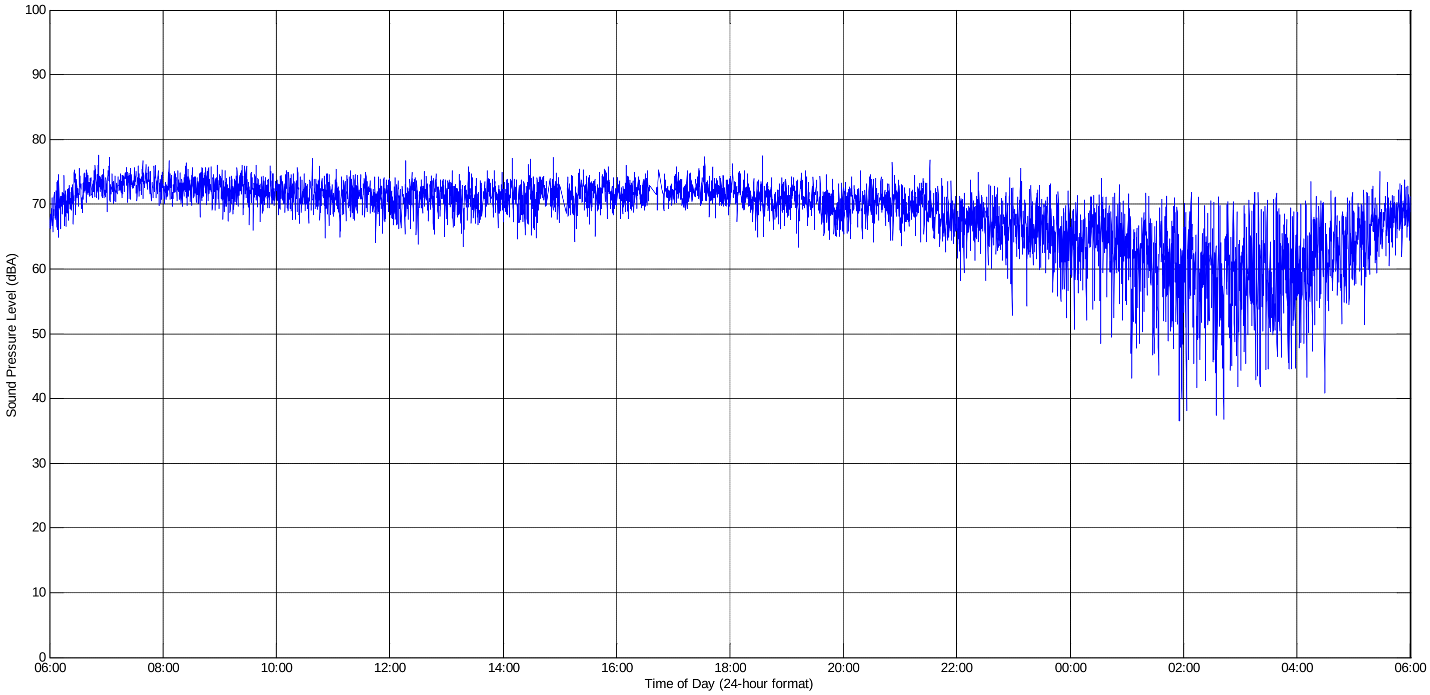

Figure 28. 24-Hour Broadband A-Weighted L_{eq} Sound Levels at Monitor Location 7

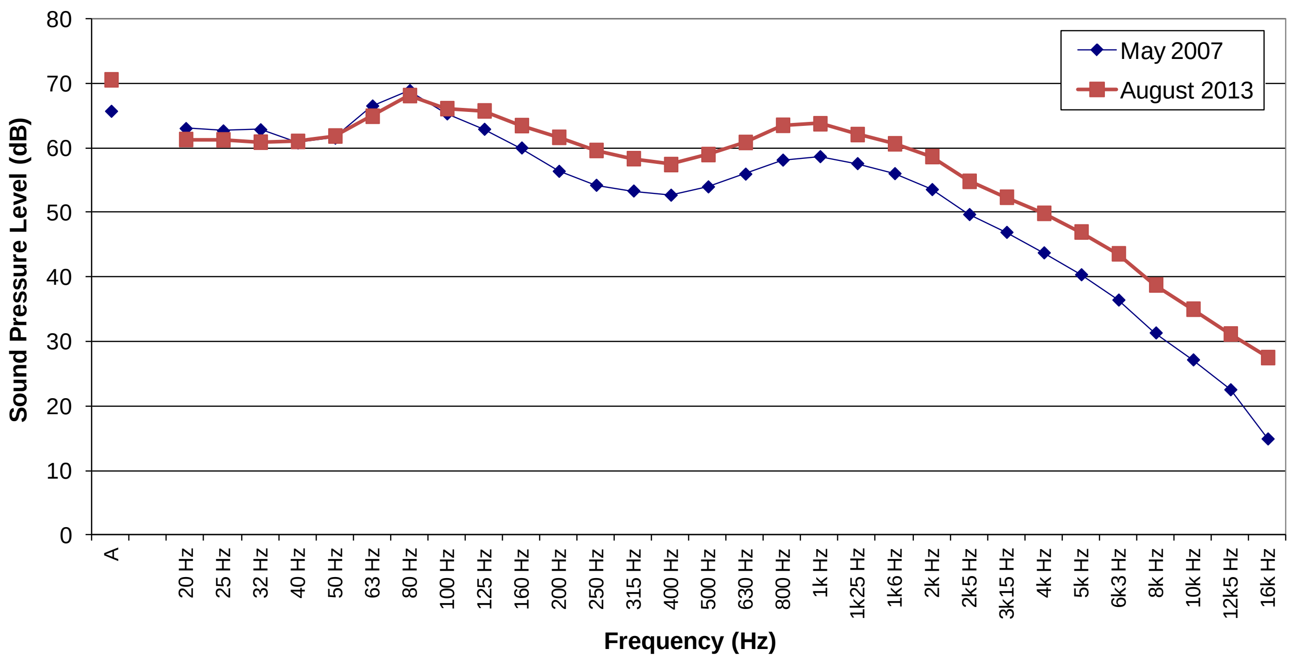

Figure 29. 24-Hour 1/3 Octave Band L_{eq} Sound Levels at Monitor Location 7

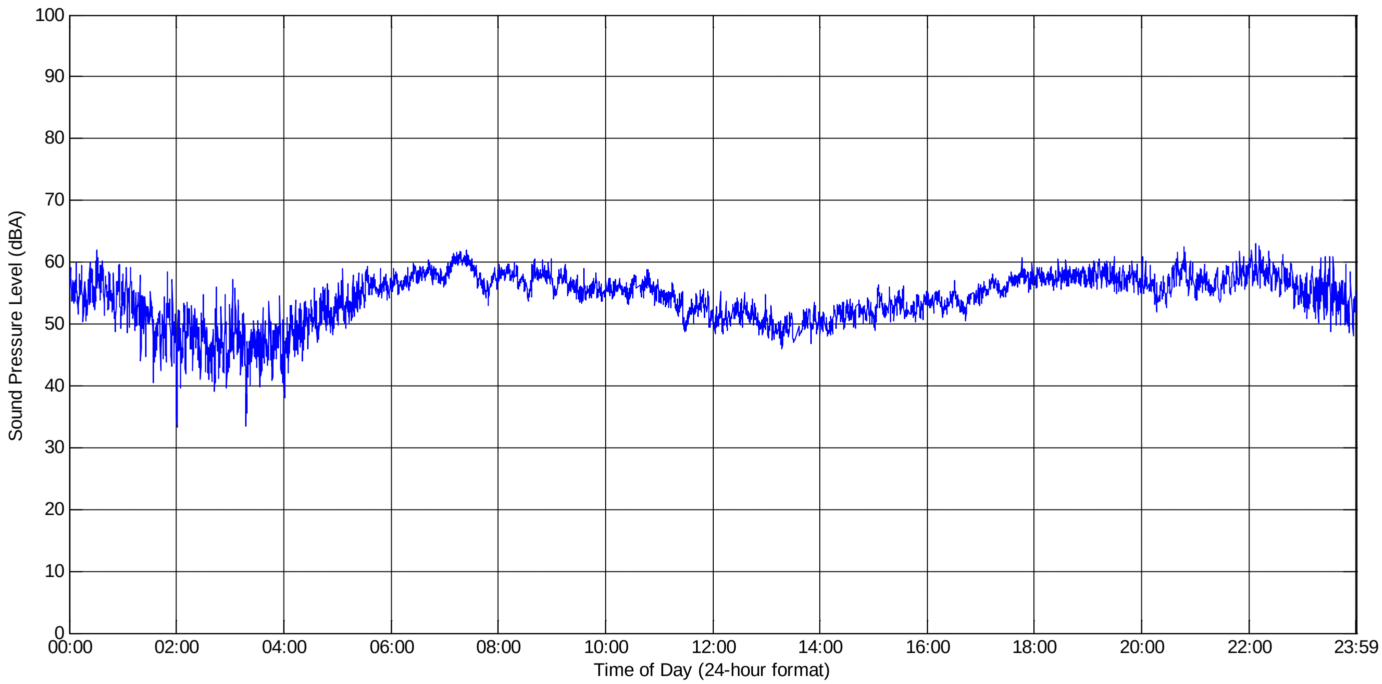

Figure 30. 24-Hour Broadband A-Weighted L_{eq} Sound Levels at Monitor Location 8

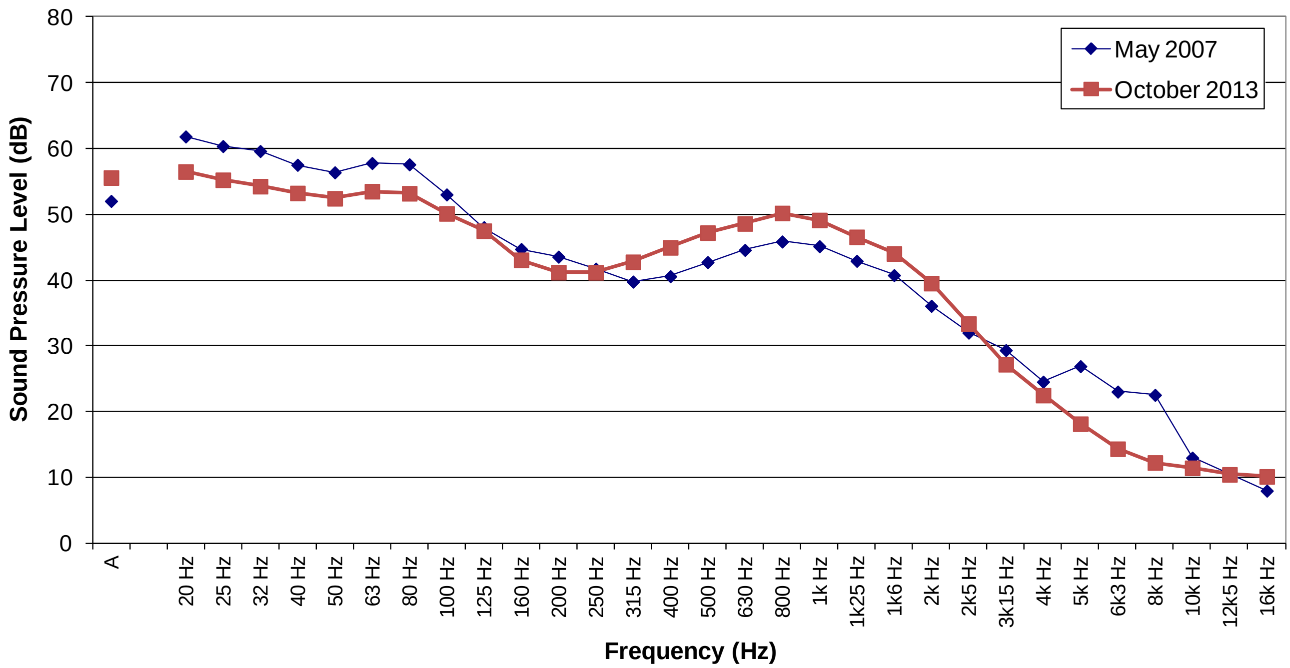

Figure 31. 24-Hour 1/3 Octave Band L_{eq} Sound Levels at Monitor Location 8

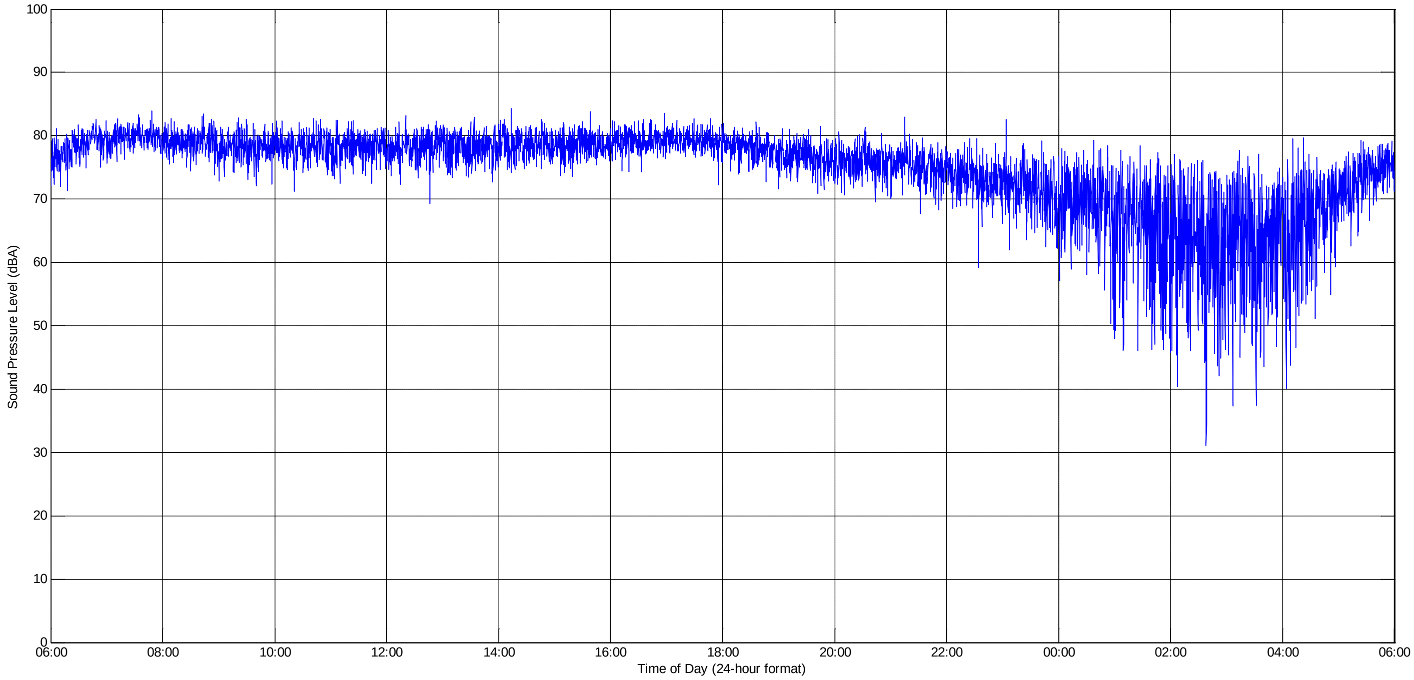

Figure 32. 24-Hour Broadband A-Weighted L_{eq} Sound Levels at Monitor Location 9

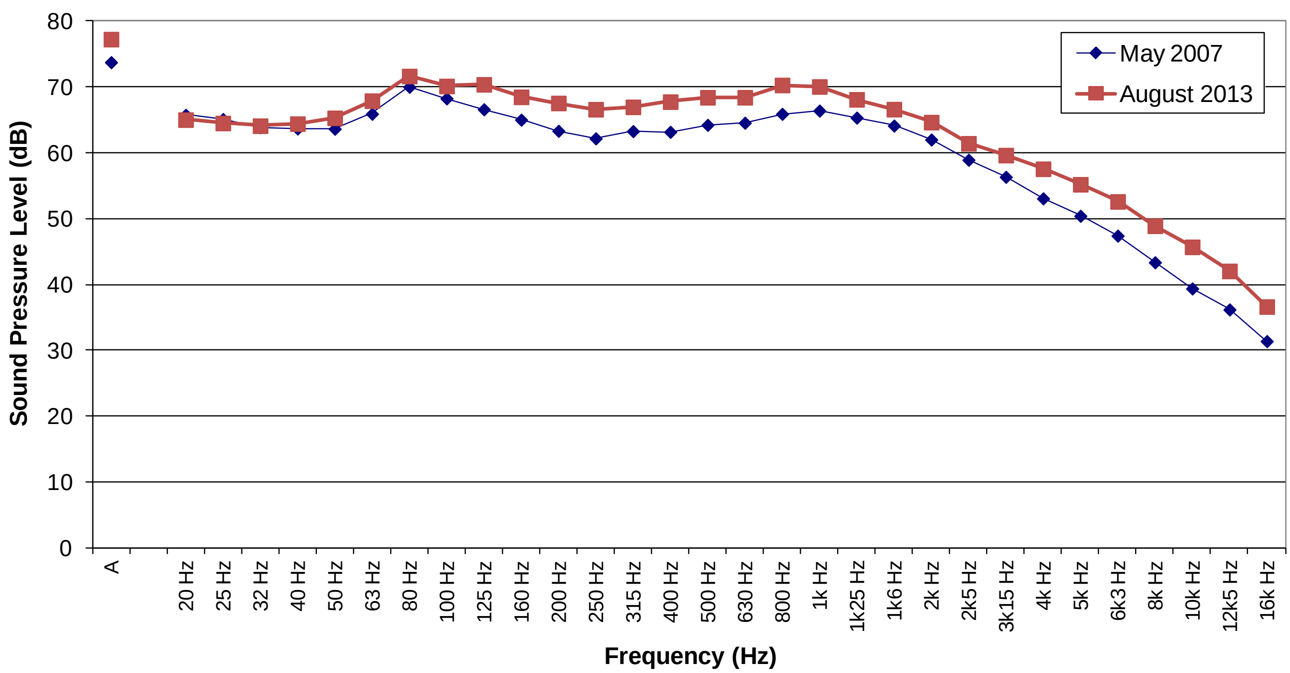

Figure 33. 24-Hour 1/3 Octave Band L_{eq} Sound Levels at Monitor Location 9

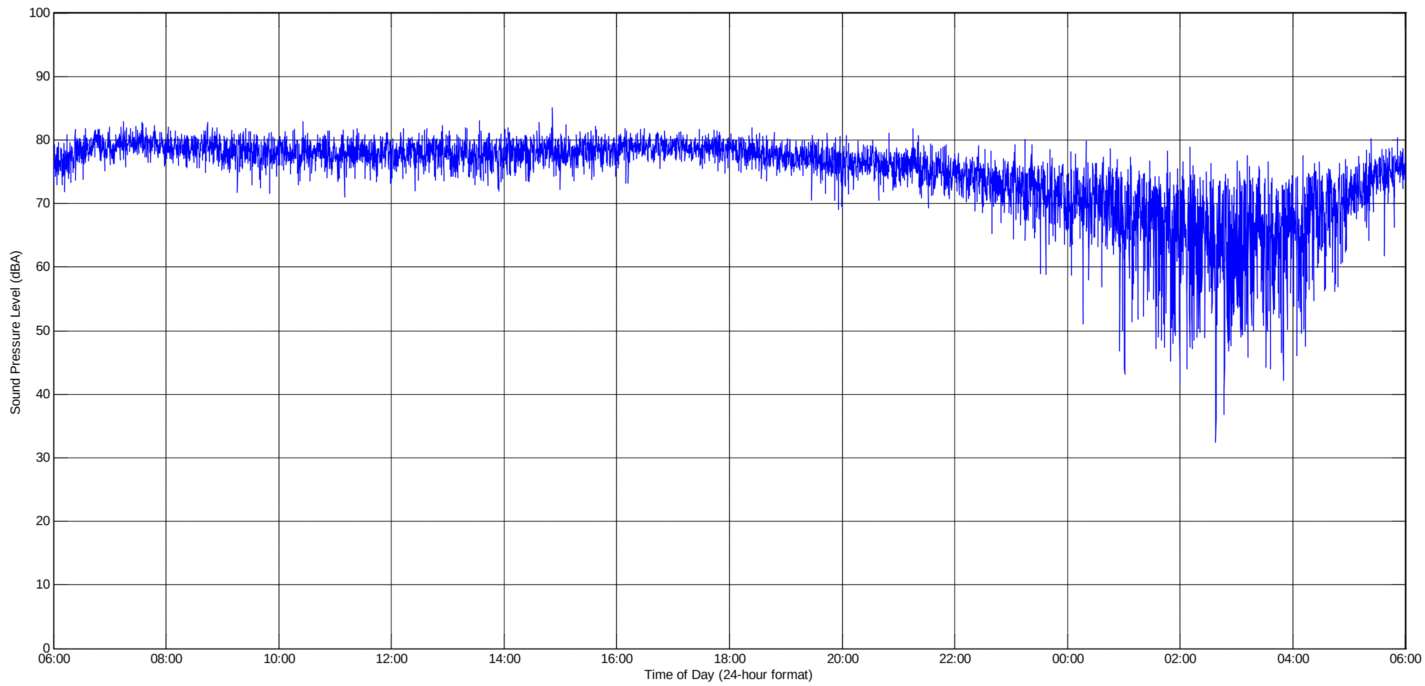

Figure 34. 24-Hour Broadband A-Weighted L_{eq} Sound Levels at Monitor Location 10

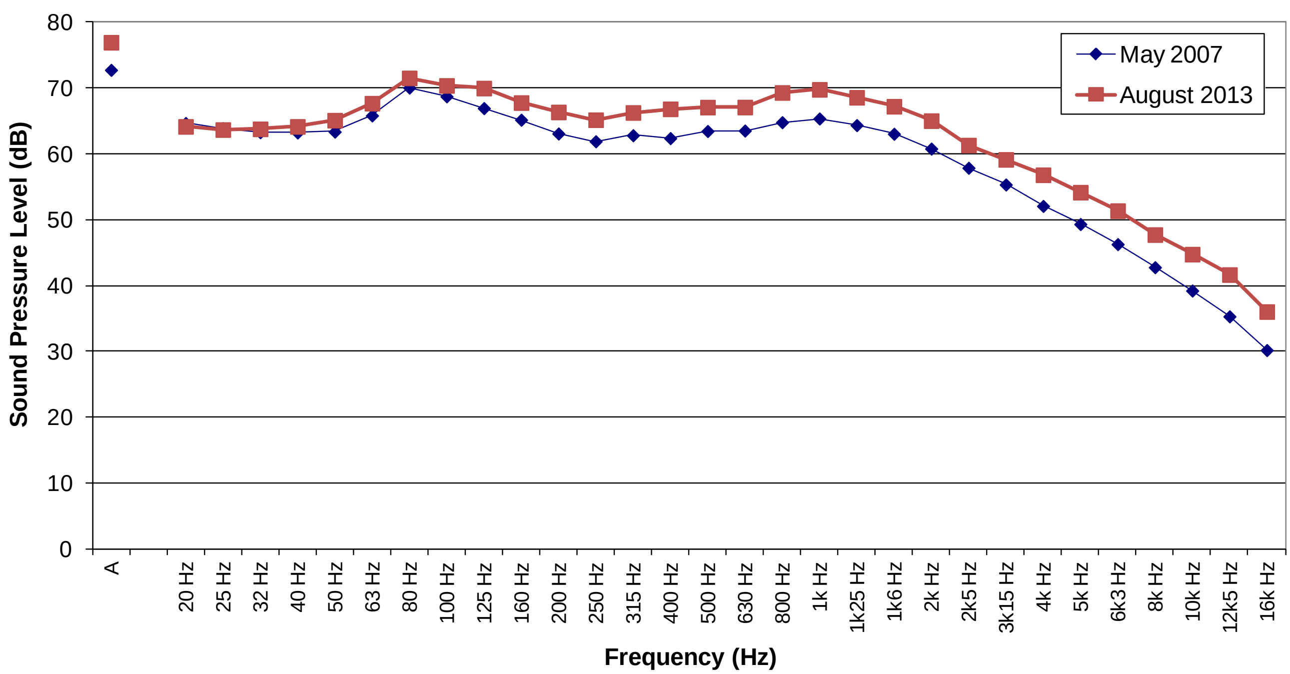

Figure 35. 24-Hour 1/3 Octave Band L_{eq} Sound Levels at Monitor Location 10

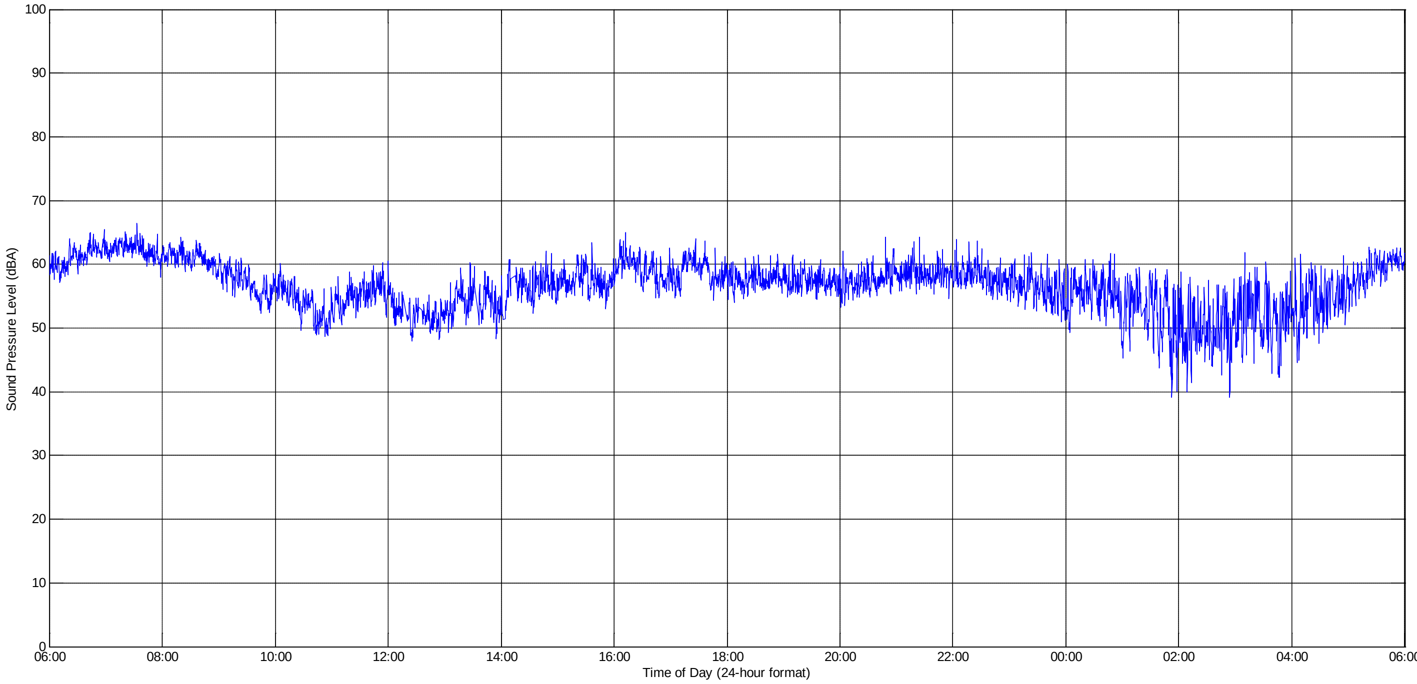

Figure 36. 24-Hour Broadband A-Weighted L_{eq} Sound Levels at Monitor Location 11

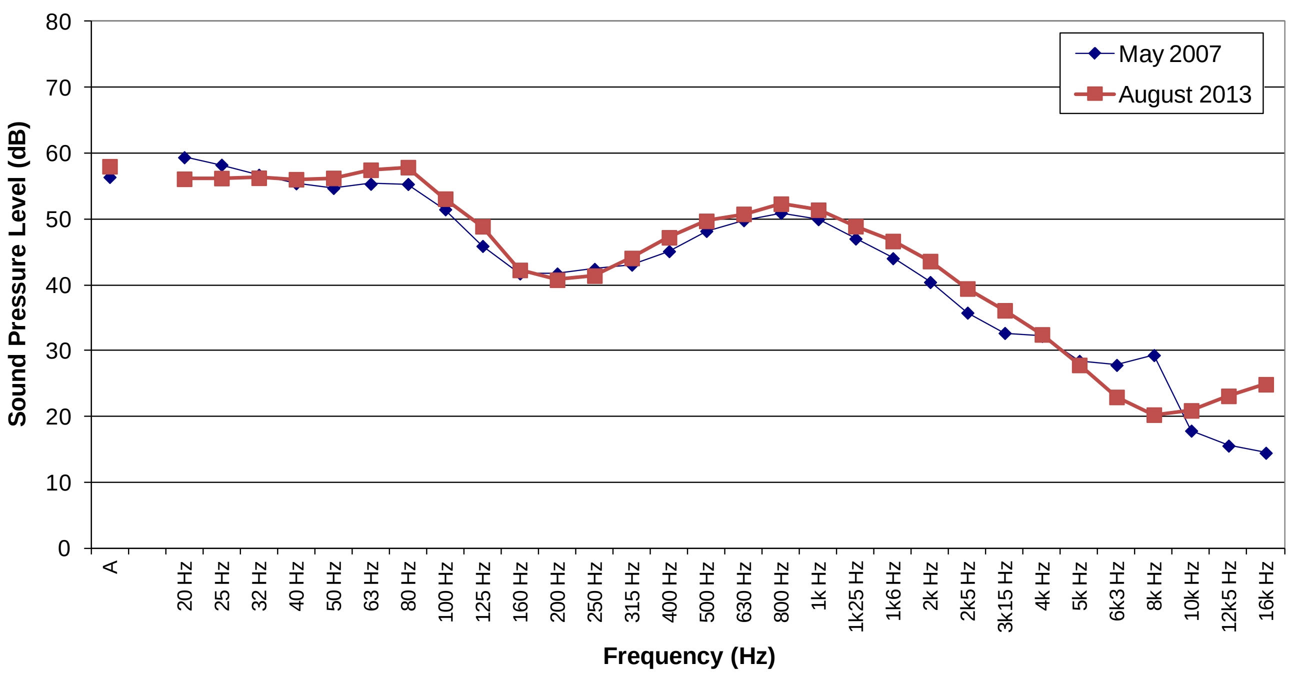

Figure 37. 24-Hour 1/3 Octave Band L_{eq} Sound Levels at Monitor Location 11

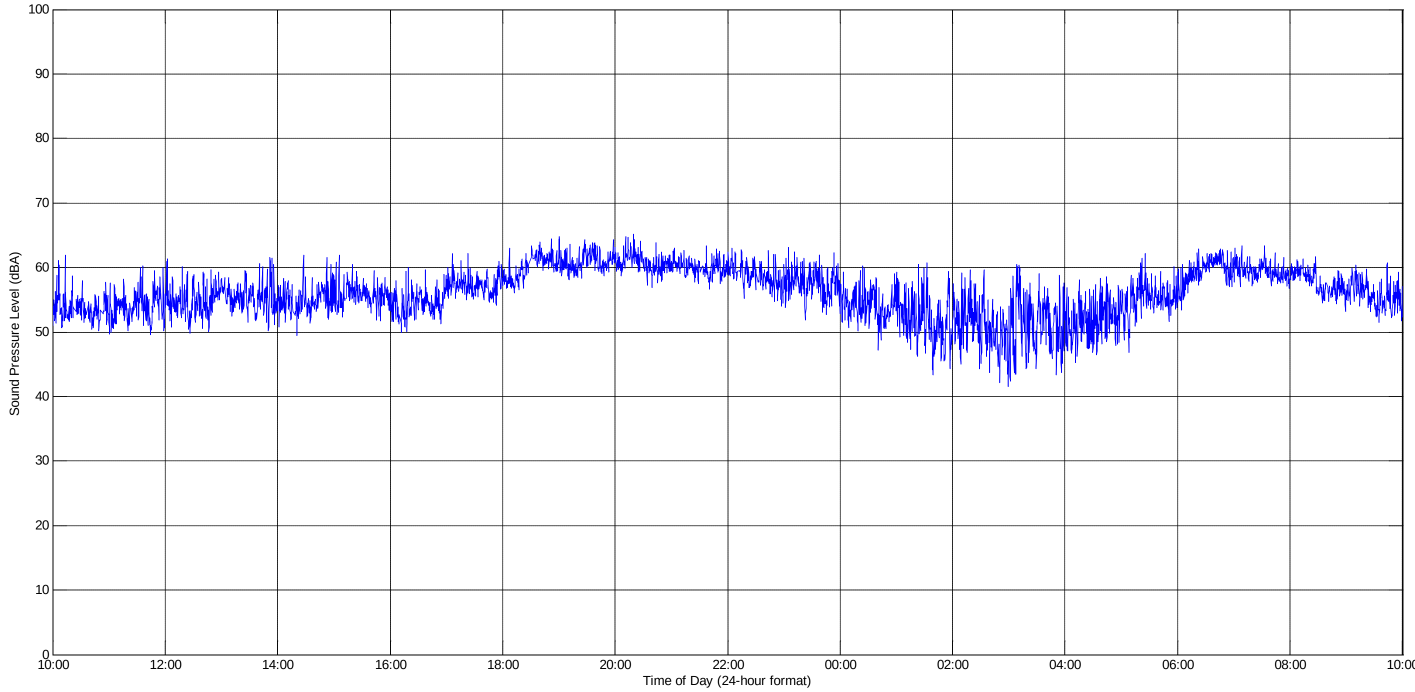

Figure 38. 24-Hour Broadband A-Weighted L_{eq} Sound Levels at Monitor Location 12

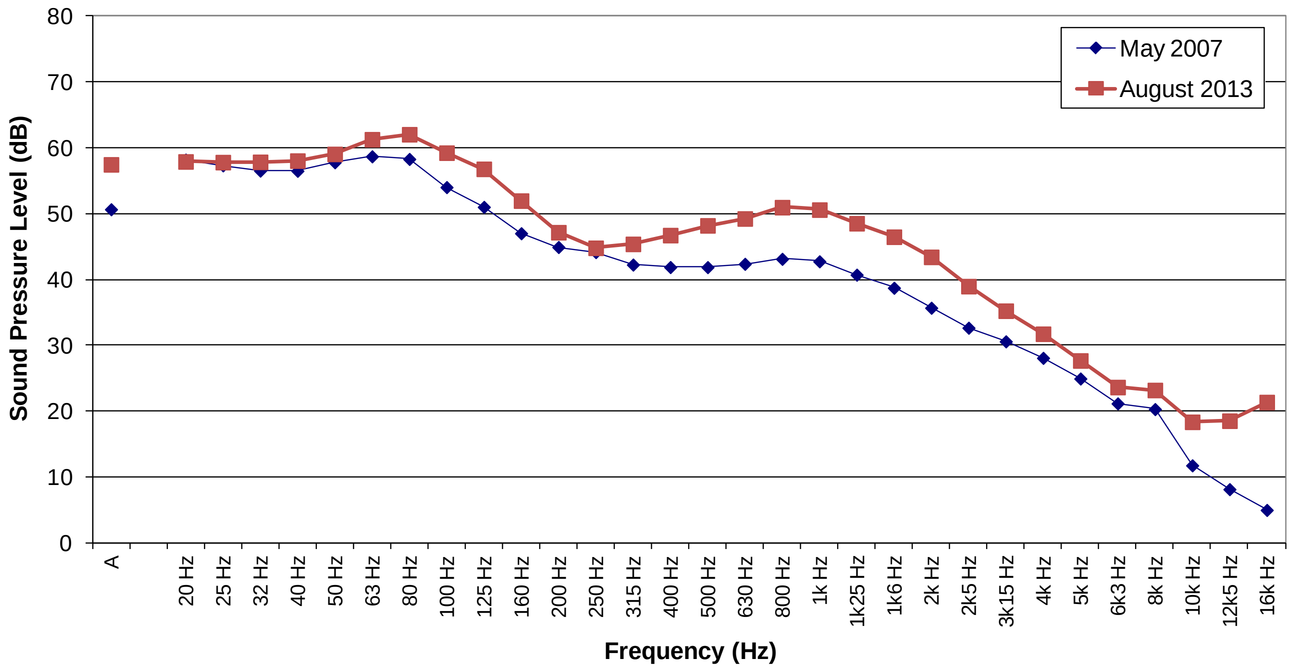

Figure 39. 24-Hour 1/3 Octave Band L_{eq} Sound Levels at Monitor Location 12

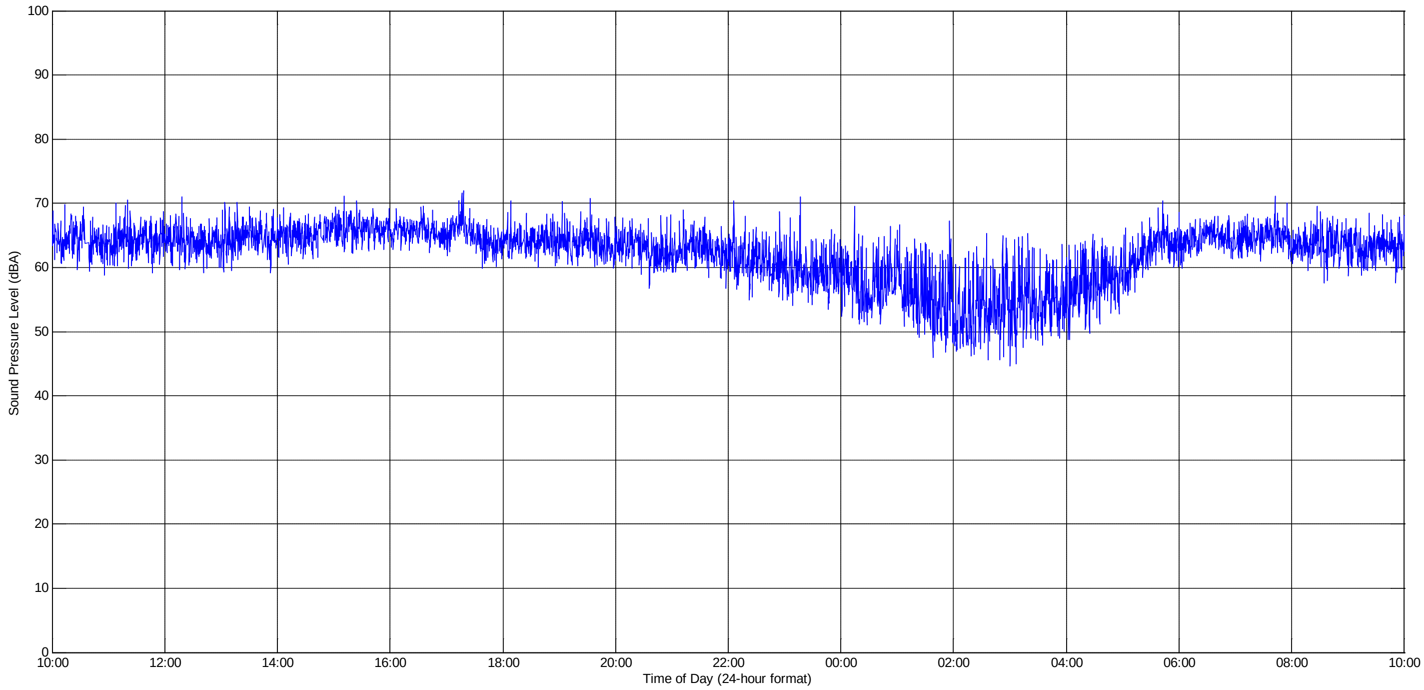

Figure 40. 24-Hour Broadband A-Weighted L_{eq} Sound Levels at Monitor Location 13

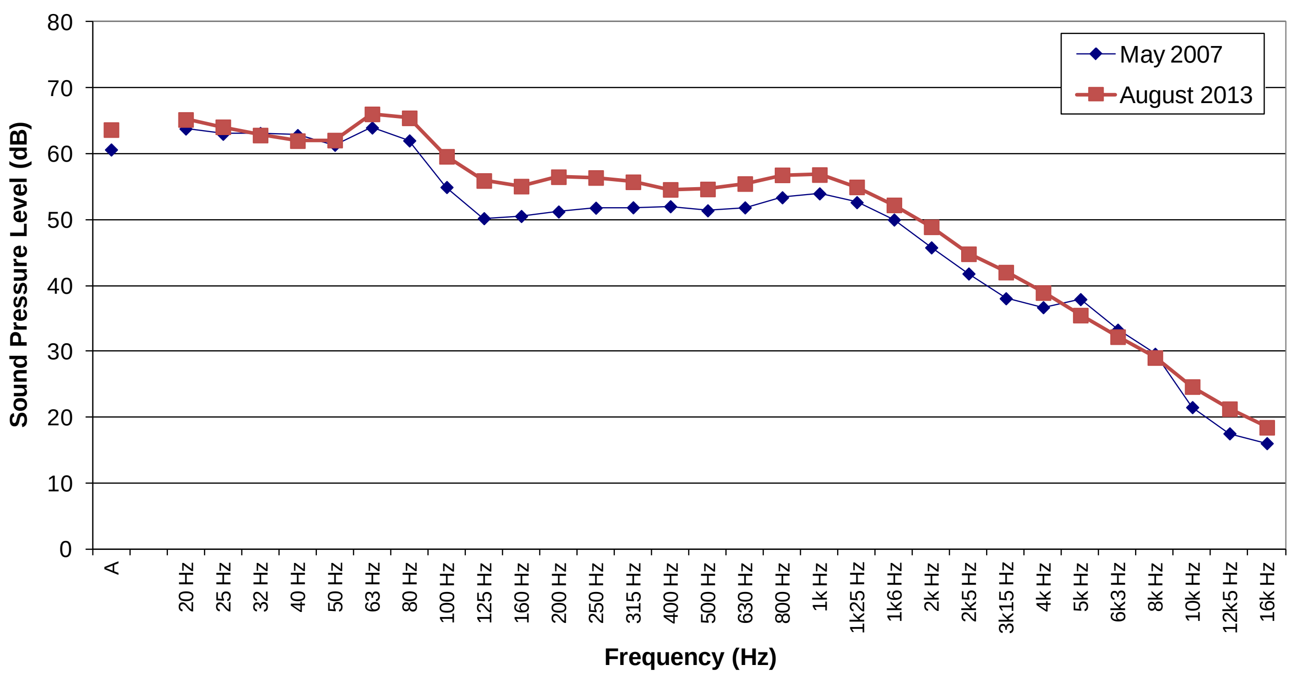

Figure 41. 24-Hour 1/3 Octave Band L_{eq} Sound Levels at Monitor Location 13

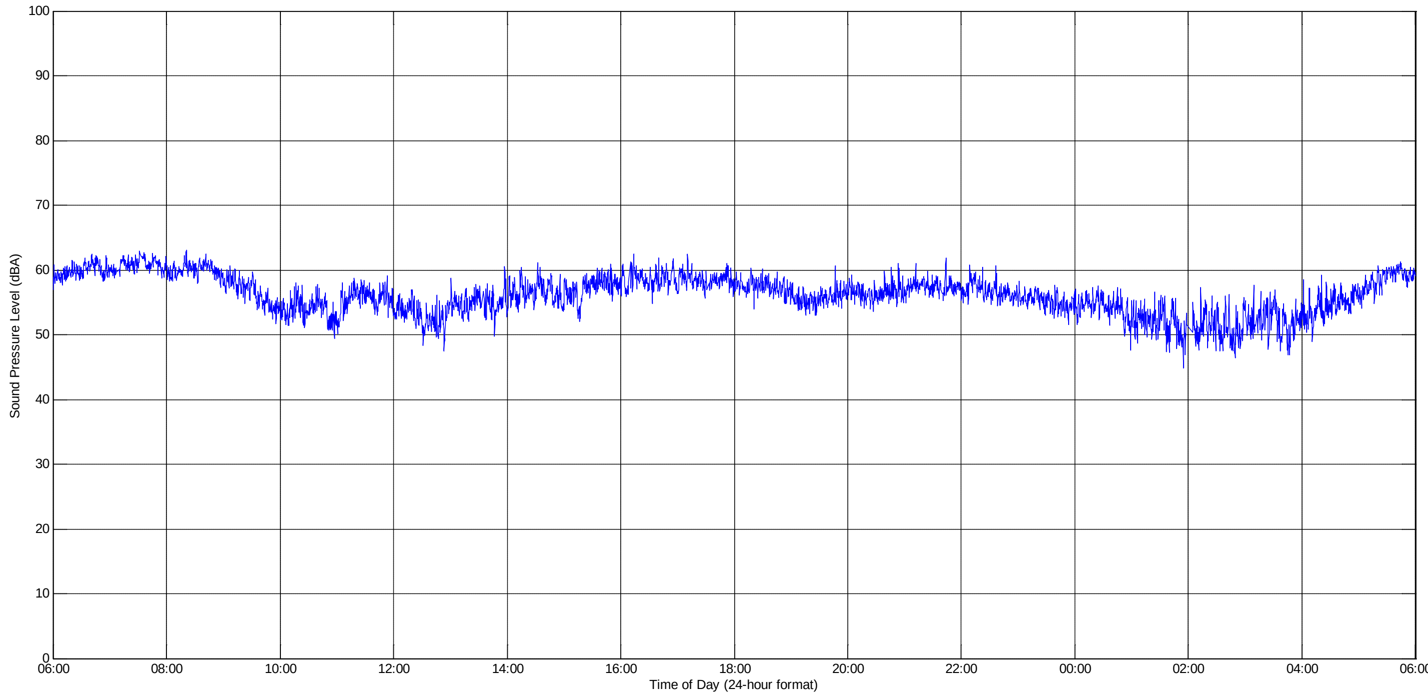

Figure 42. 24-Hour Broadband A-Weighted L_{eq} Sound Levels at Monitor Location 14

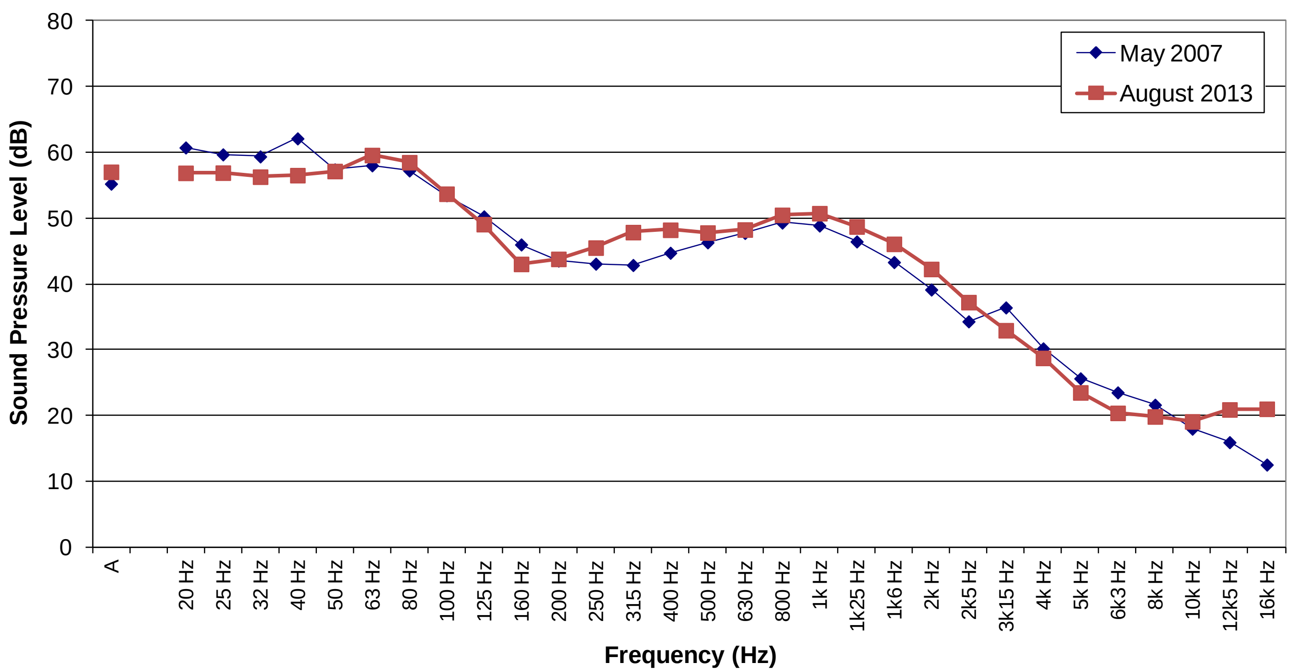

Figure 43. 24-Hour 1/3 Octave Band L_{eq} Sound Levels at Monitor Location 14

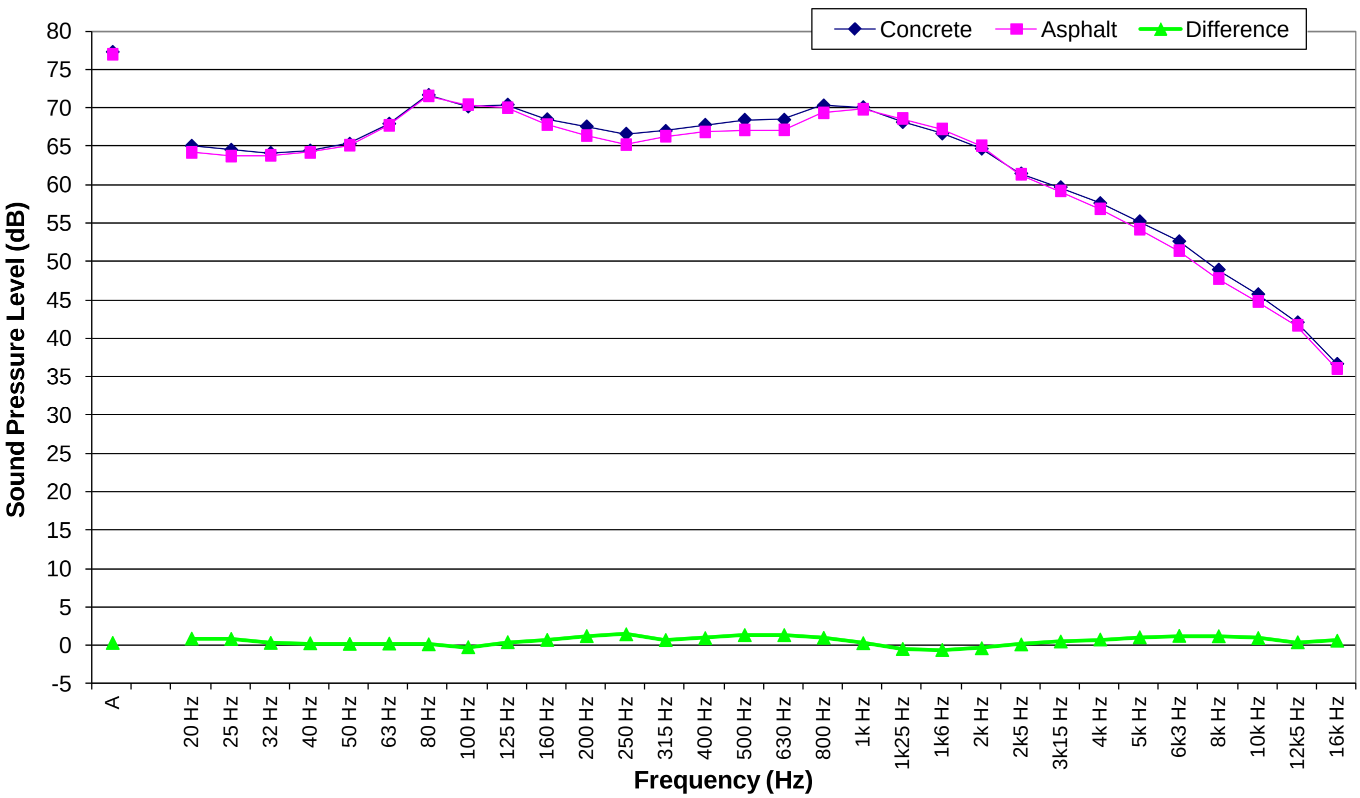

Figure 44. 24-Hour 1/3 Octave Band L_{eq} Sound Levels for Concrete and Asphalt Surfaces

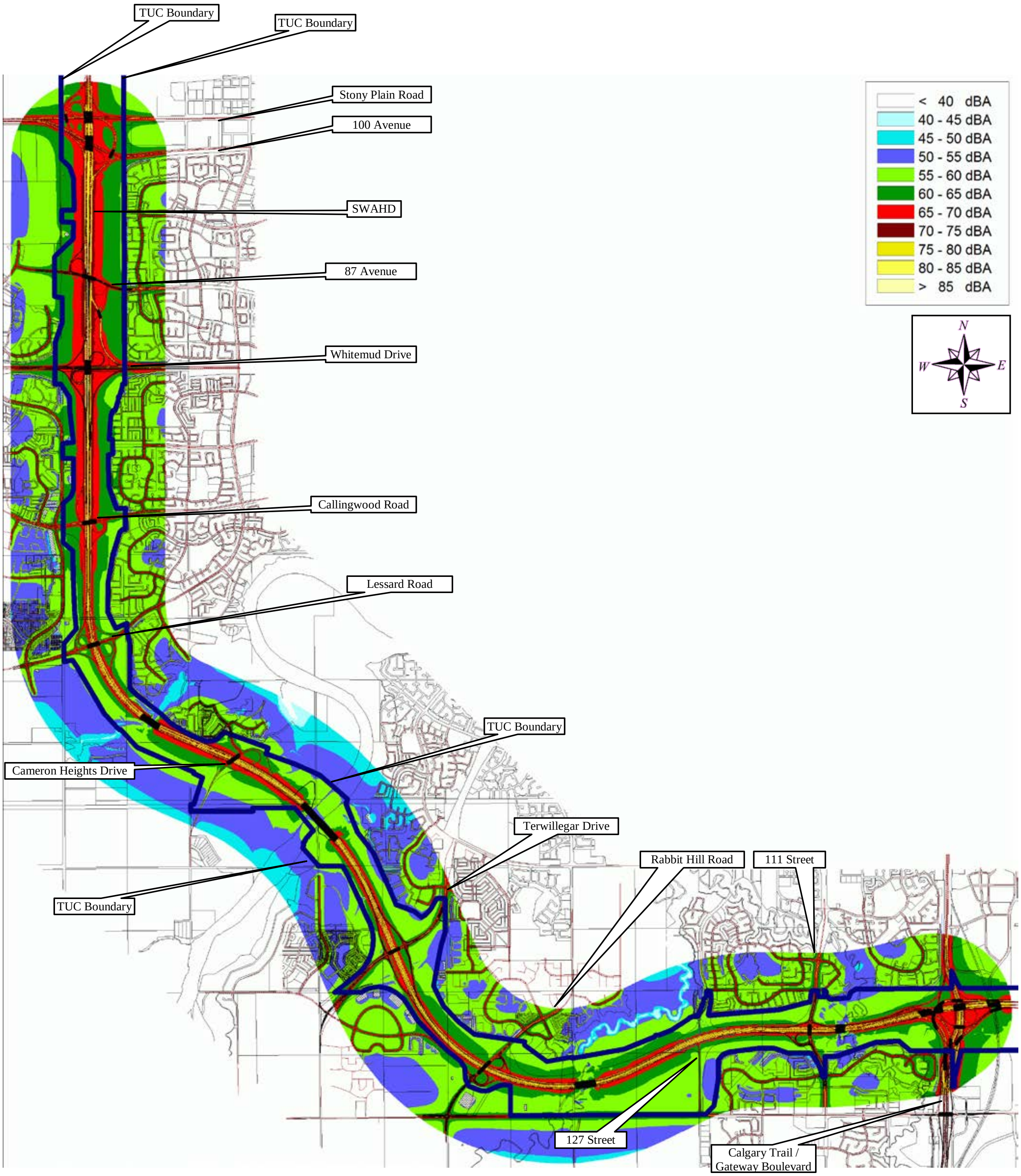

Figure 45a. Current Conditions L_{eq}24 Sound Levels for Entire Study Area

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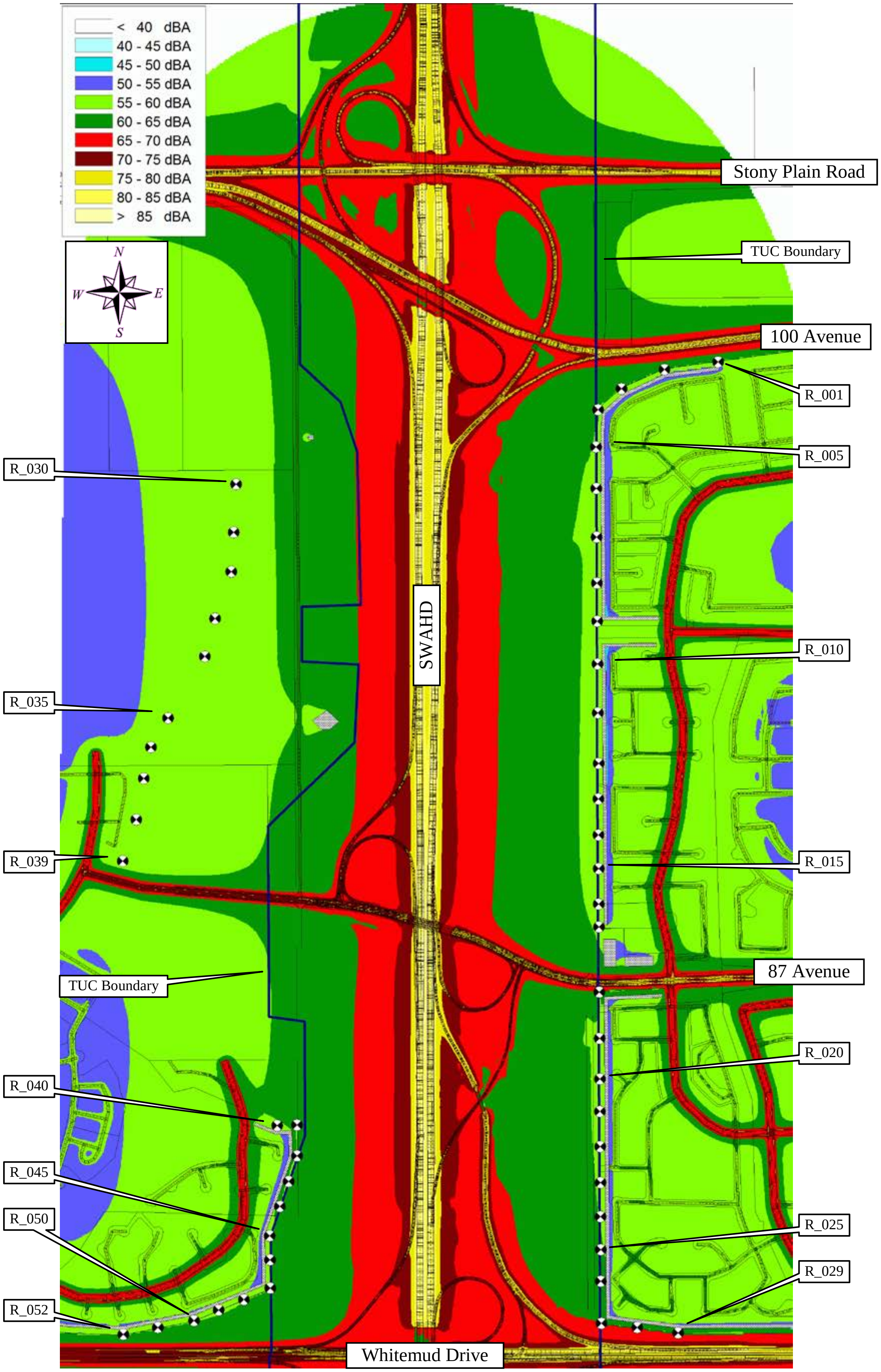

Figure 45b. Current Conditions L_{eq}24 Sound Levels for Region 1

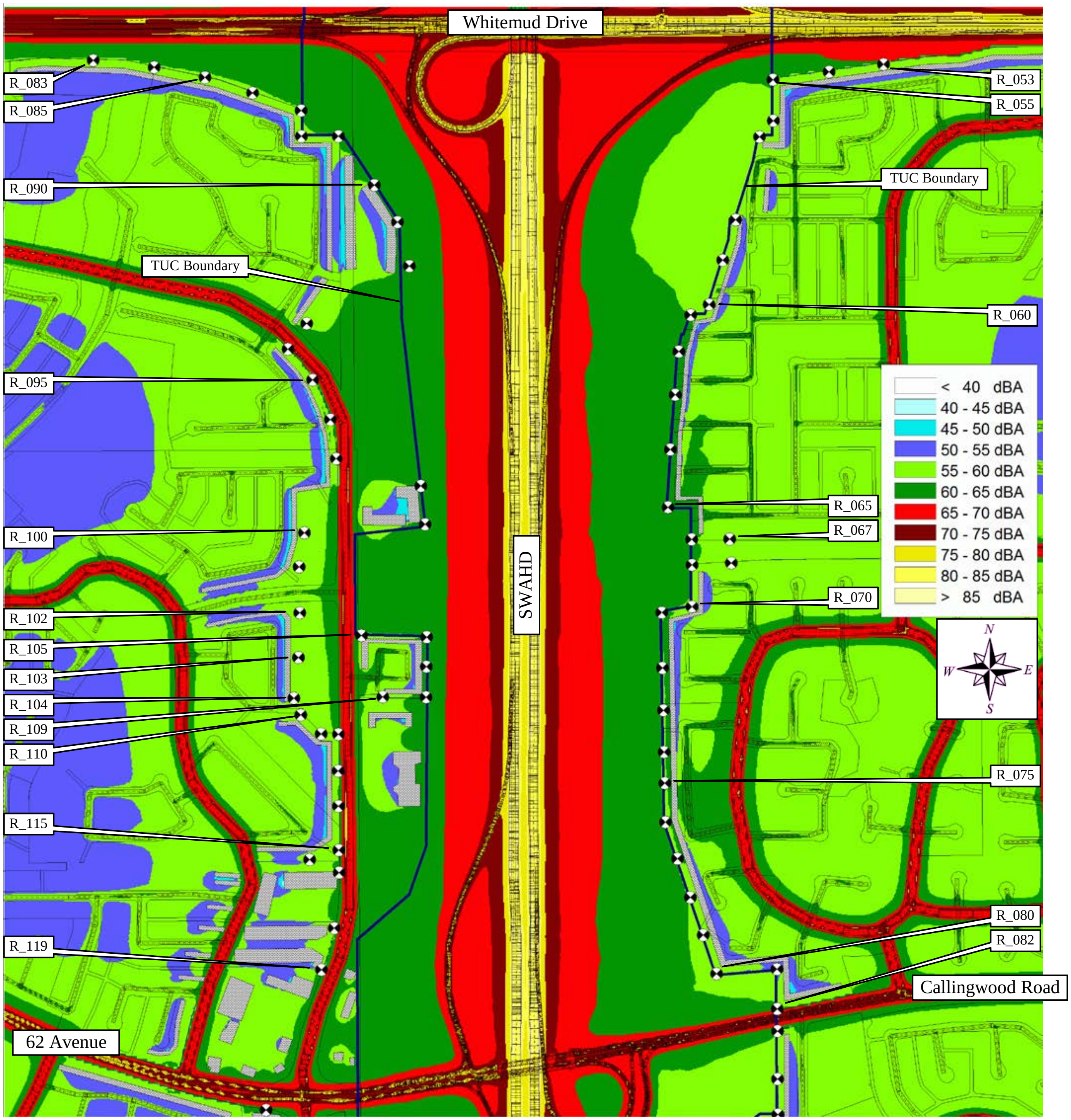

Figure 45c. Current Conditions L_{eq}24 Sound Levels for Region 2

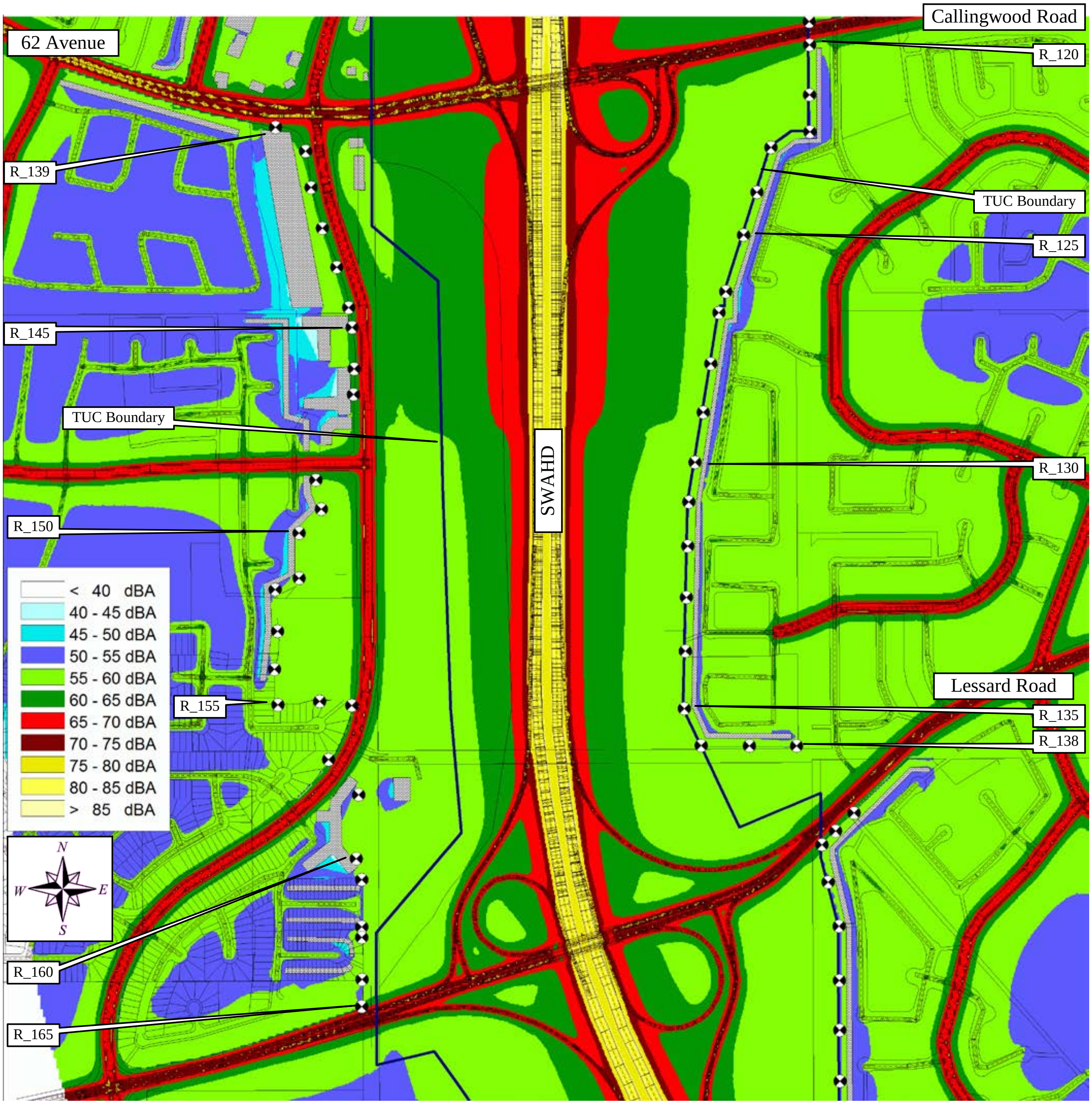

Figure 45d. Current Conditions L_{eq}24 Sound Levels for Region 3

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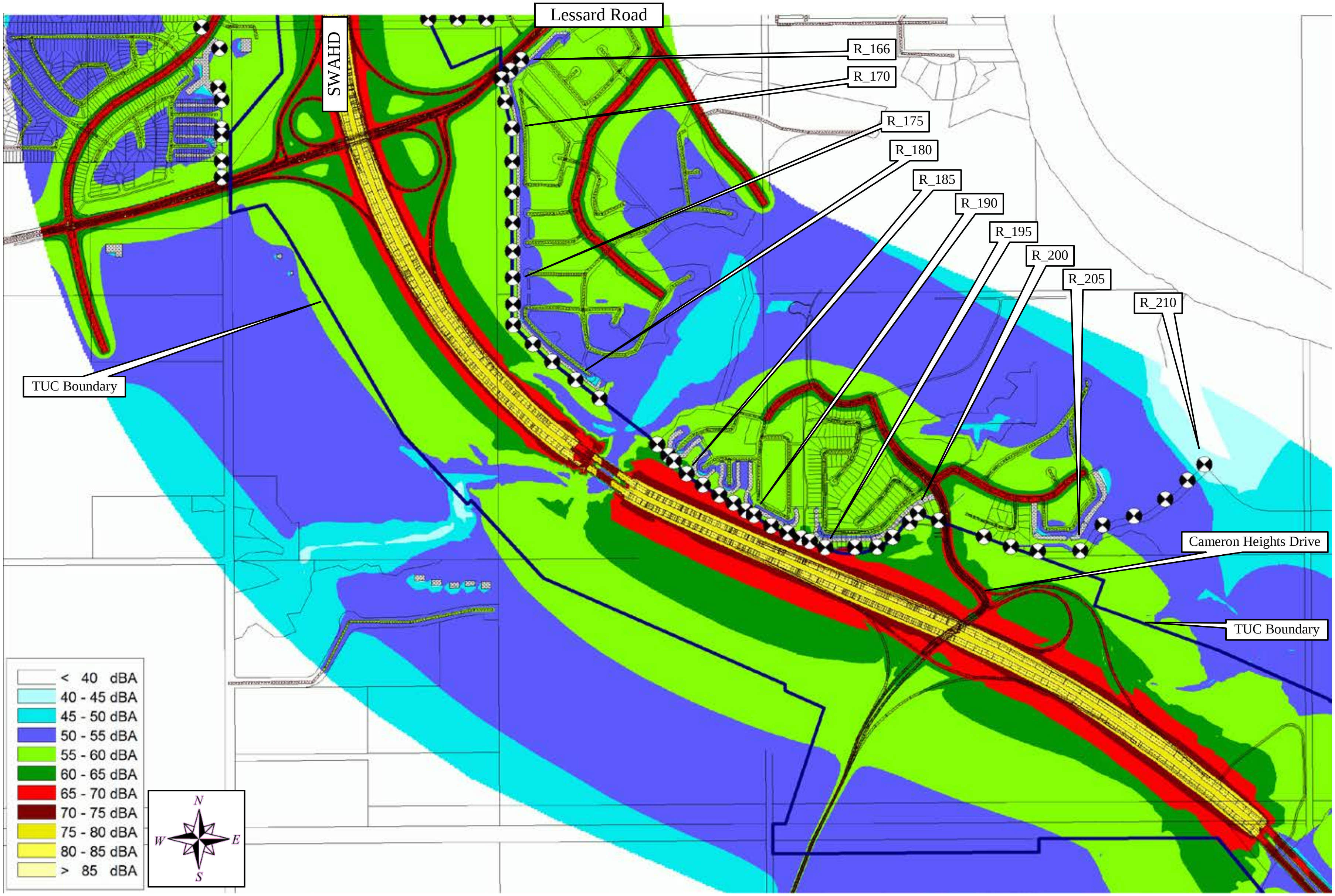

Figure 45e. Current Conditions L_{eq}24 Sound Levels for Region 4

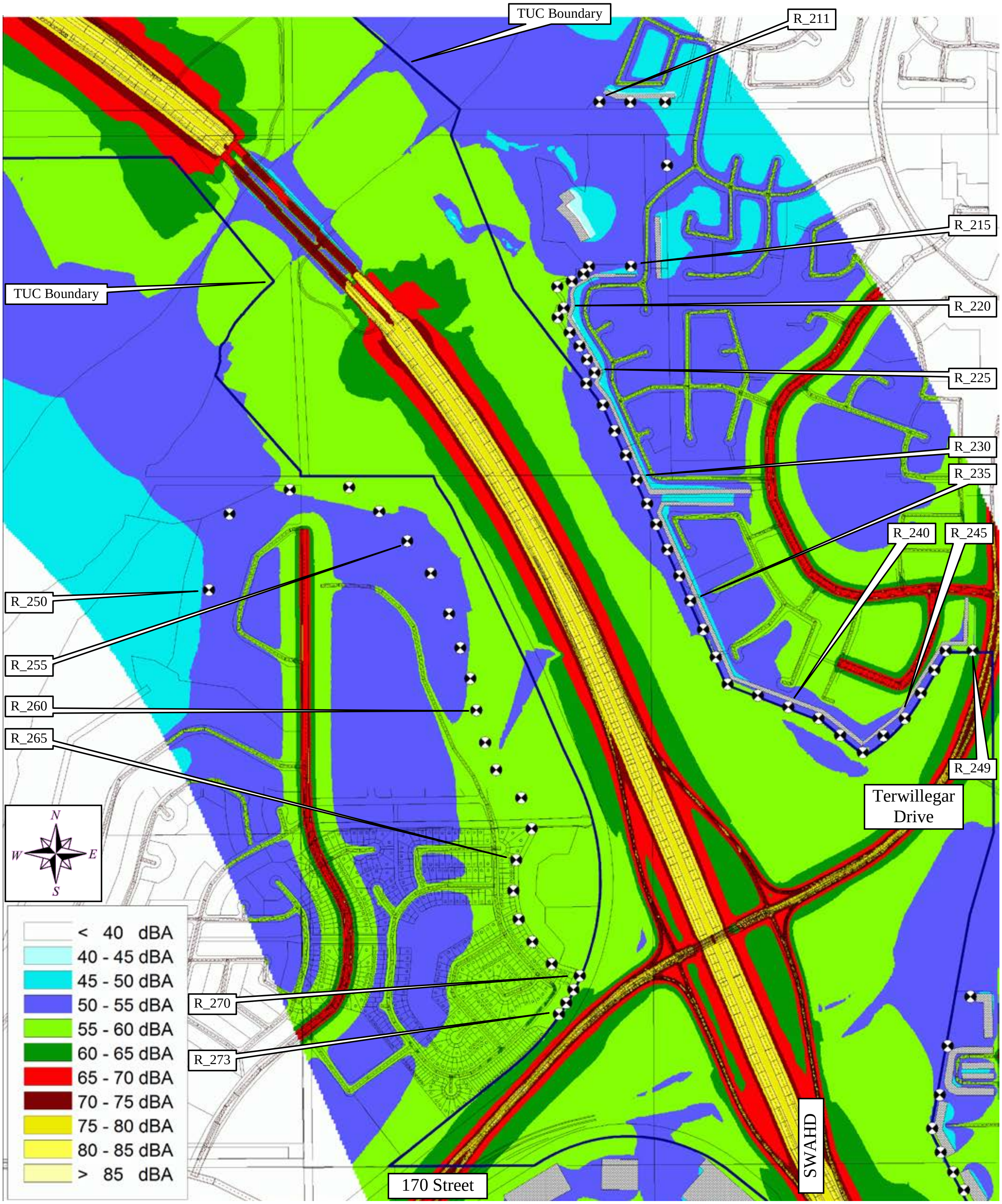

Figure 45f. Current Conditions L_{eq}24 Sound Levels for Region 5

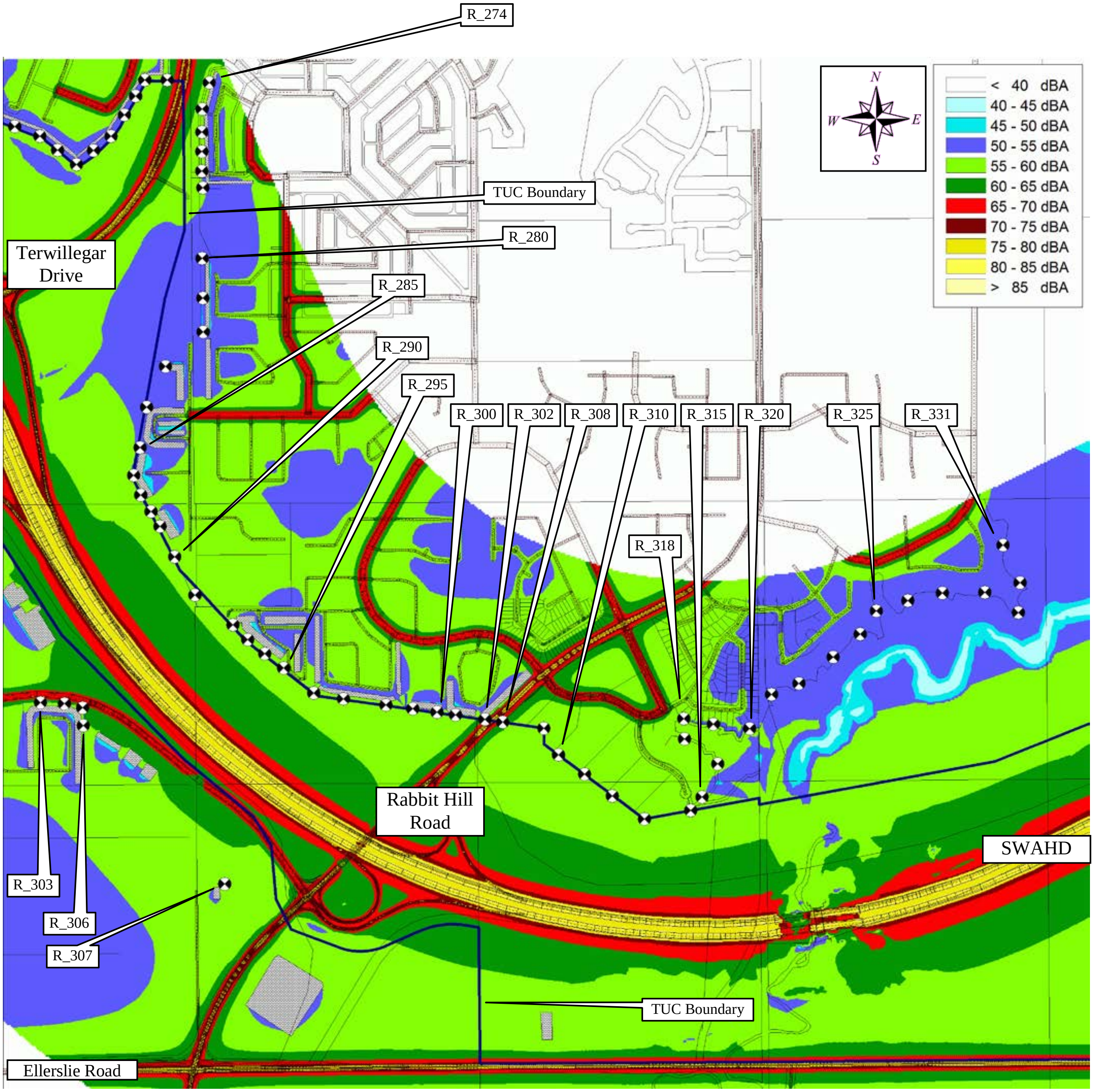

Figure 45g. Current Conditions L_{eq}24 Sound Levels for Region 6

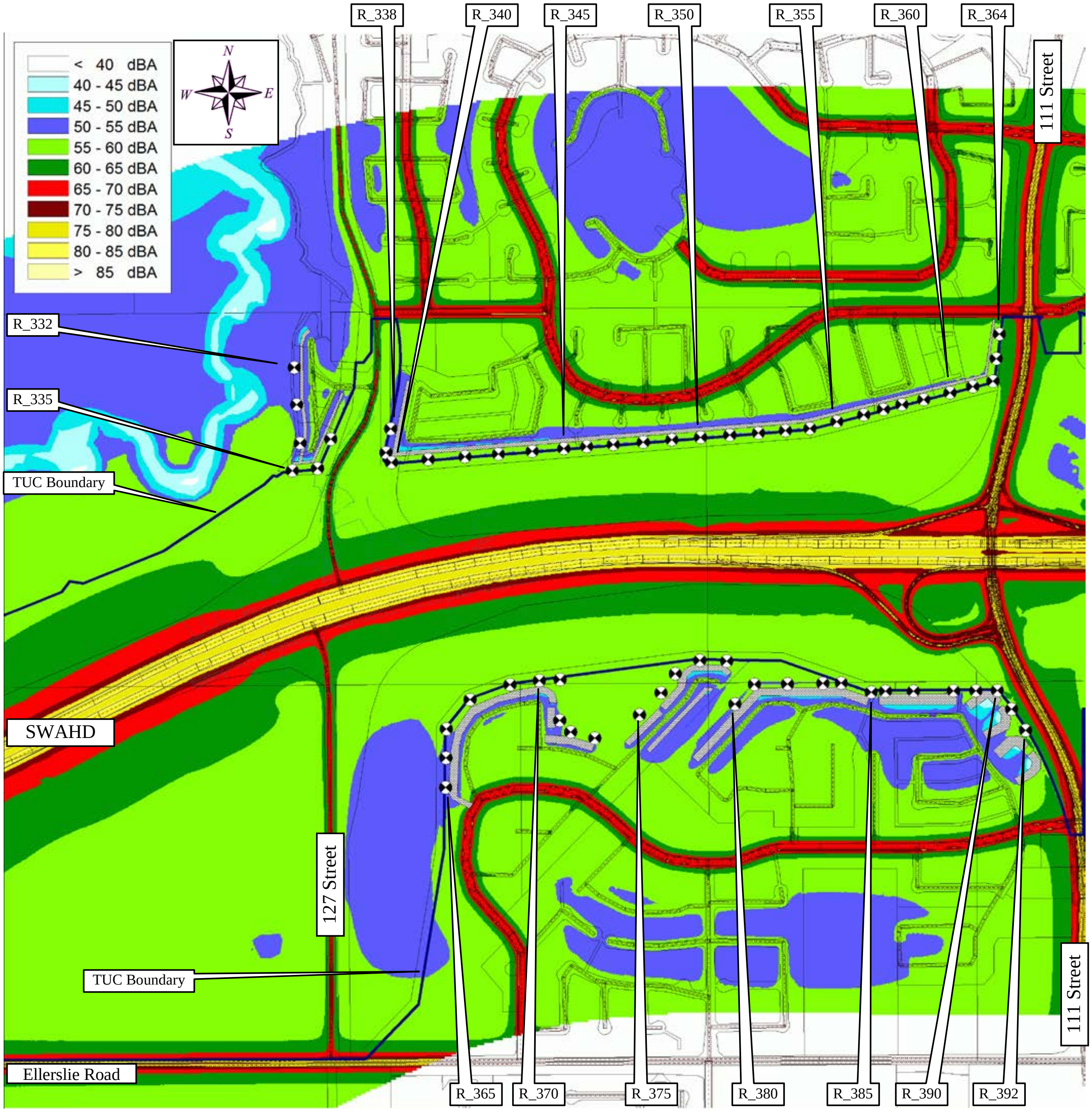

Figure 45h. Current Conditions L_{eq}24 Sound Levels for Region 7

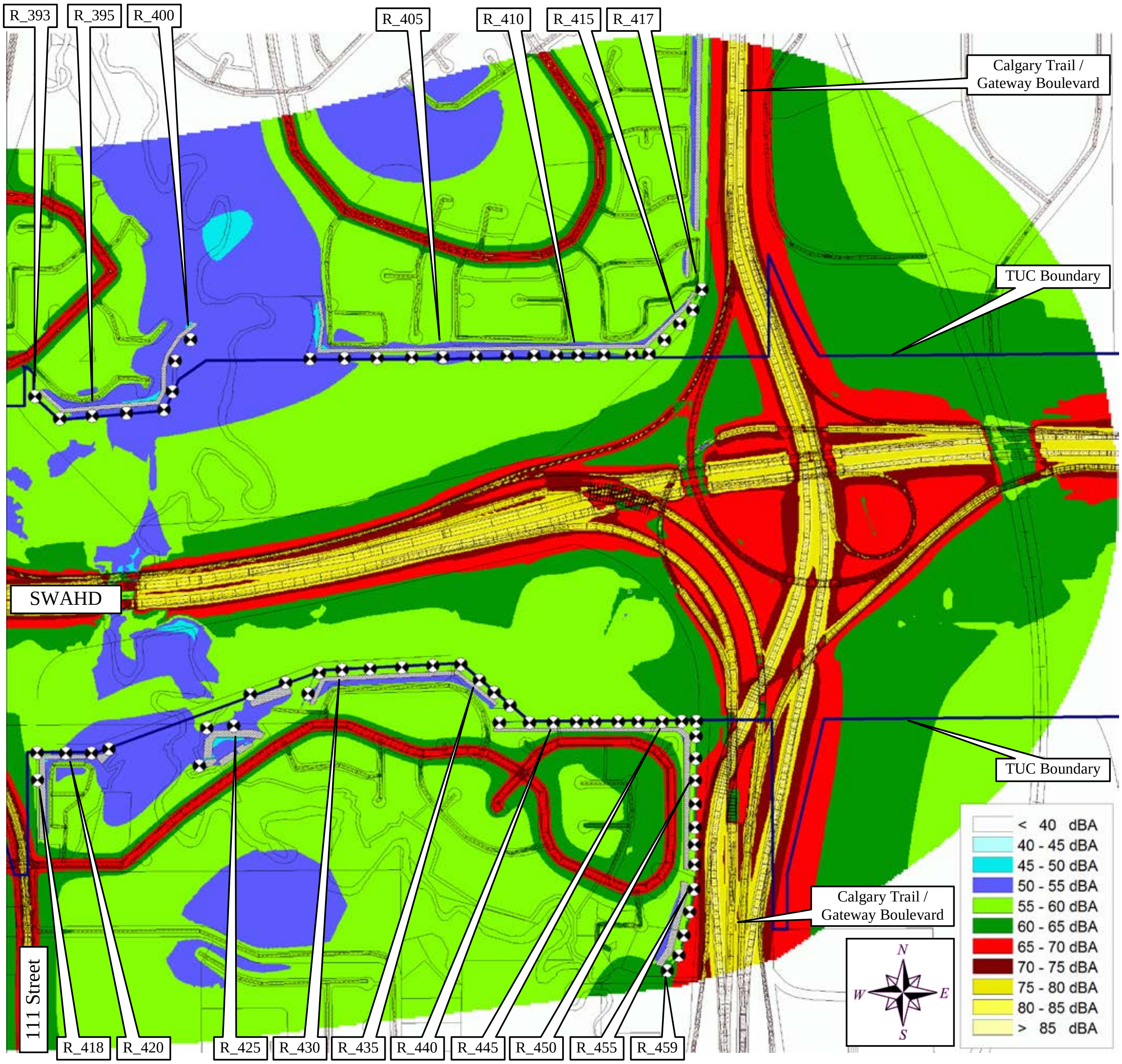

Figure 45i. Current Conditions L_{eq}24 Sound Levels for Region 8

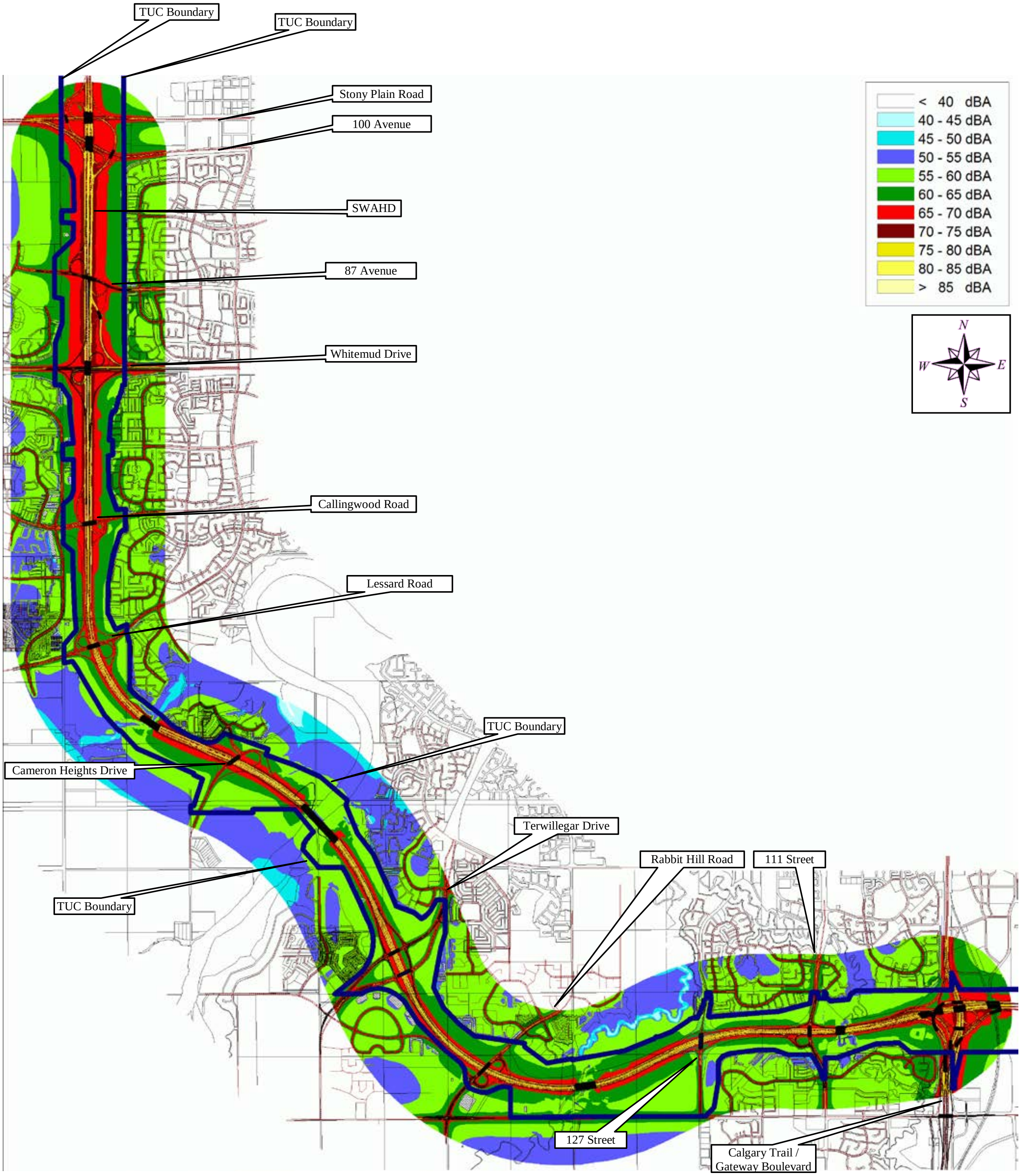

Figure 46a. Future Conditions (Year 2024) L_{eq}24 Sound Levels for Entire Study Area

Figure 46b. Future Conditions (Year 2024) L_{eq}24 Sound Levels for Region 1

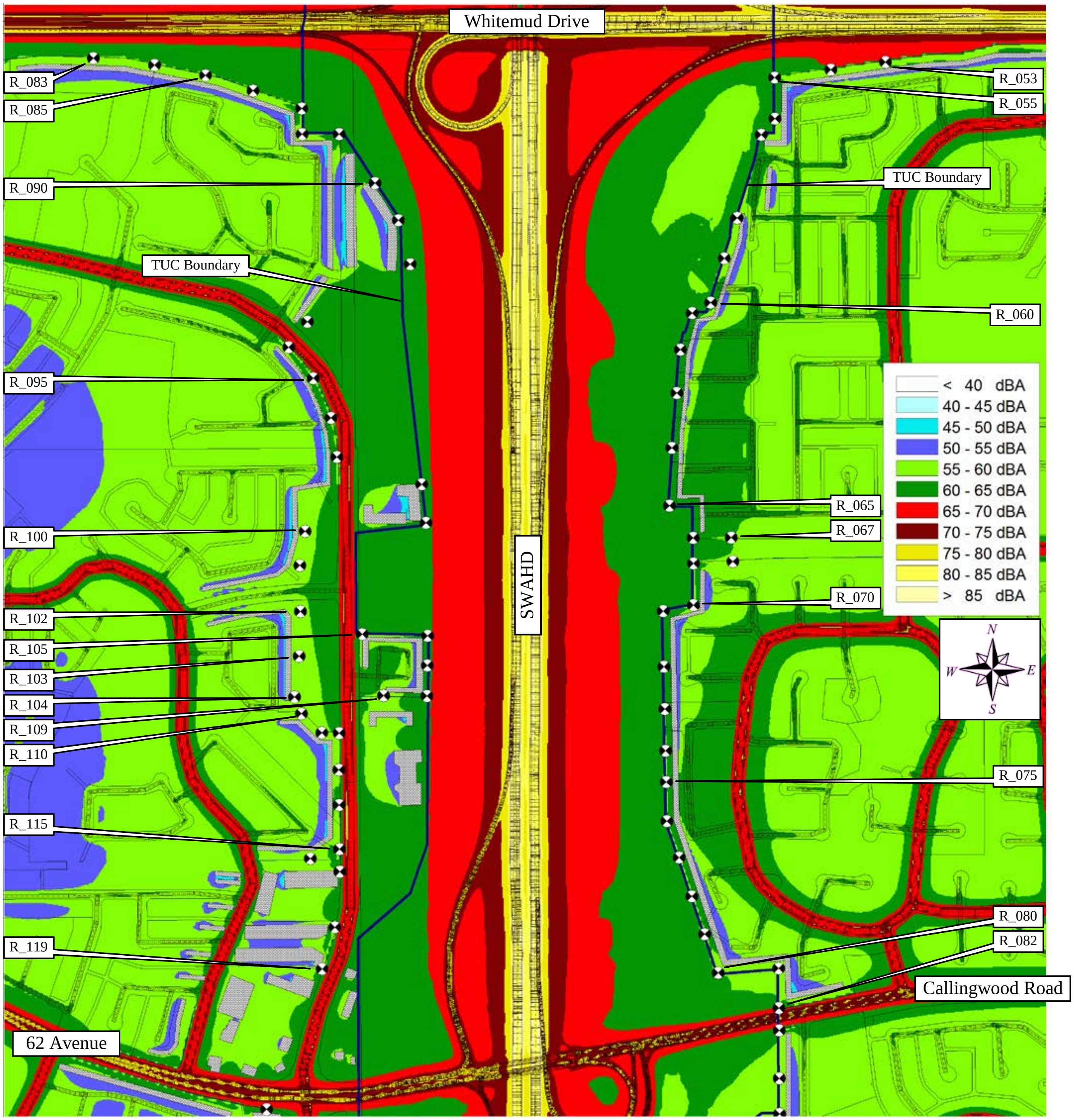

Figure 46c. Future Conditions (Year 2024) L_{eq}24 Sound Levels for Region 2

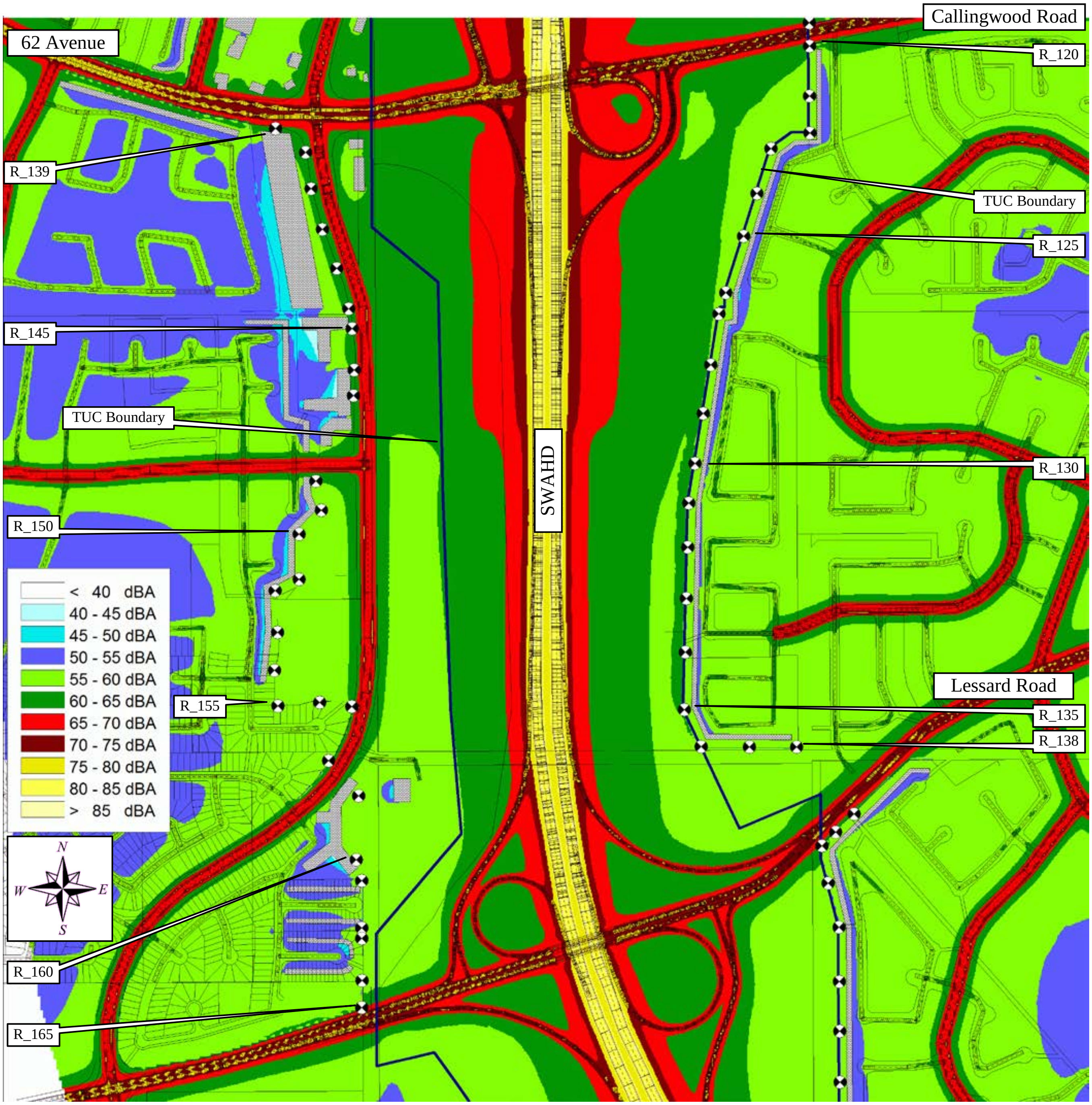

Figure 46d. Future Conditions (Year 2024) L_{eq}24 Sound Levels for Region 3

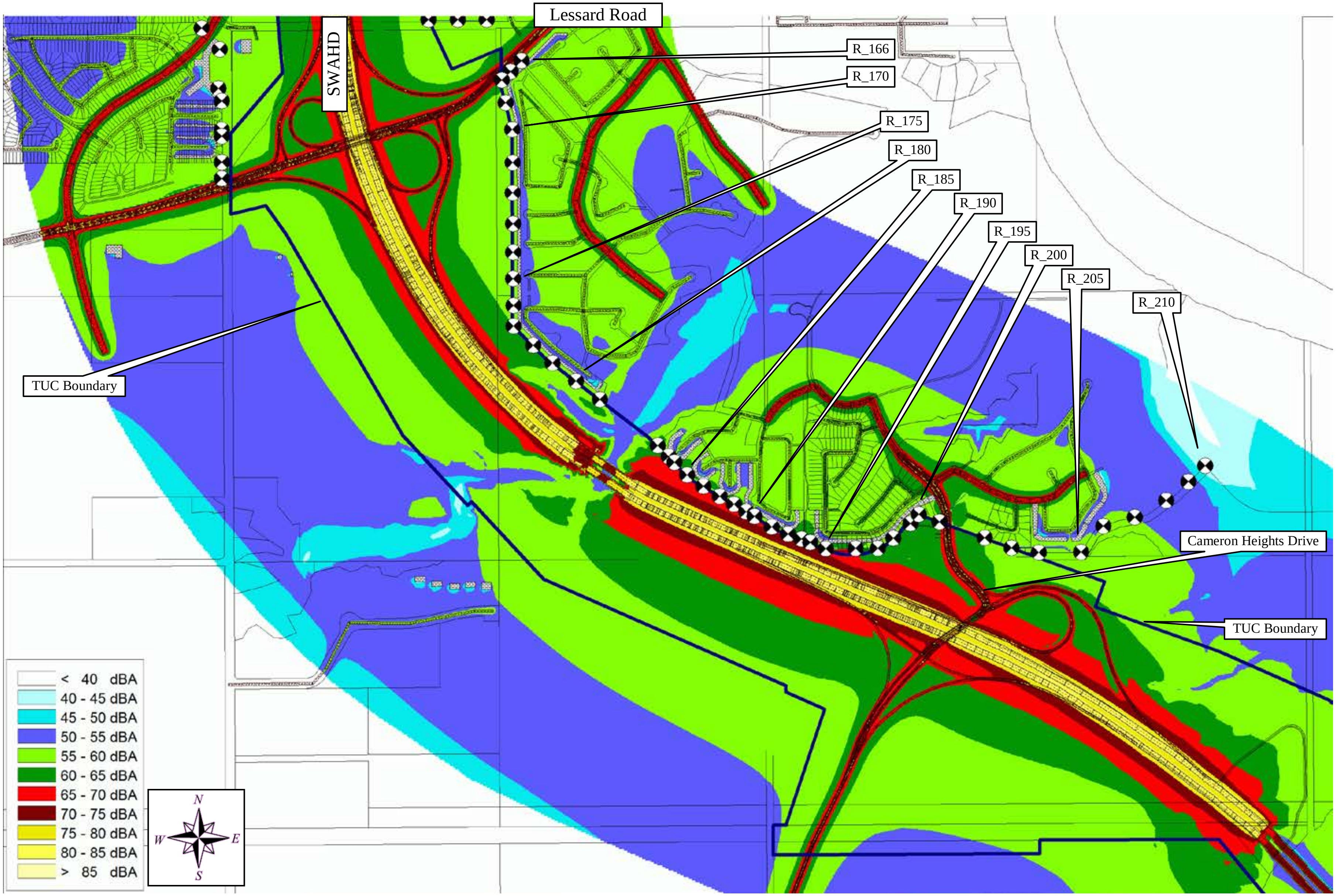

Figure 46e. Future Conditions (Year 2024) L_{eq}24 Sound Levels for Region 4

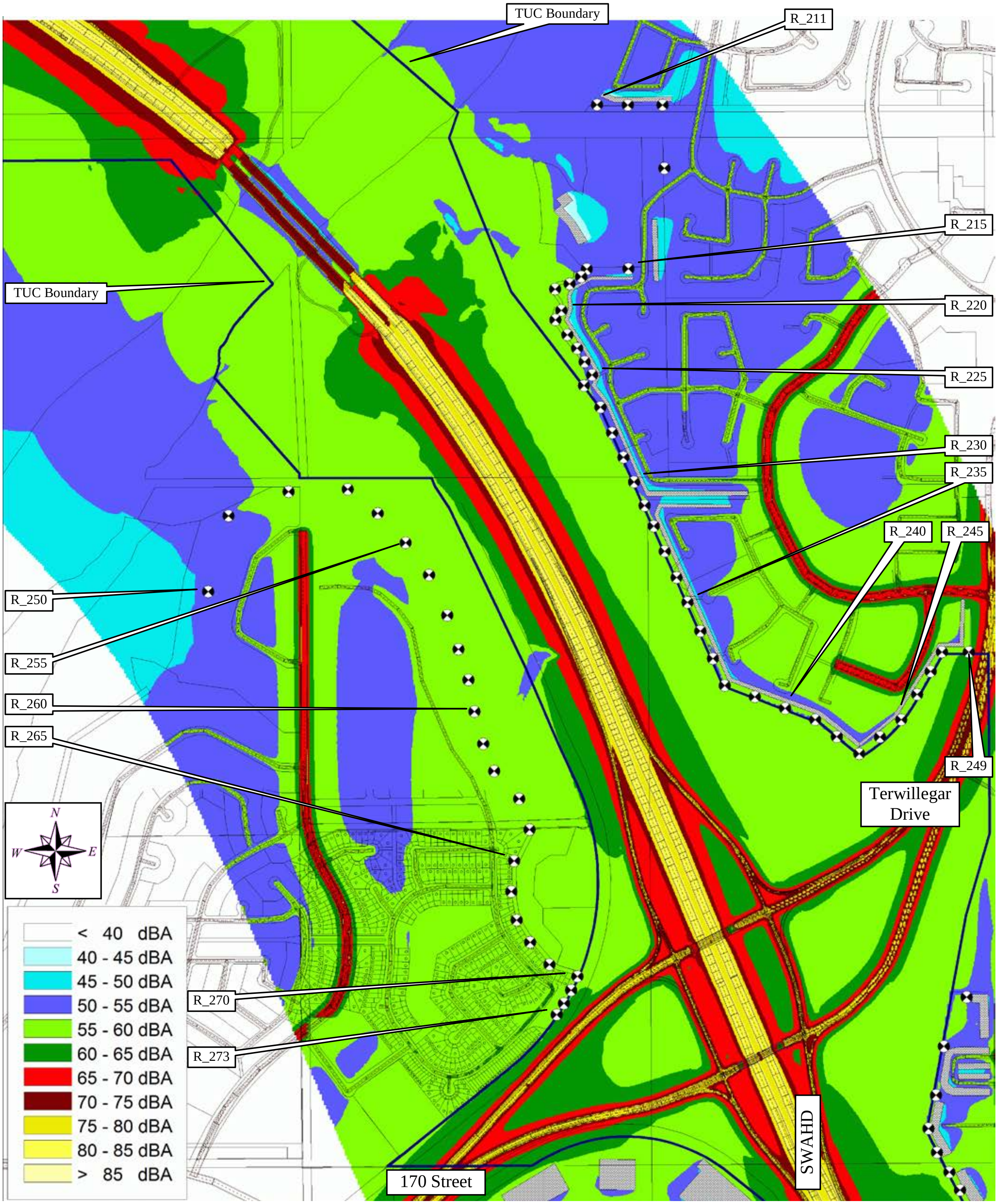

Figure 46f. Future Conditions (Year 2024) L_{eq}24 Sound Levels for Region 5

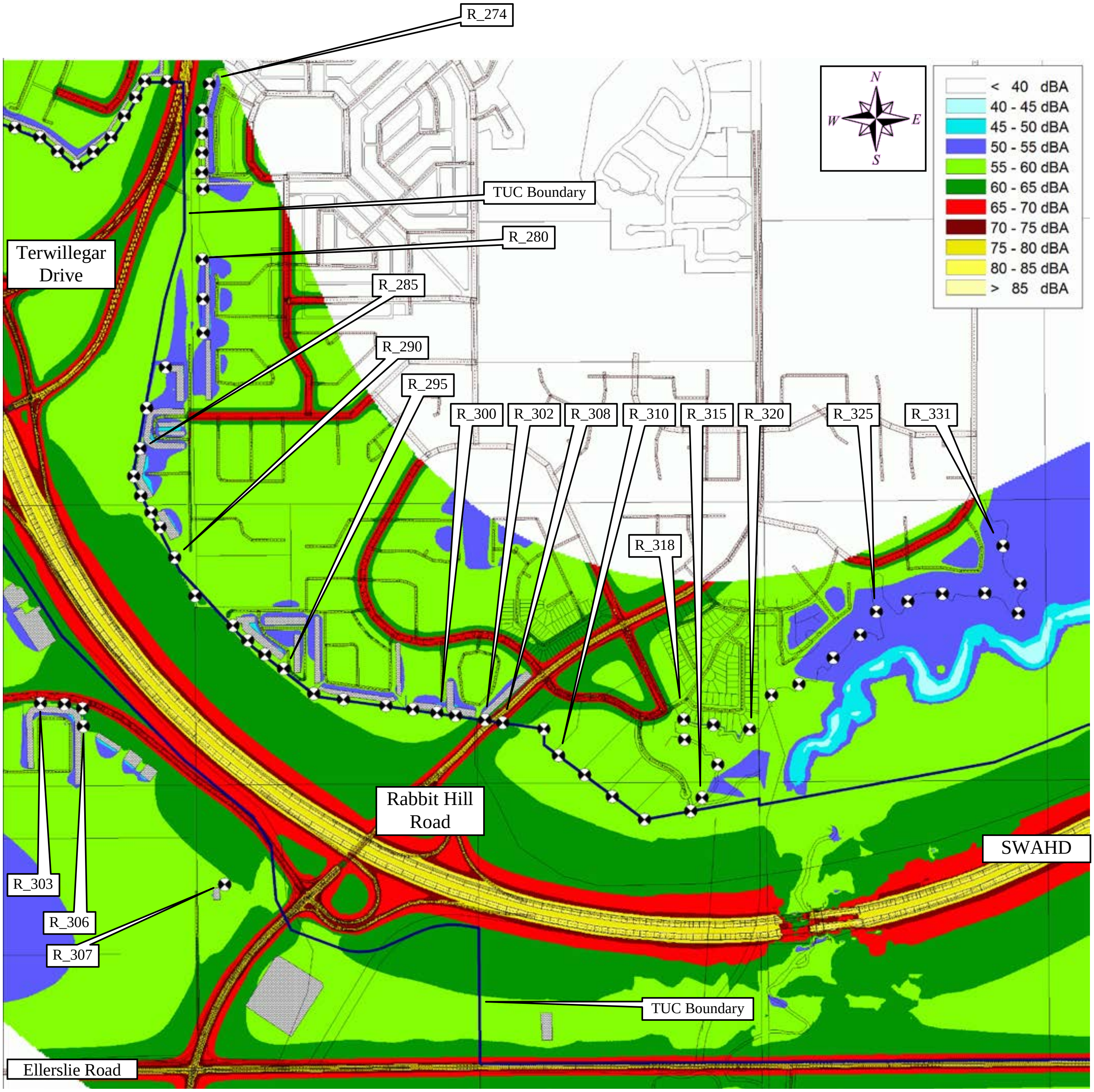

Figure 46g. Future Conditions (Year 2024) L_{eq}24 Sound Levels for Region 6

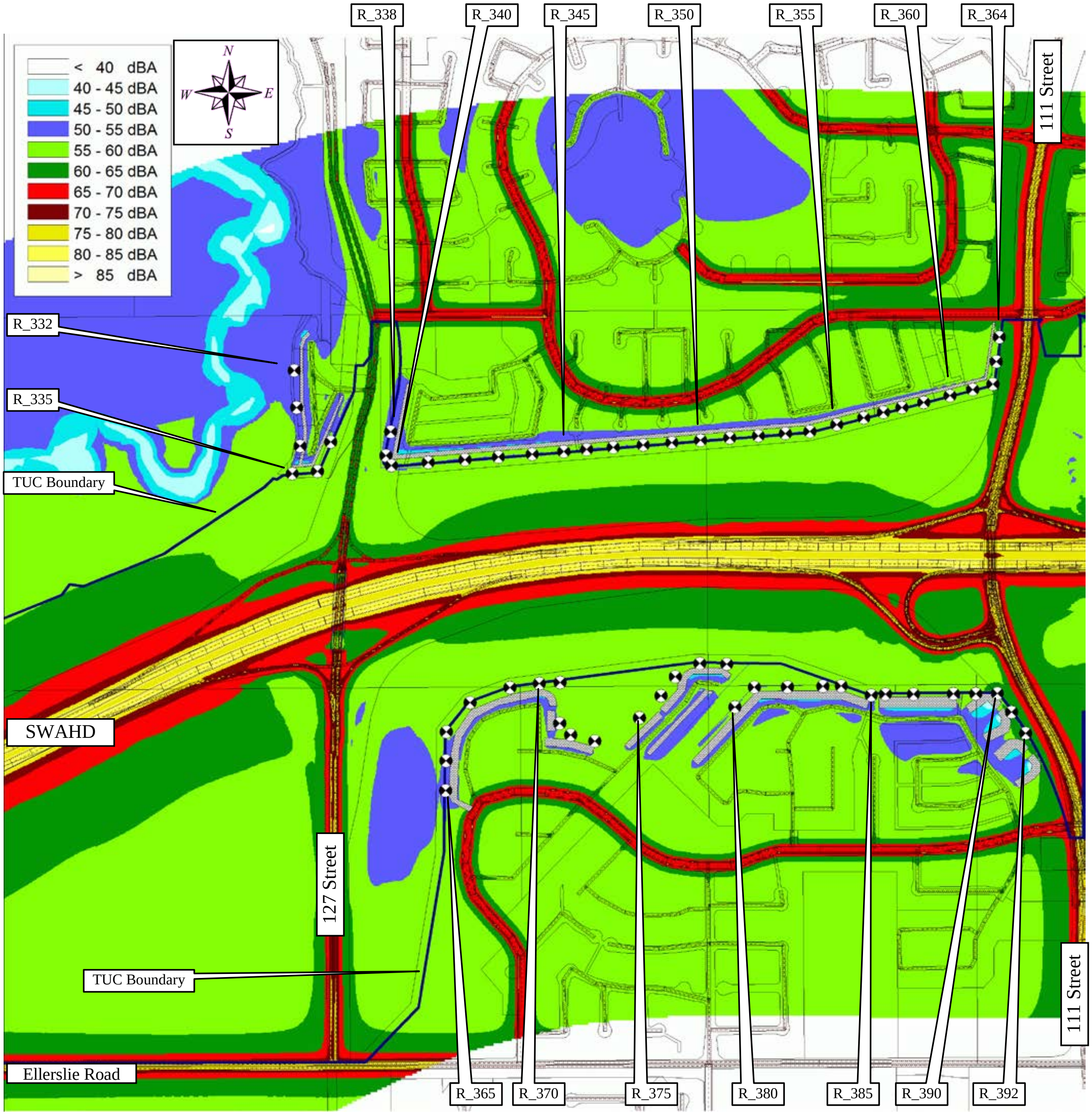

Figure 46h. Future Conditions (Year 2024) L_{eq}24 Sound Levels for Region 7

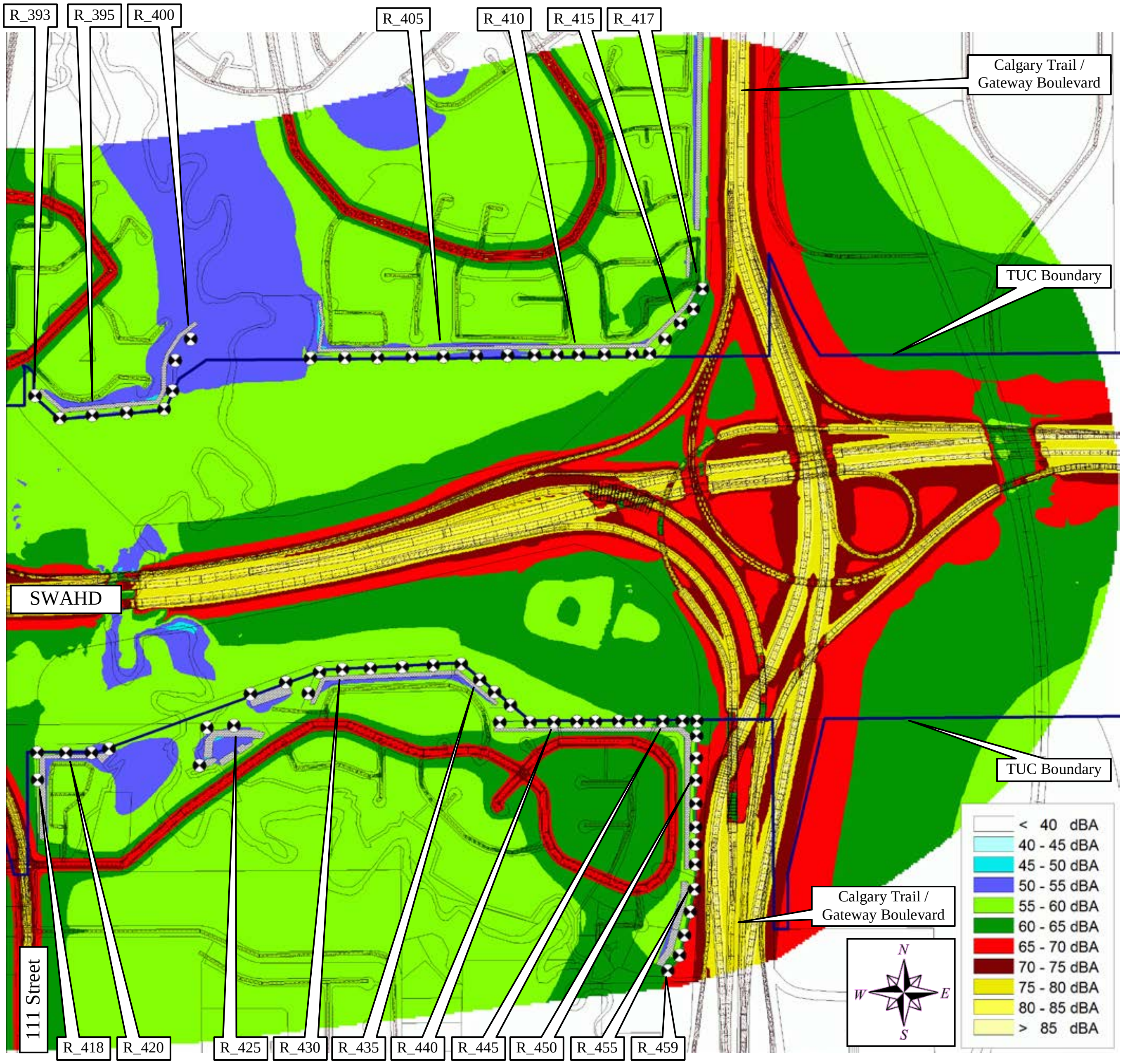

Figure 46i. Future Conditions (Year 2024) L_{eq}24 Sound Levels for Region 8

Appendix I. MEASUREMENT EQUIPMENT USED

Noise Monitors

The environmental noise monitoring equipment used consisted of Brüel and Kjær Type 2250/2270 Precision Integrating Sound Level Meters enclosed in environmental cases, with tripods, and weather protective microphone hoods. The systems acquired data in 15-second L_{eq} samples using 1/3 octave band frequency analysis and overall A-weighted and C-weighted sound levels. The sound level meters conform to Type 1, ANSI S1.4, ANSI S1.43, IEC 61672-1, IEC 60651, IEC 60804 and DIN 45657. The 1/3 octave filters conform to S1.11 – Type 0-C, and IEC 61260 – Class 0. The calibrator conforms to IEC 942 and ANSI S1.40. The sound level meters, pre-amplifier and microphone were certified on June 27, 2013 / December 11, 2012 / December 11, 2012 / October 2, 2012 / October 2, 2012 / October 2, 2012 / October 1, 2012 and the calibrators (type B&K 4231) were certified on October 1, 2012 / June 27, 2013 by a NIST NVLAP Accredited Calibration Laboratory for all requirements of ISO 17025: 1999 and relevant requirements of ISO 9002:1994, ISO 9001:2000 and ANSI/NCSL Z540: 1994 Part 1. Simultaneous digital audio was recorded directly on the sound level meter using a 8 kHz sample rate for more detailed post-processing analysis. Refer to the next section in the Appendix for a detailed description of the various acoustical descriptive terms used.

Weather Monitor

The weather monitoring equipment used for the study consisted of an Orion Weather Station with a WXT520 Self-Aspirating Radiation Shield Sensor Unit, a Weather MicroServer Data-logger, and a Lightning Arrestor. The Data-logger and batteries were located in a grounded, weather protective case. The Sensor Unit was mounted on a sturdy survey tripod (with supporting guy-wires) at approximately 5.0 m above ground. The system was set up to record data in 1-minute samples obtaining the wind-speed, peak wind-speed, and wind-direction in a rolling 2-minute average as well as the temperature, relative humidity, rain rate and total rain accumulation.

Record of Calibration Results

Description	Date	Time	Pre / Post	Calibration Level	Calibrator Model	Serial Number
M1	September 09 2013	7:45	Pre	93.9 dBA	B&K 4231	2594693
M1	September 11 2013	10:15	Post	93.8 dBA	B&K 4231	2594693
M2	October 22 2013	12:00	Pre	93.9 dBA	B&K 4231	2478139
M2	October 24 2013	12:00	Post	93.9 dBA	B&K 4231	2478139
M3	September 09 2013	8:30	Pre	93.9 dBA	B&K 4231	2594693
M3	September 11 2013	10:40	Post	93.8 dBA	B&K 4231	2594693
M4	September 09 2013	9:00	Pre	93.9 dBA	B&K 4231	2594693
M4	September 11 2013	11:00	Post	93.9 dBA	B&K 4231	2594693
M5	August 14 2013	17:15	Pre	93.9 dBA	B&K 4231	2594693
M5	August 16 2013	9:45	Post	93.9 dBA	B&K 4231	2594693
M6	August 12 2013	15:00	Pre	93.9 dBA	B&K 4231	2594693
M6	August 14 2013	11:00	Post	94.0 dBA	B&K 4231	2594693
M7	August 12 2013	14:30	Pre	93.9 dBA	B&K 4231	2594693
M7	August 14 2013	10:45	Post	93.9 dBA	B&K 4231	2594693
M8	October 28 2013	10:00	Pre	93.9 dBA	B&K 4231	2478139
M8	October 31 2013	8:30	Post	93.9 dBA	B&K 4231	2478139
M9	August 12 2013	14:00	Pre	93.9 dBA	B&K 4231	2594693
M9	August 14 2013	10:30	Post	93.9 dBA	B&K 4231	2594693
M10	August 12 2013	13:00	Pre	93.9 dBA	B&K 4231	2594693
M10	August 14 2013	10:00	Post	93.9 dBA	B&K 4231	2594693
M11	August 12 2013	12:30	Pre	93.9 dBA	B&K 4231	2594693
M11	August 14 2013	9:45	Post	93.9 dBA	B&K 4231	2594693
M12	August 28 2913	9:00	Pre	93.9 dBA	B&K 4231	2594693
M12	August 29 2013	10:30	Post	93.8 dBA	B&K 4231	2594693
M13	August 28 2913	9:30	Pre	93.9 dBA	B&K 4231	2594693
M13	August 29 2013	11:00	Post	93.8 dBA	B&K 4231	2594693
M14	August 12 2013	12:00	Pre	93.9 dBA	B&K 4231	2594693
M14	August 14 2013	9:30	Post	93.9 dBA	B&K 4231	2594693

B&K 2250 Unit #1 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.29118

Instrument: **Sound Level Meter**
Model: **2250**
Manufacturer: **Brüel and Kjær**
Serial number: **2488495**
Tested with: **Microphone 4189 s/n 2471133**
Preamplifier ZC0032 s/n 3271
Type (class): **1**
Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / -6376**

Date Calibrated: **6/28/2013** *Cal Due:*

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard
Address: **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 20, 2012	ACR Env./ A2LA	Nov 20, 2014
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Nov 20, 2012	ACR Env. / A2LA	Nov 20, 2013
DPI 141-Druck	Pressure Indicator	790/00-04	Nov 21, 2012	ACR Env./ A2LA	Nov 21, 2014
HMP233-Vaisala Oyj	Humidity & Temp.	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 14, 2012	Scantek, Inc./ NVLAP	Dec 14, 2013

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.9 °C	98.895 kPa	55.6 %RH

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	6/28/2013	Date	6/28/2013

Document stored Z:\Calibration Lab\SLM 2013\BNK2250_2488495_M1.doc Page 1 of 2

B&K 2250 Unit #1 Microphone Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.29119

Instrument: **Microphone**
Model: **4189**
Manufacturer: **Brüel & Kjær**
Serial number: **2471133**
Composed of:

Date Calibrated: **6/27/2013** *Cal Due:*

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / -6376**
Address: **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 11/30/2010

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 20, 2012	ACR Env./ A2LA	Nov 20, 2014
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Nov 20, 2012	ACR Env. / A2LA	Nov 20, 2013
DPI 141-Druck	Pressure Indicator	790/00-04	Nov 21, 2012	ACR Env./ A2LA	Nov 21, 2014
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1017 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Dec 14, 2012	Scantek, Inc./ NVLAP	Dec 14, 2013
1203-Norsonic	Preamplifier	14059	Jan 4, 2013	Scantek, Inc./ NVLAP	Jan 4, 2014
4180-Brüel&Kjær	Microphone	2246115	Nov 21, 2011	NPL-UK / UKAS	Nov 21, 2013

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	6/27/2013	Date	6/28/2013

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B&K 4231 Unit #1 Calibrator Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.29120

Instrument:	**Acoustical Calibrator**	*Date Calibrated:* **6/27/2013** *Cal Due:*		
Model:	**4231**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	X	X
Serial number:	**2478139**	*Out of tolerance:*		
Class (IEC 60942):	**1**	*See comments:*		
Barometer type:		*Contains non-accredited tests:* __Yes _X_ No		
Barometer s/n:				

Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / -6376**
Address: **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 20, 2012	ACR Env./ A2LA	Nov 20, 2014
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Nov 20, 2012	ACR Env. / A2LA	Nov 20, 2013
DPI 141-Druck	Pressure Indicator	790/00-04	Nov 21, 2012	ACR Env./ A2LA	Nov 21, 2014
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
8903A-HP	Audio Analyzer	2514A05691	Dec 1, 2010	ACR Env./ A2LA	Dec 1, 2013
PC Program 1018 Norsonic	Calibration software	v.5.2	Validated March 2011	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	456005	Mar 29, 2013	Scantek, Inc. / NVLAP	Mar 29, 2014
1203-Norsonic	Preamplifier	14059	Jan 4, 2013	Scantek, Inc./ NVLAP	Jan 4, 2014

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	6/27/2013	Date	6/28/2013

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B&K 4231 Unit #1 Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.29120

Instrument: **Acoustical Calibrator**
Model: **4231**
Manufacturer: **Brüel and Kjær**
Serial number: **2478139**
Class (IEC 60942): **1**
Barometer type:
Barometer s/n:

Date Calibrated: **6/27/2013** *Cal Due:*

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / -6376**
Address: **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 20, 2012	ACR Env./ A2LA	Nov 20, 2014
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Nov 20, 2012	ACR Env. / A2LA	Nov 20, 2013
DPI 141-Druck	Pressure Indicator	790/00-04	Nov 21, 2012	ACR Env./ A2LA	Nov 21, 2014
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
8903A-HP	Audio Analyzer	2514A05691	Dec 1, 2010	ACR Env./ A2LA	Dec 1, 2013
PC Program 1018 Norsonic	Calibration software	v.5.2	Validated March 2011	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	456005	Mar 29, 2013	Scantek, Inc. / NVLAP	Mar 29, 2014
1203-Norsonic	Preamplifier	14059	Jan 4, 2013	Scantek, Inc./ NVLAP	Jan 4, 2014

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by:	Valentin Buzduga	Authorized signatory:	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	6/27/2013	Date	6/28/2013

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B&K 2270 Unit #2 Calibration Certificates

MANUFACTURER'S CERTIFICATE OF CONFORMANCE

We certify that Brüel & Kjær **-2270--D00-** Serial No. **3002718** has been tested and passed all production tests, confirming compliance with the manufacturer's published specification at the date of the test.

The final test has been performed using calibrated equipment, traceable to National or International Standards or by ratio measurements.

Brüel & Kjær is certified under ISO 9001:2008 assuring that all test data is retained on file and is available for inspection upon request.

Nærum 11-dec-2012

Torben Bjørn
Vice President, Operations

Please note that this document is not a calibration certificate.
For information on our calibration services please contact your nearest Brüel & Kjær office.

HEADQUARTERS: Brüel & Kjær Sound & Vibration Measurement A/S · DK-2850 Nærum · Denmark
Telephone: +45 7741 2000 · Fax: +45 4580 1405 · www.bksv.com · info@bksv.com
Local representatives and service organisations worldwide

Brüel & Kjær

Bruel & Kjær

Prepolarized Free-field 1/2" Microphone Type 4189

Calibration Chart

Serial No:	2850742	
Open-circuit Sensitivity*, S_0:	*-26.0*	dB re 1V/Pa
Equivalent to:	*50.4*	mV/Pa
Uncertainty, 95 % confidence level	0.2	dB
Capacitance:	*13.4*	pF
Valid At:		
Temperature:	23	°C
Ambient Static Pressure:	101.3	kPa
Relative Humidity:	50	%
Frequency:	251.2	Hz
Polarization Voltage, external:	0	V

Sensitivity Traceable To:
DPLA: Danish Primary Laboratory of Acoustics
NIST: National Institute of Standards and Technology, USA

IEC 61094-4: Type WS 2 F

Environmental Calibration Conditions:
99.7 kPa 22 °C 47 % RH

Procedure: 704215 **Date:** 26. Nov. 2012 **Signature:**

*K_0 = − 26 − S_0 Example: K_0 = − 26 − (− 26.2) = + 0.2 dB

B&K 2270 Unit #3 Calibration Certificates

MANUFACTURER'S CERTIFICATE OF CONFORMANCE

We certify that Brüel & Kjær **-2270--D00-** Serial No. **3002730** has been tested and passed all production tests, confirming compliance with the manufacturer's published specification at the date of the test.

The final test has been performed using calibrated equipment, traceable to National or International Standards or by ratio measurements.

Brüel & Kjær is certified under ISO 9001:2008 assuring that all test data is retained on file and is available for inspection upon request.

Nærum 11-dec-2012

Torben Bjørn
Vice President, Operations

Please note that this document is not a calibration certificate.
For information on our calibration services please contact your nearest Brüel & Kjær office.

HEADQUARTERS: Brüel & Kjær Sound & Vibration Measurement A/S · DK-2850 Nærum · Denmark
Telephone: +45 7741 2000 · Fax: +45 4580 1405 · www.bksv.com · info@bksv.com
Local representatives and service organisations worldwide

Brüel & Kjær

Prepolarized Free-field 1/2" Microphone Type 4189

Bruel & Kjær — Calibration Chart

Serial No:	2850741	
Open-circuit Sensitivity*, S_0:	-26.0	dB re 1V/Pa
Equivalent to:	49.8	mV/Pa
Uncertainty, 95 % confidence level	0.2	dB
Capacitance:	14.1	pF
Valid At:		
Temperature:	23	°C
Ambient Static Pressure:	101.3	kPa
Relative Humidity:	50	%
Frequency:	251.2	Hz
Polarization Voltage, external:	0	V

Sensitivity Traceable To:
DPLA: Danish Primary Laboratory of Acoustics
NIST: National Institute of Standards and Technology, USA

IEC 61094-4: Type WS 2 F

Environmental Calibration Conditions:
99.7 kPa 22 °C 47 % RH

Procedure: 704215 **Date:** 26. Nov. 2012 **Signature:** AK

$^*K_0 = -26 - S_0$ Example: $K_0 = -26 - (-26.2) = +0.2$ dB

B&K 4231 Unit #3 Calibrator Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1 ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.27290

Instrument: **Acoustical Calibrator**
Model: **4231**
Manufacturer: **Brüel and Kjær**
Serial number: **2594693**
Class (IEC 60942): **1**
Barometer type:
Barometer s/n:

Date Calibrated: **10/1/2012** *Cal Due:*

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / -6376**
Address: **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
8903A-HP	Audio Analyzer	2514A05691	Dec 1, 2010	ACR Env./ A2LA	Dec 1, 2013
PC Program 1018 Norsonic	Calibration software	v.5.2	Validated March 2011	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	456005	Mar 23, 2012	Scantek, Inc. / NVLAP	Mar 23, 2013
1203-Norsonic	Preamplifier	14059	Jan 3, 2012	Scantek, Inc./ NVLAP	Jan 3, 2013

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	10/01/2012	Date	10/2/2012

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B&K 2270 Unit #4 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.27282

Instrument: **Sound Level Meter**
Model: **2270**
Manufacturer: **Brüel and Kjær**
Serial number: **2644639**
Tested with: **Microphone 4189 s/n 2643219**
Preamplifier ZC0032 s/n 8255
Type (class): **1**
Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / -6376**

Date Calibrated: **10/2/2012** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No
Calibration service: __ Basic _X_ Standard
Address: **5031 - 210 Street, Edmonton**
Alberta, CANADA T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp.	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
24 °C	100.067 kPa	49.4 %RH

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	10/02/2012	Date	10/02/2012

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B&K 2270 Unit #4 Microphone Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.27283

Instrument: **Microphone**
Model: **4189**
Manufacturer: **Brüel & Kjær**
Serial number: **2643219**
Composed of:

Date Calibrated: **10/1/2012** *Cal Due:*

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / -6376**
Address: **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 11/30/2010

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1017 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012
1203-Norsonic	Preamplifier	14059	Jan 3, 2012	Scantek, Inc./ NVLAP	Jan 3, 2013
4180-Brüel&Kjær	Microphone	2246115	Nov 21, 2011	NPL-UK / UKAS	Nov 21, 2013

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Valentin Buzduga	Authorized signatory:	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	10/02/2012	Date	10/2/2012

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B&K 2250 Unit #5 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.27284

Instrument: **Sound Level Meter**
Model: **2250**
Manufacturer: **Brüel and Kjær**
Serial number: **2722894**
Tested with: **Microphone 4189 s/n 2719777**
Preamplifier ZC0032 s/n 13895
Type (class): **1**
Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / -6376**

Date Calibrated: **10/2/2012** *Cal Due:*

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard
Address: **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp.	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
24.7 °C	100.019 kPa	48.6 %RH

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	10/02/2012	Date	10/2/2012

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B&K 2250 Unit #5 Microphone Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.27285

Instrument: **Microphone**
Model: **4189**
Manufacturer: **Brüel & Kjær**
Serial number: **2719777**
Composed of:

Date Calibrated: **10/1/2012** *Cal Due:*

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / -6376**
Address: **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 11/30/2010

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1017 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012
1203-Norsonic	Preamplifier	14059	Jan 3, 2012	Scantek, Inc./ NVLAP	Jan 3, 2013
4180-Brüel&Kjær	Microphone	2246115	Nov 21, 2011	NPL-UK / UKAS	Nov 21, 2013

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Valentin Buzduga	Authorized signatory:	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	10/01/2012	Date	10/2/2012

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B&K 2250 Unit #6 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.27286

Instrument:	**Sound Level Meter**	*Date Calibrated:* **10/2/2012**	*Cal Due:*
Model:	**2250**	*Status:*	**Received** / **Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	X / X
Serial number:	**2661161**	*Out of tolerance:*	
Tested with:	**Microphone 4189 s/n 2650730**	*See comments:*	
	Preamplifier ZC0032 s/n 9935	*Contains non-accredited tests:* __Yes _X_ No	
Type (class):	**1**	*Calibration service:* __ Basic _X_ Standard	
Customer:	**ACI Acoustical Consultants Inc.**	*Address:*	**5031 - 210 Street, Edmonton**
Tel/Fax:	**780-414-6373 / -6376**		**Alberta, CANADA T6M 0A8**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp.	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.2 °C	99.991 kPa	51.9 %RH

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	10/02/2012	Date	10/2/2012

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B&K 2250 Unit #6 Microphone Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.27287

Instrument: **Microphone**
Model: **4189**
Manufacturer: **Brüel & Kjær**
Serial number: **2650730**
Composed of:

Date Calibrated: **10/1/2012** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / -6376**
Address: **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 11/30/2010

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1017 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012
1203-Norsonic	Preamplifier	14059	Jan 3, 2012	Scantek, Inc./ NVLAP	Jan 3, 2013
4180-Brüel&Kjær	Microphone	2246115	Nov 21, 2011	NPL-UK / UKAS	Nov 21, 2013

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	10/01/2012	Date	10/2/2012

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B&K 2250 Unit #7 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.27288

Instrument: **Sound Level Meter**
Model: **2250**
Manufacturer: **Brüel and Kjær**
Serial number: **2722859**
Tested with: **Microphone 4189 s/n 2710791**
Preamplifier ZC0032 s/n 13398
Type (class): **1**
Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / -6376**

Date Calibrated: **10/1/2012** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard
Address: **5031 - 210 Street, Edmonton**
Alberta, CANADA T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp.	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.7 °C	100.02 kPa	47.4 %RH

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	10/01/2012	Date	10/2/2012

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B&K 2250 Unit #7 Microphone Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.27289

Instrument: **Microphone**
Model: **4189**
Manufacturer: **Brüel & Kjær**
Serial number: **2710791**
Composed of:

Date Calibrated: **10/1/2012** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / -6376**
Address: **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 11/30/2010

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1017 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012
1203-Norsonic	Preamplifier	14059	Jan 3, 2012	Scantek, Inc./ NVLAP	Jan 3, 2013
4180-Brüel&Kjær	Microphone	2246115	Nov 21, 2011	NPL-UK / UKAS	Nov 21, 2013

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature	[signature]	Signature	[signature]
Date	10/01/2012	Date	10/2/2012

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Appendix II. THE ASSESSMENT OF ENVIRONMENTAL NOISE (GENERAL)

Sound Pressure Level

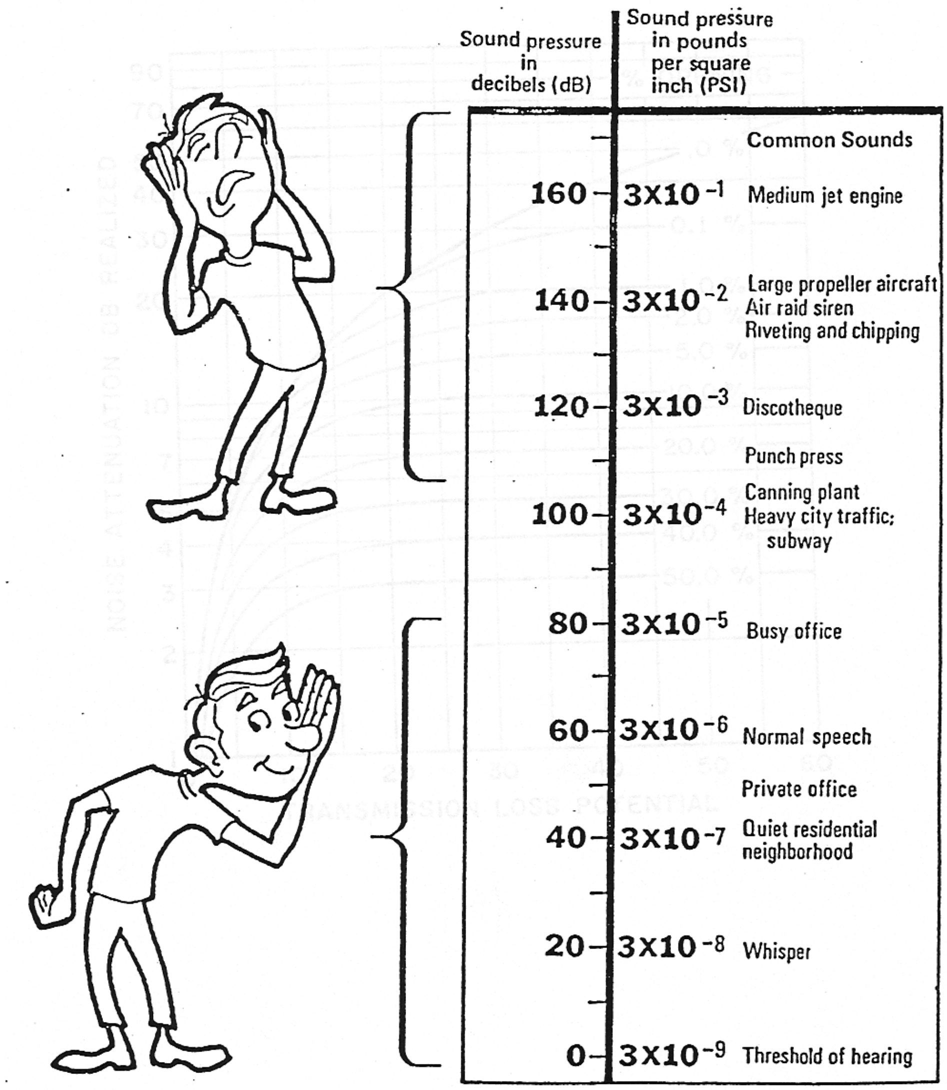
Sound pressure is initially measured in Pascal's (Pa). Humans can hear several orders of magnitude in sound pressure levels, so a more convenient scale is used. This scale is known as the decibel (dB) scale, named after Alexander Graham Bell (telephone guy). It is a base 10 logarithmic scale. When we measure pressure we typically measure the RMS sound pressure.

$$SPL = 10\log_{10}\left[\frac{P_{RMS}^2}{P_{ref}^2}\right] = 20\log_{10}\left[\frac{P_{RMS}}{P_{ref}}\right]$$

Where: SPL = Sound Pressure Level in dB
P_{RMS} = Root Mean Square measured pressure (Pa)
P_{ref} = Reference sound pressure level ($P_{ref} = 2x10^{-5}$ Pa = 20 μPa)

This reference sound pressure level is an internationally agreed upon value. It represents the threshold of human hearing for "typical" people based on numerous testing. It is possible to have a threshold which is lower than 20 μPa which will result in negative dB levels. As such, zero dB does not mean there is no sound!

In general, a difference of 1 – 2 dB is the threshold for humans to notice that there has been a change in sound level. A difference of 3 dB (factor of 2 in acoustical energy) is perceptible and a change of 5 dB is strongly perceptible. A change of 10 dB is typically considered a factor of 2. This is quite remarkable when considering that 10 dB is 10-times the acoustical energy!


Sound pressure in decibels (dB)
Sound pressure in pounds per square inch (PSI)
Common Sounds
160
3X10 -1
Medium jet engine
140
3X10 -2
Large propeller aircraft
Air raid siren
Riveting and chipping
120
3X10 -3
Discotheque
Punch press
100
3X10 -4
Canning plant
Heavy city traffic; subway
80
3X10 -5
Busy office
60
3X10 -6
Normal speech
Private office
40
3X10 -7
Quiet residential neighborhood
20
3X10 -8
Whisper
0
3X10 -9
Threshold of hearing

Frequency

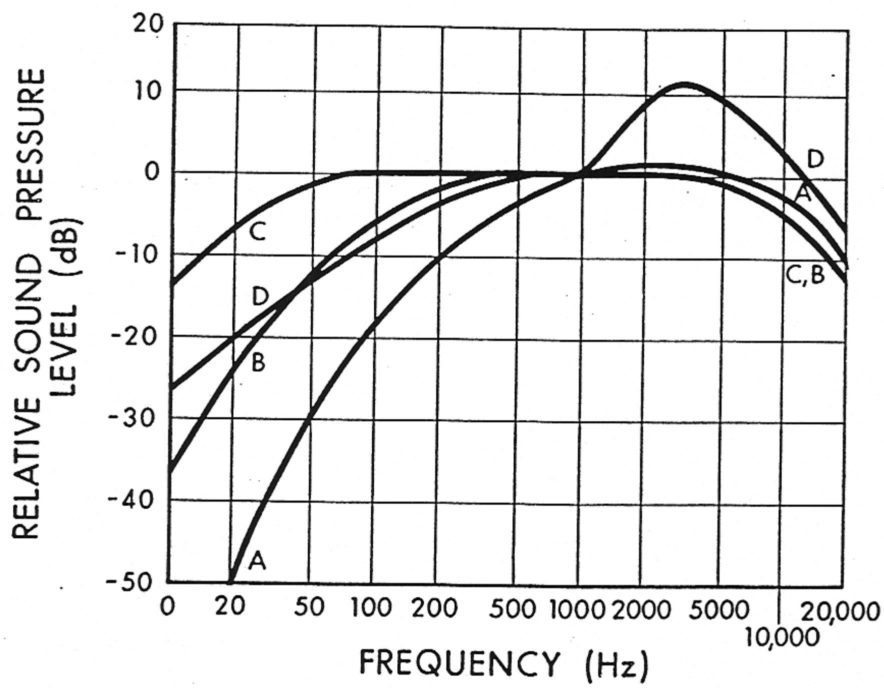
The range of frequencies audible to the human ear ranges from approximately 20 Hz to 20 kHz. Within this range, the human ear does not hear equally at all frequencies. It is not very sensitive to low frequency sounds, is very sensitive to mid frequency sounds and is slightly less sensitive to high frequency sounds. Due to the large frequency range of human hearing, the entire spectrum is often divided into 31 bands, each known as a 1/3 octave band.

The internationally agreed upon center frequencies and upper and lower band limits for the 1/1 (whole octave) and 1/3 octave bands are as follows:

Lower Band Limit	Whole Octave Center Frequency	Upper Band Limit
11	**16**	22
22	**31.5**	44
44	**63**	88
88	**125**	177
177	**250**	355
355	**500**	710
710	**1000**	1420
1420	**2000**	2840
2840	**4000**	5680
5680	**8000**	11360
11360	**16000**	22720

Lower Band Limit	1/3 Octave Center Frequency	Upper Band Limit
14.1	**16**	17.8
17.8	**20**	22.4
22.4	**25**	28.2
28.2	**31.5**	35.5
35.5	**40**	44.7
44.7	**50**	56.2
56.2	**63**	70.8
70.8	**80**	89.1
89.1	**100**	112
112	**125**	141
141	**160**	178
178	**200**	224
224	**250**	282
282	**315**	355
355	**400**	447
447	**500**	562
562	**630**	708
708	**800**	891
891	**1000**	1122
1122	**1250**	1413
1413	**1600**	1778
1778	**2000**	2239
2239	**2500**	2818
2818	**3150**	3548
3548	**4000**	4467
4467	**5000**	5623
5623	**6300**	7079
7079	**8000**	8913
8913	**10000**	11220
11220	**12500**	14130
14130	**16000**	17780
17780	**20000**	22390

Human hearing is most sensitive at approximately 3500 Hz which corresponds to the ¼ wavelength of the ear canal (approximately 2.5 cm). Because of this range of sensitivity to various frequencies, we typically apply various weighting networks to the broadband measured sound to more appropriately account for the way humans hear. By default, the most common weighting network used is the so-called "A-weighting". It can be seen in the figure that the low frequency sounds are reduced significantly with the A-weighting.



Combination of Sounds

When combining multiple sound sources the general equation is:

$$\Sigma SPL_n = 10\log_{10}\left[\sum_{i=1}^{n} 10^{\frac{SPL_i}{10}}\right]$$

Examples:

- Two sources of 50 dB each add together to result in 53 dB.
- Three sources of 50 dB each add together to result in 55 dB.
- Ten sources of 50 dB each add together to result in 60 dB.
- One source of 50 dB added to another source of 40 dB results in 50.4 dB

It can be seen that, if multiple similar sources exist, removing or reducing only one source will have little effect.

Sound Level Measurements

Over the years a number of methods for measuring and describing environmental noise have been developed. The most widely used and accepted is the concept of the Energy Equivalent Sound Level (L_{eq}) which was developed in the US (1970's) to characterize noise levels near US Air-force bases. This is the level of a steady state sound which, for a given period of time, would contain the same energy as the time varying sound. The concept is that the same amount of annoyance occurs from a sound having a high level for a short period of time as from a sound at a lower level for a longer period of time.
The L_{eq} is defined as:

$$L_{eq} = 10\log_{10}\left[\frac{1}{T}\int_0^T 10^{\frac{dB}{10}}\, dT\right] = 10\log_{10}\left[\frac{1}{T}\int_0^T \frac{P^2}{P_{ref}^2}\, dT\right]$$

We must specify the time period over which to measure the sound. i.e. 1-second, 10-seconds, 15-seconds, 1-minute, 1-day, etc**. An L_{eq} is meaningless if there is no time period associated**.

In general there a few very common L_{eq} sample durations which are used in describing environmental noise measurements. These include:

- L_{eq}24 - Measured over a 24-hour period
- L_{eq}Night - Measured over the night-time (typically 22:00 – 07:00)
- L_{eq}Day - Measured over the day-time (typically 07:00 – 22:00)
- L_{DN} - Same as L_{eq}24 with a 10 dB penalty added to the night-time

Statistical Descriptor

Another method of conveying long term noise levels utilizes statistical descriptors. These are calculated from a cumulative distribution of the sound levels over the entire measurement duration and then determining the sound level at xx % of the time.

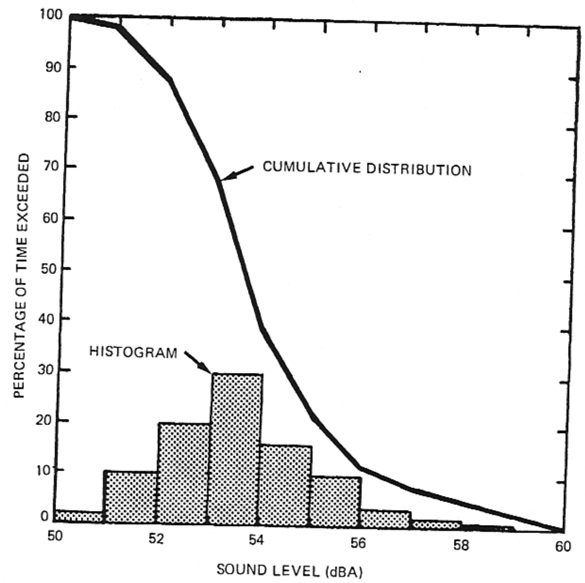


Figure 16.6 Statistically processed community noise showing histogram and cumulative distribution of A weighted sound levels.

Industrial Noise Control, Lewis Bell, Marcel Dekker, Inc. 1994

The most common statistical descriptors are:

L_{min} - minimum sound level measured
L_{01} - sound level that was exceeded only 1% of the time
L_{10} - sound level that was exceeded only 10% of the time.
- Good measure of intermittent or intrusive noise
- Good measure of Traffic Noise

L_{50} - sound level that was exceeded 50% of the time (arithmetic average)
- Good to compare to L_{eq} to determine steadiness of noise

L_{90} - sound level that was exceeded 90% of the time
- Good indicator of typical “ambient” noise levels

L_{99} - sound level that was exceeded 99% of the time
L_{max} - maximum sound level measured

These descriptors can be used to provide a more detailed analysis of the varying noise climate:

- If there is a large difference between the L_{eq} and the L_{50} (L_{eq} can never be any lower than the L_{50}) then it can be surmised that one or more short duration, high level sound(s) occurred during the time period.
- If the gap between the L_{10} and L_{90} is relatively small (less than 15 – 20 dBA) then it can be surmised that the noise climate was relatively steady.

Sound Propagation

In order to understand sound propagation, the nature of the source must first be discussed. In general, there are three types of sources. These are known as ‘point’, ‘line’, and ‘area’. This discussion will concentrate on point and line sources since area sources are much more complex and can usually be approximated by point sources at large distances.

Point Source

As sound radiates from a point source, it dissipates through geometric spreading. The basic relationship between the sound levels at two distances from a point source is:

$$\therefore SPL_1 - SPL_2 = 20\log_{10}\left(\frac{r_2}{r_1}\right)$$

Where: SPL_1 = sound pressure level at location 1, SPL_2 = sound pressure level at location 2
r_1 = distance from source to location 1, r_2 = distance from source to location 2

Thus, the reduction in sound pressure level for a point source radiating in a free field is **6 dB per doubling of distance**. This relationship is independent of reflectivity factors provided they are always present. Note that this only considers geometric spreading and does not take into account atmospheric effects. Point sources still have some physical dimension associated with them, and typically do not radiate sound equally in all directions in all frequencies. The directionality of a source is also highly dependent on frequency. As frequency increases, directionality increases.

Examples (note no atmospheric absorption):

- A point source measuring 50 dB at 100m will be 44 dB at 200m.
- A point source measuring 50 dB at 100m will be 40.5 dB at 300m.
- A point source measuring 50 dB at 100m will be 38 dB at 400m.
- A point source measuring 50 dB at 100m will be 30 dB at 1000m.

Line Source

A line source is similar to a point source in that it dissipates through geometric spreading. The difference is that a line source is equivalent to a long line of many point sources. The basic relationship between the sound levels at two distances from a line source is:

$$SPL_1 - SPL_2 = 10\log_{10}\left(\frac{r_2}{r_1}\right)$$

The difference from the point source is that the ‘20’ term in front of the ‘log’ is now only 10. Thus, the reduction in sound pressure level for a line source radiating in a free field is **3 dB per doubling of distance**.

Examples (note no atmospheric absorption):

- A line source measuring 50 dB at 100m will be 47 dB at 200m.
- A line source measuring 50 dB at 100m will be 45 dB at 300m.
- A line source measuring 50 dB at 100m will be 34 dB at 400m.
- A line source measuring 50 dB at 100m will be 40 dB at 1000m.

Atmospheric Absorption

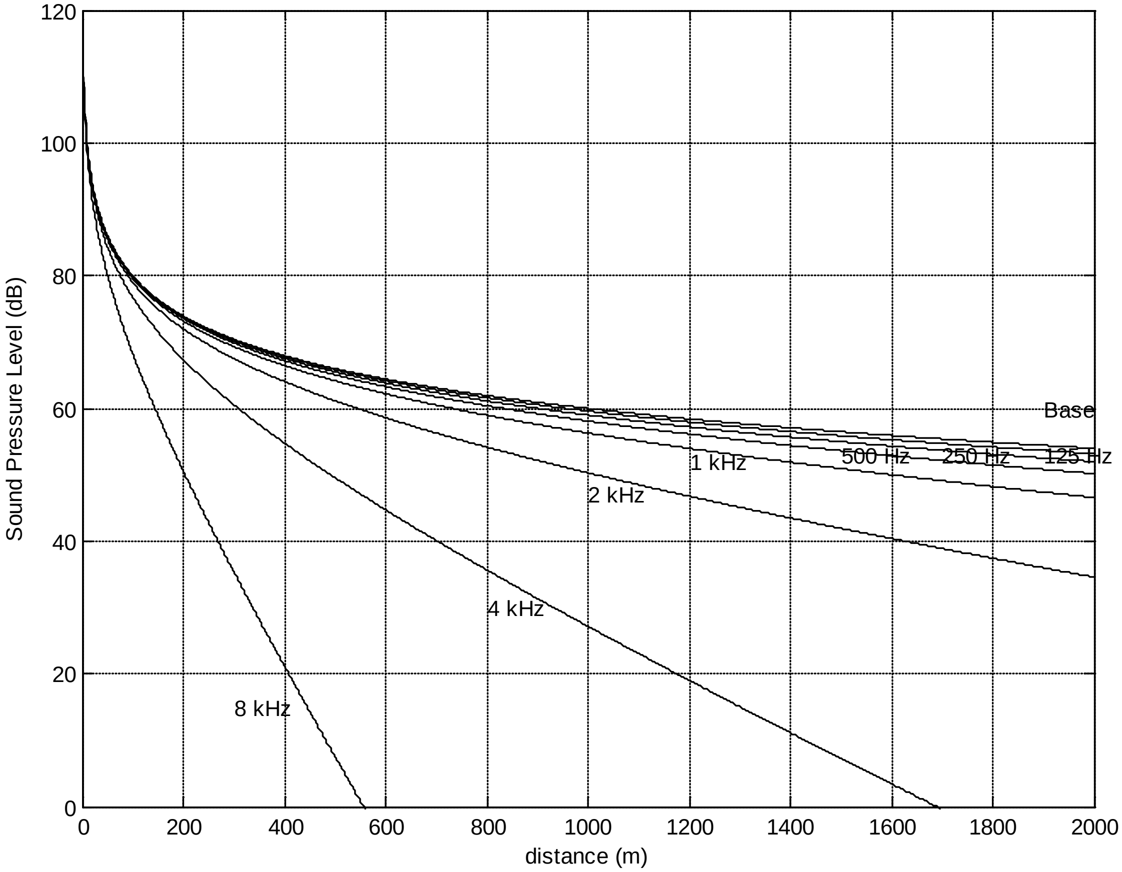
As sound transmits through a medium, there is an attenuation (or dissipation of acoustic energy) which can be attributed to three mechanisms:

1) **Viscous Effects** - Dissipation of acoustic energy due to fluid friction which results in thermodynamically irreversible propagation of sound.
2) **Heat Conduction Effects** - Heat transfer between high and low temperature regions in the wave which result in non-adiabatic propagation of the sound.
3) **Inter Molecular Energy Interchanges** - Molecular energy relaxation effects which result in a time lag between changes in translational kinetic energy and the energy associated with rotation and vibration of the molecules.

The following table illustrates the attenuation coefficient of sound at standard pressure (101.325 kPa) in units of dB/100m.

Temperature ^oC	Relative Humidity (%)	Frequency (Hz)					
		125	250	500	1000	2000	4000
30	20	0.06	0.18	0.37	0.64	1.40	4.40
	50	0.03	0.10	0.33	0.75	1.30	2.50
	90	0.02	0.06	0.24	0.70	1.50	2.60
20	20	0.07	0.15	0.27	0.62	1.90	6.70
	50	0.04	0.12	0.28	0.50	1.00	2.80
	90	0.02	0.08	0.26	0.56	0.99	2.10
10	20	0.06	0.11	0.29	0.94	3.20	9.00
	50	0.04	0.11	0.20	0.41	1.20	4.20
	90	0.03	0.10	0.21	0.38	0.81	2.50
0	20	0.05	0.15	0.50	1.60	3.70	5.70
	50	0.04	0.08	0.19	0.60	2.10	6.70
	90	0.03	0.08	0.15	0.36	1.10	4.10

- As frequency increases, absorption increases
- As Relative Humidity increases, absorption decreases
- There is no direct relationship between absorption and temperature
- **The net result of atmospheric absorption is to modify the sound propagation of a point source from 6 dB/doubling-of-distance to approximately 7 – 8 dB/doubling-of-distance (based on anecdotal experience)**



Atmospheric Absorption at 10°C and 70% RH

Meteorological Effects

There are many meteorological factors which can affect how sound propagates over large distances. These various phenomena must be considered when trying to determine the relative impact of a noise source either after installation or during the design stage.

Wind
- Can greatly alter the noise climate away from a source depending on direction
- Sound levels downwind from a source can be increased due to refraction of sound back down towards the surface. This is due to the generally higher velocities as altitude increases.
- Sound levels upwind from a source can be decreased due to a “bending” of the sound away from the earth’s surface.
- Sound level differences of ±10dB are possible depending on severity of wind and distance from source.
- Sound levels crosswind are generally not disturbed by an appreciable amount
- Wind tends to generate its own noise, however, and can provide a high degree of masking relative to a noise source of particular interest.

Temperature
- Temperature effects can be similar to wind effects
- Typically, the temperature is warmer at ground level than it is at higher elevations.
- If there is a very large difference between the ground temperature (very warm) and the air aloft (only a few hundred meters) then the transmitted sound refracts upward due to the changing speed of sound.
- If the air aloft is warmer than the ground temperature (known as an *inversion*) the resulting higher speed of sound aloft tends to refract the transmitted sound back down towards the ground. This essentially works on Snell’s law of reflection and refraction.
- Temperature inversions typically happen early in the morning and are most common over large bodies of water or across river valleys.
- Sound level differences of ±10dB are possible depending on gradient of temperature and distance from source.

Rain
- Rain does not affect sound propagation by an appreciable amount unless it is very heavy
- The larger concern is the noise generated by the rain itself. A heavy rain striking the ground can cause a significant amount of highly broadband noise. The amount of noise generated is difficult to predict.
- Rain can also affect the output of various noise sources such as vehicle traffic.

Summary
- In general, these wind and temperature effects are difficult to predict
- Empirical models (based on measured data) have been generated to attempt to account for these effects.
- Environmental noise measurements must be conducted with these effects in mind. Sometimes it is desired to have completely calm conditions, other times a “worst case” of downwind noise levels are desired.

Topographical Effects

Similar to the various atmospheric effects outlined in the previous section, the effect of various geographical and vegetative factors must also be considered when examining the propagation of noise over large distances.

Topography

- One of the most important factors in sound propagation.
- Can provide a natural barrier between source and receiver (i.e. if berm or hill in between).
- Can provide a natural amplifier between source and receiver (i.e. large valley in between or hard reflective surface in between).
- Must look at location of topographical features relative to source and receiver to determine importance (i.e. small berm 1km away from source and 1km away from receiver will make negligible impact).

Grass

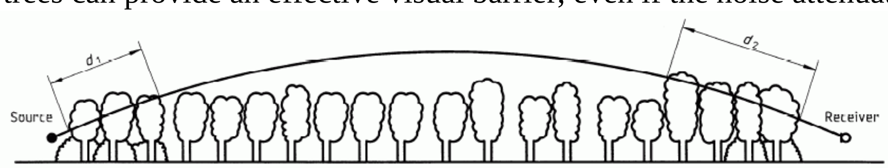
- Can be an effective absorber due to large area covered
- Only effective at low height above ground. Does not affect sound transmitted direct from source to receiver if there is line of sight.
- Typically less absorption than atmospheric absorption when there is line of sight.
- Approximate rule of thumb based on empirical data is:

$$A_g = 18\log_{10}(f) - 31 \qquad (dB/100m)$$

Where: A_g is the absorption amount

Trees

- Provide absorption due to foliage
- Deciduous trees are essentially ineffective in the winter
- Absorption depends heavily on density and height of trees
- No data found on absorption of various kinds of trees
- Large spans of trees are required to obtain even minor amounts of sound reduction
- In many cases, trees can provide an effective visual barrier, even if the noise attenuation is negligible.



NOTE — $d_f = d_1 + d_2$

For calculating d_1 and d_2, the curved path radius may be assumed to be 5 km.

Figure A.1 — Attenuation due to propagation through foliage increases linearly with propagation distance d_f through the foliage

Table A.1 — Attenuation of an octave band of noise due to propagation a distance d_f through dense foliage

Propagation distance d_f (m)		Nominal midband frequency (Hz)						
	63	125	250	500	1 000	2 000	4 000	8 000
$10 \leq d_f \leq 20$	Attenuation, dB: 0	0	1	1	1	1	2	3
$20 \leq d_f \leq 200$	Attenuation, dB/m: 0,02	0,03	0,04	0,05	0,06	0,08	0,09	0,12

Tree/Foliage attenuation from ISO 9613-2:1996

Bodies of Water

- Large bodies of water can provide the opposite effect to grass and trees.
- Reflections caused by small incidence angles (grazing) can result in larger sound levels at great distances (increased reflectivity, Q).
- Typically air temperatures are warmer high aloft since air temperatures near water surface tend to be more constant. Result is a high probability of temperature inversion.
- Sound levels can “carry” much further.

Snow

- Covers the ground for approximately 1/2 of the year in northern climates.
- Can act as an absorber or reflector (and varying degrees in between).
- Freshly fallen snow can be quite absorptive.
- Snow which has been sitting for a while and hard packed due to wind can be quite reflective.
- Falling snow can be more absorptive than rain, but does not tend to produce its own noise.
- Snow can cover grass which might have provided some means of absorption.
- Typically sound propagates with less impedance in winter due to hard snow on ground and no foliage on trees/shrubs.

Appendix III. SOUND LEVELS OF FAMILIAR NOISE SOURCES

Used with Permission Obtained from EUB Guide 38: Noise Control Directive User Guide (November 1999)

Source[1]	Sound Level (dBA)
Bedroom of a country home	30
Soft whisper at 1.5 m	30
Quiet office or living room	40
Moderate rainfall	50
Inside average urban home	50
Quiet street	50
Normal conversation at 1 m	60
Noisy office	60
Noisy restaurant	70
Highway traffic at 15 m	75
Loud singing at 1 m	75
Tractor at 15 m	78-95
Busy traffic intersection	80
Electric typewriter	80
Bus or heavy truck at 15 m	88-94
Jackhammer	88-98
Loud shout	90
Freight train at 15 m	95
Modified motorcycle	95
Jet taking off at 600 m	100
Amplified rock music	110
Jet taking off at 60 m	120
Air-raid siren	130

[1] Cottrell, Tom, 1980, *Noise in Alberta*, Table 1, p.8, ECA80 - 16/1B4 (Edmonton: Environment Council of Alberta).

SOUND LEVELS GENERATED BY COMMON APPLIANCES

Used with Permission Obtained from EUB Guide 38: Noise Control Directive User Guide (November 1999)

Source[1]	**Sound level at 3 feet (dBA)**
Freezer	38-45
Refrigerator	34-53
Electric heater	47
Hair clipper	50
Electric toothbrush	48-57
Humidifier	41-54
Clothes dryer	51-65
Air conditioner	50-67
Electric shaver	47-68
Water faucet	62
Hair dryer	58-64
Clothes washer	48-73
Dishwasher	59-71
Electric can opener	60-70
Food mixer	59-75
Electric knife	65-75
Electric knife sharpener	72
Sewing machine	70-74
Vacuum cleaner	65-80
Food blender	65-85
Coffee mill	75-79
Food waste disposer	69-90
Edger and trimmer	81
Home shop tools	64-95
Hedge clippers	85
Electric lawn mower	80-90

[1] Reif, Z. F., and Vermeulen, P. J., 1979, "Noise from domestic appliances, construction, and industry," Table 1, p.166, in Jones, H. W., ed., *Noise in the Human Environment*, vol. 2, ECA79-SP/1 (Edmonton: Environment Council of Alberta).

Appendix IV NOISE MODELLING PARAMETERS

Current Conditions (Year 2013)

Road	Day (Vehicles Per Hour)	Day % Heavy Vehicles	Night (Vehicles Per Hour)	Night % Heavy Vehicles	Speed (km/hr)	Total Volume (vehicles per day)
AHD North of Stony Plain Road NB	2281	10.6	604	10.6	100	39650
AHD North of Stony Plain Road SB	2281	10.6	604	10.6	100	39650
AHD South of Stony Plain Road NB	3035	9.8	803	9.8	100	52754
AHD South of Stony Plain Road SB	3035	9.8	803	9.8	100	52754
AHD South of 87 Avenue NB	2971	11.5	786	11.5	100	51638
AHD South of 87 Avenue SB	2971	11.5	786	11.5	100	51638
AHD South of Whitemud Drive NB	2427	8.9	642	8.9	100	42190
AHD South of Whitemud Drive SB	2427	8.9	642	8.9	100	42190
AHD South of 62 Avenue NB	2065	12.3	546	12.3	100	35884
AHD South of 62 Avenue SB	2065	12.3	546	12.3	100	35884
AHD South of Lessard Road NB	2154	11.5	570	11.5	100	37446
AHD South of Lessard Road SB	2154	11.5	570	11.5	100	37446
AHD East of Cameron Heights Drive NB	2160	11.0	571	11.0	100	37537
AHD East of Cameron Heights Drive SB	2160	11.0	571	11.0	100	37537
AHD South of Terwillegar Drive NB	2105	10.6	557	10.6	100	36593
AHD South of Terwillegar Drive SB	2105	10.6	557	10.6	100	36593
AHD East of Rabbit Hill Road WB	2281	10.0	604	10.0	100	39649
AHD East of Rabbit Hill Road EB	2281	10.0	604	10.0	100	39649
AHD East of 127 Street WB	2353	10.2	622	10.2	100	40891
AHD East of 127 Street EB	2353	10.2	622	10.2	100	40891
AHD East of 111 Street WB	2327	9.5	616	9.5	100	40445
AHD East of 111 Street EB	2327	9.5	616	9.5	100	40445
AHD East of Gateway Boulevard WB	2223	11.3	588	11.3	100	38630
AHD East of Gateway Boulevard EB	2223	11.3	588	11.3	100	38630
Gateway Boulevard South of AHD NB	3275	9.6	866	9.6	100	56920
Calgary Trail South of AHD SB	3275	9.6	866	9.6	100	56920
Gateway Boulevard South of Ellerslie Road NB	3129	10.7	828	10.7	110	54392
Calgary Trail South of Ellerslie Road SB	3129	10.7	828	10.7	110	54392
Stony Plain Road East of AHD EB	1480	4.8	391	4.8	70	25720
Stony Plain Road East of AHD WB	1480	4.8	391	4.8	70	25720
Stony Plain Road West of AHD EB	1243	7.3	329	7.3	80	21600
Stony Plain Road West of AHD WB	1243	7.3	329	7.3	80	21600
AHD NB to Stony Plain Road EB Ramp	489	3.3	129	3.3	80	8500
AHD NB to Stony Plain Road WB Ramp	368	11.9	97	11.9	80	6400
Stony Plain Road WB to AHD NB Ramp	197	3.5	52	3.5	70	3420
Stony Plain Road WB to AHD SB Ramp	489	7.5	129	7.5	60	8500
AHD SB to Stony Plain Road WB Ramp	81	20.1	21	20.1	80	1400
AHD SB to Stony Plain Road EB Ramp	197	3.6	52	3.6	80	3420
Stony Plain Road EB to AHD SB Ramp	368	9.4	97	9.4	80	6400
Stony Plain Road EB to AHD NB Ramp	81	15.9	21	15.9	80	1400
87 Avenue East of AHD EB	533	6.0	141	6.0	60	9260
87 Avenue East of AHD WB	533	6.0	141	6.0	60	9260
87 Avenue West of AHD EB	329	6.4	87	6.4	60	5710
87 Avenue West of AHD WB	329	6.4	87	6.4	60	5710
AHD NB to 87 Avenue EB Ramp	162	1.6	43	1.6	70	2820
AHD NB to 87 Avenue WB Ramp	30	6.3	8	6.3	70	520
87 Avenue WB to AHD NB Ramp	174	2.8	46	2.8	60	3030
87 Avenue WB to AHD SB Ramp	162	2.4	43	2.4	60	2810
AHD SB to 87 Avenue WB Ramp	102	7.3	27	7.3	70	1770
AHD SB to 87 Avenue EB Ramp	174	2.0	46	2.0	70	3030
87 Avenue EB to AHD SB Ramp	30	9.2	8	9.2	60	530
87 Avenue EB to AHD NB Ramp	102	6.9	27	6.9	60	1770
Whitemud Drive East of AHD EB	1218	9.6	322	9.6	80	21170
Whitemud Drive East of AHD WB	1218	9.6	322	9.6	80	21170
Whitemud Drive West of AHD EB	583	3.8	154	3.8	80	10125

Current Conditions (Year 2013) (Cont.)

Road	Day (Vehicles Per Hour)	Day % Heavy Vehicles	Night (Vehicles Per Hour)	Night % Heavy Vehicles	Speed (km/hr)	Total Volume (vehicles per day)
Whitemud Drive West of AHD WB	583	3.8	154	3.8	80	10125
AHD NB to Whitemud Drive EB Ramp	228	2.7	60	2.7	90	3960
AHD NB to Whitemud Drive WB Ramp	57	5.2	15	5.2	70	990
Whitemud Drive WB to AHD NB Ramp	594	16.4	157	16.4	80	10330
Whitemud Drive WB to AHD SB Ramp	228	2.4	60	2.4	80	3970
AHD SB to Whitemud Drive WB Ramp	130	3.8	34	3.8	80	2260
AHD SB to Whitemud Drive EB Ramp	594	16.7	157	16.7	70	10330
Whitemud Drive EB to AHD SB Ramp	57	4.2	15	4.2	80	990
Whitemud Drive EB to AHD NB Ramp	130	6.0	34	6.0	80	2260
Callingwood Road East of AHD EB	362	3.2	96	3.2	60	6300
Callingwood Road East of AHD WB	362	3.2	96	3.2	60	6300
62 Avenue West of AHD EB	600	3.9	159	3.9	60	10430
62 Avenue West of AHD WB	600	3.9	159	3.9	60	10430
AHD NB to Callingwood Road EB Ramp	68	3.6	18	3.6	70	1190
AHD NB to 62 Avenue WB Ramp	81	5.9	21	5.9	70	1400
Callingwood Road WB to AHD NB Ramp	108	4.3	29	4.3	60	1880
Callingwood Road WB to AHD SB Ramp	68	3.4	18	3.4	60	1180
AHD SB to 62 Avenue WB Ramp	334	4.3	88	4.3	70	5800
AHD SB to Callingwood Road EB Ramp	108	3.9	29	3.9	70	1880
62 Avenue EB to AHD SB Ramp	80	4.6	21	4.6	60	1390
62 Avenue EB to AHD NB Ramp	334	4.4	88	4.4	60	5800
Lessard Road East of AHD EB	317	4.2	84	4.2	60	5515
Lessard Road East of AHD WB	317	4.2	84	4.2	60	5515
Lessard Road West of AHD EB	313	4.8	83	4.8	60	5445
Lessard Road West of AHD WB	313	4.8	83	4.8	60	5445
AHD NB to Lessard Road EB Ramp	129	4.0	34	4.0	70	2250
AHD NB to Lessard Road WB Ramp	120	7.0	32	7.0	70	2090
Lessard Road WB to AHD NB Ramp	101	4.1	27	4.1	70	1750
Lessard Road WB to AHD SB Ramp	129	5.2	34	5.2	60	2250
AHD SB to Lessard Road WB Ramp	106	5.5	28	5.5	70	1840
AHD SB to Lessard Road EB Ramp	101	5.9	27	5.9	70	1750
Lessard Road EB to AHD SB Ramp	120	5.7	32	5.7	70	2090
Lessard Road EB to AHD NB Ramp	106	4.1	28	4.1	60	1840
Cameron Heights Drive South of AHD NB	6	2.0	2	2.0	70	100
Cameron Heights Drive South of AHD SB	6	2.0	2	2.0	70	100
Cameron Heights Drive North of AHD NB	105	9.5	28	9.5	60	1830
Cameron Heights Drive North of AHD SB	105	9.5	28	9.5	60	1830
AHD WB to Cameron Heights Drive NB Ramp	49	6.0	13	6.0	60	850
AHD WB to Cameron Heights Drive SB Ramp	3	2.0	1	2.0	60	50
Cameron Heights Drive SB to AHD WB Ramp	56	9.9	15	9.9	60	980
Cameron Heights Drive SB to AHD EB Ramp	49	8.6	13	8.6	60	850
AHD EB to Cameron Heights Drive SB Ramp	3	2.0	1	2.0	60	50
AHD EB to Cameron Heights Drive NB Ramp	56	12.9	15	12.9	60	980
Cameron Heights Drive NB to AHD EB Ramp	3	2.0	1	2.0	60	50
Cameron Heights Drive NB to AHD WB Ramp	3	2.0	1	2.0	60	50
170 Street South of AHD NB	621	7.4	164	7.4	70	10785
170 Street South of AHD SB	621	7.4	164	7.4	70	10785
Terwillegar Drive North of AHD NB	643	4.2	170	4.2	70	11170
Terwillegar Drive North of AHD SB	643	4.2	170	4.2	70	11170
AHD NB to Terwillegar Drive NB Ramp	139	8.0	37	8.0	70	2410
AHD NB to 170 Street SB Ramp	190	11.4	50	11.4	70	3300
Terwillegar Drive SB to AHD NB Ramp	193	4.8	51	4.8	70	3350
Terwillegar Drive SB to AHD SB Ramp	139	8.8	37	8.8	70	2410
AHD SB to 170 Street SB Ramp	158	4.2	42	4.2	70	2750
AHD SB to Terwillegar Drive NB Ramp	193	4.3	51	4.3	70	3350

Current Conditions (Year 2013) (Cont.)

Road	Day (Vehicles Per Hour)	Day % Heavy Vehicles	Night (Vehicles Per Hour)	Night % Heavy Vehicles	Speed (km/hr)	Total Volume (vehicles per day)
170 Street NB to AHD SB Ramp	190	13.2	50	13.2	70	3310
170 Street NB to AHD NB Ramp	158	5.2	42	5.2	70	2750
156 Street South of AHD NB	271	10.0	72	10.0	60	4715
156 Street South of AHD SB	271	10.0	72	10.0	60	4715
Rabbit Hill Road North of AHD NB	399	6.2	106	6.2	60	6935
Rabbit Hill Road North of AHD SB	399	6.2	106	6.2	60	6935
AHD WB to Rabbit Hill Road NB Ramp	180	6.0	47	6.0	60	3120
AHD WB to 156 Street SB Ramp	96	12.2	25	12.2	60	1660
Rabbit Hill Road SB to AHD WB Ramp	83	12.1	22	12.1	60	1440
Rabbit Hill Road SB to AHD EB Ramp	180	5.8	47	5.8	60	3120
AHD EB to 156 Street SB Ramp	39	36.6	10	36.6	60	680
AHD EB to Rabbit Hill Road NB Ramp	83	8.8	22	8.8	60	1440
156 Street NB to AHD EB Ramp	96	11.4	25	11.4	60	1660
156 Street NB to AHD WB Ramp	39	16.2	10	16.2	60	680
127 Street South of AHD	151	3.7	40	3.7	60	2630
127 Street North of AHD	93	1.3	25	1.3	60	1620
111 Street South of AHD NB	874	5.1	231	5.1	60	15195
111 Street South of AHD SB	874	5.1	231	5.1	60	15195
111 Street North of AHD NB	744	4.2	197	4.2	60	12930
111 Street North of AHD SB	744	4.2	197	4.2	60	12930
AHD WB to 111 Street NB Ramp	144	2.0	38	2.0	70	2500
AHD WB to 111 Street SB Ramp	195	4.1	52	4.1	70	3390
111 Street SB to AHD WB Ramp	133	7.1	35	7.1	70	2310
111 Street SB to AHD EB Ramp	144	3.2	38	3.2	60	2500
AHD EB to 111 Street SB Ramp	212	8.9	56	8.9	70	3680
AHD EB to 111 Street NB Ramp	133	5.5	35	5.5	70	2310
111 Street NB to AHD EB Ramp	195	4.2	52	4.2	60	3390
111 Street NB to AHD WB Ramp	212	7.3	56	7.3	70	3690
Gateway Boulevard North of AHD NB	1826	4.6	483	4.6	100	31740
Calgary Trail North of AHD SB	1826	4.6	483	4.6	100	31740
AHD WB to Gateway Boulevard NB Ramp	161	3.7	43	3.7	80	2800
AHD WB to Calgary Trail SB Ramp	613	16.2	162	16.2	80	10660
Calgary Trail SB to AHD WB Ramp	306	3.9	81	3.9	80	5320
Calgary Trail SB to AHD EB Ramp	161	4.8	43	4.8	80	2800
AHD EB to Calgary Trail SB Ramp	547	14.3	145	14.3	80	9510
AHD EB to Gateway Boulevard NB Ramp	307	3.6	81	3.6	70	5330
Gateway Boulevard NB to AHD EB Ramp	613	16.8	162	16.8	80	10660
Gateway Boulevard NB to AHD WB Ramp	547	13.4	145	13.4	80	9510
Ellerslie Road East of Gateway Boulevard EB	895	3.9	237	3.9	60	15560
Ellerslie Road East of Gateway Boulevard WB	895	3.9	237	3.9	60	15560
Ellerslie Road West of Gateway Boulevard EB	740	3.5	196	3.5	60	12855
Ellerslie Road West of Gateway Boulevard WB	740	3.5	196	3.5	60	12855
Gateway Boulevard NB to Ellerslie Road EB Ramp	208	5.4	55	5.4	70	3610
Gateway Boulevard NB to Ellerslie Road WB Ramp	111	3.7	29	3.7	70	1930
Ellerslie Road WB to Gateway Boulevard NB Ramp	245	2.3	65	2.3	70	4250
Ellerslie Road WB to Calgary Trail SB Ramp	208	6.1	55	6.1	70	3610
Calgary Trail SB to Ellerslie Road WB Ramp	185	2.3	49	2.3	70	3220
Calgary Trail SB to Ellerslie Road EB Ramp	245	2.8	65	2.8	70	4250
Ellerslie Road EB to Calgary Trail SB Ramp	110	5.6	29	5.6	70	1920
Ellerslie Road EB to Gateway Boulevard NB Ramp	186	1.4	49	1.4	70	3240
91 Street	1517	5.7	401	5.7	70	26370
AHD WB to 91 Street NB Ramp	126	5.1	33	5.1	60	2190
AHD WB to 91 Street SB Ramp	153	7.3	40	7.3	60	2660
91 Street SB to AHD WB Ramp	251	6.6	66	6.6	60	4360
91 Street SB to AHD EB Ramp	127	4.0	33	4.0	60	2200

Current Conditions (Year 2013) (Cont.)

Road	Day (Vehicles Per Hour)	Day % Heavy Vehicles	Night (Vehicles Per Hour)	Night % Heavy Vehicles	Speed (km/hr)	Total Volume (vehicles per day)
AHD EB to 91 Street SB Ramp	171	5.9	45	5.9	60	2980
AHD EB to 91 Street NB Ramp	251	6.9	66	6.9	60	4360
91 Street NB to AHD EB Ramp	154	5.7	41	5.7	60	2670
91 Street NB to AHD WB Ramp	171	6.0	45	6.0	60	2980
66 Street	506	9.1	134	9.1	60	8800
50 Street	1513	4.4	400	4.4	60	26300
50 Street NB to AHD WB Ramp	173	8.1	46	8.1	60	3000
50 Street SB to AHD WB Ramp	379	3.2	100	3.2	60	6590
AHD WB to 50 Street NB/SB Ramp	257	5.7	68	5.7	60	4470
AHD EB to 50 Street NB/SB Ramp	551	6.0	146	6.0	60	9570
50 Street NB/SB to AHD EB Ramp	258	6.1	68	6.1	60	4480
34 Street	196	11.8	52	11.8	60	3400
17 Street	303	10.6	80	10.6	60	5260
AHD WB to 17 Street NB/SB Ramp	60	11.5	16	11.5	60	1040
17 Street NB/SB to AHD WB Ramp	109	10.8	29	10.8	60	1890
AHD EB to 17 Street NB/SB Ramp	108	9.6	28	9.6	60	1870
17 Street NB/SB to AHD EB Ramp	60	9.5	16	9.5	60	1040
Hwy 14 WB to AHD NB Ramp	240	8.0	64	8.0	100	4180
Hwy 14 WB to AHD SB Ramp	174	5.6	46	5.6	100	3030
AHD NB to Hwy 14 EB Ramp	174	7.4	46	7.4	100	3030
AHD SB to Hway 14 EB Ramp	240	8.8	64	8.8	100	4180
Collector Roads	480	3	89	3	60	8000
Residential Streets	12	3	2	3	50	200

Future Conditions (Year 2024)

Road	Day (Vehicles Per Hour)	Day % Heavy Vehicles	Night (Vehicles Per Hour)	Night % Heavy Vehicles	Speed (km/hr)	Total Volume (vehicles per day)
AHD North of Stony Plain Road NB	3335	10.6	882	10.6	100	57968
AHD North of Stony Plain Road SB	3408	10.6	902	10.6	100	59231
AHD South of Stony Plain Road NB	4069	9.8	1077	9.8	100	70731
AHD South of Stony Plain Road SB	4016	9.8	1063	9.8	100	69808
AHD South of 87 Avenue NB	3899	11.5	1032	11.5	100	67772
AHD South of 87 Avenue SB	3898	11.5	1031	11.5	100	67754
AHD South of Whitemud Drive NB	3112	8.9	823	8.9	100	54081
AHD South of Whitemud Drive SB	3187	8.9	843	8.9	100	55397
AHD South of 62 Avenue NB	2620	12.3	693	12.3	100	45540
AHD South of 62 Avenue SB	2772	12.3	733	12.3	100	48176
AHD South of Lessard Road NB	2723	11.5	720	11.5	100	47331
AHD South of Lessard Road SB	2815	11.5	745	11.5	100	48935
AHD East of Cameron Heights Drive NB	2804	11.0	742	11.0	100	48728
AHD East of Cameron Heights Drive SB	2891	11.0	765	11.0	100	50250
AHD South of Terwillegar Drive NB	2637	10.6	698	10.6	100	45841
AHD South of Terwillegar Drive SB	2708	10.6	716	10.6	100	47065
AHD East of Rabbit Hill Road WB	2720	10.0	720	10.0	100	47283
AHD East of Rabbit Hill Road EB	2877	10.0	761	10.0	100	49998
AHD East of 127 Street WB	2807	10.2	743	10.2	100	48786
AHD East of 127 Street EB	2925	10.2	774	10.2	100	50840
AHD East of 111 Street WB	2775	9.5	734	9.5	100	48230
AHD East of 111 Street EB	2763	9.5	731	9.5	100	48025
AHD East of Gateway Boulevard WB	2649	11.3	701	11.3	100	46036
AHD East of Gateway Boulevard EB	2718	11.3	719	11.3	100	47240
Gateway Boulevard South of AHD NB	3930	9.6	1040	9.6	100	68305
Calgary Trail South of AHD SB	3930	9.6	1040	9.6	100	68305
Gateway Boulevard South of Ellerslie Road NB	3755	10.7	993	10.7	110	65270
Calgary Trail South of Ellerslie Road SB	3755	10.7	993	10.7	110	65270
Stony Plain Road East of AHD EB	1925	4.8	509	4.8	70	33450
Stony Plain Road East of AHD WB	1893	4.8	501	4.8	70	32900
Stony Plain Road West of AHD EB	1559	7.3	412	7.3	80	27100
Stony Plain Road West of AHD WB	1620	7.3	428	7.3	80	28150
AHD NB to Stony Plain Road EB Ramp	656	3.3	174	3.3	80	11400
AHD NB to Stony Plain Road WB Ramp	630	11.9	167	11.9	80	10950
Stony Plain Road WB to AHD NB Ramp	414	3.5	110	3.5	70	7200
Stony Plain Road WB to AHD SB Ramp	713	7.5	189	7.5	60	12400
AHD SB to Stony Plain Road WB Ramp	224	20.1	59	20.1	80	3900
AHD SB to Stony Plain Road EB Ramp	492	3.6	130	3.6	80	8550
Stony Plain Road EB to AHD SB Ramp	524	9.4	139	9.4	80	9100
Stony Plain Road EB to AHD NB Ramp	259	15.9	68	15.9	80	4500
87 Avenue East of AHD EB	774	6.0	205	6.0	60	13450
87 Avenue East of AHD WB	745	6.0	197	6.0	60	12950
87 Avenue West of AHD EB	541	6.4	143	6.4	60	9400
87 Avenue West of AHD WB	501	6.4	132	6.4	60	8700
AHD NB to 87 Avenue EB Ramp	204	1.6	54	1.6	70	3550
AHD NB to 87 Avenue WB Ramp	60	6.3	16	6.3	70	1050
87 Avenue WB to AHD NB Ramp	325	2.8	86	2.8	60	5650
87 Avenue WB to AHD SB Ramp	210	2.4	56	2.4	60	3650
AHD SB to 87 Avenue WB Ramp	230	7.3	61	7.3	70	4000
AHD SB to 87 Avenue EB Ramp	345	2.0	91	2.0	70	6000
87 Avenue EB to AHD SB Ramp	78	9.2	21	9.2	60	1350
87 Avenue EB to AHD NB Ramp	239	6.9	63	6.9	60	4150
Whitemud Drive East of AHD EB	1749	9.6	463	9.6	80	30400
Whitemud Drive East of AHD WB	1720	9.6	455	9.6	80	29900
Whitemud Drive West of AHD EB	840	3.8	222	3.8	80	14600

Future Conditions (Year 2024) (Cont.)

Road	Day (Vehicles Per Hour)	Day % Heavy Vehicles	Night (Vehicles Per Hour)	Night % Heavy Vehicles	Speed (km/hr)	Total Volume (vehicles per day)
Whitemud Drive West of AHD WB	711	3.8	188	3.8	80	12350
AHD NB to Whitemud Drive EB Ramp	282	2.7	75	2.7	90	4900
AHD NB to Whitemud Drive WB Ramp	95	5.2	25	5.2	70	1650
Whitemud Drive WB to AHD NB Ramp	978	16.4	259	16.4	80	17000
Whitemud Drive WB to AHD SB Ramp	339	2.4	90	2.4	80	5900
AHD SB to Whitemud Drive WB Ramp	213	3.8	56	3.8	80	3700
AHD SB to Whitemud Drive EB Ramp	958	16.7	253	16.7	70	16650
Whitemud Drive EB to AHD SB Ramp	124	4.2	33	4.2	80	2150
Whitemud Drive EB to AHD NB Ramp	207	6.0	55	6.0	80	3600
Callingwood Road East of AHD EB	480	3.2	127	3.2	60	8350
Callingwood Road East of AHD WB	498	3.2	132	3.2	60	8650
62 Avenue West of AHD EB	780	3.9	206	3.9	60	13550
62 Avenue West of AHD WB	759	3.9	201	3.9	60	13200
AHD NB to Callingwood Road EB Ramp	127	3.6	33	3.6	70	2200
AHD NB to 62 Avenue WB Ramp	135	5.9	36	5.9	70	2350
Callingwood Road WB to AHD NB Ramp	230	4.3	61	4.3	60	4000
Callingwood Road WB to AHD SB Ramp	98	3.4	26	3.4	60	1700
AHD SB to 62 Avenue WB Ramp	455	4.3	120	4.3	70	7900
AHD SB to Callingwood Road EB Ramp	173	3.9	46	3.9	70	3000
62 Avenue EB to AHD SB Ramp	92	4.6	24	4.6	60	1600
62 Avenue EB to AHD NB Ramp	506	4.4	134	4.4	60	8800
Lessard Road East of AHD EB	414	4.2	110	4.2	60	7200
Lessard Road East of AHD WB	457	4.2	121	4.2	60	7950
Lessard Road West of AHD EB	584	4.8	154	4.8	60	10150
Lessard Road West of AHD WB	486	4.8	129	4.8	60	8450
AHD NB to Lessard Road EB Ramp	175	4.0	46	4.0	70	3050
AHD NB to Lessard Road WB Ramp	181	7.0	48	7.0	70	3150
Lessard Road WB to AHD NB Ramp	190	4.1	50	4.1	70	3300
Lessard Road WB to AHD SB Ramp	173	5.2	46	5.2	60	3000
AHD SB to Lessard Road WB Ramp	210	5.5	56	5.5	70	3650
AHD SB to Lessard Road EB Ramp	101	5.9	27	5.9	70	1750
Lessard Road EB to AHD SB Ramp	224	5.7	59	5.7	70	3900
Lessard Road EB to AHD NB Ramp	222	4.1	59	4.1	60	3850
Cameron Heights Drive South of AHD NB	198	2.0	53	2.0	70	3450
Cameron Heights Drive South of AHD SB	190	2.0	50	2.0	70	3300
Cameron Heights Drive North of AHD NB	173	9.5	46	9.5	60	3000
Cameron Heights Drive North of AHD SB	201	9.5	53	9.5	60	3500
AHD WB to Cameron Heights Drive NB Ramp	63	6.0	17	6.0	60	1100
AHD WB to Cameron Heights Drive SB Ramp	138	2.0	37	2.0	60	2400
Cameron Heights Drive SB to AHD WB Ramp	112	9.9	30	9.9	60	1950
Cameron Heights Drive SB to AHD EB Ramp	69	8.6	18	8.6	60	1200
AHD EB to Cameron Heights Drive SB Ramp	32	2.0	8	2.0	60	550
AHD EB to Cameron Heights Drive NB Ramp	98	12.9	26	12.9	60	1700
Cameron Heights Drive NB to AHD EB Ramp	158	2.0	42	2.0	60	2750
Cameron Heights Drive NB to AHD WB Ramp	29	2.0	8	2.0	60	500
170 Street South of AHD NB	1076	7.4	285	7.4	70	18700
170 Street South of AHD SB	975	7.4	258	7.4	70	16950
Terwillegar Drive North of AHD NB	1024	4.2	271	4.2	70	17800
Terwillegar Drive North of AHD SB	906	4.2	240	4.2	70	15750
AHD NB to Terwillegar Drive NB Ramp	273	8.0	72	8.0	70	4750
AHD NB to 170 Street SB Ramp	239	11.4	63	11.4	70	4150
Terwillegar Drive SB to AHD NB Ramp	270	4.8	72	4.8	70	4700
Terwillegar Drive SB to AHD SB Ramp	253	8.8	67	8.8	70	4400
AHD SB to 170 Street SB Ramp	354	4.2	94	4.2	70	6150
AHD SB to Terwillegar Drive NB Ramp	282	4.3	75	4.3	70	4900

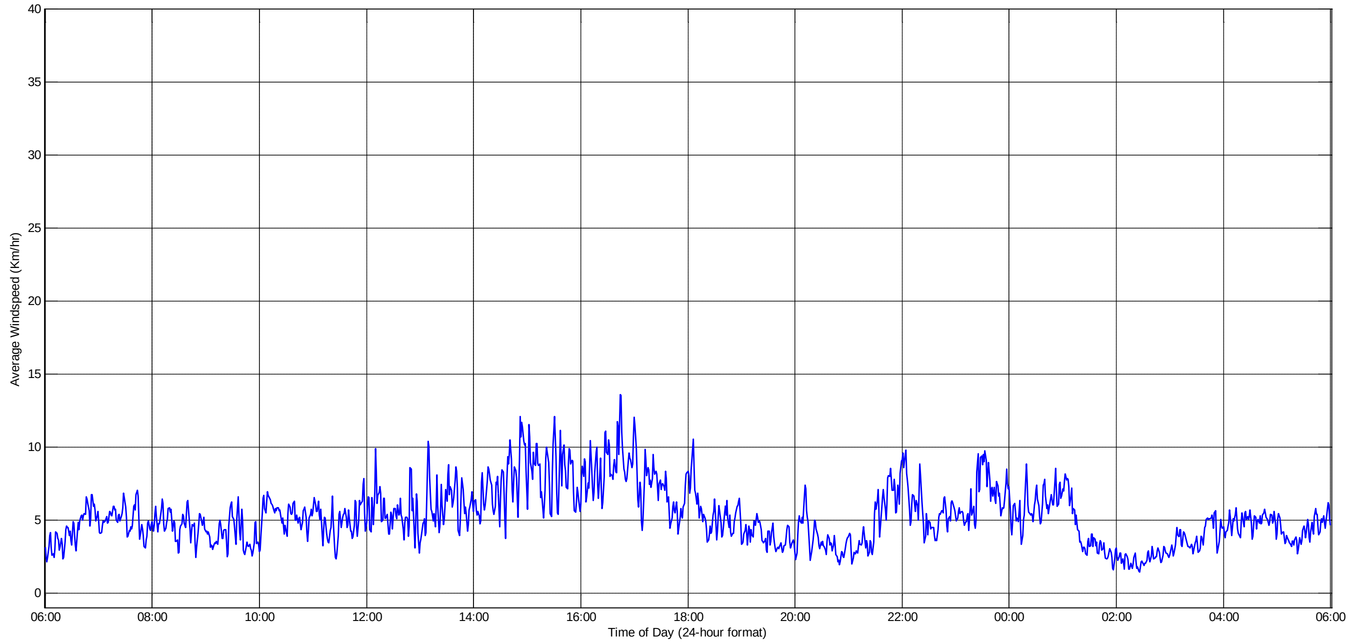
Future Conditions (Year 2024) (Cont.)

Road	Day (Vehicles Per Hour)	Day % Heavy Vehicles	Night (Vehicles Per Hour)	Night % Heavy Vehicles	Speed (km/hr)	Total Volume (vehicles per day)
170 Street NB to AHD SB Ramp	262	13.2	69	13.2	70	4550
170 Street NB to AHD NB Ramp	345	5.2	91	5.2	70	6000
156 Street South of AHD NB	932	10.0	247	10.0	60	16200
156 Street South of AHD SB	713	10.0	189	10.0	60	12400
Rabbit Hill Road North of AHD NB	688	6.2	182	6.2	60	11950
Rabbit Hill Road North of AHD SB	742	6.2	196	6.2	60	12900
AHD WB to Rabbit Hill Road NB Ramp	256	6.0	68	6.0	60	4450
AHD WB to 156 Street SB Ramp	279	12.2	74	12.2	60	4850
Rabbit Hill Road SB to AHD WB Ramp	129	12.1	34	12.1	60	2250
Rabbit Hill Road SB to AHD EB Ramp	394	5.8	104	5.8	60	6850
AHD EB to 156 Street SB Ramp	216	36.6	57	36.6	60	3750
AHD EB to Rabbit Hill Road NB Ramp	124	8.8	33	8.8	60	2150
156 Street NB to AHD EB Ramp	314	11.4	83	11.4	60	5450
156 Street NB to AHD WB Ramp	311	16.2	82	16.2	60	5400
127 Street South of AHD NB	547	3.7	145	3.7	60	9500
127 Street South of AHD SB	503	3.7	133	3.7	60	8750
127 Street North of AHD NB	46	1.3	12	1.3	60	800
127 Street North of AHD SB	49	1.3	13	1.3	60	850
AHD WB to 127 Street NB Ramp	32	1.3	8	1.3	60	550
AHD WB to 127 Street SB Ramp	81	1.3	21	1.3	60	1400
127 Street SB to AHD WB Ramp	37	1.3	10	1.3	60	650
127 Street SB to AHD EB Ramp	12	1.3	3	1.3	60	200
AHD EB to 127 Street SB Ramp	411	1.3	109	1.3	60	7150
AHD EB to 127 Street NB Ramp	9	1.3	2	1.3	60	150
127 Street NB to AHD EB Ramp	457	1.3	121	1.3	60	7950
127 Street NB to AHD WB Ramp	83	1.3	22	1.3	60	1450
111 Street South of AHD NB	1223	5.1	323	5.1	60	21250
111 Street South of AHD SB	1096	5.1	290	5.1	60	19050
111 Street North of AHD NB	972	4.2	257	4.2	60	16900
111 Street North of AHD SB	998	4.2	264	4.2	60	17350
AHD WB to 111 Street NB Ramp	173	2.0	46	2.0	70	3000
AHD WB to 111 Street SB Ramp	299	4.1	79	4.1	70	5200
111 Street SB to AHD WB Ramp	233	7.1	62	7.1	70	4050
111 Street SB to AHD EB Ramp	302	3.2	80	3.2	60	5250
AHD EB to 111 Street SB Ramp	334	8.9	88	8.9	70	5800
AHD EB to 111 Street NB Ramp	233	5.5	62	5.5	70	4050
111 Street NB to AHD EB Ramp	302	4.2	80	4.2	60	5250
111 Street NB to AHD WB Ramp	354	7.3	94	7.3	70	6150
Gateway Boulevard North of AHD NB	2503	4.6	662	4.6	100	43500
Calgary Trail North of AHD SB	1979	4.6	524	4.6	100	34400
AHD WB to Gateway Boulevard NB Ramp	357	3.7	94	3.7	80	6200
AHD WB to Calgary Trail SB Ramp	1227	16.2	325	16.2	80	21320
Calgary Trail SB to AHD WB Ramp	682	3.9	180	3.9	80	11850
Calgary Trail SB to AHD EB Ramp	598	4.8	158	4.8	80	10400
AHD EB to Calgary Trail SB Ramp	748	14.3	198	14.3	80	13000
AHD EB to Gateway Boulevard NB Ramp	639	3.6	169	3.6	70	11100
Gateway Boulevard NB to AHD EB Ramp	1227	16.8	325	16.8	80	21320
Gateway Boulevard NB to AHD WB Ramp	903	13.4	239	13.4	80	15700
Ellerslie Road East of Gateway Boulevard EB	1343	3.9	355	3.9	60	23340
Ellerslie Road East of Gateway Boulevard WB	1343	3.9	355	3.9	60	23340
Ellerslie Road West of Gateway Boulevard EB	1109	3.5	293	3.5	60	19282
Ellerslie Road West of Gateway Boulevard WB	1109	3.5	293	3.5	60	19282
Gateway Boulevard NB to Ellerslie Road EB Ramp	312	5.4	82	5.4	70	5415
Gateway Boulevard NB to Ellerslie Road WB Ramp	167	3.7	44	3.7	70	2895
Ellerslie Road WB to Gateway Boulevard NB Ramp	367	2.3	97	2.3	70	6375

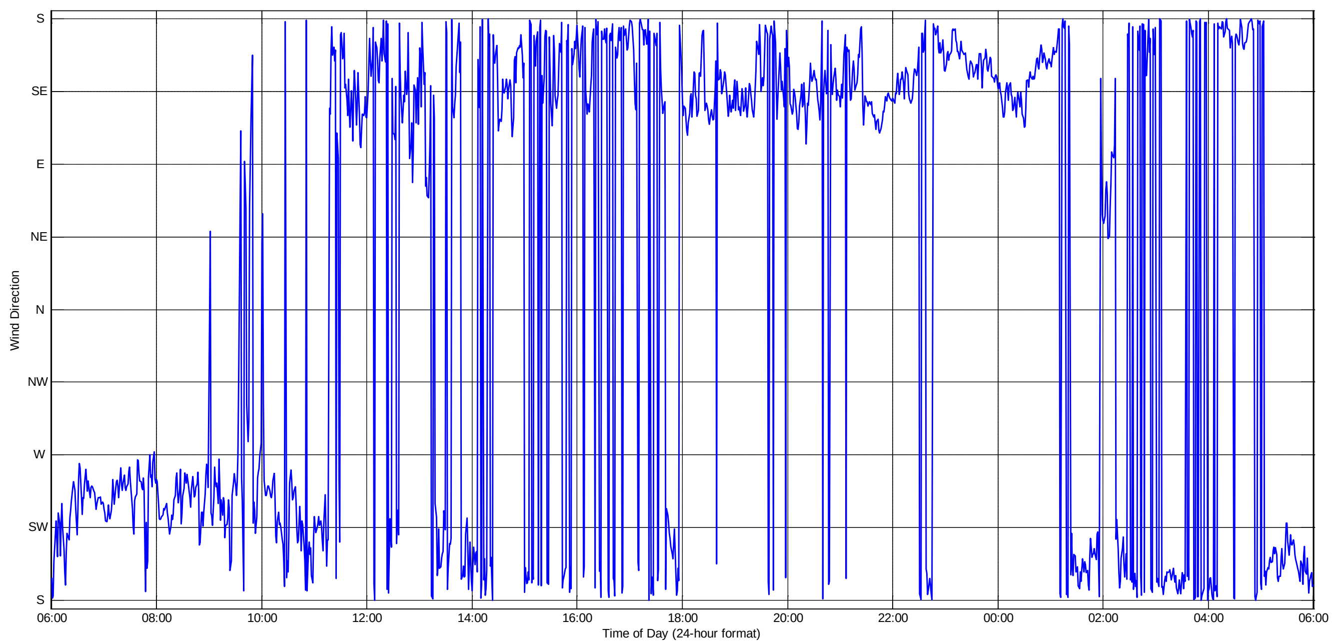
Future Conditions (Year 2024) (Cont.)

Road	Day (Vehicles Per Hour)	Day % Heavy Vehicles	Night (Vehicles Per Hour)	Night % Heavy Vehicles	Speed (km/hr)	Total Volume (vehicles per day)
Ellerslie Road WB to Calgary Trail SB Ramp	312	6.1	82	6.1	70	5415
Calgary Trail SB to Ellerslie Road WB Ramp	278	2.3	74	2.3	70	4830
Calgary Trail SB to Ellerslie Road EB Ramp	367	2.8	97	2.8	70	6375
Ellerslie Road EB to Calgary Trail SB Ramp	166	5.6	44	5.6	70	2880
Ellerslie Road EB to Gateway Boulevard NB Ramp	280	1.4	74	1.4	70	4860
91 Street	2276	5.7	602	5.7	70	39555
AHD WB to 91 Street NB Ramp	189	5.1	50	5.1	60	3285
AHD WB to 91 Street SB Ramp	230	7.3	61	7.3	60	3990
91 Street SB to AHD WB Ramp	376	6.6	100	6.6	60	6540
91 Street SB to AHD EB Ramp	190	4.0	50	4.0	60	3300
AHD EB to 91 Street SB Ramp	257	5.9	68	5.9	60	4470
AHD EB to 91 Street NB Ramp	376	6.9	100	6.9	60	6540
91 Street NB to AHD EB Ramp	230	5.7	61	5.7	60	4005
91 Street NB to AHD WB Ramp	257	6.0	68	6.0	60	4470
66 Street	506	9.1	134	9.1	60	8800
50 Street	1513	4.4	400	4.4	60	26300
50 Street NB to AHD WB Ramp	173	8.1	46	8.1	60	3000
50 Street SB to AHD WB Ramp	379	3.2	100	3.2	60	6590
AHD WB to 50 Street NB/SB Ramp	257	5.7	68	5.7	60	4470
AHD EB to 50 Street NB/SB Ramp	551	6.0	146	6.0	60	9570
50 Street NB/SB to AHD EB Ramp	258	6.1	68	6.1	60	4480
34 Street	196	11.8	52	11.8	60	3400
17 Street	303	10.6	80	10.6	60	5260
AHD WB to 17 Street NB/SB Ramp	60	11.5	16	11.5	60	1040
17 Street NB/SB to AHD WB Ramp	109	10.8	29	10.8	60	1890
AHD EB to 17 Street NB/SB Ramp	108	9.6	28	9.6	60	1870
17 Street NB/SB to AHD EB Ramp	60	9.5	16	9.5	60	1040
Hwy 14 WB to AHD NB Ramp	240	8.0	64	8.0	100	4180
Hwy 14 WB to AHD SB Ramp	174	5.6	46	5.6	100	3030
AHD NB to Hwy 14 EB Ramp	174	7.4	46	7.4	100	3030
AHD SB to Hway 14 EB Ramp	240	8.8	64	8.8	100	4180
Collector Roads	480	3	89	3	60	8000
Residential Streets	12	3	2	3	50	200

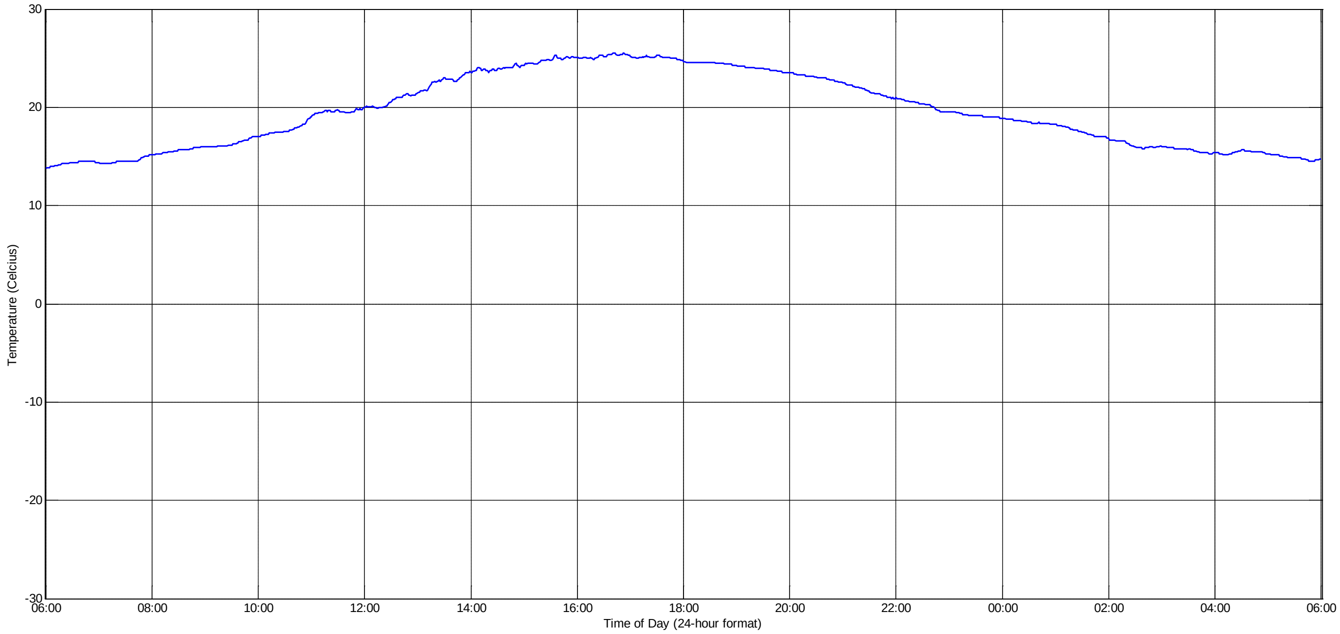
Appendix V. WEATHER DATA



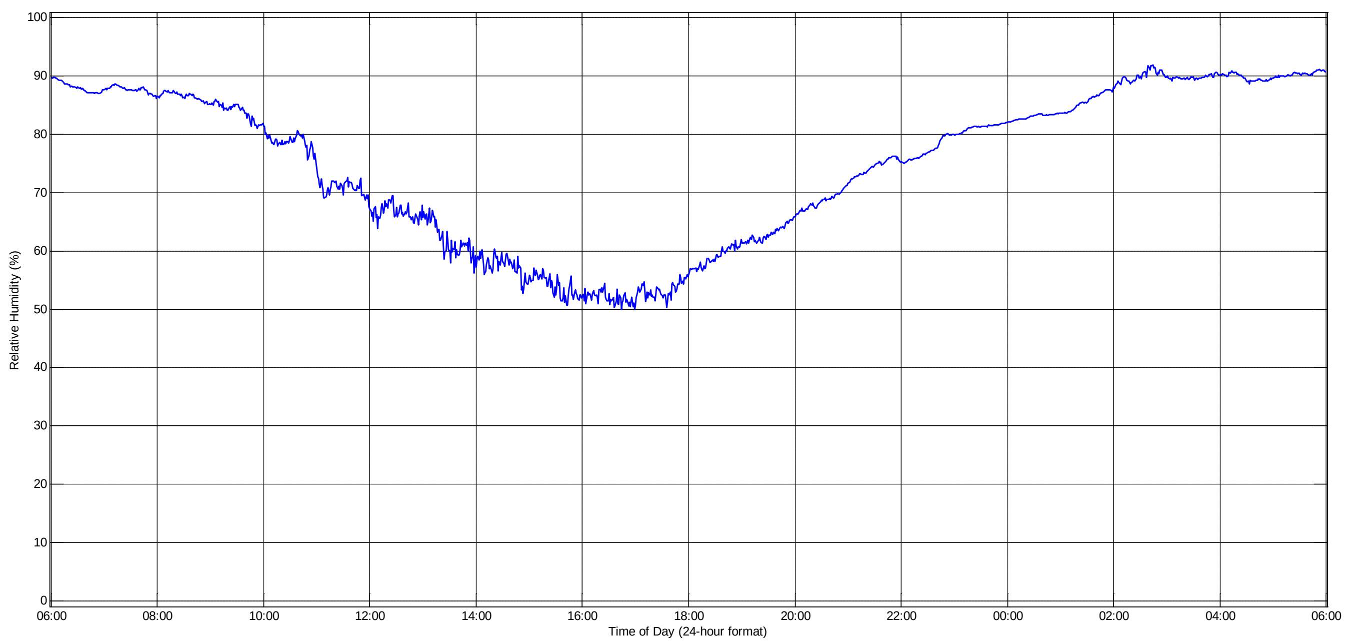
August 13 - 14, 2013 Monitored Wind Speed



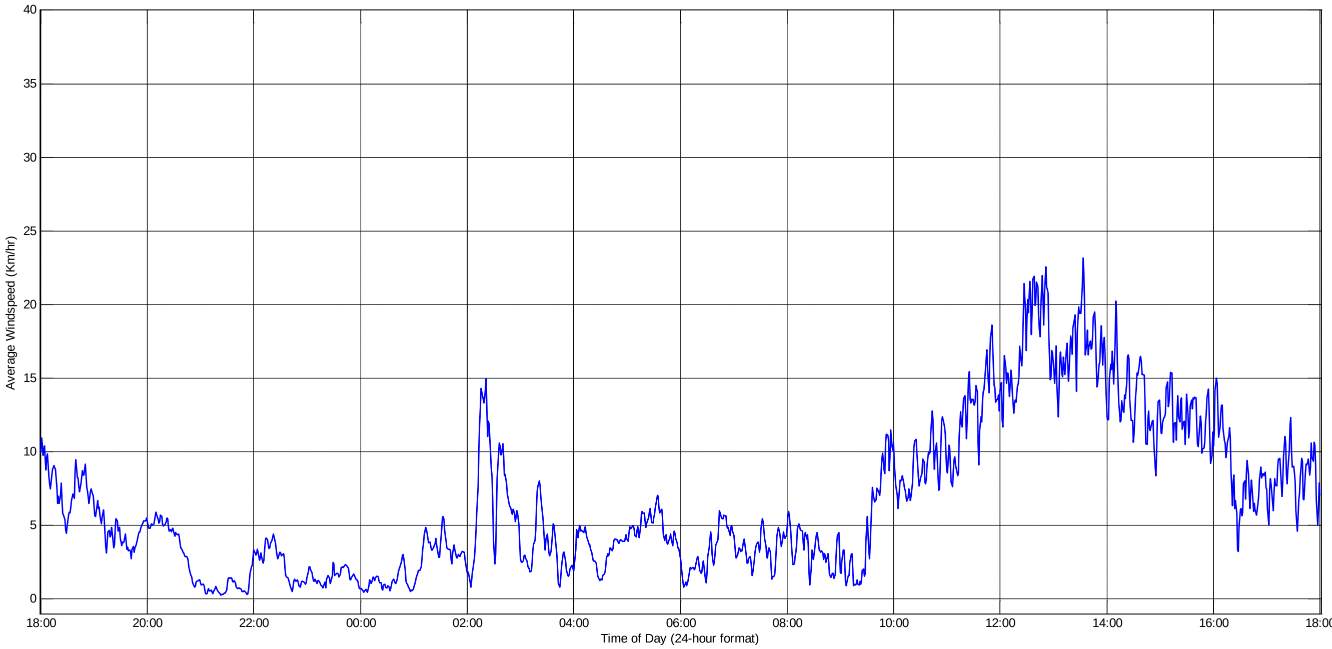
August 13 - 14, 2013 Monitored Wind Direction



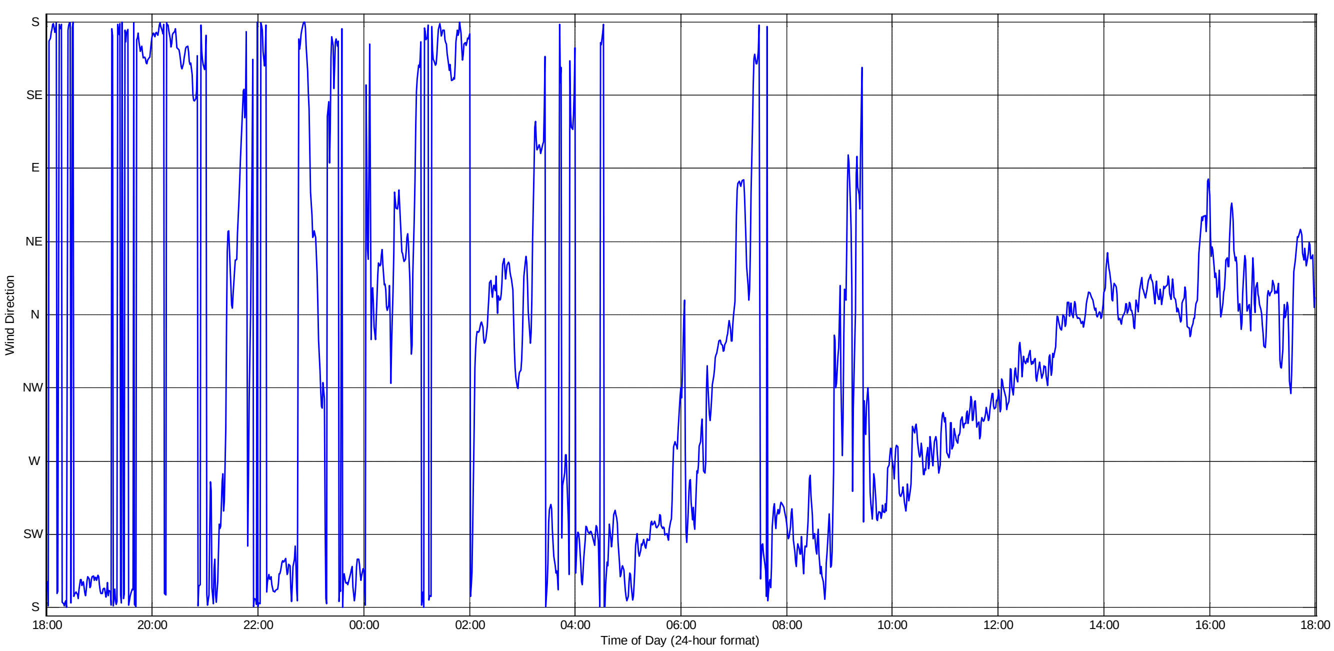
August 13 - 14, 2013 Monitored Temperature



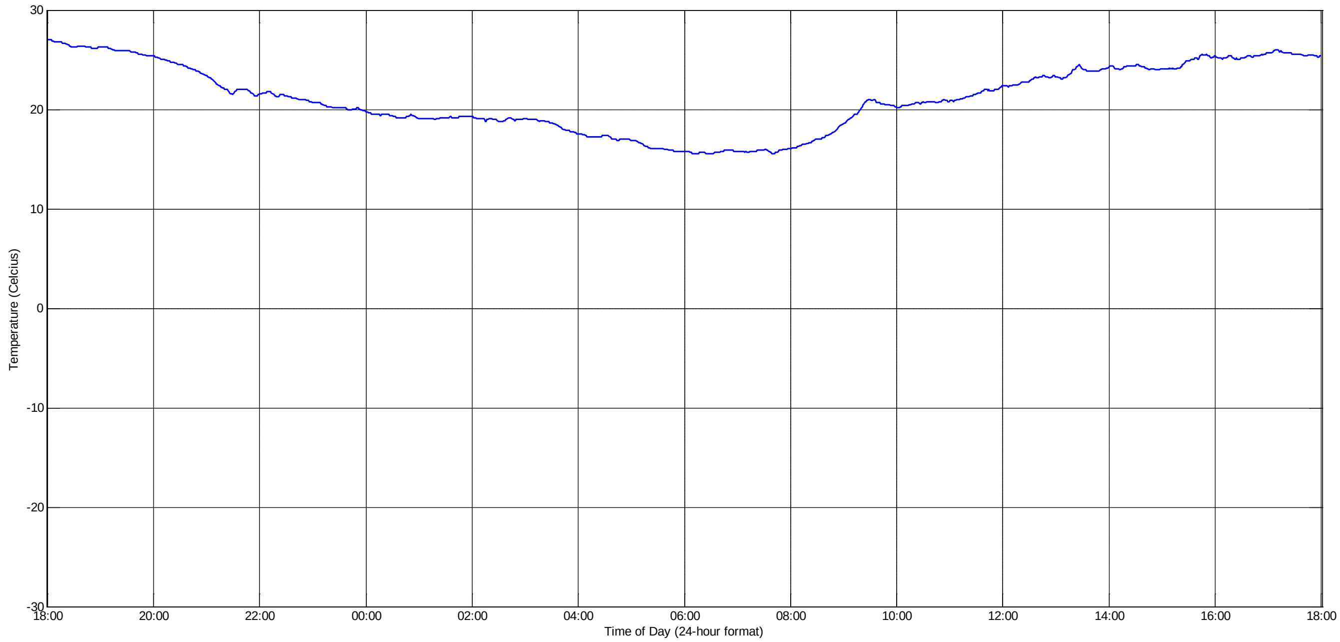
August 13 - 14, 2013 Monitored Relative Humidity



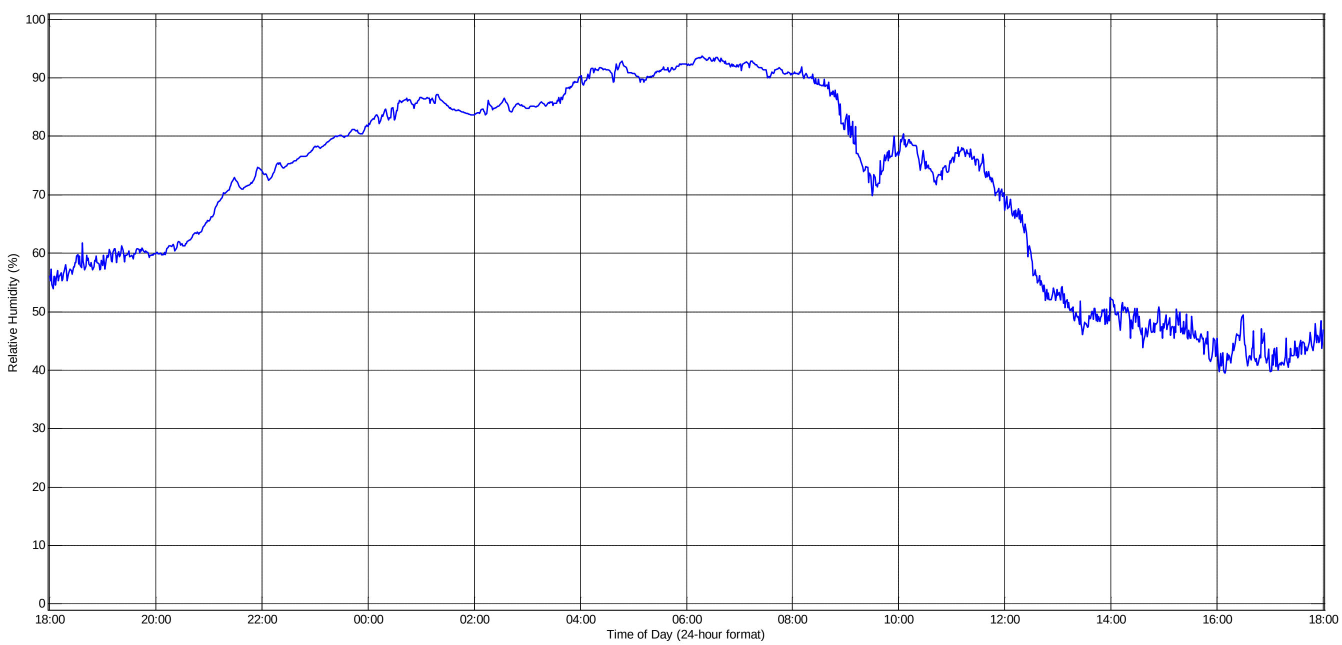
August 14 - 15, 2013 Monitored Wind Speed



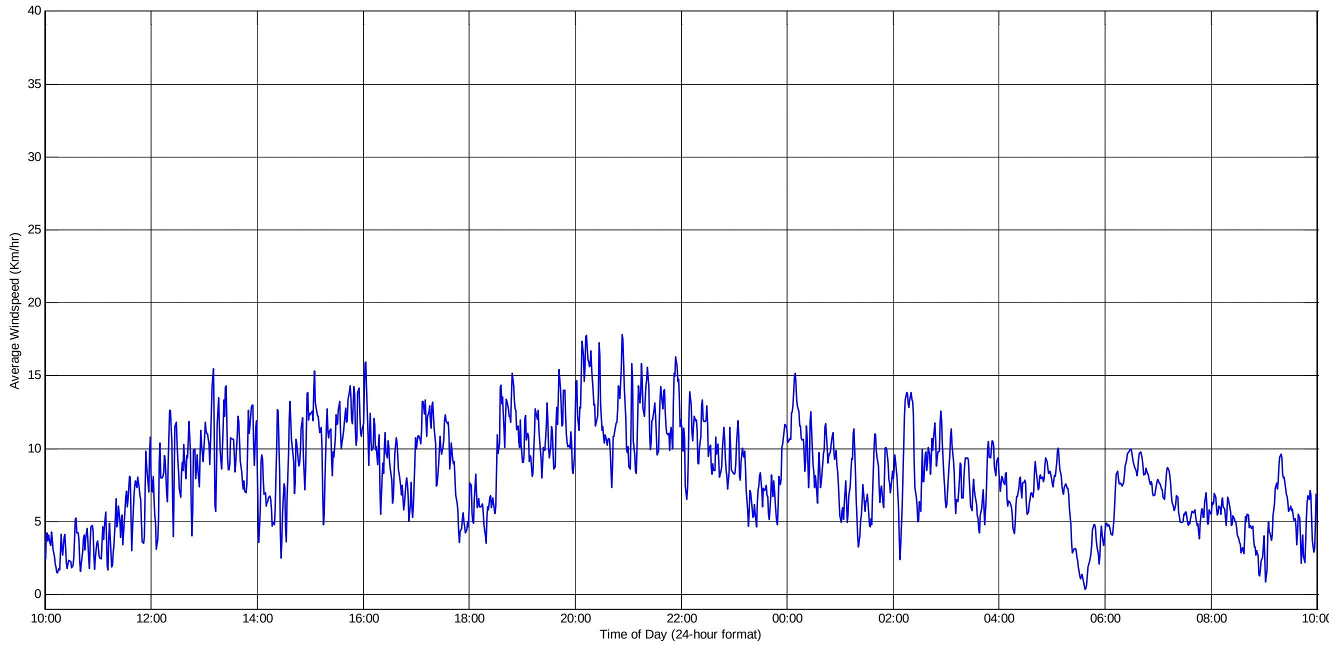
August 14 - 15, 2013 Monitored Wind Direction



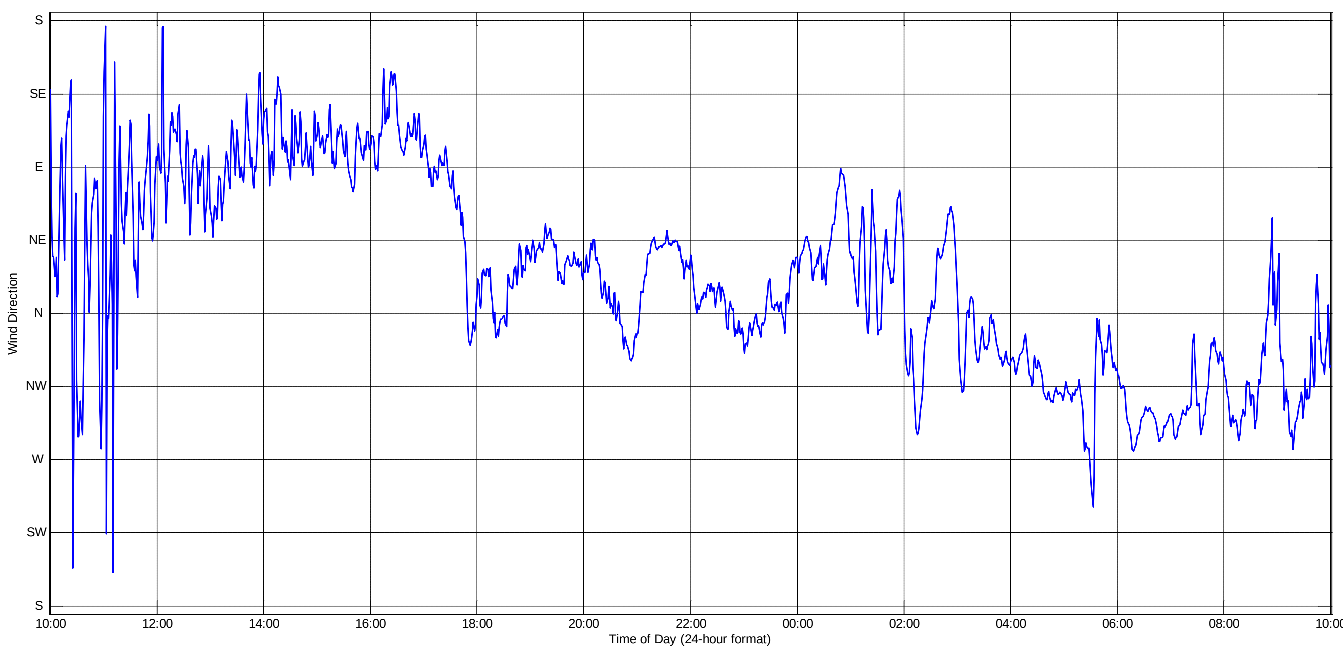
August 14 - 15, 2013 Monitored Temperature



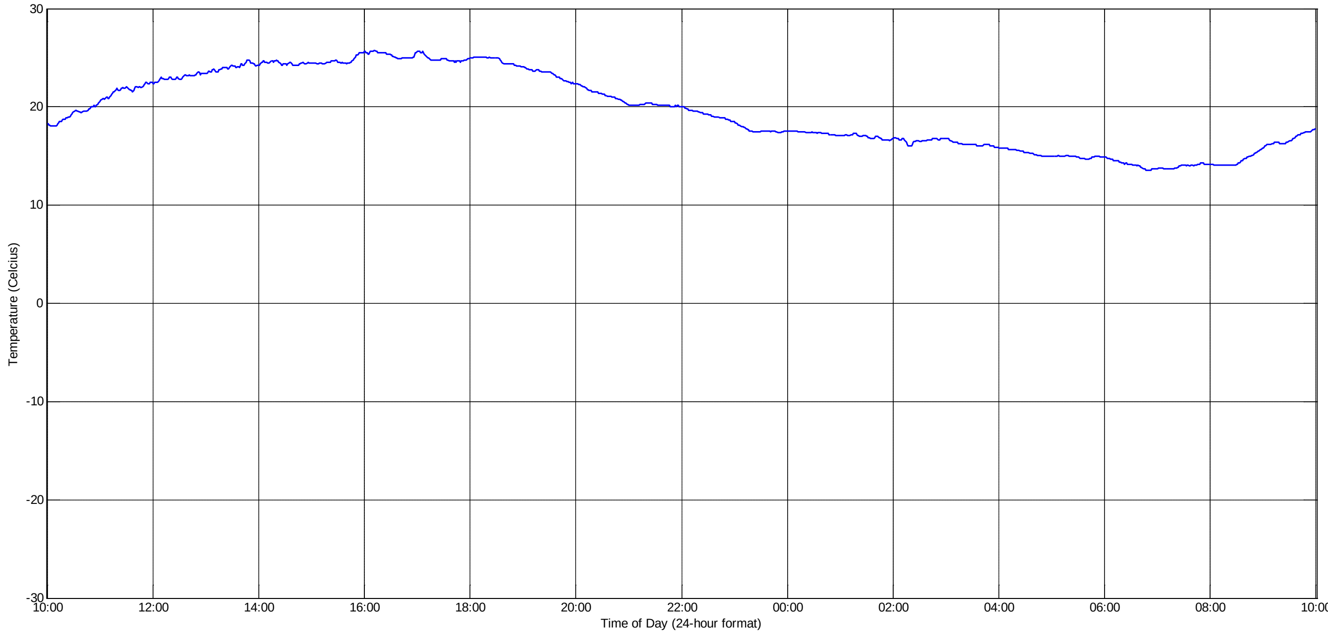
August 14 - 15, 2013 Monitored Relative Humidity



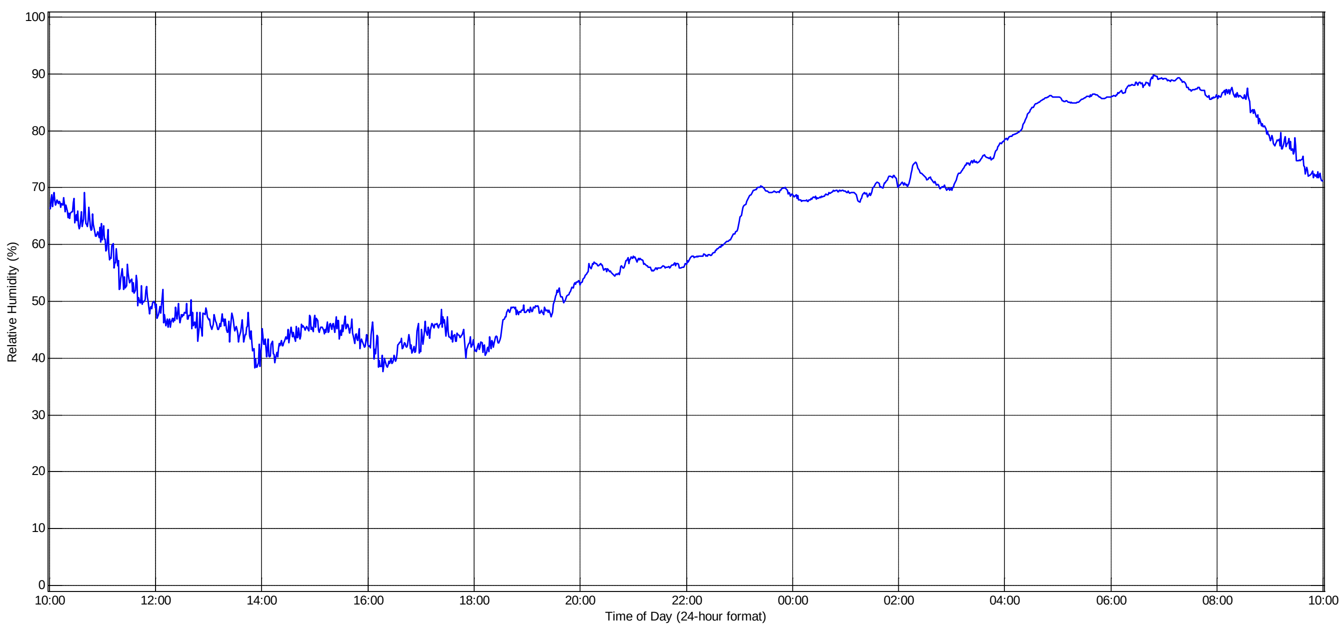
August 28 - 29, 2013 Monitored Wind Speed



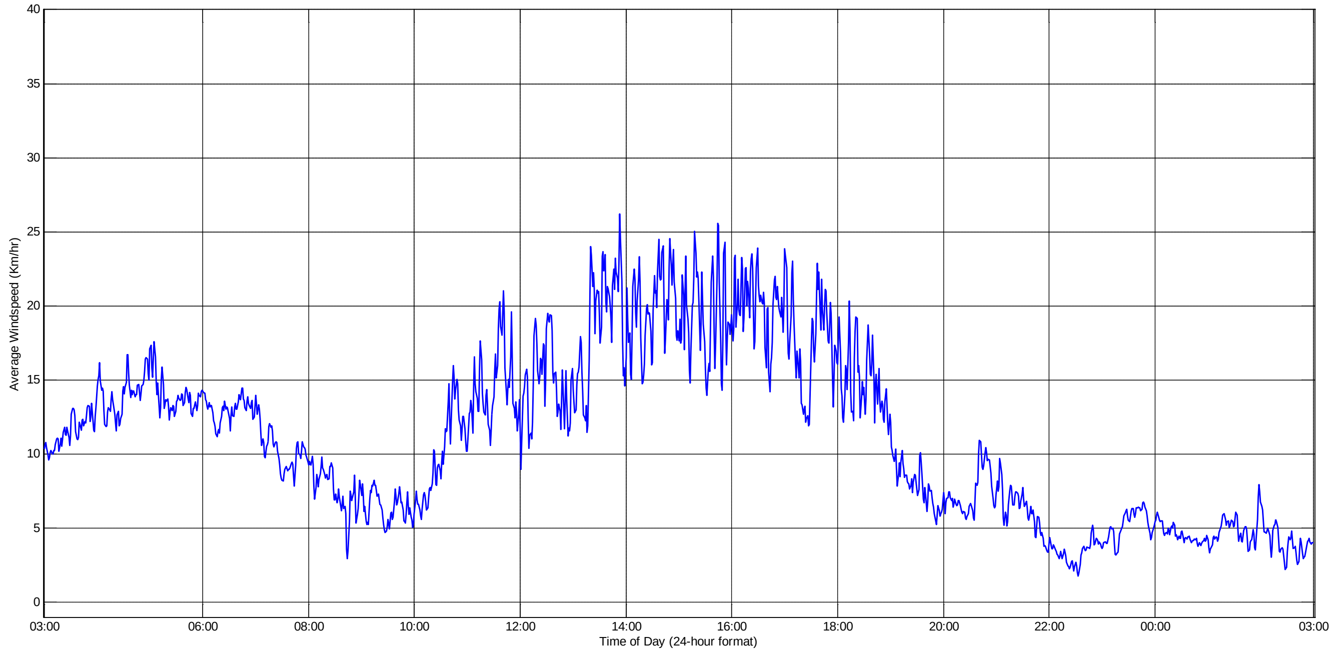
August 28 - 29, 2013 Monitored Wind Direction



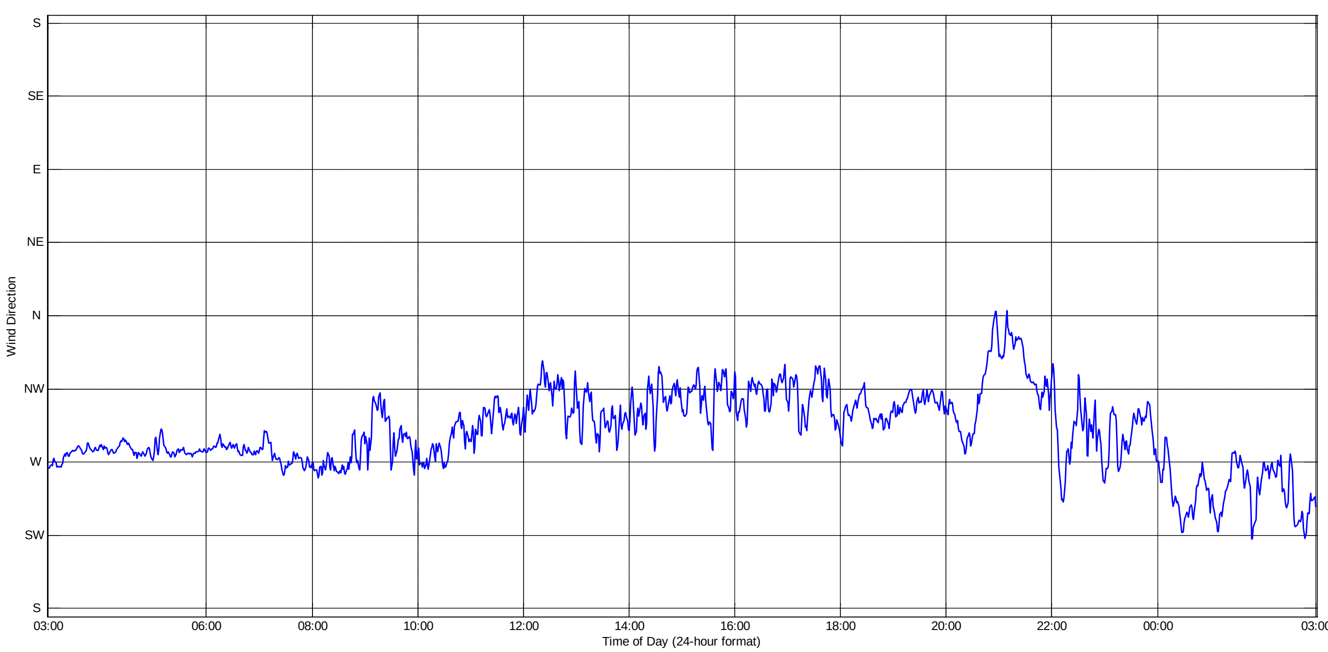
August 28 - 29, 2013 Monitored Temperature



August 28 - 29, 2013 Monitored Relative Humidity



September 10 - 11, 2013 Monitored Wind Speed



September 10 - 11, 2013 Monitored Wind Direction

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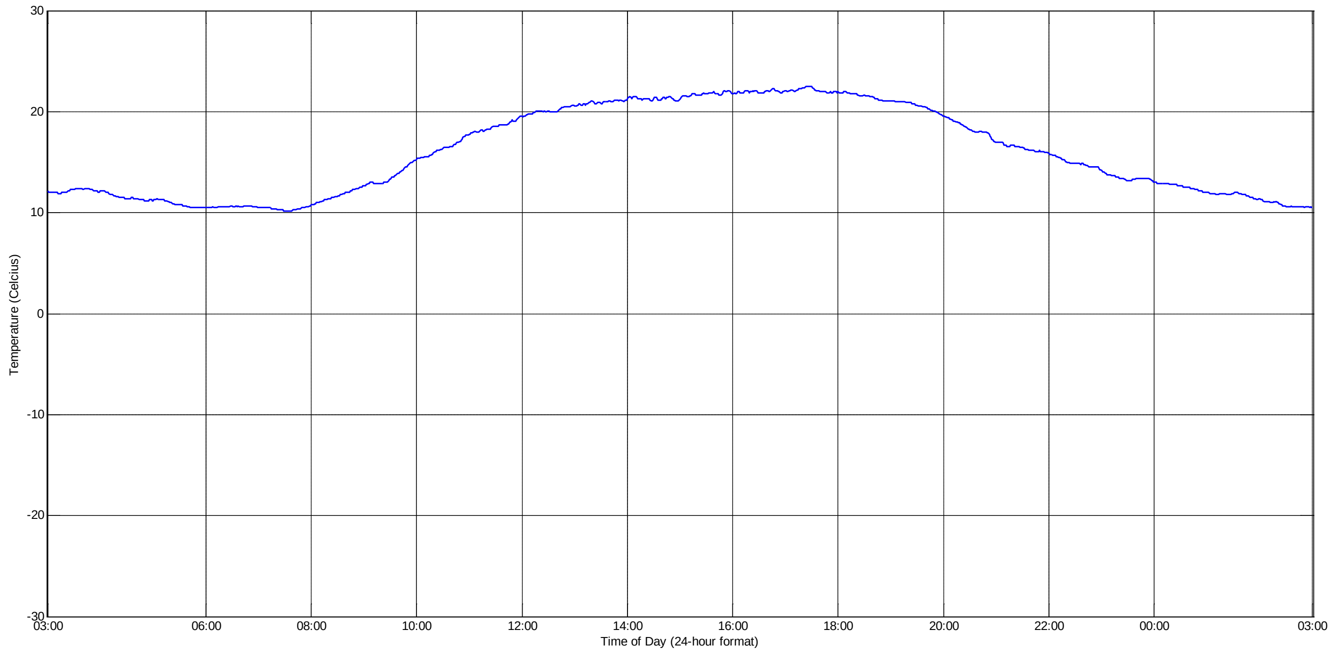
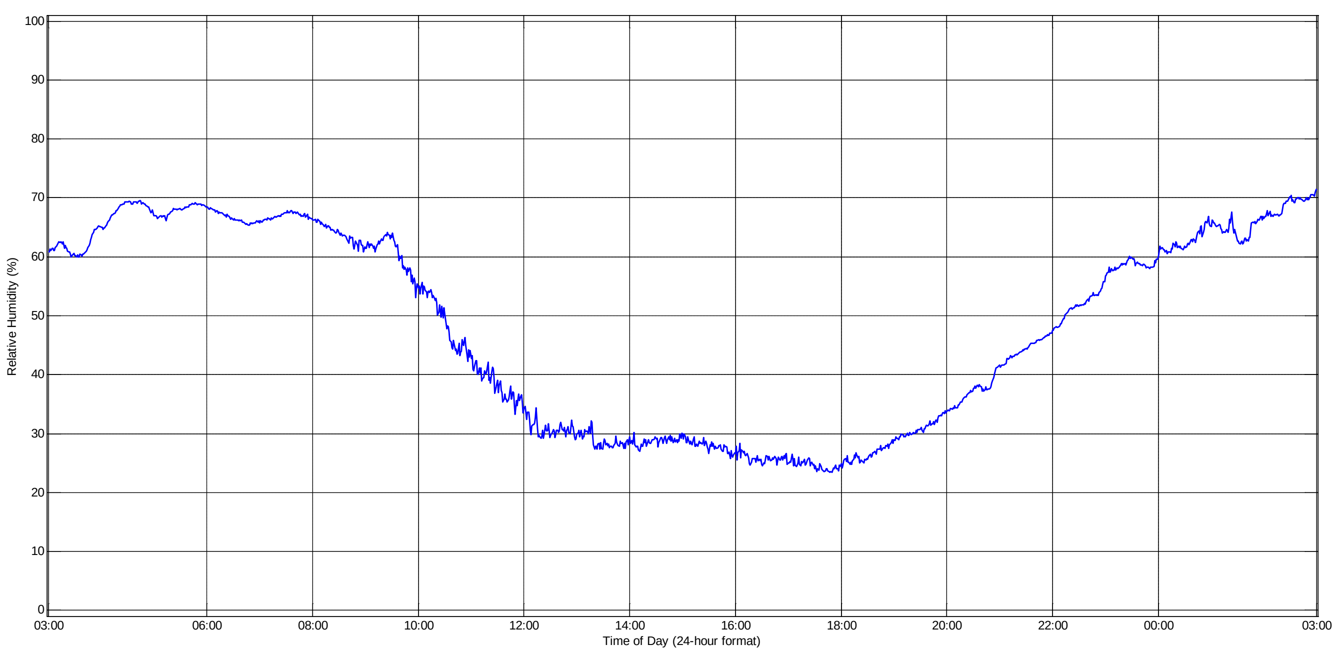
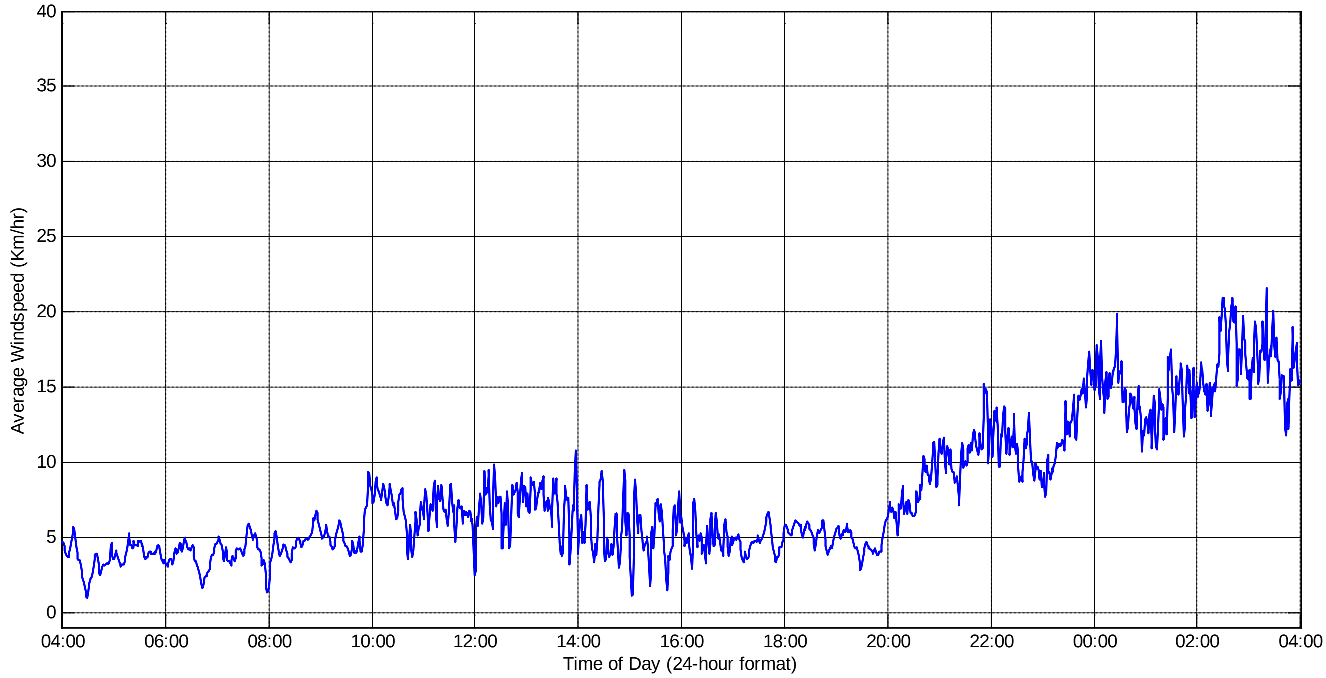


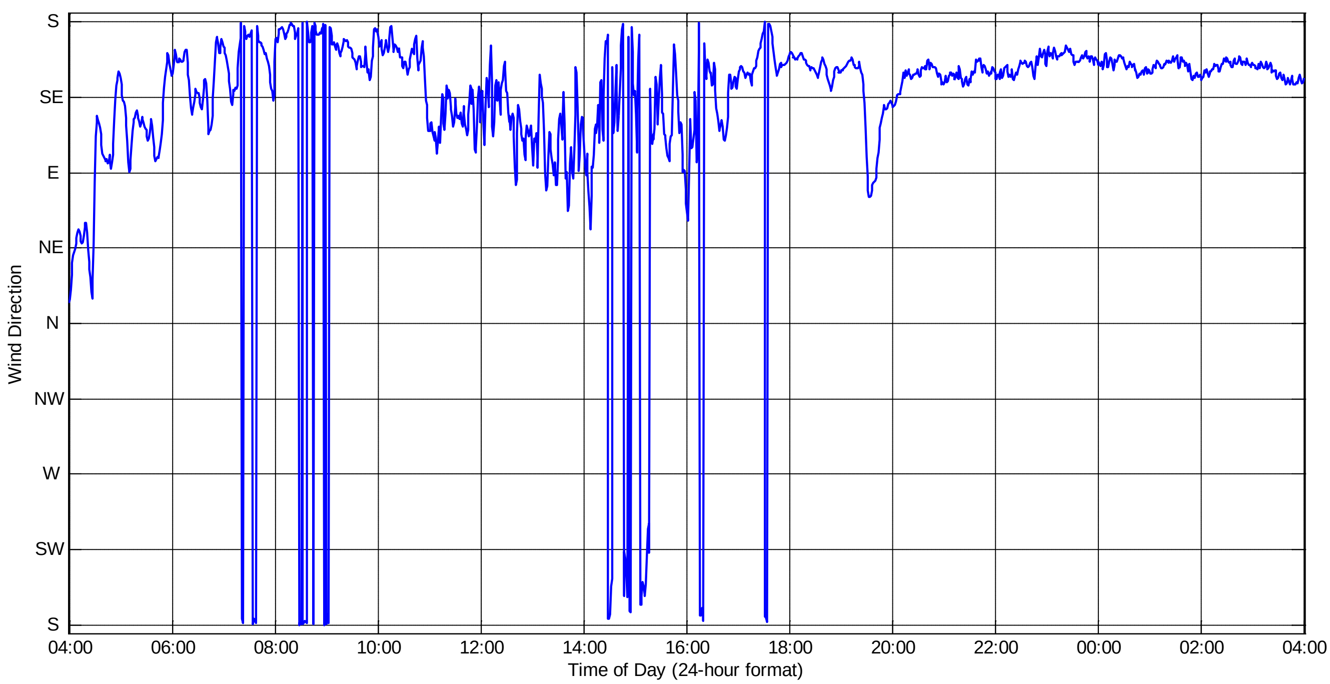
September 10 - 11, 2013 Monitored Temperature



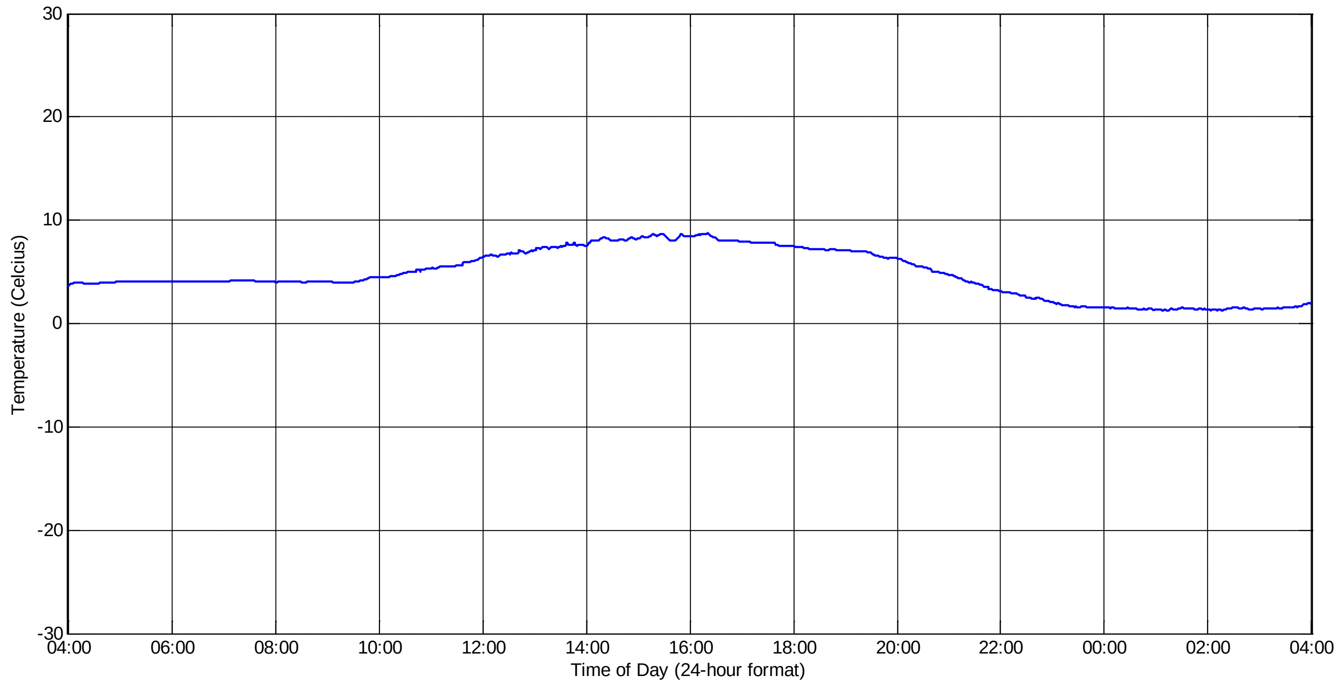
September 10 - 11, 2013 Monitored Relative Humidity



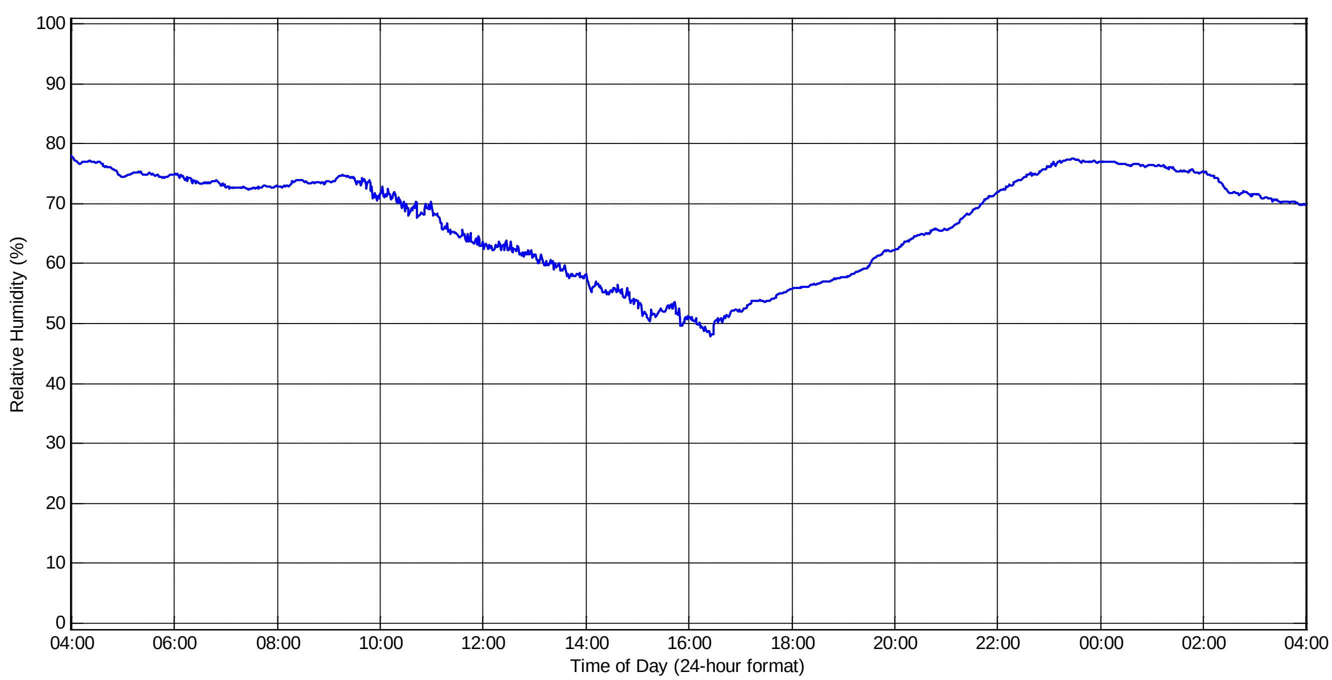
October 23 - 24, 2013 Monitored Wind Speed



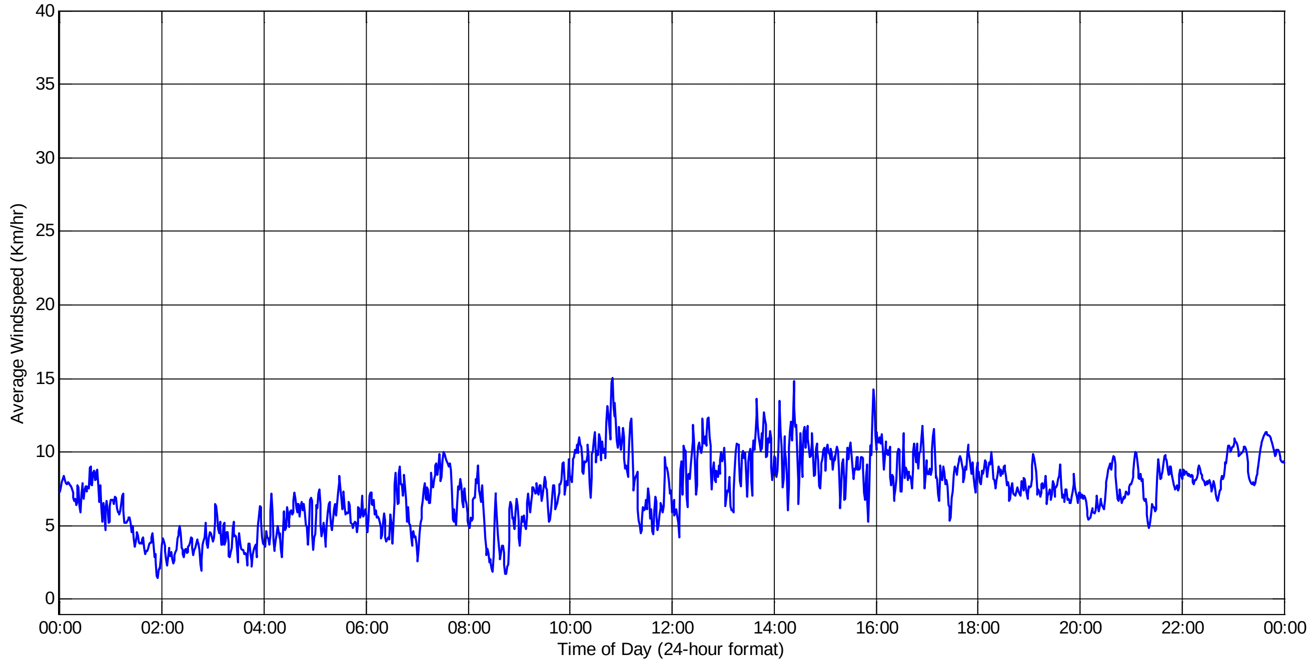
October 23 - 24, 2013 Monitored Wind Direction



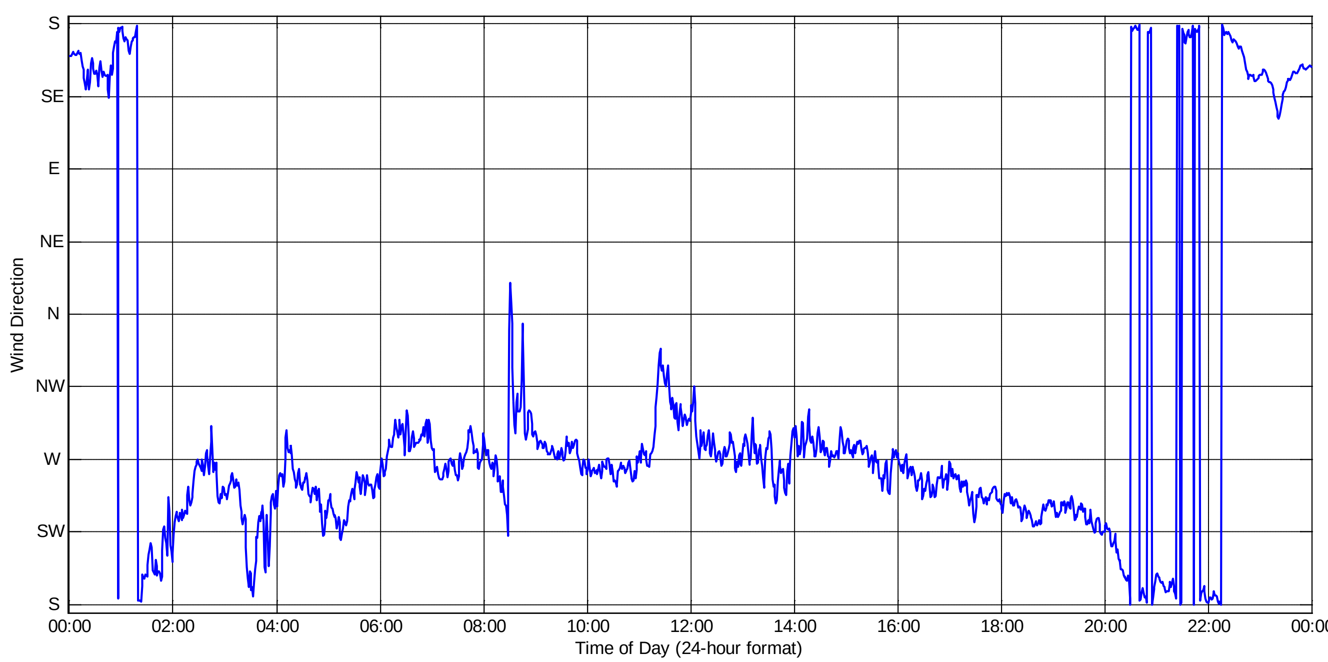
October 23 - 24, 2013 Monitored Temperature



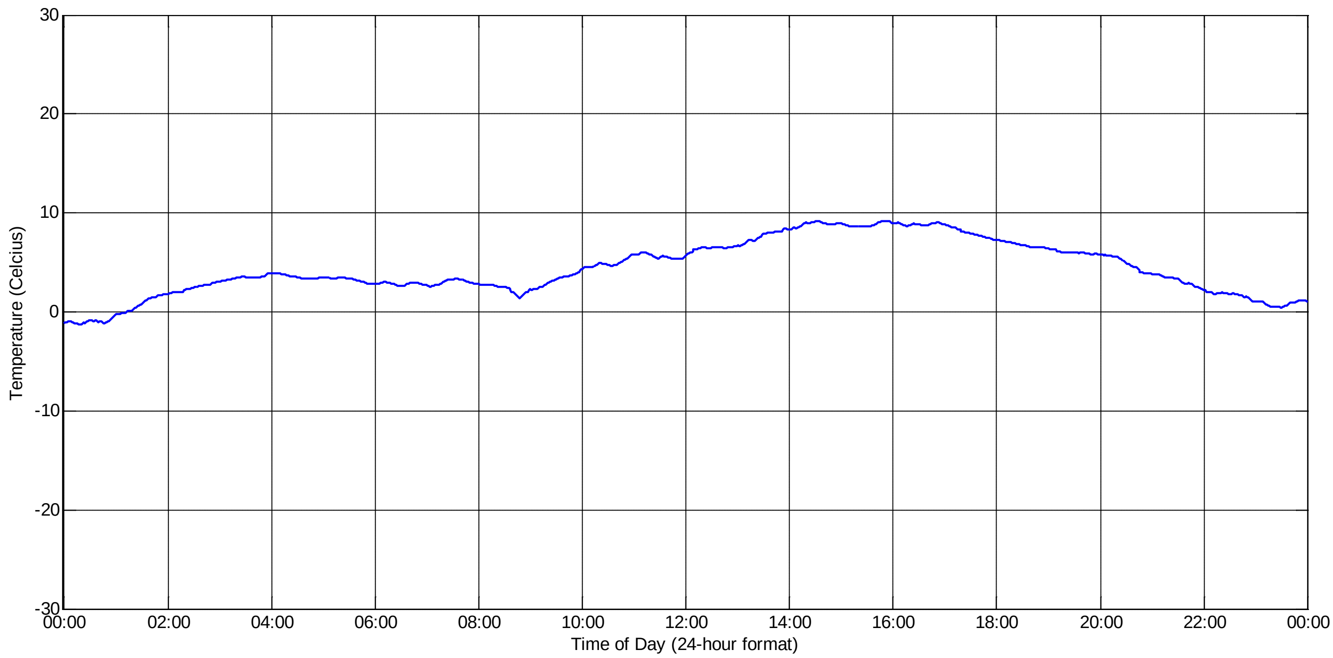
October 23 - 24, 2013 Monitored Relative Humidity



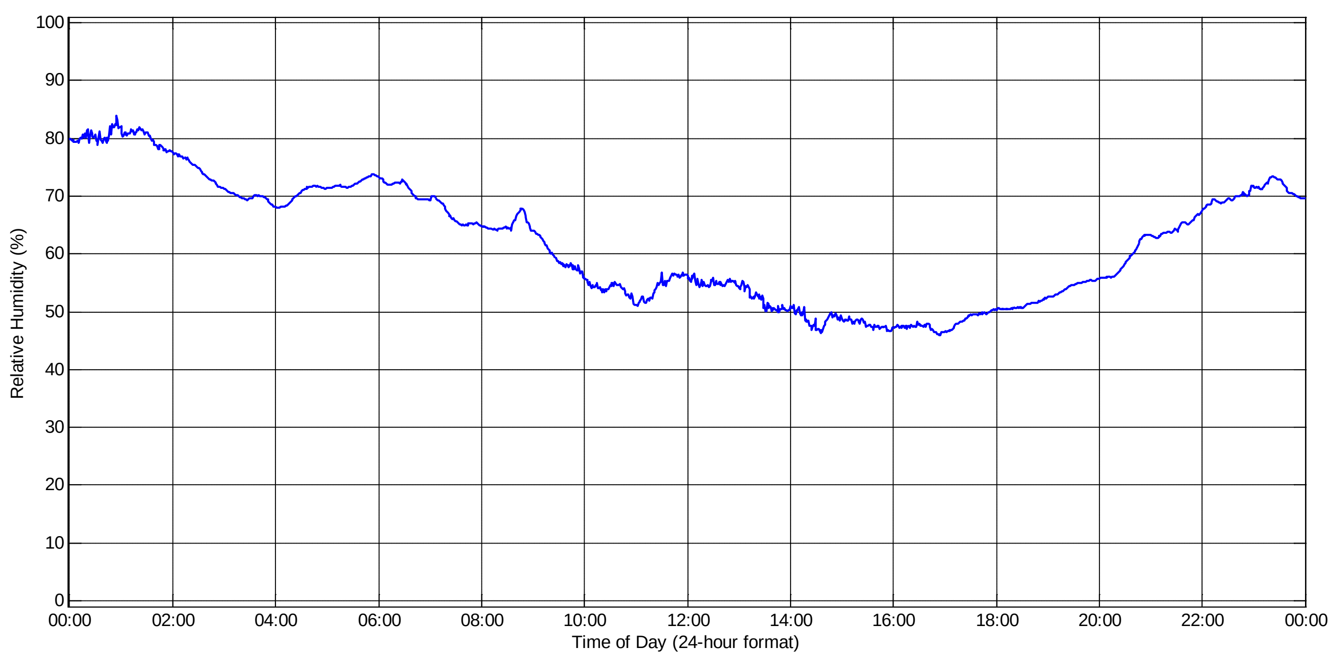
October 30 - 31, 2013 Monitored Wind Speed



October 30 - 31, 2013 Monitored Wind Direction



October 30 - 31, 2013 Monitored Temperature



October 30 - 31, 2013 Monitored Relative Humidity