APPENDIX H

NOISE

Appendix H-1

Acoustical Terminology

Acoustics The science of sound.

Ambient Noise The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.

Attenuation The reduction of an acoustic signal.

A-Weighting A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.

Decibel or dB Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.

CNEL Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.

Frequency The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz.

L_{dn} Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.

L_{eq} Equivalent or energy-averaged sound level.

L_{max} The highest root-mean-square (RMS) sound level measured over a given period of time.

Loudness A subjective term for the sensation of the magnitude of sound.

Masking The amount (or the process) by which the threshold of audibility is for one sound is raised by the presence of another (masking) sound.

Noise Unwanted sound.

Peak Noise The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the "Maximum" level, which is the highest RMS level.

RT_{60} The time it takes reverberant sound to decay by 60 dB once the source has been removed.

Sabin The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 sabin.

Threshold of Hearing The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.

Threshold of Pain Approximately 120 dB above the threshold of hearing.

Appendix H-2
Ambient Noise Monitoring Results - Site 1
Stonegate Subdivision - Chico, California
7/19/2016 - 7/20/16

Hour	Leq	Lmax	L50	L90
11:00	53	65	52	48
12:00	54	68	52	49
13:00	55	65	53	49
14:00	55	65	54	50
15:00	56	72	54	50
16:00	57	67	56	51
17:00	54	62	53	50
18:00	55	67	54	50
19:00	55	78	53	49
20:00	54	64	54	50
21:00	54	64	53	47
22:00	51	62	49	44
23:00	48	59	46	41
0:00	46	59	42	34
1:00	44	58	40	31
2:00	45	57	38	30
3:00	49	60	45	32
4:00	52	66	50	41
5:00	58	68	57	50
6:00	59	67	59	55
7:00	54	63	53	49
8:00	55	63	54	49
9:00	53	63	52	47
10:00	53	62	52	47

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	57	53	55	59	44	53
Lmax (Maximum)	78	62	66	68	57	62
L50 (Median)	56	52	53	59	38	47
L90 (Background)	51	47	49	55	30	40

Computed Ldn, dB	60
% Daytime Energy	69%
% Nighttime Energy	31%

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Appendix H-3
Ambient Noise Monitoring Results - Site 1
Stonegate Subdivision - Chico, California
7/20/2016 - 7/21/16

Hour	Leq	Lmax	L50	L90
11:00	54	67	52	48
12:00	53	61	51	46
13:00	52	63	50	46
14:00	52	62	50	47
15:00	53	62	51	47
16:00	55	63	54	50
17:00	56	73	55	52
18:00	55	67	54	50
19:00	55	63	54	50
20:00	54	62	53	50
21:00	57	85	53	48
22:00	51	61	48	44
23:00	48	61	46	41
0:00	47	70	43	37
1:00	45	63	43	39
2:00	46	59	41	35
3:00	49	60	46	37
4:00	53	63	51	40
5:00	55	63	54	48
6:00	57	63	56	53
7:00	57	65	56	53
8:00	53	62	52	49
9:00	53	66	51	48
10:00	54	64	52	48

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	57	52	54	57	45	52
Lmax (Maximum)	85	61	66	70	59	63
L50 (Median)	56	50	53	56	41	48
L90 (Background)	53	46	49	53	35	41

Computed Ldn, dB	59
% Daytime Energy	76%
% Nighttime Energy	24%

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Appendix H-4
Ambient Noise Monitoring Results - Site 2
Stonegate Subdivision - Chico, California
7/19/2016 - 7/20/16

Hour	Leq	Lmax	L50	L90
12:00	52	69	43	40
13:00	53	70	44	41
14:00	50	67	44	41
15:00	52	68	45	42
16:00	52	69	44	42
17:00	53	68	44	41
18:00	52	70	43	39
19:00	52	68	44	40
20:00	52	69	46	43
21:00	50	67	43	40
22:00	49	69	40	38
23:00	47	71	39	36
0:00	42	67	36	34
1:00	40	64	35	34
2:00	45	76	35	34
3:00	43	68	36	34
4:00	44	66	40	38
5:00	49	68	43	39
6:00	53	71	47	44
7:00	57	79	44	39
8:00	54	70	43	38
9:00	53	70	40	36
10:00	54	68	47	39
11:00	55	78	44	37

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	57	49	53	53	40	47
Lmax (Maximum)	79	67	70	76	64	69
L50 (Median)	47	40	44	47	35	39
L90 (Background)	43	36	40	44	34	37

Computed Ldn, dB	55
% Daytime Energy	88%
% Nighttime Energy	12%

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Appendix H-5
Ambient Noise Monitoring Results - Site 2
Stonegate Subdivision - Chico, California
7/20/2016 - 7/21/16

Hour	Leq	Lmax	L50	L90
12:00	53	68	42	37
13:00	51	67	42	39
14:00	53	75	42	39
15:00	53	68	42	39
16:00	51	69	43	40
17:00	54	73	44	42
18:00	52	70	43	40
19:00	53	71	45	42
20:00	52	68	46	43
21:00	51	69	43	41
22:00	48	69	41	38
23:00	44	67	38	36
0:00	42	67	37	36
1:00	44	70	38	37
2:00	44	69	38	36
3:00	40	62	37	35
4:00	45	67	38	36
5:00	51	71	44	40
6:00	52	71	47	44
7:00	53	70	45	42
8:00	52	69	41	38
9:00	52	69	41	38
10:00	52	69	41	38
11:00	51	66	44	40

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	54	48	52	52	40	47
Lmax (Maximum)	75	66	69	71	62	68
L50 (Median)	46	41	43	47	37	40
L90 (Background)	43	37	40	44	35	37

Computed Ldn, dB	55
% Daytime Energy	86%
% Nighttime Energy	14%

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Appendix H-6
Ambient Noise Monitoring Results - Site 3
Stonegate Subdivision - Chico, California
7/19/2016 - 7/20/16

Hour	Leq	Lmax	L50	L90
12:00	61	76	58	45
13:00	62	72	60	47
14:00	61	72	59	46
15:00	62	77	59	46
16:00	62	71	60	46
17:00	63	74	61	48
18:00	62	73	59	46
19:00	61	74	56	44
20:00	62	81	57	45
21:00	60	72	55	44
22:00	56	74	46	40
23:00	53	69	41	37
0:00	49	67	38	34
1:00	49	70	36	33
2:00	51	73	35	32
3:00	50	71	38	33
4:00	55	73	41	37
5:00	61	75	52	40
6:00	62	73	57	47
7:00	62	77	59	45
8:00	62	77	58	42
9:00	62	76	57	41
10:00	62	78	58	43
11:00	62	78	59	43

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	63	56	62	62	49	56
Lmax (Maximum)	81	71	75	75	67	72
L50 (Median)	61	46	58	57	35	42
L90 (Background)	48	40	44	47	32	36

Computed Ldn, dB	64
% Daytime Energy	86%
% Nighttime Energy	14%

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Appendix H-7
Ambient Noise Monitoring Results - Site 3
Stonegate Subdivision - Chico, California
7/20/2016 - 7/21/16

Hour	Leq	Lmax	L50	L90
12:00	62	72	59	43
13:00	61	74	59	43
14:00	61	76	57	44
15:00	61	73	59	46
16:00	62	76	60	49
17:00	63	85	61	51
18:00	61	75	58	46
19:00	60	74	56	45
20:00	61	72	58	46
21:00	61	84	54	45
22:00	58	71	50	42
23:00	55	72	45	41
0:00	51	70	42	38
1:00	50	71	39	36
2:00	49	69	38	35
3:00	51	71	40	37
4:00	55	72	42	38
5:00	59	71	50	42
6:00	60	73	55	46
7:00	62	72	58	47
8:00	61	72	58	47
9:00	61	75	56	45
10:00	60	75	56	45
11:00	61	73	58	49

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	63	58	61	60	49	55
Lmax (Maximum)	85	71	75	73	69	71
L50 (Median)	61	50	57	55	38	44
L90 (Background)	51	42	46	46	35	39

Computed Ldn, dB	63
% Daytime Energy	88%
% Nighttime Energy	12%

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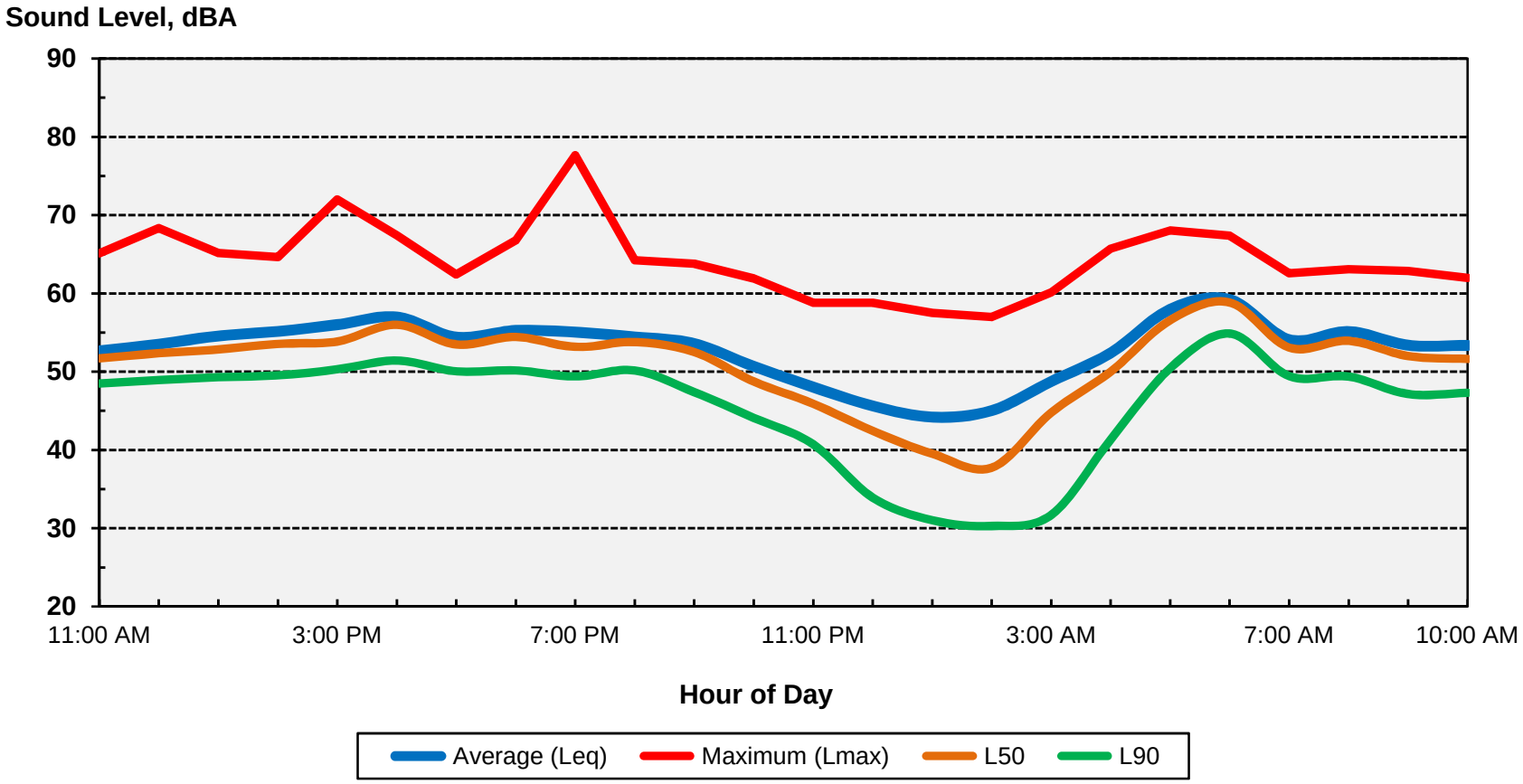
Appendix H-8
Ambient Noise Monitoring Results - Site 1
Stonegate Subdivision - Chico, California
7/19/2016 - 7/20/16



Ldn: 60 dB

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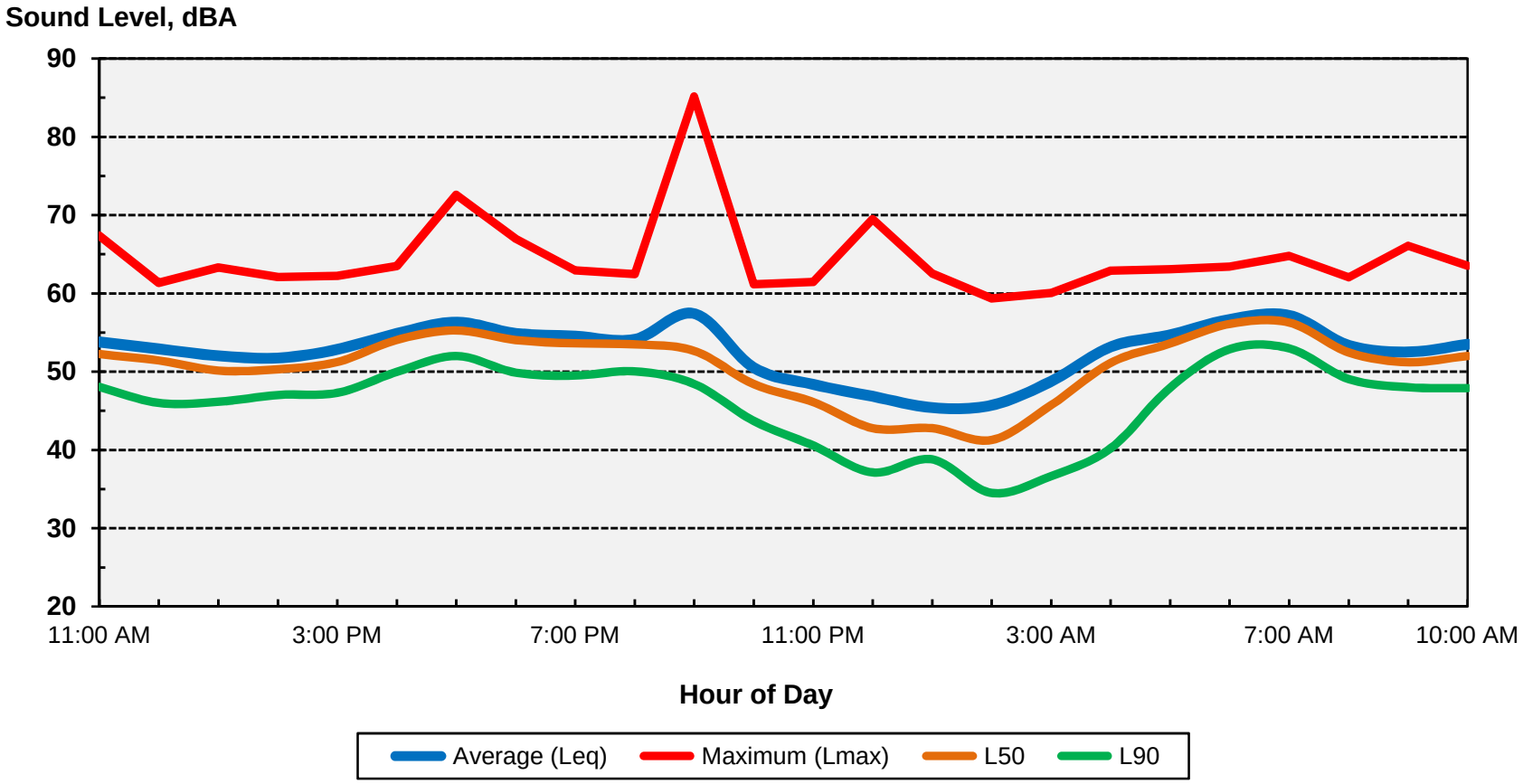
Appendix H-9
Ambient Noise Monitoring Results - Site 1
Stonegate Subdivision - Chico, California
7/20/2016 - 7/21/16



Ldn: 59 dB

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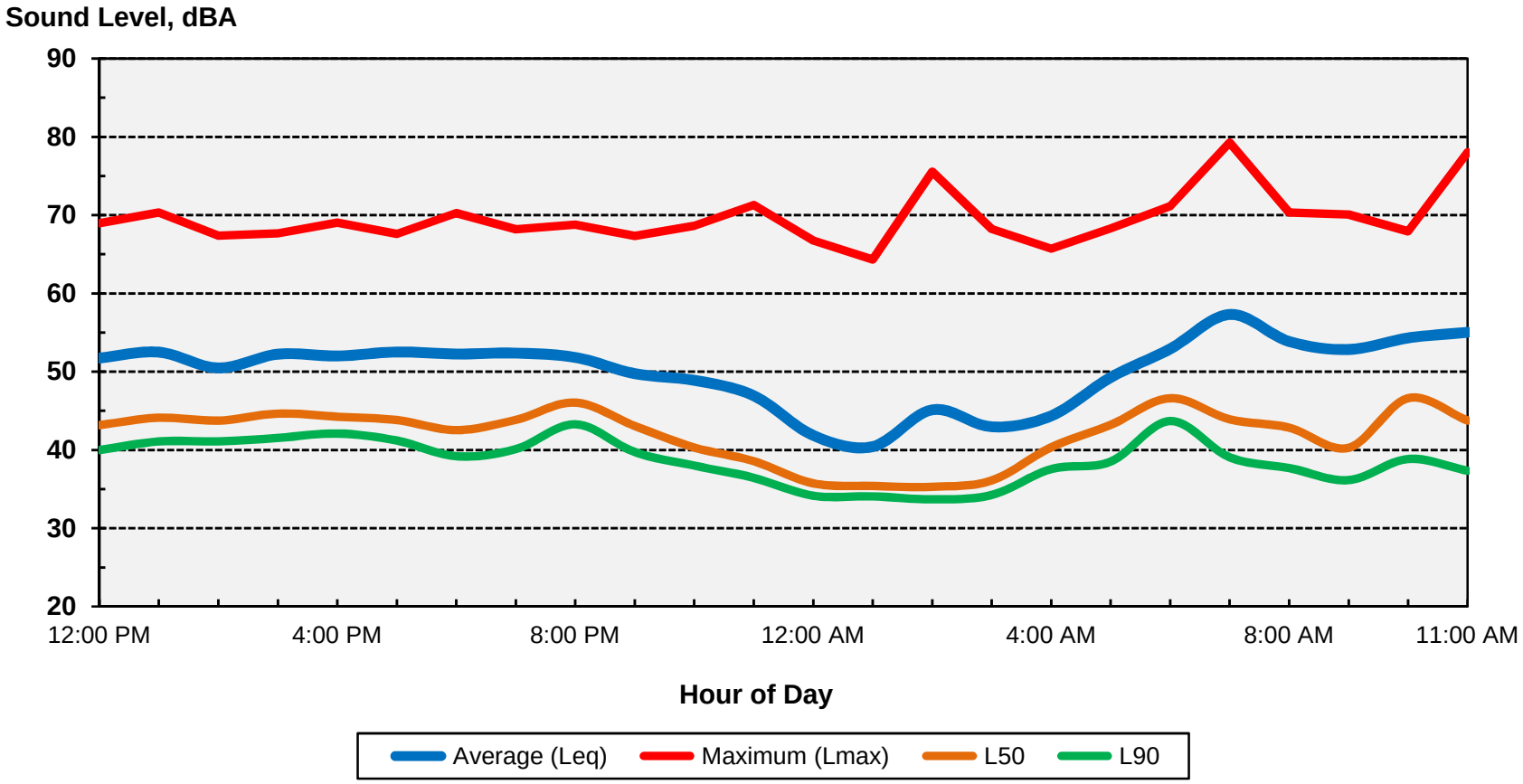
Appendix H-10
Ambient Noise Monitoring Results - Site 2
Stonegate Subdivision - Chico, California
7/19/2016 - 7/20/16



Ldn: 55 dB

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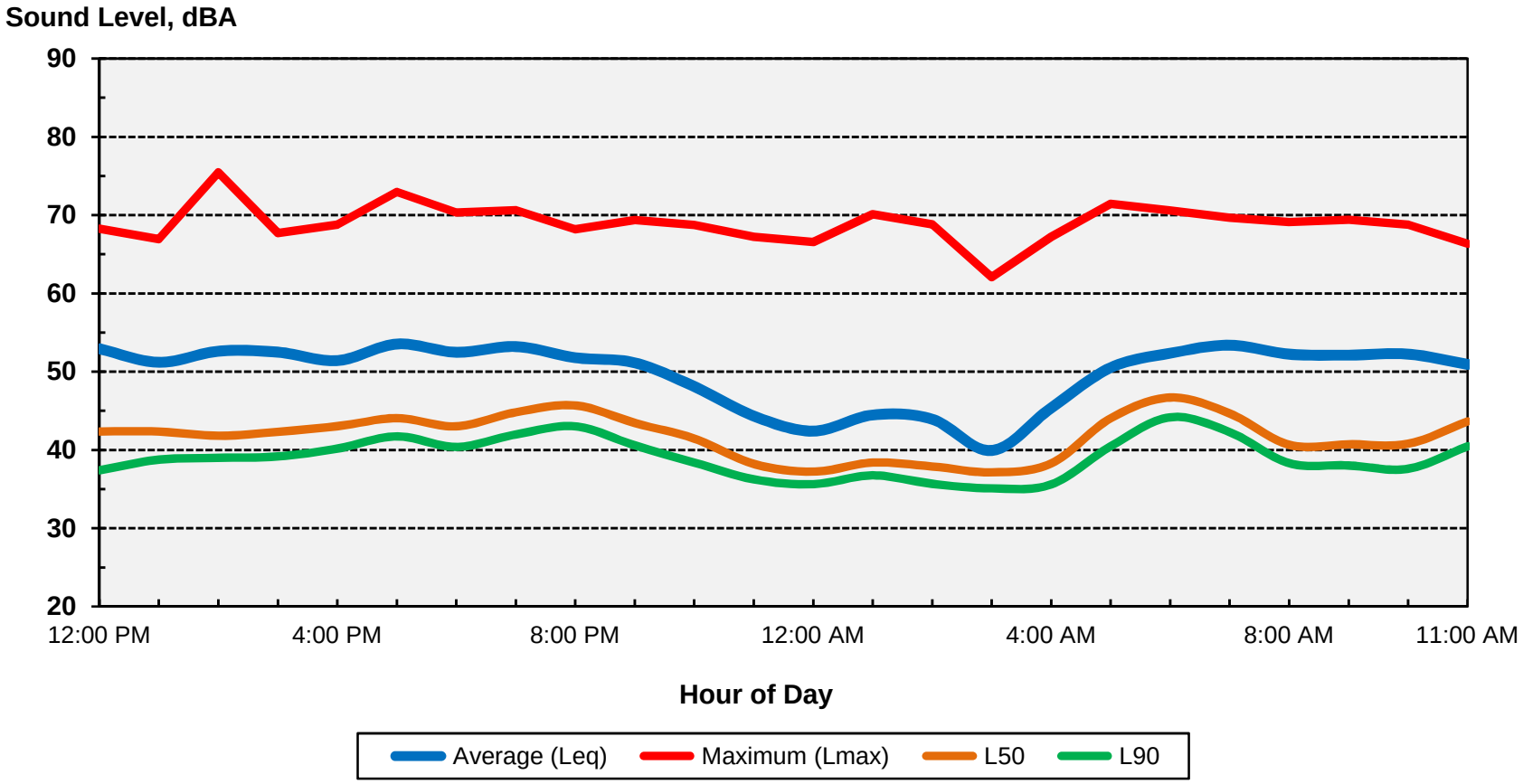
Appendix H-11
Ambient Noise Monitoring Results - Site 2
Stonegate Subdivision - Chico, California
7/20/2016 - 7/21/16



Ldn: 55 dB

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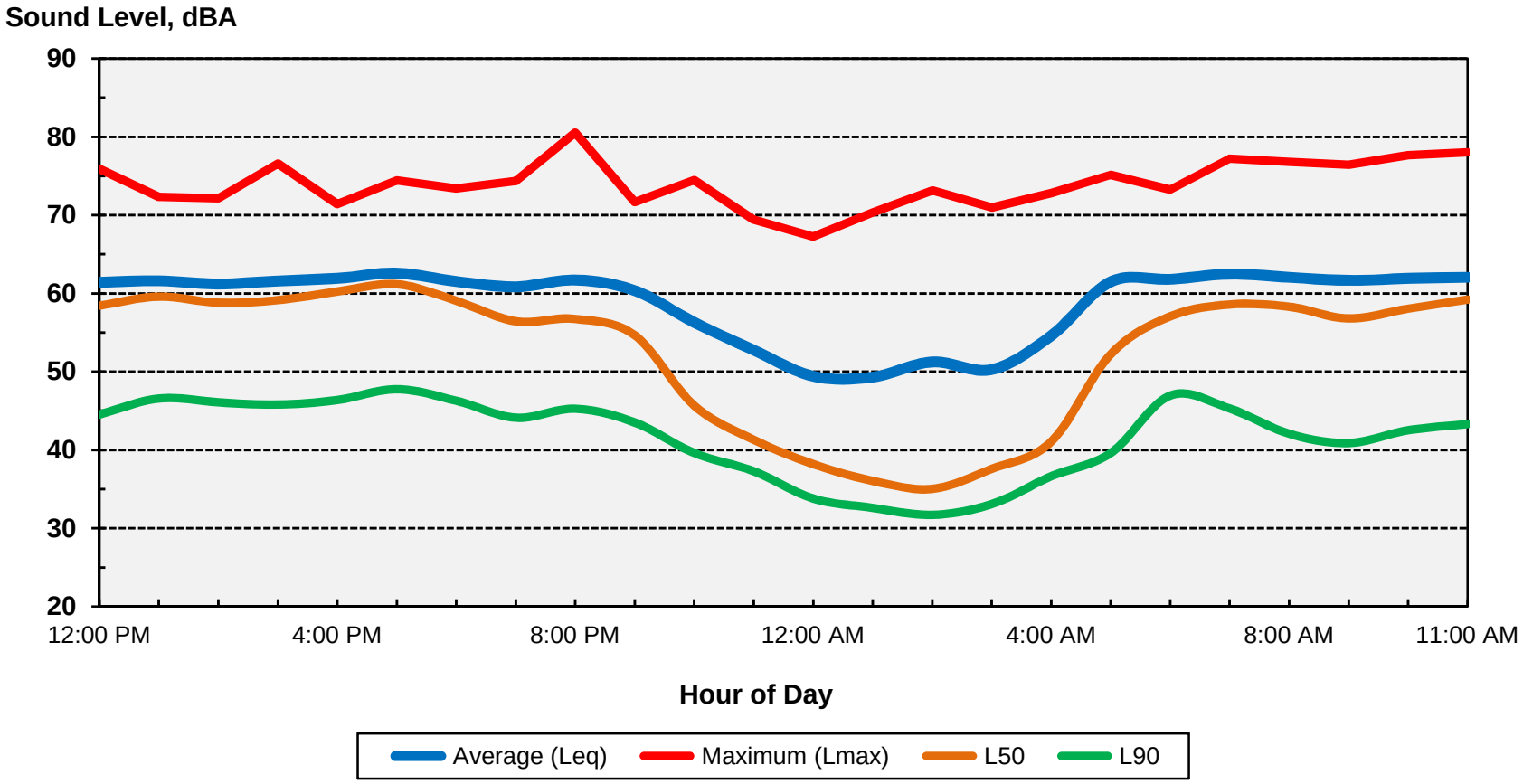
Appendix H-12
Ambient Noise Monitoring Results - Site 3
Stonegate Subdivision - Chico, California
7/19/2016 - 7/20/16



Ldn: 64 dB

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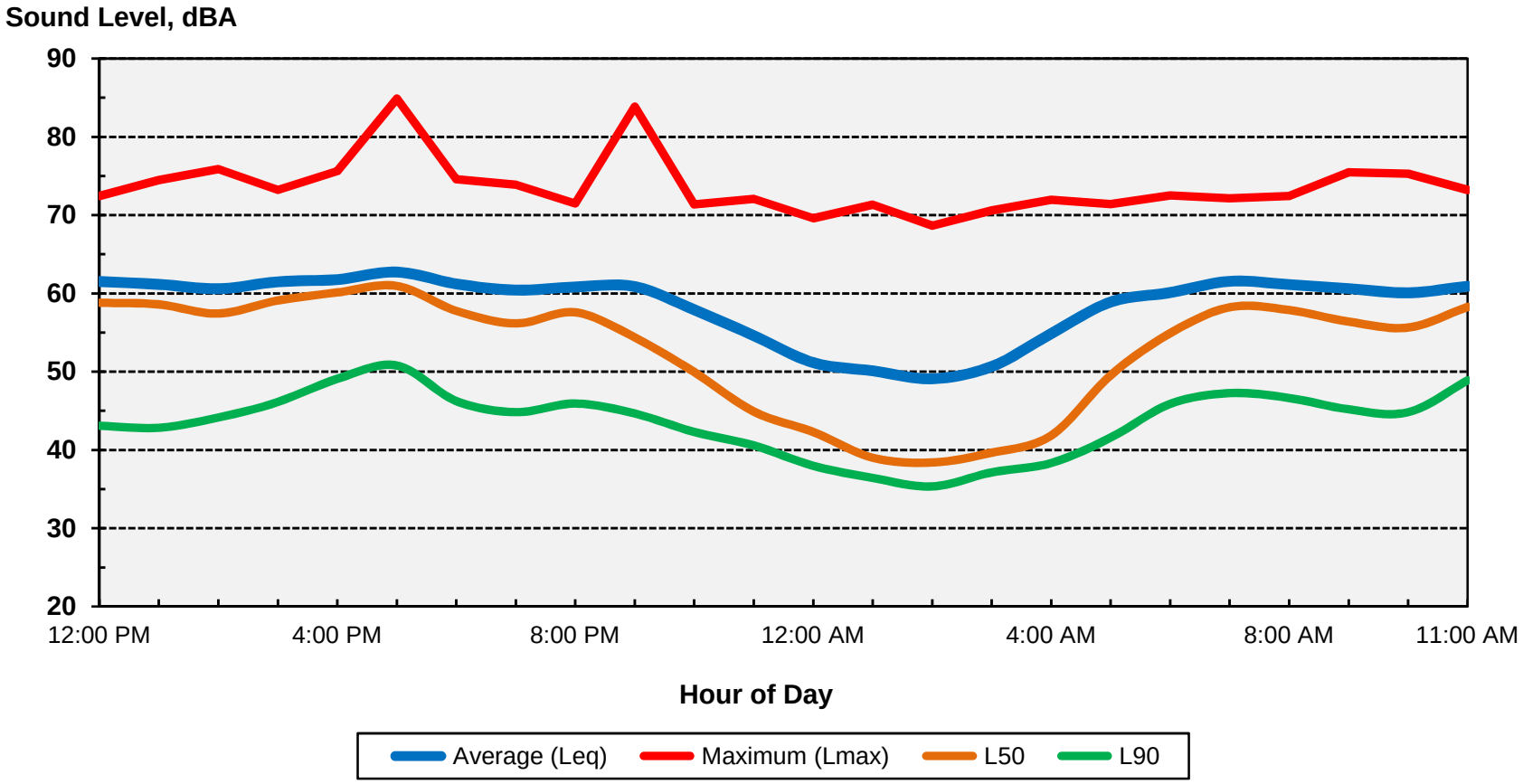
Appendix H-13
Ambient Noise Monitoring Results - Site 3
Stonegate Subdivision - Chico, California
7/20/2016 - 7/21/16



Ldn: 63 dB

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Appendix H-14

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2016-114 Stonegate Subdivision
Description: Existing
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	East 20th Street	W of SR 99 SB Ramps	11,310	84		16	2	1	35	100	
2	East 20th Street	SR 99 NB Ramps to Chico Mall	14,700	84		16	2	1	35	100	
3	East 20th Street	Chico Mall to Forest Ave	13,260	84		16	2	1	35	100	
4	East 20th Street	Forest Ave to Huntington Dr	8,780	84		16	2	1	35	100	
5	East 20th Street	Huntington Dr to Notre Dame Blvd	7,340	84		16	2	1	35	100	
6	East 20th Street	Notre Dame Blvd to Bruce Rd	6,480	84		16	2	1	35	100	
7	East 20th Street	East of Bruce Rd	3,020	84		16	2	1	25	100	
8	Skyway	W of SR 99 SB Ramps	20,950	84		16	2	1	40	100	
9	Skyway	SR 99 NB Ramps to Notre Dame Blvd	32,970	84		16	2	1	35	100	
10	Skyway	Notre Dame Blvd to Forest Ave	22,460	84		16	2	1	45	100	
11	Skyway	Forest Ave to Bruce Rd	20,420	84		16	2	1	45	100	
12	Skyway	East of Bruce Rd	22,830	84		16	2	1	45	100	
13	Notre Dame Blvd	E 20th St to Parkhurst St	2,980	84		16	2	1	25	100	
14	Notre Dame Blvd	Parkhurst St to Jasper Dr	2,620	84		16	2	1	25	100	
15	Notre Dame Blvd	Jasper Dr to Webster Dr	2,850	84		16	2	1	25	100	
16	Notre Dame Blvd	Webster Dr to Forest Ave	2,980	84		16	2	1	25	100	
17	Notre Dame Blvd	Forest Ave to Skyway	9,000	84		16	2	1	35	100	
18	Notre Dame Blvd	South of Skyway	8,410	84		16	2	1	25	100	
19	Bruce Rd	North of E 20th St	9,550	84		16	2	1	45	100	
20	Bruce Rd	E 20th St to Webster Dr	22,000	84		16	2	1	45	100	
21	Bruce Rd	Webster Dr to Raley Blvd	21,900	84		16	2	1	45	100	
22	Bruce Rd	Raley Blvd to Skyway	8,260	84		16	2	1	25	100	
23	Bruce Rd	South of Skyway	1,740	84		16	2	1	25	100	
24	Webster Dr	Notre Dame Blvd to Bruce Rd	800	84		16	2	1	25	100	

Note: Segments 20 and 21 ADTs include project specific intersection for comparative purposes.

Appendix H-15

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2016-114 Stonegate Subdivision
Description: Existing Plus Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	East 20th Street	W of SR 99 SB Ramps	11,670	84		16	2	1	35	100	
2	East 20th Street	SR 99 NB Ramps to Chico Mall	16,210	84		16	2	1	35	100	
3	East 20th Street	Chico Mall to Forest Ave	15,280	84		16	2	1	35	100	
4	East 20th Street	Forest Ave to Huntington Dr	11,890	84		16	2	1	35	100	
5	East 20th Street	Huntington Dr to Notre Dame Blvd	11,000	84		16	2	1	35	100	
6	East 20th Street	Notre Dame Blvd to Bruce Rd	9,580	84		16	2	1	35	100	
7	East 20th Street	East of Bruce Rd	3,880	84		16	2	1	25	100	
8	Skyway	W of SR 99 SB Ramps	21,460	84		16	2	1	40	100	
9	Skyway	SR 99 NB Ramps to Notre Dame Blvd	34,370	84		16	2	1	35	100	
10	Skyway	Notre Dame Blvd to Forest Ave	24,870	84		16	2	1	45	100	
11	Skyway	Forest Ave to Bruce Rd	23,340	84		16	2	1	45	100	
12	Skyway	East of Bruce Rd	23,160	84		16	2	1	45	100	
13	Notre Dame Blvd	E 20th St to Parkhurst St	2,740	84		16	2	1	25	100	
14	Notre Dame Blvd	Parkhurst St to Jasper Dr	2,380	84		16	2	1	25	100	
15	Notre Dame Blvd	Jasper Dr to Webster Dr	2,600	84		16	2	1	25	100	
16	Notre Dame Blvd	Webster Dr to Forest Ave	3,530	84		16	2	1	25	100	
17	Notre Dame Blvd	Forest Ave to Skyway	8,620	84		16	2	1	35	100	
18	Notre Dame Blvd	South of Skyway	8,240	84		16	2	1	25	100	
19	Bruce Rd	North of E 20th St	10,060	84		16	2	1	45	100	
20	Bruce Rd	E 20th St to Webster Dr	11,350	84		16	2	1	45	100	
21	Bruce Rd	Webster Dr to Raley Blvd	10,930	84		16	2	1	45	100	
22	Bruce Rd	Raley Blvd to Skyway	12,260	84		16	2	1	25	100	
23	Bruce Rd	South of Skyway	1,970	84		16	2	1	25	100	
24	Webster Dr	Notre Dame Blvd to Bruce Rd	1,570	84		16	2	1	25	100	

Appendix H-16

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2016-114 Stonegate Subdivision
Description: Cumulative
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	East 20th Street	W of SR 99 SB Ramps	61	54	56	62.5
2	East 20th Street	SR 99 NB Ramps to Chico Mall	62.4	55.2	57.4	64.1
3	East 20th Street	Chico Mall to Forest Ave	62.3	55.1	57.3	64.1
4	East 20th Street	Forest Ave to Huntington Dr	60.9	53.8	55.9	62.7
5	East 20th Street	Huntington Dr to Notre Dame Blvd	61.1	54.0	56.1	62.9
6	East 20th Street	Notre Dame Blvd to Bruce Rd	61.8	54.6	56.8	63.6
7	East 20th Street	East of Bruce Rd	55.0	49.8	54.4	58.4
8	Skyway	W of SR 99 SB Ramps	63.5	55.6	57.4	65.0
9	Skyway	SR 99 NB Ramps to Notre Dame Blvd	63.8	56.6	58.8	65.6
10	Skyway	Notre Dame Blvd to Forest Ave	65.1	56.5	58.0	66.4
11	Skyway	Forest Ave to Bruce Rd	64.7	56.1	57.6	66.0
12	Skyway	East of Bruce Rd	66.3	57.6	59.1	67.5
13	Notre Dame Blvd	E 20th St to Parkhurst St	51.4	46.1	50.7	54.7
14	Notre Dame Blvd	Parkhurst St to Jasper Dr	51.1	45.9	50.5	54.5
15	Notre Dame Blvd	Jasper Dr to Webster Dr	50.8	45.6	50.2	54.2
16	Notre Dame Blvd	Webster Dr to Forest Ave	51.0	45.8	50.4	54.4
17	Notre Dame Blvd	Forest Ave to Skyway	59.1	51.9	54.1	60.9
18	Notre Dame Blvd	South of Skyway	53.0	47.8	52.4	56.4
19	Bruce Rd	North of E 20th St	64.4	55.8	57.3	65.7
20	Bruce Rd	E 20th St to Webster Dr	65.1	56.5	57.9	66.3
21	Bruce Rd	Webster Dr to Raley Blvd	65.0	56.4	57.9	66.3
22	Bruce Rd	Raley Blvd to Skyway	56.8	51.5	56.2	60.1
23	Bruce Rd	South of Skyway	47.9	42.7	47.3	51.3
24	Webster Dr	Notre Dame Blvd to Bruce Rd	43.3	38.1	42.7	46.7

Appendix H-17

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2016-114 Stonegate Subdivision
Description: Cumulative Plus Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	East 20th Street	W of SR 99 SB Ramps	17,100	84		16	2	1	35	100	
2	East 20th Street	SR 99 NB Ramps to Chico Mall	25,600	84		16	2	1	35	100	
3	East 20th Street	Chico Mall to Forest Ave	25,300	84		16	2	1	35	100	
4	East 20th Street	Forest Ave to Huntington Dr	18,900	84		16	2	1	35	100	
5	East 20th Street	Huntington Dr to Notre Dame Blvd	20,000	84		16	2	1	35	100	
6	East 20th Street	Notre Dame Blvd to Bruce Rd	22,800	84		16	2	1	35	100	
7	East 20th Street	East of Bruce Rd	12,400	84		16	2	1	25	100	
8	Skyway	W of SR 99 SB Ramps	27,600	84		16	2	1	40	100	
9	Skyway	SR 99 NB Ramps to Notre Dame Blvd	34,600	84		16	2	1	35	100	
10	Skyway	Notre Dame Blvd to Forest Ave	24,500	84		16	2	1	45	100	
11	Skyway	Forest Ave to Bruce Rd	21,800	84		16	2	1	45	100	
12	Skyway	East of Bruce Rd	29,600	84		16	2	1	45	100	
13	Notre Dame Blvd	E 20th St to Parkhurst St	4,900	84		16	2	1	25	100	
14	Notre Dame Blvd	Parkhurst St to Jasper Dr	4,400	84		16	2	1	25	100	
15	Notre Dame Blvd	Jasper Dr to Webster Dr	4,300	84		16	2	1	25	100	
16	Notre Dame Blvd	Webster Dr to Forest Ave	4,800	84		16	2	1	25	100	
17	Notre Dame Blvd	Forest Ave to Skyway	11,300	84		16	2	1	35	100	
18	Notre Dame Blvd	South of Skyway	7,400	84		16	2	1	25	100	
19	Bruce Rd	North of E 20th St	19,700	84		16	2	1	45	100	
20	Bruce Rd	E 20th St to Webster Dr	22,000	84		16	2	1	45	100	
21	Bruce Rd	Webster Dr to Raley Blvd	21,900	84		16	2	1	45	100	
22	Bruce Rd	Raley Blvd to Skyway	21,300	84		16	2	1	25	100	
23	Bruce Rd	South of Skyway	2,500	84		16	2	1	25	100	
24	Webster Dr	Notre Dame Blvd to Bruce Rd	1,100	84		16	2	1	25	100	

Appendix H-18

FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Calibration Worksheet

Project Information:	Job Number:	2016-114
	Project Name:	Stonegate Subdivision
	Roadway Tested:	Bruce Road
	Test Location:	Site A
	Test Date:	July 19, 2016
Weather Conditions:	Temperature (Fahrenheit):	73
	Relative Humidity:	43%
	Wind Speed and Direction:	S 9mph
	Cloud Cover:	Clear
Sound Level Meter:	Sound Level Meter:	LDL Model 820 (BAC #8)
	Calibrator:	LDL Model CAL200
	Meter Calibrated:	Immediately before
	Meter Settings:	A-weighted, slow response
Microphone:	Microphone Location:	On project site
	Distance to Centerline (feet):	75
	Microphone Height:	5 feet above ground
	Intervening Ground (Hard or Soft):	**Soft**
	Elevation Relative to Road (feet):	5
Roadway Condition:	Pavement Type	Asphalt
	Pavement Condition:	Good
	Number of Lanes:	2
	Posted Maximum Speed (mph):	45
Test Parameters:	Test Time:	12:00 PM
	Test Duration (minutes):	15
	Observed Number Automobiles:	168
	Observed Number Medium Trucks:	3
	Observed Number Heavy Trucks:	2
	Observed Average Speed (mph):	45
Model Calibration:	Measured Average Level (L_{eq}):	62.7
	Level Predicted by FHWA Model:	63.1
	Difference:	***0.5 dB***

Conclusions:

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Appendix H-19

FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Calibration Worksheet

Project Information:	Job Number:	2016-114
	Project Name:	Stonegate Subdivision
	Roadway Tested:	Skyway Road
	Test Location:	Site B
	Test Date:	July 19, 2016
Weather Conditions:	Temperature (Fahrenheit):	73
	Relative Humidity:	43%
	Wind Speed and Direction:	S 9mph
	Cloud Cover:	Clear
Sound Level Meter:	Sound Level Meter:	LDL Model 820 (BAC #8)
	Calibrator:	LDL Model CAL200
	Meter Calibrated:	Immediately before
	Meter Settings:	A-weighted, slow response
Microphone:	Microphone Location:	On project site
	Distance to Centerline (feet):	350
	Microphone Height:	5 feet above ground
	Intervening Ground (Hard or Soft):	**Soft**
	Elevation Relative to Road (feet):	5
Roadway Condition:	Pavement Type	Asphalt
	Pavement Condition:	Good
	Number of Lanes:	4
	Posted Maximum Speed (mph):	45
Test Parameters:	Test Time:	12:00 PM
	Test Duration (minutes):	15
	Observed Number Automobiles:	482
	Observed Number Medium Trucks:	14
	Observed Number Heavy Trucks:	15
	Observed Average Speed (mph):	45
Model Calibration:	Measured Average Level (L_{eq}):	56.5
	Level Predicted by FHWA Model:	58.9
	Difference:	***2.4 dB***

Conclusions:

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Appendix H-20

FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Prediction Worksheet

Project Information:

Job Number: 2016-114
Project Name: Stonegate Subdivision
Roadway Name: East 20th Street

Traffic Data:

Year:	Future
Average Daily Traffic Volume[1]:	12,400
Percent Daytime Traffic:	87
Percent Nighttime Traffic:	13
Percent Medium Trucks (2 axle):	1
Percent Heavy Trucks (3+ axle):	1
Assumed Vehicle Speed (mph):	25
Intervening Ground Type (hard/soft):	**Soft**

Traffic Noise Levels:

				----------L_{dn}, dB----------			
Location	**Description**	**Distance**	**Offset (dB)[2]**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**
1	Nearest backyards	45	0	60	52	59	63
2	Nearest first-floor facades	60	0	58	50	57	61
3	Nearest upper-level facades	60	3	61	53	60	64

Traffic Noise Contours (No Calibration Offset):

L_{dn} Contour, dB	Distance from Centerline, (ft)
75	7
70	15
65	33
60	71

Notes:

[1] Future average daily traffic volume (Cumulative Plus Project Conditions) was calculated by using peak hour traffic volume data obtained from the Stonegate Subdivision Traffic Impact Analysis prepared by Fehr & Peers (2016). Specifically, future peak hour traffic volumes were estimated by conservatively multiplying peak hour conditions by a factor of 10.

[2] A +3 dB offset was applied at upper-level facades to account for reduced ground absorption at elevated locations.

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Appendix H-21

FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Prediction Worksheet

Project Information:

Job Number: 2016-114
Project Name: Stonegate Subdivision
Roadway Name: Bruce Road

Traffic Data:

Year:	Future
Average Daily Traffic Volume[1]:	22,000
Percent Daytime Traffic:	87
Percent Nighttime Traffic:	13
Percent Medium Trucks (2 axle):	2
Percent Heavy Trucks (3+ axle):	2
Assumed Vehicle Speed (mph):	45
Intervening Ground Type (hard/soft):	**Soft**

Traffic Noise Levels:

				----------L_{dn}, dB----------			
Location	**Description**	**Distance**	**Offset (dB)[2]**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**
1	Nearest backyards	75	0	66	58	62	68
2	Nearest first-floor facades	90	0	65	57	61	67
3	Nearest upper-level facades	90	3	68	60	64	70

Traffic Noise Contours (No Calibration Offset):

L_{dn} Contour, dB	Distance from Centerline, (ft)
75	27
70	57
65	123
60	266

Notes:

[1] Future average daily traffic volume (Cumulative Plus Project Conditions) was calculated by using peak hour traffic volume data obtained from the Stonegate Subdivision Traffic Impact Analysis prepared by Fehr & Peers (2016). Specifically, future peak hour traffic volumes were estimated by conservatively multiplying peak hour conditions by a factor of 10.

[2] A +3 dB offset was applied at upper-level facades to account for reduced ground absorption at elevated locations.

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Appendix H-22

FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Prediction Worksheet

Project Information:

Job Number: 2016-114
Project Name: Stonegate Subdivision
Roadway Name: Skyway Road

Traffic Data:

Year:	Future
Average Daily Traffic Volume[1]:	28,900
Percent Daytime Traffic:	73
Percent Nighttime Traffic:	27
Percent Medium Trucks (2 axle):	2
Percent Heavy Trucks (3+ axle):	2
Assumed Vehicle Speed (mph):	45
Intervening Ground Type (hard/soft):	**Soft**

Traffic Noise Levels:

				----------L_{dn}, dB----------			
Location	**Description**	**Distance**	**Offset (dB)[2]**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**
1	Nearest backyards	265	0	61	53	57	63
2	Nearest first-floor facades	285	0	61	52	57	63
3	Nearest upper-floor facades	285	3	64	55	60	66

Traffic Noise Contours (No Calibration Offset):

L_{dn} Contour, dB	Distance from Centerline, (ft)
75	43
70	93
65	201
60	432

Notes:

[1] Future average daily traffic volume (Cumulative Plus Project Conditions) was calculated by using peak hour traffic volume data obtained from the Stonegate Subdivision Traffic Impact Analysis prepared by Fehr & Peers (2016). Specifically, future peak hour traffic volumes were estimated by conservatively multiplying peak hour conditions by a factor of 10.

[2] A +3 dB offset was applied at upper-level facades to account for reduced ground absorption at elevated locations.

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Appendix H-23

FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number: 2016-114
Project Name: Stonegate Subdivision
Roadway Name: Bruce Road
Location(s): Nearest backyards

Noise Level Data:

Year: Future
Auto L_{dn}, dB: 66
Medium Truck L_{dn}, dB: 58
Heavy Truck L_{dn}, dB: 62

Site Geometry:

Receiver Description: Nearest backyards
Centerline to Barrier Distance (C_1): 60
Barrier to Receiver Distance (C_2): 15
Automobile Elevation: 0
Medium Truck Elevation: 2
Heavy Truck Elevation: 8
Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 6

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height[2] (ft)	L_{dn}, dB Autos	Medium Trucks	Heavy Trucks	Total	Barrier Breaks Line of Sight to… Autos?	Medium Trucks?	Heavy Trucks?
6	6	60	52	57	**62**	Yes	Yes	Yes
7	7	59	51	57	**61**	Yes	Yes	Yes
8	8	57	49	55	**60**	Yes	Yes	Yes
9	9	56	48	54	**59**	Yes	Yes	Yes
10	10	55	47	53	**58**	Yes	Yes	Yes
11	11	54	46	52	**57**	Yes	Yes	Yes
12	12	53	45	51	**56**	Yes	Yes	Yes
13	13	53	44	50	**55**	Yes	Yes	Yes
14	14	52	44	49	**54**	Yes	Yes	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s)

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Appendix H-24

FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number: 2016-114
Project Name: Stonegate Subdivision
Roadway Name: Bruce Road
Location(s): Nearest first-floor facades

Noise Level Data:

Year: Future
Auto L_{dn}, dB: 65
Medium Truck L_{dn}, dB: 57
Heavy Truck L_{dn}, dB: 61

Site Geometry:

Receiver Description: Nearest first-floor facades
Centerline to Barrier Distance (C_1): 60
Barrier to Receiver Distance (C_2): 30
Automobile Elevation: 0
Medium Truck Elevation: 2
Heavy Truck Elevation: 8
Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 6

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height[2] (ft)	L_{dn}, dB				Barrier Breaks Line of Sight to…		
		Autos	Medium Trucks	Heavy Trucks	Total	Autos?	Medium Trucks?	Heavy Trucks?
6	6	59	51	56	**61**	Yes	Yes	No
7	7	58	50	56	**60**	Yes	Yes	Yes
8	8	57	49	55	**59**	Yes	Yes	Yes
9	9	56	48	54	**58**	Yes	Yes	Yes
10	10	55	47	53	**58**	Yes	Yes	Yes
11	11	54	46	52	**57**	Yes	Yes	Yes
12	12	53	45	51	**56**	Yes	Yes	Yes
13	13	53	45	51	**55**	Yes	Yes	Yes
14	14	52	44	50	**54**	Yes	Yes	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s)

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