CALGARY SOUTHEAST STONEY TRAIL
Detailed Design

17th Avenue SE to Macleod Trail South (Hwy 2A) Calgary, Alberta

NOISE REPORT

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for

Chinook Roads Partnership
Southeast Stoney Trail Project

September 26, 2011

PAAE Project No. 2010-2880 (rev1)

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1 NOISE ANALYSIS

1.1 INTRODUCTION

Patching Associates Acoustical Engineering Ltd. was retained by Chinook Roads Partnership (Chinook) to assess the potential noise impact of the proposed Calgary Southeast Stoney Trail (SEST) roadway network from north of 17th Avenue SE to east of Macleod Trail South (Hwy 2A).

The purpose of this study is to determine the predicted noise levels generated by future traffic on the SEST for the existing (2011) first row residential developments adjacent to the project and if required, the height of barrier needed to maintain the Alberta Transportation (AT) target noise level of 65 dBA L_{eq} (24 Hour). This study also determines the 45 dBA L_{eq} (24 Hour) to 75 dBA L_{eq} (24 Hour) noise contours for the proposed roadways.

Noise predictions for road traffic were developed using the Federal Highway Administration's Traffic Noise Model (FHWA TNM version 2.5) computer program based on the traffic volumes and detailed road designs provided by Chinook. Input data are included in Appendix E.

1.2 NOISE CRITERIA

Sound is typically measured using the A-weighting scale and is commonly expressed as an L_{eq} value. The A-weighted equivalent-continuous sound level is the noise descriptor used in the Alberta Transportation noise attenuation guidelines. This index is an energy average of the varying sound level over a specified period. The use of this index permits the description of a varying sound level environment as a single number. As the L_{eq} is an "average" level, the measured sound level may exceed the criterion level, provided the duration is limited. The L_{eq} value considers both the sound level and the length of time that the sound level occurs. Appendix A provides a detailed explanation of the Leq as well as other units and descriptors used in noise analysis.

The AT ***Noise Attenuation Guidelines for Provincial Highways Under Provincial Jurisdiction within Cities and Urban Areas*** (adopted 2002) specifies that a basic noise abatement threshold level of 65 dBA Leq (24 Hours) may be received in a resident's yard at a location two metres inside the property line (away from the road right of way), at a height of 1.2 metres above the ground surface. Noise studies for AT are normally to be adjusted to the 10 year planning horizon.

For this study, PAAE was requested to examine the impact of traffic noise based on the contractual design traffic volume as per Schedule 18 from Alberta Transportation. The Schedule 18 design traffic volume takes into consideration an Average Annual Daily Traffic (AADT) of 95,000 vehicles per day (VPD) and the end of the Chinook concession period at the year 2043, whichever comes first. Both horizons examined are beyond the standard 10-year horizon stated in the Guideline.

A copy of the **Noise Attenuation Guidelines for Provincial Highways under Provincial Jurisdiction within Cities and Urban Areas** document is found in Appendix B.

1.3 MODEL INPUT

Layouts for the SEST, crossing roads and the surrounding area were modeled using drawings received from Chinook using the Federal Highway Administration TNM 2.5 computer program.

Appendix C contains modeled coordinates for receivers and barriers. Appendix D contains modeled coordinates for roadways.

1.3.1 TRAFFIC DATA

Traffic volume projections for this study are based on AADT 95,000 VPD and 2043 year horizons for Stoney Trail and Deerfoot Trail. The following principles were considered:

- If the traffic volume of the mainline section at the 2030 year horizon reaches 95,000 VPD, the year 2030 traffic volume will be used for the noise prediction.
- If the 95,000 VPD traffic volume of the mainline section happens in some year between 2030 and 2043, the traffic volume of the year that reaches the 95,000 VPD criteria will be used for the noise prediction.
- If the traffic volume of the mainline section at the 2043 year horizon does not reach 95,000 VPD, the year 2043 traffic volume will be used for the noise prediction.

The following table summarizes the traffic volume projections for the noise prediction for the adjacent community areas.

Table 1 Traffic volume projections of SEST Stage 1 Design

Impacted Study Area	Impacted Communities	Year Based Traffic volume projection
Stoney Tr - North of 17th Avenue	Applewood Park	2043
Stoney Tr - From north of 22X to east of Deerfoot Trail	McKenzie Towne, Auburn Bay, Copperfield, Mahogany Marques Meadows	2043
Stoney Tr - From west of Deerfoot Trail to east of Sun Valley Blvd/Chaparral Blvd	Mountain Park, McKenzie, Cranston	2030
Stoney Tr - West of Sun Valley Blvd/Chaparral Blvd	Sundance, Chaparral	95,000 VPD at 2038
Deerfoot Tr - South of 22X to north of 196th Avenue	Cranston, Auburn Bay	95,000 VPD at 2031
Stoney Tr - From south of 17th Avenue to south of 114th Avenue	No specific residential area considered	95,000 VPD (approximate year 2030), noise contour calculations only

Appendix E contains the projected traffic volumes and truck percentages provided in the Functional Planning Study by Earthtech ranging between 3% and 5% for the AM and PM peak periods on the SEST and between 2% and 11% on the crossing roads. Twenty-four hour traffic volumes were calculated based on the data provided indicating 20% of daily traffic occurring during the combined AM and PM peak hours. The SEST mainline and Deerfoot Trail (Hwy 2) were modeled carrying a 1:1 medium to heavy truck ratio. All the other crossing roads were modeled with a 2:1 medium to heavy truck ratio.

The predicted levels for the Stage 1 design were calculated based on the traffic volume projections at each of the Stoney Trail and Deerfoot Trail mainline segments using the assumption that the breakdown in vehicle traffic classifications remains the same.

The modeled speeds were based on the design speeds listed in Schedule 18. Vehicles were modeled traveling at 110 kph on SEST. Ramps were modeled ranging between 45 kph and 110 kph. Crossing roads with SEST were modeled at the speeds as follows:

Chaparral Blvd and Sun Valley Blvd, 70 kph
Cranston Blvd and McKenzie Lake Blvd, 70 kph
Deerfoot Trail South, 110 kph
196 Avenue SE (Cranston Road (W)/Seton Blvd (E)), 70 kph
52nd Street, 70 kph
Highway 22X, east of the interchange 130 kph, west of the interchange 90 kph
88 Street SE, 90 kph
114 Avenue, 70 kph
Glenmore Trail, 90 kph
Peigan Trail, 80 kph
17 Avenue, 70 kph.

Environmental conditions used in the model were 20 degrees Celsius with 50% relative humidity.

1.4 FUTURE NOISE LEVEL PREDICTIONS

Based on the projected traffic volumes, grades of roads, speeds and land topography, predictions can be made for the noise levels that will be generated by the traffic at given receiver points and noise contours (isobels) for 65 dBA L_{eq} (24 Hours) can be plotted.

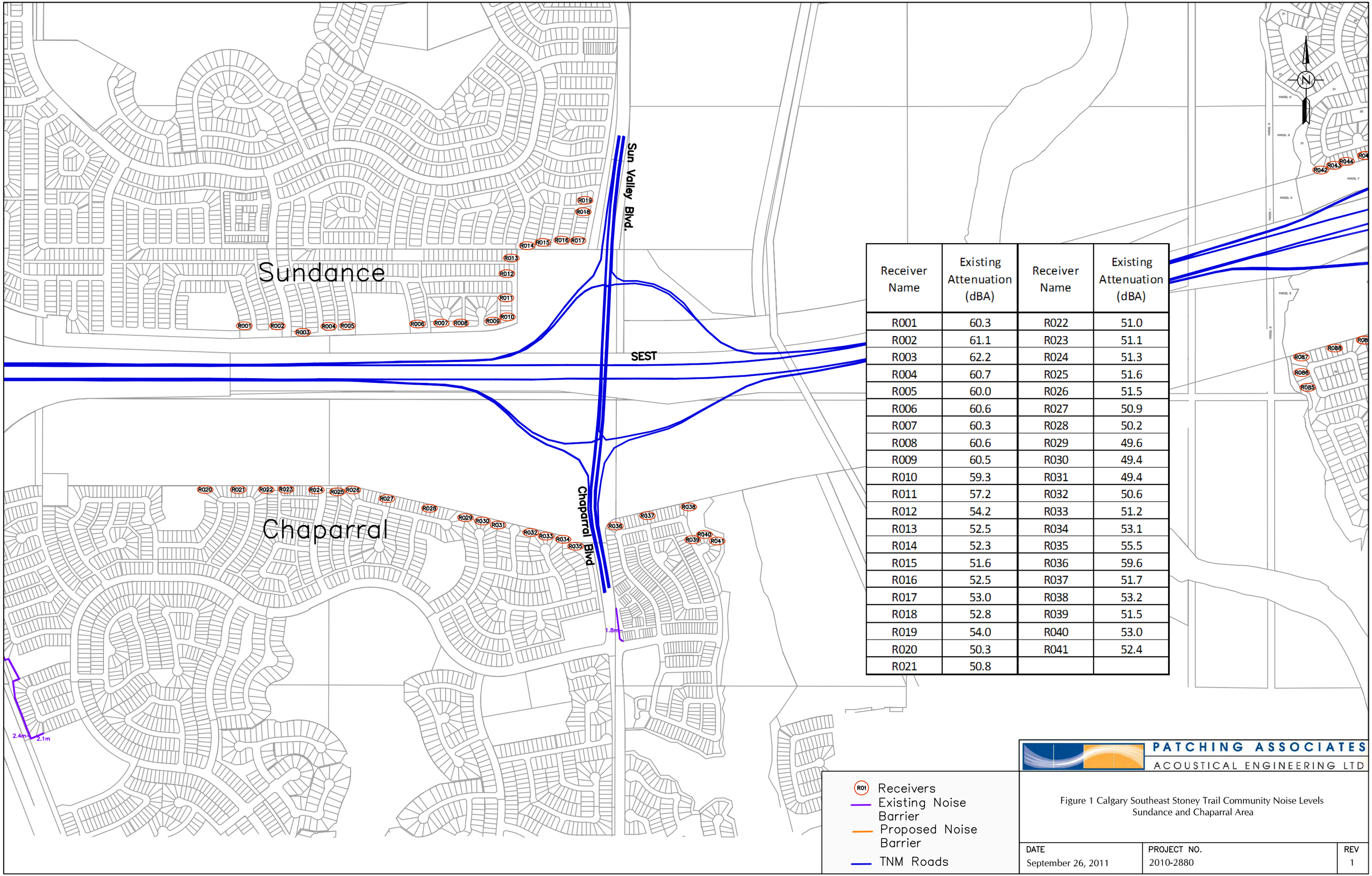
Figures 1 to 7 depict the modeled receivers along with corresponding predicted noise levels shown on Stage 1 plans.

The modeled results indicate that the 65 dBA L_{eq} (24 Hours) noise target will not be exceeded for any receivers modeled for the existing (2011) communities of:

- Sundance and Chaparral (Figure 1)
- Mountain Park, McKenzie (Figure 2)
- McKenzie Towne (Figure 3)
- Cranston (Figure 2 and 4)
- Copperfield and Mahogany (Figure 5)
- Copperfield and Marques Meadows (Figure 6)

Areas that are predicted to exceed the target noise level include areas within the community of:

- Auburn Bay (Figures 3 and 4)
- Applewood Park (Figure 7)



Receiver Name	Existing Attenuation (dBA)	Receiver Name	Existing Attenuation (dBA)
R001	60.3	R022	51.0
R002	61.1	R023	51.1
R003	62.2	R024	51.3
R004	60.7	R025	51.6
R005	60.0	R026	51.5
R006	60.6	R027	50.9
R007	60.3	R028	50.2
R008	60.6	R029	49.6
R009	60.5	R030	49.4
R010	59.3	R031	49.4
R011	57.2	R032	50.6
R012	54.2	R033	51.2
R013	52.5	R034	53.1
R014	52.3	R035	55.5
R015	51.6	R036	59.6
R016	52.5	R037	51.7
R017	53.0	R038	53.2
R018	52.8	R039	51.5
R019	54.0	R040	53.0
R020	50.3	R041	52.4
R021	50.8		

R01 Receivers
Existing Noise Barrier
Proposed Noise Barrier
TNM Roads

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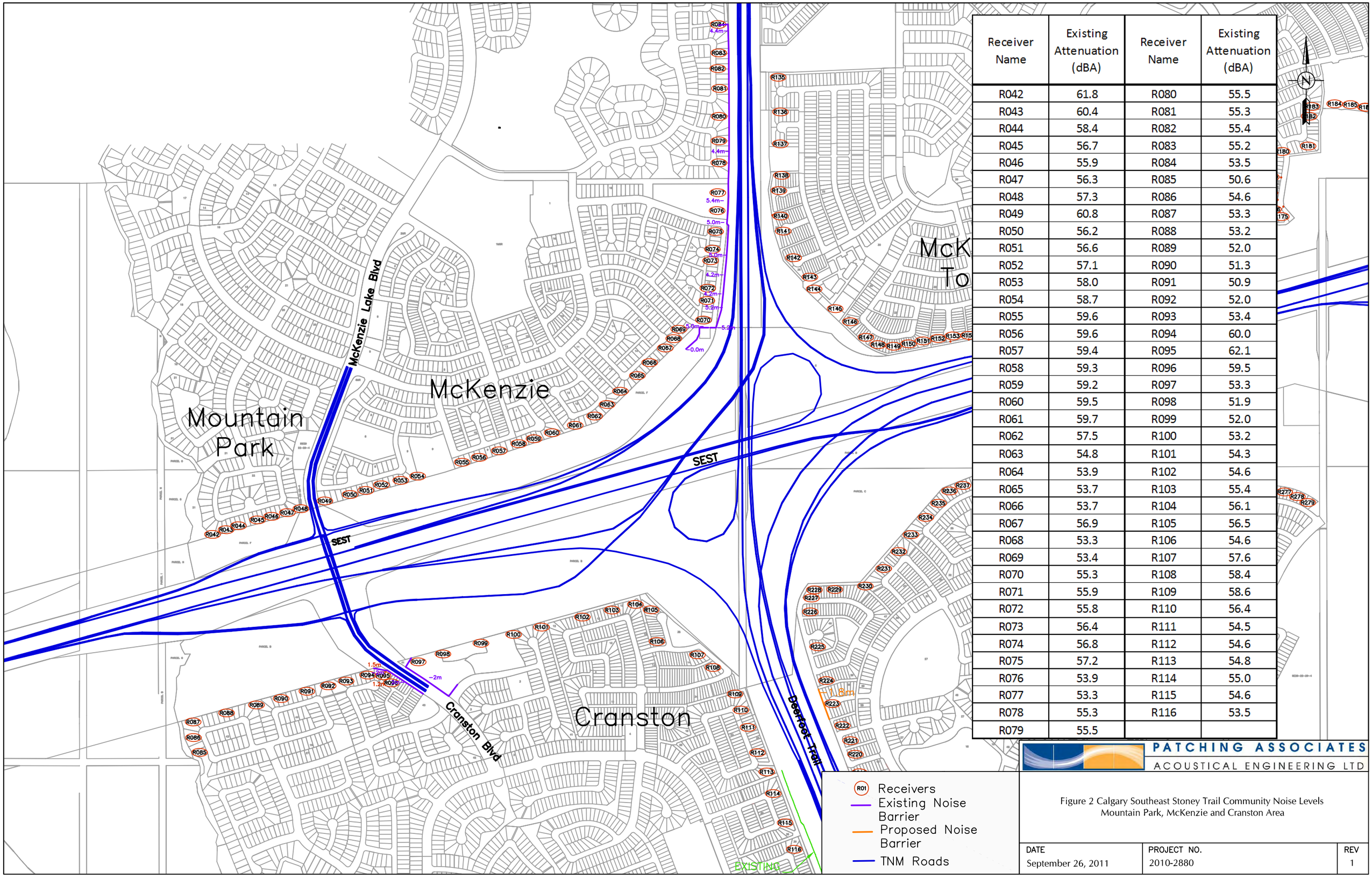
Figure 1 Calgary Southeast Stoney Trail Community Noise Levels
Sundance and Chaparral Area

DATE	PROJECT NO.	REV
September 26, 2011	2010-2880	1



Receiver Name	Existing Attenuation (dBA)	Receiver Name	Existing Attenuation (dBA)
R042	61.8	R080	55.5
R043	60.4	R081	55.3
R044	58.4	R082	55.4
R045	56.7	R083	55.2
R046	55.9	R084	53.5
R047	56.3	R085	50.6
R048	57.3	R086	54.6
R049	60.8	R087	53.3
R050	56.2	R088	53.2
R051	56.6	R089	52.0
R052	57.1	R090	51.3
R053	58.0	R091	50.9
R054	58.7	R092	52.0
R055	59.6	R093	53.4
R056	59.6	R094	60.0
R057	59.4	R095	62.1
R058	59.3	R096	59.5
R059	59.2	R097	53.3
R060	59.5	R098	51.9
R061	59.7	R099	52.0
R062	57.5	R100	53.2
R063	54.8	R101	54.3
R064	53.9	R102	54.6
R065	53.7	R103	55.4
R066	53.7	R104	56.1
R067	56.9	R105	56.5
R068	53.3	R106	54.6
R069	53.4	R107	57.6
R070	55.3	R108	58.4
R071	55.9	R109	58.6
R072	55.8	R110	56.4
R073	56.4	R111	54.5
R074	56.8	R112	54.6
R075	57.2	R113	54.8
R076	53.9	R114	55.0
R077	53.3	R115	54.6
R078	55.3	R116	53.5
R079	55.5		

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Figure 2 Calgary Southeast Stoney Trail Community Noise Levels
Mountain Park, McKenzie and Cranston Area

DATE	PROJECT NO.	REV
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Receiver Name	Existing Attenuation (dBA)	PAAE Upgraded Attenuation (dBA)	Receiver Name	Existing Attenuation (dBA)	PAAE Upgraded Attenuation (dBA)
R135	59.4	---	R221	62.1	---
R136	55.5	---	R222	62.9	---
R137	56.5	---	R223	65.2	57.0
R138	57.4	---	R224	64.0	63.9
R139	60.4	---	R225	63.1	---
R140	59.4	---	R226	62.7	---
R141	59.6	---	R227	61.1	---
R142	60.4	---	R228	59.6	---
R143	53.9	---	R229	55.5	---
R144	54.1	---	R230	52.4	---
R145	54.5	---	R231	52.3	---
R146	56.1	---	R232	51.8	---
R147	56.8	---	R233	52.0	---
R148	58.7	---	R234	51.8	---
R149	60.4	---	R235	53.7	---
R150	60.7	---	R236	55.1	---
R151	61.2	---	R237	55.7	---
R152	62.2	---	R238	55.8	---
R153	60.7	---	R239	55.6	---
R154	62.8	---	R240	54.4	---
R155	60.4	---	R241	52.8	---
R156	60.8	---	R242	52.5	---
R157	60.8	---	R243	53.2	---
R158	60.5	---	R244	52.6	---
R159	57.7	---	R245	50.2	---
R160	57.6	---	R246	50.5	---
R161	57.8	---	R247	48.9	---
R162	58.8	---	R248	49.8	---
R163	57.1	---	R249	49.8	---
R164	57.9	---	R250	49.5	---
R165	58.1	---	R251	49.6	---
R166	58.6	---	R252	49.9	---
R167	60.2	---	R253	49.7	---
R168	60.0	---	R254	50.3	---
R169	59.2	---	R255	50.3	---
R170	58.1	---	R256	50.5	---
R171	56.0	---	R257	50.0	---
R172	55.6	---	R258	50.2	---
R173	54.9	---	R259	51.5	---
R174	54.7	---	R260	53.7	---
R175	54.9	---	R261	53.6	---
R176	55.0	---	R262	53.2	---
R177	53.5	---	R263	53.2	---
R178	52.7	---	R264	53.1	---
R179	51.2	---	R265	52.9	---
R180	50.2	---	R266	52.2	---
R181	50.4	---	R267	51.7	---
R182	49.7	---	R268	51.3	---
R183	48.9	---	R269	51.1	---
R184	49.7	---	R270	51.9	---
R185	50.1	---	R271	50.3	---
R186	51.3	---	R272	51.3	---
R187	54.2	---	R273	49.7	---
R188	54.0	---	R274	50.0	---
R189	55.4	---	R275	48.8	---
R190	55.8	---	R276	48.9	---
R217	64.2	57.8	R277	48.4	---
R218	60.0	---	R278	48.5	---
R219	62.2	---	R279	47.6	---
R220	61.5	---			

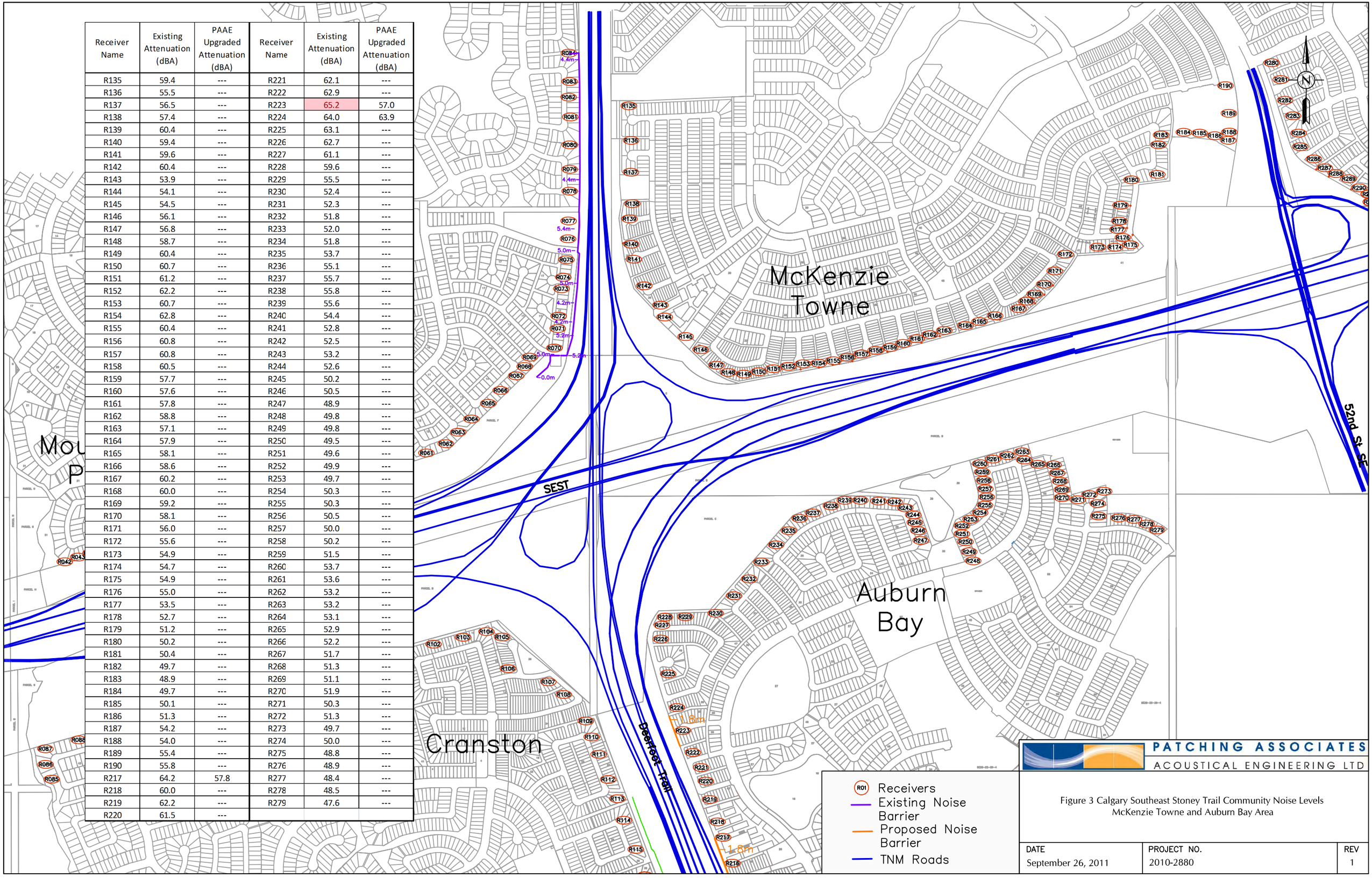

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Figure 3 Calgary Southeast Stoney Trail Community Noise Levels
McKenzie Towne and Auburn Bay Area

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Figures 8 to 17 give a general depiction of the predicted noise levels adjacent to the roadways by plotting the locations of the 45 dBA to 75 dBA L_{eq} (24 Hour) noise contours at the mainline traffic designed volume. Each figure also shows the locations of the existing subdivisions and proposed roadways.

Note: The contours are based on interpolation for a range of grid points. The predictions for individual locations are based on the specific data for each site and as such, the individual predicted levels should be taken as more accurate in the event of any discrepancies.

Sundance

Chaparral

Sun Valley Blvd.

Chaparral Blvd

SEST

Mountain Park

1.8m

2.4m

2.1m

< 45 dBA
45 - 50 dBA
50 - 55 dBA
55 - 60 dBA
60 - 65 dBA
65 - 70 dBA
70 - 75 dBA
> 75 dBA

R01 Receivers
Existing Noise Barrier
Proposed Noise Barrier
TNM Roads

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Figure 8 Calgary Southeast Stoney Trail Predicted Noise Contour
Sundance and Chaparral Area

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< 45 dBA
45 - 50 dBA
50 - 55 dBA
55 - 60 dBA
60 - 65 dBA
65 - 70 dBA
70 - 75 dBA
> 75 dBA

McKenzie Lake Blvd
SEST
SEST
Cranston Blvd
Deerfoot Trail
Mountain Park
McKenzie
McKenzie Towne
Cranston
Auburn Bay

Receivers
Existing Noise Barrier
Proposed Noise Barrier
TNM Roads

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Figure 9 Calgary Southeast Stoney Trail Predicted Noise Contours
Mountain Park, McKenzie and Cranston Area

DATE	PROJECT NO.	REV
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< 45 dBA
45 - 50 dBA
50 - 55 dBA
55 - 60 dBA
60 - 65 dBA
65 - 70 dBA
70 - 75 dBA
> 75 dBA

McKenzie Towne

McKenzie Mountain Park

Auburn Bay

Cranston

McKenzie Lake Blvd

SEST

Deerfoot Trail

Cranston Blvd

52nd St SE

R01 Receivers
Existing Noise Barrier
Proposed Noise Barrier
TNM Roads

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Figure 10 Calgary Southeast Stoney Trail Predicted Noise Contours
McKenzie Towne and Auburn Bay Area

DATE	PROJECT NO.	REV
September 26, 2011	2010-2880	1

1.5 CONCLUSION

The analysis predicts that three short sections of noise wall 1.8 m in height are required on the east side of Deerfoot Trail and north of 17th Avenue. All other areas are assessed as receiving adequate benefit from existing screening or located with a separation distance great enough to the roadways to meet the AT target level. The communities considered in this analysis include:

- Sundance (Figure 1)
- Chaparral (Figure 1)
- Mountain Park (Figure 2)
- McKenzie Lake (Figure 2)
- Cranston (Figure 2 and 4)
- McKenzie Towne (Figure 3)
- Auburn Bay (Figure 3 and 4)
- Copperfield (Figure 5 and 6)
- Mahogany (Figure 5)
- Marques Meadows (Figure 6)
- Applewood Park (Figures 7)

Appendix A

Explanation of Technical Details Regarding Sound Measurement & Analysis

2 TECHNICAL DETAILS

Sound is the phenomena of vibrations transmitted through air, or other medium such as water or a building structure. The range of pressure amplitudes, intensities, and frequencies of the sound energy is very wide, and many specialized fields have developed using different ranges of these variables, such as room acoustics and medical ultrasound.

Due to the wide range of intensities, which are perceived as sound, standard engineering units become inconvenient. Sound levels are commonly measured on a logarithmic scale, with the level (in decibels, or dB) being proportional to ten times the common logarithm of the sound energy or intensity. Normal human hearing covers a range of about twelve to fourteen orders of magnitude in energy, from the threshold of hearing to the threshold of pain. On the decibel scale, the threshold of hearing is set as zero, written as 0 dB, while the threshold of pain varies between 120 to 140 dB. The most usual measure of sound is the sound pressure level (SPL), with 0 dB SPL set at 2.0 X 10^{-5} N/m^2 (also written 20 μPa), which corresponds to a sound intensity of 10^{-12} Watts/m^2 (or 1 picoWatt/m^2, written 1 pW/m^2).

Normal human hearing spans a frequency range from about 20 Hertz (Hz, or cycles per second) to about 20,000 Hz (written 20 KHz). However, the sensitivity of human hearing is not the same at all frequencies. To accommodate the variation in sensitivity, various frequency-weighting scales have been developed. The most common is the A-weighting scale, which is based on the sensitivity of human hearing at moderate levels; this scale reflects the low sensitivity to sounds of very high or very low frequencies. Sound levels measured on the A-weighted scale are written in A-weighted decibels, commonly shown as dBA or dB(A).

When sound is measured using the A-weighting scale, the reading is often called the "Noise level", to confirm that human sensitivity and reactions are being addressed. A table of some common noise sources and their associated noise levels are shown in Table A1.

When the A-weighting scale is not used, the measurement is said to have a "linear" weighting, or to be unweighted, and may be called a "linear" level. As the linear reading is an accurate measurement of the physical (sound) pressure, the term "Sound Pressure Level", or SPL, is usually (but not universally) reserved for un-weighted measurements.

Noise is usually defined as "unwanted sound", which indicates that it is not just the physical sound that is important, but also the human reaction to the sound that leads to the perception of sound as noise. It implies a judgment of the quality or quantity of sound experienced. As a human reaction to sound is involved, noise levels are usually given in A-weighted decibels (dBA). An alternate definition of noise is "sound made by somebody else", which emphasizes that the ability to control the level of the sound alters the perception of noise.

The single number A-weighted level is often inadequate for engineering purposes, although it does supply a good estimate of people's reaction to a noise environment. As noise sources, control measures, and materials differ in the frequency dependence of their noise responses or production, sound is measured with a narrower frequency bandwidth; the specific methodology varies with the application. For most work, the acoustic frequency range is divided into frequency bands where the center frequency of each band is twice the frequency of the next lower band; these are called "Octave" bands, as their frequency relation is called an "Octave" in music, where the field of acoustics has its roots. For more detailed work, the octave bands, and certain standard octave and 1/3 octave bands have been specified by international agreements.

Table A1- Noise Levels of Familiar Sources

Source Or Environment	Noise Level (dBA)
High Pressure Steam Venting To Atmosphere (3m)	121
Steam Boiler (2m)	90-95
Drilling Rig (10m)	80-90
Pneumatic Drill (15m)	85
Pump Jack (10m)	68-72
Truck (15m)	65-70
Business Office	65
Conversational Speech (1m)	60
Light Auto Traffic (30m)	50
Living Room	40
Library	35
Soft Whisper (5m)	20-35

Where the noise at the receiver is steady, it is easy to assess the noise level. However, both the production of noise at the source and the transmission of noise can vary with time; most noise levels are not constant, either because of the motion of the noise source (as in traffic noise), because the noise source itself varies, or because the transmission of sound to the receiver location is not steady as over long distances. This is almost always the case for environmental noise studies. Several single number descriptors have been developed and are used to assess noise in these conditions.

The most common is the measurement of the "equivalent continuous" sound level, or L_{eq}, which is the level of a hypothetical source of a constant level which would give the same total sound energy as is measured during the sampling period. This is the "energy" average noise level.

Typical sampling periods are one hour, nighttime (9 hours) or one day (24 hours); the sampling period used must be reported when using this unit.

The greatest value of the L_{eq} is that the contributions of different sources to the total noise level can be assessed, or in a case where a new noise source is to be added to an existing environment, the total noise level from new and old sources can be easily calculated. It is also sensitive to short term high noise levels.

Statistical noise levels are sometimes used to assess an unsteady noise environment. They indicate the levels that are exceeded a fixed percentage of the measurement time period measured. For example, the 10%-ile level, written L_{10}, is the levels exceeded 10% of the time; this level is a good measure of frequent noisy occurrences such as steady road traffic. The 90% level, L_{90}, is the level exceeded 90% of the time, and is the background level, or noise floor. A steady noise source will modify the background level, while an intermittent noise source such as road or rail traffic will affect the short-term levels only.

One disadvantage with the L_{eq} measure, when used alone, is that nearby loud sources (e.g. dogs barking, or birds singing) can confuse the assessment of the situation when it is the noise from a distant source that is the concern. For this reason, the equivalent level and the statistical levels can be used together to better understand the noise environment. One such indication is the difference between the L_{eq} and the L_{90} levels. A large difference between the L_{eq} and L_{90}, greater than 10 dB, indicates the intrusion of short-term noise events on the general background level. A small difference, less than 5 dB, indicates a very steady noise environment. If the L_{eq} value exceeds the L_{10} value this indicates the presence of significant short-term loud events.

Some jurisdictions separate the daytime and nighttime, and calculate the L_{eq} for each time period. Typically, the daytime is defined as the hours between 7 AM (07:00) and 10 PM (22:00); the nighttime is defined as being between 22:00 and 07:00 the following morning. In some localities, the nighttime is defined as being from 11 PM (23:00) to 7 AM (07:00).

Other indexes exist for the evaluation of residents' response to the noise environment. One commonly used value is the Day-night level, L_{DN}. This index is similar to the L_{eq} measure taken over 24 hours, except that a penalty of 10 dBA is added to the noise levels at nighttime when calculating the L_{DN} value. This is to account for the greater sensitivity of people to noise which occurs during hours when most would like to sleep. For calculating this parameter according to the original definition from the US Environmental Protection Agency (EPA), "nighttime" is defined as being the time between the hours of 22:00 (10 PM) and 07:00 (7 AM).

Table A2 shows the adjustment factors used to approximate the equivalent L_{eq} (day), L_{eq} (night) and L_{DN} from the L_{eq} (24 Hours) based on the percentage of the total daily volume on the roadway at night. Previous studies on arterial roads and highways have shown that a typical range is between 10 and 15 percent of daily traffic occurring over the nighttime period.

Note: Table A2 assumes that vehicles are traveling at the same speed and the vehicle classification mix is unchanged throughout the day.

Table A2 – Adjustment Factors from L_{eq} (24 Hours)

Percentage of Vehicles at Night (%)	L_{eq} (day) (07:00-22:00)	L_{eq} (night) (22:00-07:00)	L_{DN} (dBA)
5	1.8	-8.8	1.6
6	1.8	-8.0	1.9
7	1.7	-7.3	2.1
8	1.7	-6.7	2.4
9	1.6	-6.2	2.6
10	1.6	-5.7	2.8
11	1.5	-5.3	3.0
12	1.5	-5.0	3.2
13	1.4	-4.6	3.4
14	1.4	-4.3	3.5
15	1.3	-4.0	3.7
16	1.3	-3.7	3.9
17	1.2	-3.4	4.0
18	1.2	-3.2	4.2
19	1.1	-3.0	4.3
20	1.1	-2.7	4.5
21	1.0	-2.5	4.6
22	1.0	-2.3	4.7
23	0.9	-2.1	4.9
24	0.8	-1.9	5.0
25	0.8	-1.8	5.1
26	0.7	-1.6	5.2
27	0.7	-1.4	5.4
28	0.6	-1.3	5.5
29	0.6	-1.1	5.6
30	0.5	-1.0	5.7
31	0.4	-0.8	5.8
32	0.4	-0.7	5.9
33	0.3	-0.6	6.0
34	0.2	-0.4	6.1
35	0.2	-0.3	6.2
36	0.1	-0.2	6.3
37	0.0	-0.1	6.4
37.5	0.0	0.0	6.4
38	0.0	0.1	6.5
39	-0.1	0.2	6.5
40	-0.2	0.3	6.6

Leq (Day) = Leq (24 Hours) + Adjustment (Leq (day))
Leq (Night) = Leq (24 Hours) + Adjustment (Leq (night))
Ldn = Leq (24 Hours) + Adjustment (Ldn)

Appendix B

Noise Attenuation Guidelines for Provincial Highways Under Provincial Jurisdiction within Cities and Urban Areas

NOISE ATTENUATION GUIDELINES FOR PROVINCIAL HIGHWAYS UNDER PROVINCIAL JURISDICTION WITHIN CITIES AND URBAN AREAS

Definition:
Noise is defined as the sounds generated by vehicles operating on the highway. It includes but is not limited to engine/exhaust sounds and road contact sounds.

Guidelines:

- For construction or improvements of highways through cities and other urban areas, Alberta Transportation will adopt a noise level of 65 dBA Leq_{24} * measured 1.2 metres above ground the level and 2 metres inside the property line (outside the highway right-of-way). The measurements should be adjusted to the 10 year planning horizon value, as a threshold to consider noise mitigation measures.
- The mitigation of noise issues could include constructing noise walls and/or berms. The decision to implement noise mitigation must consider whether mitigation is cost-effective, technically practical, broadly supported by the affected residents, and fits into overall provincial priorities.
- Any accepted noise mitigation measures consistent with this guideline will be the responsibility of Alberta Transportation. Where established local noise mitigation policies are more stringent than this guideline, the local policy may be considered on a shared responsibility basis.
- Alberta Transportation will be responsible for noise attenuation, in accordance with this guideline, in areas where Alberta Transportation is undertaking widening (by at lease one lane width) or major realignment of an existing road or constructing a new road adjacent to an existing residential development. .
- In areas where a residential subdivision is constructed adjacent to an existing roadway, the development proponent will be responsible for noise attenuation consistent with these guidelines.
- In areas where a residential subdivision is constructed adjacent to a designated highway that has not been constructed, Alberta Transportation will request that the development proponent and approving authority address future noise concerns consistent with these guidelines.

* Noise level expressed in decibels (dB) is taken to mean the A-weighted 24-hour equivalent sound level.

Alberta
TRANSPORTATION

October 2002

Appendix E
Traffic Volumes and Truck Percentages

Southeast Stoney Trail
DBFO
Source: Calgary East Ringroad Functional Pllaning Study 2006
And Information Notice # 9, #10 & # 14 (July 8, 10 & 16, 2009)

Note: Numbers in Blue are revised numbers from AT (Synchro File) and **Black** numbers are from FPS Report
NBL, NBT & NBR = Northbound Left, Northbound Through & Northbound Right Turning Movements
All Volumes are vehicles per hour (vph)

Southeast Stoney Trail and 17 Avenue SE Interchange

		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Short Term	AM Peak	950	**2480**	390	380	**3690**	450	310	310	660	810	1140	740
	PM Peak	440	**2840**	1030	660	**4070**	440	420	1240	440	570	370	530
Long Term	AM Peak	430	**3093**	1060	1280	**4380**	640	140	450	880	880	680	850
	PM Peak	970	**4868**	1040	900	**2962**	120	630	740	450	1130	500	1260

Southeast Stoney Trail and Peigan Trail SE Interchange

		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Short Term	AM Peak	410	**3780**	140	200	**3340**	2160	140	130	200	260	130	210
	PM Peak	120	**4350**	240	190	**4740**	380	420	380	910	200	220	250
Long Term	AM Peak	720	**3768**	140	1270	**3480**	1530	320	380	170	510	530	210
	PM Peak	140	**3878**	500	230	**3704**	340	1330	580	790	130	410	1290

Southeast Stoney Trail and Glenmore Trail SE Interchange

		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Short Term	AM Peak	1510	**3530**	400	330	**2170**	1310	210	500	160	260	1380	130
	PM Peak	230	**2830**	210	380	**4880**	420	1210	1430	450	360	740	210
Long Term	AM Peak	1050	3768	900	525	1980	1350	300	1050	75	150	675	300
FPS Numbers	PM Peak	83	2228	165	330	3704	330	1485	743	1155	990	1155	578

Southeast Stoney Trail and 114 Avenue SE Interchange (New Numbers July 16, 09)

		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Short Term	AM Peak	820	**4680**	620	580	**1210**	1100	100	250	110	180	200	230
	PM Peak	200	**1890**	360	340	**5250**	130	650	230	610	540	160	920
Long Term	AM Peak	250	**5493**	750	900	**1830**	650	380	150	210	140	150	380
	PM Peak	330	**2063**	510	260	**5602**	250	450	165	410	660	165	900

AADT on Main Line Stoney Trail
Based on Factor of 0.20 (derived from nearby Traffic Data 2008) AADT = (AM+PM)/0.2

	Peak Hour Volume						AADT	
	NorthSide		SouthSide					
	AM	PM	AM	PM			NorthSide	SouthSide
NB	3530	3790	3820	4310		NB	36,600	40,650
SB	4520	5170	5160	5080		SB	48,450	51,200
NB	4083	6758	4583	6878		NB	54,210	57,310
SB	6300	3982	6140	4542		SB	51,410	53,410
NB	4130	5020	4330	4710		NB	45,750	45,200
SB	5700	5310	3800	5850		SB	55,050	48,250
NB	4298	6498	4628	4518		NB	53,980	45,730
SB	6280	4274	4160	4624		SB	52,770	43,920
NB	3870	4250	5440	3270		NB	40,600	43,550
SB	3810	5680	2590	5690		SB	47,450	41,400
NB	4368	4291	5718	2476		NB	43,300	40,970
SB	3855	4364	2205	5849		SB	41,100	40,270
NB	5010	3460	6120	2450		NB	42,350	42,850
SB	2890	5720	1500	6400		SB	43,050	39,500
NB	6253	3413	6493	2903		NB	48,330	46,980
SB	3380	6112	2180	6672		SB	47,460	44,260

Southeast Stoney Trail
DBFO
Source: Calgary East Ringroad Functional Pllaning Study 2006
And Information Notice # 9, #10 & # 14 (July 8, 10 & 16, 2009)

Note: Numbers in Blue are revised numbers from AT (Synchro File) and **Black** numbers are from FPS Report
NBL, NBT & NBR = Northbound Left, Northbound Through & Northbound Right Turning Movements
All Volumes are vehicles per hour (vph)

Southeast Stoney Trail and 130 Avenue SE Interchange - Long Term Only

		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Short Term	AM Peak	NA	**4790**	NA	70	**1140**	190	930	50	NA	NA	20	20
FPS	PM Peak	NA	**1945**	NA	20	**5090**	1070	360	30	NA	NA	210	50
Long Term	AM Peak	NA	**5793**	NA	110	**1830**	970	500	110	NA	NA	320	200
	PM Peak	NA	**2063**	NA	170	**5744**	380	960	230	NA	NA	100	140

NA - Not Applicable

Hw 22X and East Freeway/88 Street Interchange

		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Short Term	AM Peak	400	2070	NA	330	410	400	2220	960	180	NA	480	500
FPS Numbers	PM Peak	40	400	NA	630	2360	2100	895	970	370	NA	650	650
Long Term	AM Peak	75	2175	225	75	225	1530	3168	525	8	8	375	450
FPS Numbers	PM Peak	8	248	8	495	2849	2400	1705	413	83	360	653	110

NA - Not Applicable

Southeast Stoney Trail and 52nd Street SE Interchange

		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Short Term	AM Peak	1170	1440	1440	100	560	600	560	2350	560	60	1110	140
	PM Peak	820	600	430	100	1130	900	550	1725	1140	600	2130	300
Long Term	AM Peak	1170	1500	970	160	400	520	320	3000	1300	840	1080	240
	PM Peak	1140	440	770	220	1650	370	660	1210	1680	660	2291	190

Hw 22X and Deerfoot Trail SE Interchange

		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Short Term	AM Peak	840	3440	890	220	1700	200	1500	2000	740	770	1890	100
FPS Numbers	PM Peak	780	1100	810	220	4810	750	1000	2295	1200	1400	1870	300
Long Term	AM Peak	600	3300	1000	600	1100	600	2100	2400	500	600	1180	600
FPS Numbers	PM Peak	550	1210	660	660	3630	2310	660	1320	660	1100	1631	660

AADT on Main Line Stoney Trail
Based on Factor of 0.20 (derived from nearby Traffic Data 2008) AADT = (AM+PM)/0.2

	Peak Hour Volume						AADT	
	NorthSide		SouthSide					
	AM	PM	AM	PM			NorthSide	SouthSide
NB	5740	2355	4790	1945		NB	40,480	33,680
SB	1400	6180	1140	5090		SB	37,900	31,150
NB	6493	3163	5793	2063		NB	48,280	39,280
SB	2910	6294	1830	5744		SB	46,020	37,870
NB	4790	1945	2470	440		NB	33,680	14,550
SB	1140	5090	590	2730		SB	31,150	16,600
NB	5793	2063	2475	264		NB	39,280	13,700
SB	1830	5744	241	3292		SB	37,870	17,670
	WestSide		EastSide					
							WestSide	EastSide
EB	3470	3415	3890	2255		EB	34,430	30,730
WB	2880	3850	1310	3030		WB	33,650	21,700
EB	4620	3550	4130	2200		EB	40,850	31,650
WB	2770	3801	2160	3141		WB	32,860	26,510
EB	4240	4495	3110	3325		EB	43,680	32,180
WB	2930	3400	2760	3570		WB	31,650	31,650
EB	5000	2640	4000	2640		EB	38,200	33,200
WB	2380	4491	2380	3391		WB	34,360	28,860

Southeast Stoney Trail
DBFO
Source: Calgary East Ringroad Functional Pllaning Study 2006
And Information Notice # 9, #10 & # 14 (July 8, 10 & 16, 2009)

Note: Numbers in Blue are revised numbers from AT (Synchro File) and **Black** numbers are from FPS Report
NBL, NBT & NBR = Northbound Left, Northbound Through & Northbound Right Turning Movements
All Volumes are vehicles per hour (vph)

Southeast Stoney Trail and Cranston Blvd SE Interchange

		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Short Term	AM Peak	980	100	950	100	330	780	220	**4325**	100	110	**3330**	110
	PM Peak	440	120	240	100	190	380	430	**4205**	350	750	**3400**	320
Long Term	AM Peak	400	200	600	100	100	400	1100	ND	300	200	ND	100
	PM Peak	300	100	300	100	300	700	300	ND	400	300	ND	100

ND - Data not Available

Southeast Stoney Trail and 196 Avenue SE Interchange

		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Short Term	AM Peak	100	3090	130	970	1510	310	890	520	1400	200	280	160
	PM Peak	160	1170	180	1340	3900	1110	270	400	1300	180	540	50
Long Term	AM Peak	100	ND	150	1050	ND	380	960	620	ND	240	330	ND
	PM Peak	210	ND	240	1300	ND	1440	560	480	ND	220	650	ND

ND - Data not Available

Southeast Stoney Trail and Sunvalley Blvd SE Interchange

		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Short Term	AM Peak	400	300	1600	610	100	200	100	ND	300	900	ND	400
	PM Peak	100	100	800	400	100	200	200	ND	600	1100	ND	600
Long Term	AM Peak	400	300	1600	600	0	200	100	ND	300	900	ND	400
	PM Peak	100	100	800	400	100	200	200	ND	600	1200	ND	400

ND - Data not Available

AADT on Main Line Stoney Trail
Based on Factor of 0.20 (derived from nearby Traffic Data 2008) AADT = (AM+PM)/0.2

	Peak Hour Volume						AADT	
	WestSide		EastSide					
	AM	PM	AM	PM			WestSide	EastSide
EB	4645	4985	5375	4545		EB	48,150	49,600
WB	5090	4220	3550	4470		WB	46,550	40,100
EB	1400	700	700	400		EB	10,500	5,500
WB	800	1000	300	400		WB	9,000	3,500
	NorthSide		SouthSide				NorthSide	SouthSide
NB	4140	1490	3320	1510		NB	28,150	24,150
SB	2790	6350	3110	5380		SB	45,700	42,450
NB	960	560	250	450		NB	7,600	3,500
SB	1430	2740	240	220		SB	20,850	2,300
	WestSide		EastSide					
							WestSide	EastSide
EB	400	800	2210	1200		EB	6,000	17,050
WB	600	300	1300	1700		WB	4,500	15,000
EB	400	800	2200	1200		EB	6,000	17,000
WB	600	300	1300	1600		WB	4,500	14,500

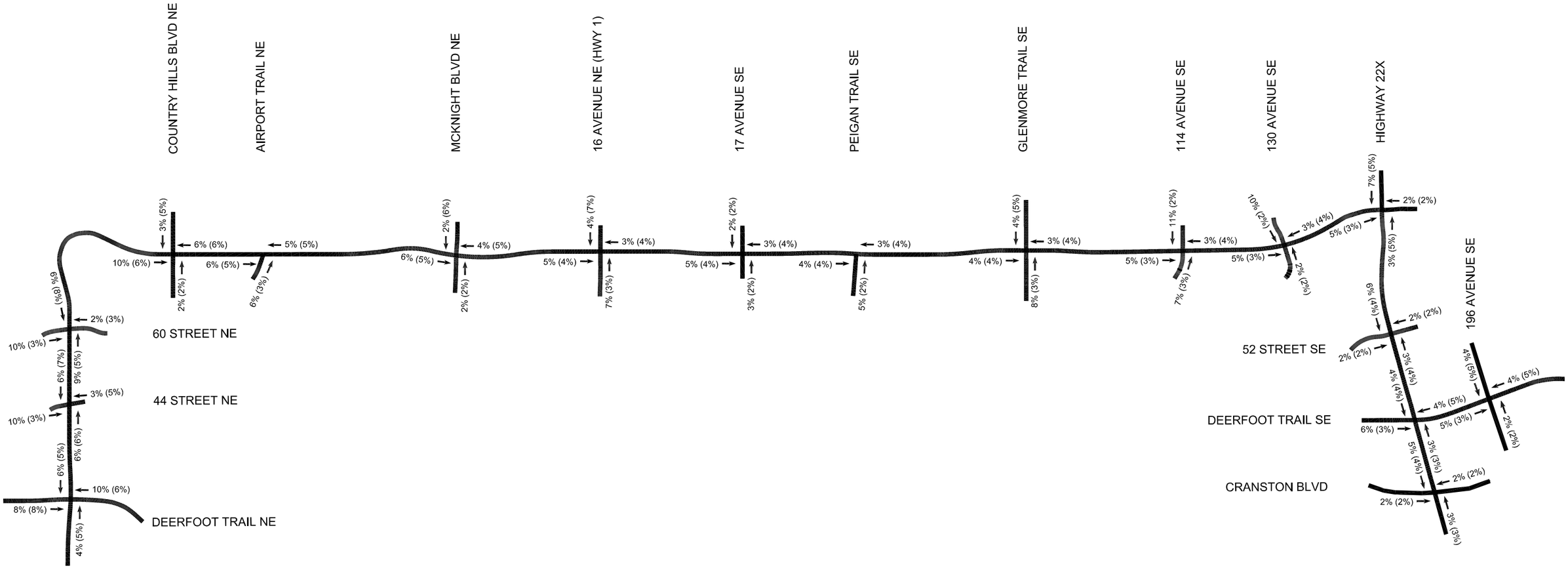
SOUTHEAST STONEY TRAIL
AADT on Main Line Stoney Trail North/South and East/West
Revised Date: July 23, 2009

Use Numbers in Shaded Box for Short Term and Long Term
AADT shown is directional
ND = Data Not Available

Long Term AADT	Short Term AADT				Short Term AADT	Long Term AADT
			16th Avenue			
51,410	48,450				36,600	54,210
			17th Avenue			
53,410	51,200				40,650	57,310
52,770	55,050				45,750	53,980
			Peigan Trail			
43,920	48,250				45,200	45,730
41,100	47,450				40,600	43,300
			Glenmore Trail			
40,270	41,400				43,550	40,970
47,460	43,050				42,350	48,330
			114th Avenue			
44,260	39,500				42,850	46,980
46,020	37,900				40,480	48,280
			130th Avenue			
37,870	31,150				33,680	39,280
37,870	31,150				33,680	39,280

Long Term AADT		ND		ND	34,360	28,860	32,860		26,510	
Short Term AADT		46,550		40,100	31,650	31,650	33,650		21,700	
	Sun Valley Blvd		Cranston Blvd.				Deerfoot Trail		52nd Street	Highway 22X
Short Term AADT		48,150		49,600	43,680	32,180	34,430		30,730	
Long Term AADT		ND		ND	38,200	33,200	40,850		31,650	
				37,950	53,100	39,300	36,600			
				ND	45,700	28,150	ND			
							196 Avenue			
				ND	42,450	24,150	ND			

AADT Calculation Based on Factor of 0.20 which was derived from nearby Traffic Data 2008.



Alberta INFRASTRUCTURE AND TRANSPORTATION		EarthTech A tyco International Ltd. Company	Consultant No.: P-830	Trans Tech Engineering	N.T.S.	CALGARY EAST RING ROAD FUNCTIONAL PLANNING STUDY Stage 1 Design Truck Percentages Morning and Afternoon Peaks - AM (PM)
					STAGE 1	Date: 03/02/06 | Region: Southern | Project No. 86713 | P-3247-16