# Appendix F

## Noise Modeling

Project: UCP Update/VST Specific Plan (existing Leq)         Input         Output           Noise Level Description:         Leq         Output           Distance to Directional           Traffic K-Factor: 10         Distance to Contour, (feet),           Number Name From To         ADT (mph) Near Far % Auto % Medium % Heavy % See % Night (dBA) <sub>56.7</sub> Centerline, (feet),
Injut         Unitse Level Descriptor: Eq Site Conditions: Hand Traffic K-factor: 10         Output         Output         Output           Nome is level Description and Location Traffic K-factor: 10         Segment Description and Location Directional         Traffic K-factor: 10         Centerline, (teet), ADT         Traffic Distribution Characteristic         Leq, Distance to Construction         Distance to Construction           Number         From         To         ADT         (mph)         Near         Far         % Auto         % Medium         % Leq, % Middlum         Distance to Construction         Seed         65 dBA         60 dBA           1         Bellevue Road         Snelling Hwy to G St         7,000         55         100         100         97,0%         2.0%         1.0%         80.0%         15.0%         67.4         12         36         12         38         121         344         467           3         Lake Road         Gampus Pkwy to Myeres Gate Road         64.00         55         100         100         97.0%         2.0%         1.0%
Noise Level Description: Hard Traffic hou: ADT Traffic Lot: 10         Distance to Directional         Value
Segment Description and Location         Speed         Center life(1)         Traffic Distribution Diraction         Leq.         Distribution Diraction         Description         Speed         Center life(1)         Traffic Distribution Diraction         Description         Speed         Center life(1)         Number         Number         Nome         Far         % Auto         % Medium         % Heav         % Day         % Leq.         Distribution Diraction         Distribution         Medium         % Heav         % Day         % Leq.         Number
Number         Name         From         To         MDT         (mph)         Near         Far         % Auto         % Medium         % Haiv         % Night         (dBA) <sub>5,67</sub> 75 dBA         70 dBA         65 dBA         60 dBA           ########
########         50         50         100         100         97.0%         2.0%         1.0%         80.0%         15.0%         5.0%         65.8         12         38         13         384           2         Bellevue Road         G St to Lake Road         7,500         55         100         100         97.0%         2.0%         1.0%         80.0%         15.0%         5.0%         67.4         17         55         173         547           3         Lake Road         Campus Pkwy to Meyers Gate Road         6,400         55         100         100         97.0%         2.0%         1.0%         80.0%         15.0%         5.0%         66.7         15         47         148         467           4         Lake Road         Meyers Gate Road to Cardella Road         6,400         55         100         100         97.0%         2.0%         1.0%         80.0%         15.0%         5.0%         66.7         15         47         148         467           5         Lake Road         Cardella Road to Yosemite Ave         35         100         100         97.0%         2.0%         1.0%         80.0%         15.0%         5.0%         66.6         145         459 <t< th=""></t<>
1         Bellevue Road         Snelling Hwy to G St         7,000         50         100         100         97.0%         2.0%         1.0%         80.0%         15.0%         50.8         12         38         121         384           2         Bellevue Road         G St to Lake Road         7,500         55         100         100         97.0%         2.0%         1.0%         80.0%         15.0%         67.4         17         55         173         547           3         Lake Road         Campus Pkwy to Meyers Gate Road         6,400         55         100         100         97.0%         2.0%         1.0%         80.0%         15.0%         56.7         15         47         148         467           5         Lake Road         Cardella Road to Yosemite Ave         6,300         55         100         100         97.0%         2.0%         1.0%         80.0%         15.0%         5.0%         66.6         15         46         145         459           5         Lake Road         Cardella Road to Yosemite Ave         35         100         100         97.0%         2.0%         1.0%         80.0%         15.0%         5.0%           35         100         100
1       Bellevue Road       Snelling Hwy to G St       7,000       50       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       65.8       12       38       121       384         2       Bellevue Road       G St to Lake Road       7,500       55       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       67.4       17       55       173       547         3       Lake Road       Campus Pkwy to Meyers Gate Road to Cardella Road       6,400       55       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.7       15       47       148       467         4       Lake Road       Cardella Road to Yosemite Ave       6,300       55       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.6       15       46       145       459         5       Lake Road       Cardella Road to Yosemite Ave       6,300       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.6       15       46       145       459         35       100       100
2       Bellevue Road       G St to Lake Road       7,500       55       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       67.4       17       55       173       547         3       Lake Road       Campus Pkwy to Meyers Gate Road       6,400       55       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.7       15       47       148       467         4       Lake Road       Meyers Gate Road to Cardella Road       6,400       55       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.7       15       47       148       467         5       Lake Road       Cardella Road to Cardella Road       6,400       55       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.6       15       46       145       459         35       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.6       15       46       145       459         35       100       100       97.0%       2.0%       1.0%       80.0% </td
3       Lake Road       Campus Pkwy to Meyers Gate Road       6,400       55       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.7       15       47       148       467         4       Lake Road       Meyers Gate Road to Cardella Road       6,400       55       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.7       15       47       148       467         5       Lake Road       Cardella Road to Yosemite Ave       6,300       55       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.6       15       46       145       459         35       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.6       15       46       145       459         35       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.6       15       46       145       459         35       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.6       15       45
4       Lake Road       Meyers Gate Road to Cardella Road       6,400       55       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.7       15       47       148       467         5       Lake Road       Cardella Road to Yosemite Ave       6,300       55       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.6       15       46       145       459         35       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.6       15       46       145       459         35       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       5.0%       5.0%       5.0%       5.0%       5.0%       5.0%       5.0%       35       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5
5       Lake Road       Cardella Road to Yosemite Ave       6,300       55       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       66.6       15       46       145       459         35       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       5.0%       5.0%       5.0%       5.0%       5.0%       5.0%       5.0%       35       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       5.0%       5.0%       5.0%       35       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       5.0%       35       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       5.0%       35       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       5.0%       35       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       5.0%       35       100       100       97.0%       2.0%       1.0%       80.0%       15.0%       5.0%       5.0%       35       100       100       97.0%<
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35         100         100         97.0%         2.0%         1.0%         80.0%         15.0%         5.0%           35         100         100         97.0%         2.0%         1.0%         80.0%         15.0%         5.0%
$\frac{35}{100}$ 100 97.0% 2.0% 1.0% 80.0% 15.0% 5.0%
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35 LUU LUU 97.0% 2.0% 1.0% 80.0% 5.0%
33 100 100 $37.0%$ 2.0% 1.0% $0.0%$ 5.0% $5.0%$
35 100 100 57.0% 2.0% 1.0% 50.0% 5.0% 35 100 100 97.0% 2.0% 1.0% 50.0% 5.0%



Traffic	Noise Spreadshe	et Calculator																
Project	UCP Update/VS	ST Specific Plan (existing Ldn)	)															
								Input	t							Output		
	Noise Level D Site Co Tra Traffic	escriptor: Ldn onditions: Hard ffic Input: ADT K-Factor:				Distar Direct	nce to tional											
		Segment Description and L	ocation		Speed	Centerlin	e, (feet) <sub>4</sub>		Traffic D	istribution	Characte	ristics		Ldn,	Di	stance to Co	ntour, (feet	)3
Numbe	Name	From	То	ADT	(mph)	Near	Far	% Auto	% Medium	% Heavy	% Day	% Eve	% Night	(dBA) <sub>5,6,7</sub>	75 dBA	70 dBA	65 dBA	60 dBA
######	#																	1
1	Bellevue Road	Snelling Hwy to G St		7,000	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	63.7	7	23	73	232
2	Bellevue Road	G St to Lake Road		7,500	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	65.2	10	33	104	330
3	Lake Road	Campus Pkwy to Mey	ers Gate Road	6,400	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	64.5	9	28	89	282
4	Lake Road	Meyers Gate Road to	Cardella Road	6,400	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	64.5	9	28	89	282
5	Lake Road	Cardella Road to Yose	emite Ave	6,300	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	64.4	9	28	88	277
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					55	200	200	2.1070	2.070	2.070	22.070		2.070					



Traffic I	Noise Spreadsheet C	Calculator																
Project:	UCP Update/VST S	pecific Plan (2023 Plus Project Ldn)																
								Input	:							Output		
	Noise Level Descri Site Condit Traffic II Traffic K-Fa	iptor: Ldn tions: Hard nput: ADT actor:				Distano Directio	e to onal											
		Segment Description and Location			Speed	Centerline	, (feet) <sub>4</sub>		Traffic Di	istribution	Character	ristics		Ldn,	Dis	tance to Co	ntour, (feet)	3
Number	Name	From	То	ADT	(mph)	Near	Far	% Auto	% Medium	% Heavy	% Day	% Eve	% Night	(dBA) <sub>5,6,7</sub>	75 dBA	70 dBA	65 dBA	60 dBA
1	Bellevue Road	Snelling Hwy to G St		11,500	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	65.8	12	38	121	381
2	Bellevue Road	G St to Lake Road		14,300	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	68.0	20	63	199	630
3	Lake Road	Campus Pkwy to Meyers Gate Ro	bad	n/a	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
4	Lake Road	Meyers Gate Road to Cardella Ro	bad	800	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	55.5	1	4	11	35
5	Lake Road	Cardella Road to Yosemite Ave		900	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	56.0	1	4	13	40
6	Campus Parkway	Bellevue Road to Meyers Gate Re	oad	14,700	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	68.1	20	65	205	647
7	Campus Parkway	Meyers Gate Road to Cardella Ro	bad	15,800	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	68.4	22	70	220	696
8	Campus Parkway	Cardella Road to Yosemite Ave		13,700	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	67.8	19	60	191	603
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
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					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					



Traffic	Noise Spreadshee	et Calculator															OWBONMEN	
Project:	UCP Update/VS	T Specific Plan (2042 Plus Pro	oject Ldn)													_		
	Noise Level De Site Co Traf Traffic	escriptor: Ldn nditions: Hard fic Input: ADT K-Factor:				Distar	nce to	Inpu	t							Output		
						Direc	tional				a .				D	internet to Cr	mtour lfoot	<b>,</b>
Number	Nome	Segment Description and Lo	Te		Speed	Neer	re, (reet) <sub>4</sub>	0/ A.uto	I rattic L		Characte		0/ Niaht	Lan, (dRA)				/3 CO 4DA
Number	Name	From	10	ADT	(mpn)	Near	Far	% Auto	% iviedium	% Heavy	% Day	% EVe	% Night	(UBA) <sub>5,6,7</sub>	75 dBA	70 dBA	65 GBA	60 dBA
#######																		
1	Pollovuo Pood	Spolling Hugeto C St		22 500	EO	100	100	07.0%	2.0%	1.0%	<u>80.0%</u>	15.0%	E 0%	69 7	24	75	226	746
2	Bellevue Road	G St to Lake Road		33,900	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	71 7	24 47	149	472	1493
3	Lake Road	Campus Pkwy to Meye	ers Gate Road	n/a	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	/1./	47	145	472	1455
4	Lake Road	Meyers Gate Road to	Cardella Road	3,800	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	62.2	5	17	53	167
5	Lake Road	Cardella Road to Yose	mite Ave	4,000	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	62.5	6	18	56	176
6	Campus Parkway	Bellevue Road to Mey	ers Gate Road	16,200	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	68.5	23	71	226	713
7	Campus Parkway	Meyers Gate Road to	Cardella Road	19,000	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	69.2	26	84	265	837
8	Campus Parkway	Cardella Road to Yose	mite Ave	21,300	55	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	69.7	30	94	297	938
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					
					35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%					



#### Citation # Citations

- 1 Caltrans Technical Noise Supplement. 2009 (November). Table (5-11), Pg 5-60.
- 2 Caltrans Technical Noise Supplement. 2009 (November). Equation (5-26), Pg 5-60.
- 3 Caltrans Technical Noise Supplement. 2009 (November). Equation (2-16), Pg 2-32.
- 4 Caltrans Technical Noise Supplement. 2009 (November). Equation (5-11), Pg 5-47, 48.
- 5 Caltrans Technical Noise Supplement. 2009 (November). Equation (2-26), Pg 2-55, 56.
- 6 Caltrans Technical Noise Supplement. 2009 (November). Equation (2-27), Pg 2-57.
- 7 Caltrans Technical Noise Supplement. 2009 (November). Pg 2-53.
- 8 Caltrans Technical Noise Supplement. 2009 (November). Equation (5-7), Pg 5-45.
- 9 Caltrans Technical Noise Supplement. 2009 (November). Equation (5-8), Pg 5-45.
- 10 Caltrans Technical Noise Supplement. 2009 (November). Equation (5-9), Pg 5-45.
- 11 Caltrans Technical Noise Supplement. 2009 (November). Equation (5-13), Pg 5-49.
- 12 Caltrans Technical Noise Supplement. 2009 (November). Equation (5-14), Pg 5-49.
- Caltrans Technical Noise Supplement. 2013 (September). Table (4-2), Pg 4-17. Caltrans Technical Noise Supplement. 2013 (September). Equation (4-5), Pg 4-17. FHWA 2004 TNM Version 2.5 FHWA 2004 TNM Version 2.5 Caltrans Technical Noise Supplement. 2013 (September). Equation (2-23), Pg 2-51 Caltrans Technical Noise Supplement. 2013 (September). Equation (2-24), Pg 2-55 Caltrans Technical Noise Supplement. 2013 (September). Equation (2-24), Pg 2-55 Caltrans Technical Noise Supplement. 2013 (September). Pg 2-57. FHWA 2004 TNM Version 2.5 FHWA 2004 TNM Version 2.5 FHWA 2004 TNM Version 2.5 FHWA 2004 TNM Version 2.5
- FHWA 2004 TNM Version 2.5
- 13 Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (16), Pg 67
- 14 Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (20), Pg 69
- 15 Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (18), Pg 69

#### **References**

California Department of Transportation (Caltrans). 2009 (November). Technical Noise Supplement. Available: http://www.dot.ca.gov/hq/env/noise/pub/tens\_complete.pdf. Accessed Aug 2017.



### **KEY:** Orange cells are for input.

Grey cells are intermediate calculations performed by the model.

Green cells are data to present in a written analysis (output).

### **STEP 1:** Determine units in which to perform calculation.

- If vibration decibels (VdB), then use Table A and proceed to Steps 2A and 3A.
- If peak particle velocity (PPV), then use Table B and proceed to Steps 2B and 3B.

### STEP 2A: Identify the vibration source and enter the reference vibration level (VdB) and distance.

### STEP 3A: Select the distance to the receiver.

### Table A. Propagation of vibration decibels (VdB) with distance

Noise Source/ID	Reference Noise Level						
	vibration level		distance				
	(VdB)	@	(ft)				
Impact pile driver (Threshold for							
human annoyance)	112	@	25				
Impact pile driver (Theshold of							
perception)	112	@	25				

Attenuated Noise Level at Receptor									
vibration level	distance								
(VdB)	@	(ft)							
70.0	@	630							
65.0	@	925							

The Lv metric (VdB) is used to assess the likelihood for vibration to result in human annoyance.

### STEP 2B: Identify the vibration source and enter the reference peak particle velocity (PPV) and distance.

### STEP 3B: Select the distance to the receiver.

### Table B. Propagation of peak particle velocity (PPV) with distance

Noise Source/ID	Reference Noise Level								
	vibration level		distance						
	(PPV)	@	(ft)						
Impact pile driver	1.518	@	25						

Attenuated Noise Level at Receptor									
vibration level		distance							
(PPV)	@	(ft)							
0.199	0	97							

The PPV metric (in/sec) is used for assessing the likelihood for the potential of structural damage.

### Notes:

Computation of propagated vibration levels is based on the equations presented on pg. 185 of FTA 2018. Estimates of attenuated vibration levels do not account for reductions from intervening underground barriers or other underground structures of any type, or changes in soil type.

Federal Transit Association (FTA). 2018 (September). Transit Noise and Vibration Impact Assessment Manual. FTA Report <a href="https://www.stes/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta">https://www.stes/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta</a>