Appendix D

Noise Modeling Data

Construction Source Noise Prediction Model

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Grader	85	0.4

Ground Type	HARD
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Grader	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
81.0

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006. Table 1.

[2] Based on Figure 6-5 from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 6-23).

[3] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 12-3).

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects (FTA 2006: pg 6-23); and

D = Distance from source to receiver.

Construction Source Noise Prediction Model

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Grader	85	1

Ground Type	HARD
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Grader	85.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
85.0

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006. Table 1.

[2] Based on Figure 6-5 from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 6-23).

[3] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 12-3).

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects (FTA 2006: pg 6-23); and

D = Distance from source to receiver.

Equipment Description	Acoustical Usage Factor (%)	Spec 721.560 Lmax @ 50ft (dBA slow)	Actual Measured Lmax @ 50ft (dBA slow)	No. of Actual Data Samples (count)	Spec 721.560 LmaxCalc	Spec 721.560 Leq	Distance	Actual Measured LmaxCalc	Actual Measured Leq
Auger Drill Rig	20	85	84	36	79.0	72.0	100	78.0	71.0
Backhoe	40	80	78	372	74.0	70.0	100	72.0	68.0
Bar Bender	20	80	na	0	74.0	67.0	100		
Blasting	na	94	na	0	88.0		100		
Boring Jack Power Unit	50	80	83	1	74.0	71.0	100	77.0	74.0
Chain Saw	20	85	84	46	79.0	72.0	100	78.0	71.0
Clam Shovel (dropping)	20	93	87	4	87.0	80.0	100	81.0	74.0
Compactor (ground)	20	80	83	57	74.0	67.0	100	77.0	70.0
Compressor (air)	40	80	78	18	74.0	70.0	100	72.0	68.0
Concrete Batch Plant	15	83	na	0	77.0	68.7	100		
Concrete Mixer Truck	40	85	79	40	79.0	75.0	100	73.0	69.0
Concrete Pump Truck	20	82	81	30	76.0	69.0	100	75.0	68.0
Concrete Saw	20	90	90	55	84.0	77.0	100	84.0	77.0
Crane	16	85	81	405	79.0	71.0	100	75.0	67.0
Dozer	40	85	82	55	79.0	75.0	100	76.0	72.0
Drill Rig Truck	20	84	79	22	78.0	71.0	100	73.0	66.0
Drum Mixer	50	80	80	1	74.0	71.0	100	74.0	71.0
Dump Truck	40	84	76	31	78.0	74.0	100	70.0	66.0
Excavator	40	85	81	170	79.0	75.0	100	75.0	71.0
Flat Bed Truck	40	84	74	4	78.0	74.0	100	68.0	64.0
Front End Loader	40	80	79	96	74.0	70.0	100	73.0	69.0
Generator	50	82	81	19	76.0	73.0	100	75.0	72.0
Generator (<25KVA, VMS s	50	70	73	74	64.0	61.0	100	67.0	64.0
Gradall	40	85	83	70	79.0	75.0	100	77.0	73.0
Grader	40	85	na	0	79.0	75.0	100		
Grapple (on Backhoe)	40	85	87	1	79.0	75.0	100	81.0	77.0
Horizontal Boring Hydr. Jac	25	80	82	6	74.0	68.0	100	76.0	70.0
Hydra Break Ram	10	90	na	0	84.0	74.0	100		
Impact Pile Driver	20	95	101	11	89.0	82.0	100	95.0	88.0
Jackhammer	20	85	89	133	79.0	72.0	100	83.0	76.0
Man Lift	20	85	75	23	79.0	72.0	100	69.0	62.0
Mounted Impact Hammer (	20	90	90	212	84.0	77.0	100	84.0	77.0
Pavement Scarafier	20	85	90	2	79.0	72.0	100	84.0	77.0
Paver	50	85	77	9	79.0	76.0	100	71.0	68.0
Pickup Truck	40	55	75	1	49.0	45.0	100	69.0	65.0
Pneumatic Tools	50	85	85	90	79.0	76.0	100	79.0	76.0
Pumps	50	77	81	17	71.0	68.0	100	75.0	72.0
Refrigerator Unit	100	82	73	3	76.0	76.0	100	67.0	67.0
Rivit Buster/chipping gun	20	85	79	19	79.0	72.0	100	73.0	66.0
Rock Drill	20	85	81	3	79.0	72.0	100	75.0	68.0
Roller	20	85	80	16	79.0	72.0	100	74.0	67.0
Sand Blasting (Single Nozzl	20	85	96	9	79.0	72.0	100	90.0	83.0
Scraper	40	85	84	12	79.0	75.0	100	78.0	74.0
Shears (on backhoe)	40	85	96	5	79.0	75.0	100	90.0	86.0
Slurry Plant	100	78	78	1	72.0	72.0	100	72.0	72.0
Slurry Trenching Machine	50	82	80	75	76.0	73.0	100	74.0	71.0
Soil Mix Drill Rig	50	80	na	0	74.0	71.0	100		
Tractor	40	84	na	0	78.0	74.0	100		
Vacuum Excavator (Vac-tru	40	85	85	149	79.0	75.0	100	79.0	75.0
Vacuum Street Sweeper	10	80	82	19	74.0	64.0	100	76.0	66.0
Ventilation Fan	100	85	79	13	79.0	79.0	100	73.0	73.0
Vibrating Hopper	50	85	87	1	79.0	76.0	100	81.0	78.0
Vibratory Concrete Mixer	20	80	80	1	74.0	67.0	100	74.0	67.0
Vibratory Pile Driver	20	95	101	44	89.0	82.0	100	95.0	88.0
Warning Horn	5	85	83	12	79.0	66.0	100	77.0	64.0
Welder / Torch	40	73	74	5	67.0	63.0	100	68.0	64.0

Source:
FHWA Roadway Construction Noise Model, January 2006. Table 9.1
U.S. Department of Transportation
CA/T Construction Spec. 721.560

Attenuation Calculations for Stationary Noise Sources

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: Identify the noise source and enter the reference noise level (dBA and distance).

STEP 2: Select the ground type (hard or soft), and enter the source and receiver heights.

STEP 3: Select the distance to the receiver.

Noise Source/ID	Reference Noise Level			Attenuation Characteristics				Attenuated Noise Level at Receptor			
	noise level (dBA)	@	distance (ft)	Ground Type (soft/hard)	Source Height (ft)	Receiver Height (ft)	Ground Factor	noise level (dBA)	@	distance (ft)	Interior Noise Level
loader/backhoe/grader/dozer (Leq)	81.0	@	50	soft	8	5	0.63	58.7	@	350	43.7
loader/backhoe/grader/dozer (Leq)	81.0	@	50	soft	8	5	0.63	54.7	@	500	39.7
loader/backhoe/grader/dozer (Leq)	81.0	@	50	soft	8	5	0.63	46.7	@	1000	31.7
loader/backhoe/grader/dozer (Lmax)	85.0	@	50	soft	8	5	0.63	62.7	@	350	47.7
loader/backhoe/grader/dozer (Lmax)	85.0	@	50	soft	8	5	0.63	58.7	@	500	43.7
loader/backhoe/grader/dozer (Lmax)	85.0	@	50	soft	8	5	0.63	50.7	@	1000	35.7
Trimmer	81.0	@	3	soft	8	5	0.63	26.6	@	350	
Trimmer	81.0	@	3	soft	8	5	0.63	22.5	@	500	
Trimmer	81.0	@	3	soft	8	5	0.63	14.5	@	1000	
							0.66				
							0.66				
							0.66				
							0.66				
							0.66				

Notes:

Estimates of attenuated noise levels do not account for reductions from intervening barriers, including walls, trees, vegetation, or structures of any type.

Computation of the attenuated noise level is based on the equation presented on pg. 12-3 and 12-4 of FTA 2006.

Computation of the ground factor is based on the equation presentd in Figure 6-23 on pg. 6-23 of FTA 2006, where the distance of the reference noise leve can be adjusted and the usage factor is not applied (i.e., the usage factor is equal to 1).

Sources:

Federal Transit Association (FTA). 2006 (May). Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06. Washington, D.C. Available: <http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf>. Accessed: September 24, 2010.

Traffic Noise Spreadsheet Calculator

Project:

Noise Level Descriptor: Ldn
Site Conditions: Soft
Traffic Input: ADT
Traffic K-Factor:

		Segment Description and Location		Input										Output				
						Distance to Directional Centerline, (feet)$_4$		Traffic Distribution Characteristics							Distance to Contour, (feet)$_3$			
Number	Name	From	To	ADT	Speed (mph)	Near	Far	% Auto	% Medium	% Heavy	% Day	% Eve	% Night	Ldn, (dBA)$_{5,6,7}$	70 dBA	65 dBA	60 dBA	55 dBA
Existing Conditions																		
1	State Route 3		Junction of Route 36, north	620	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	50.4	5	11	23	49
2	State Route 3		Morgan Hill Road, south	1,450	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	54.1	9	19	40	87
3	State Route 3		Morgan Hill Road, north	2,400	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	56.3	12	26	57	122
4	State Route 3		Hayfork	2,400	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	56.3	12	26	57	122
5	State Route 3		Weaverville, North Junction	3,850	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	58.3	17	36	77	167
6	State Route 3		Rush Creek Road, south	1,150	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	53.1	7	16	35	75
7	State Route 3		Rush Creek Road, north	860	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	51.8	6	13	29	61
8	State Route 3		Trinity Center Maintenance Station	470	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	49.2	4	9	19	41
9	State Route 3		Siskiyou County Line	140	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	43.9	2	4	9	18
10	State Route 36		Lower Mad River Road, west	1,250	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	53.5	8	17	37	79
11	State Route 36		Lower Mad River Road, east	620	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	50.4	5	11	23	49
12	State Route 36		Forest Glen Maintenance Station	550	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	49.9	5	10	21	46
13	State Route 36		Jct. of Route 3, east	470	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	49.2	4	9	19	41
14	State Route 299		East Limits Salyer, west	2,950	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	57.2	14	30	65	140
15	State Route 299		East Limits Salyer, east	2,500	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	56.5	13	27	58	125
16	State Route 299		Burnt Ranch Road, west	2,350	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	56.2	12	26	56	120
17	State Route 299		Del Loma, east	1,850	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	55.2	10	22	48	102
18	State Route 299		Weaverville, West City Limits, west	3,400	35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	53.4	8	17	36	78
19	State Route 299		Weaverville, Washington Street, east	10,700	35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	58.4	17	36	78	168
20	State Route 299		Martin/Nugget Roads, west	8,800	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	61.9	29	62	134	290
21	State Route 299		Martin/Nugget Roads, east	6,600	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	60.7	24	52	111	239
22	State Route 299		East Junction SR 3, west	4,750	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	59.3	19	41	89	192
23	State Route 299		East Junction SR 3, east	4,150	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	58.7	18	38	81	175
24	State Route 299		Lewiston Road, east	3,950	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	58.4	17	37	79	170
25	State Route 299		Trinity Dam Road, east	3,900	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	58.4	17	36	78	168

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

Traffic Noise Spreadsheet Calculator

Project:

Noise Level Descriptor: Ldn
Site Conditions: Soft
Traffic Input: ADT
Traffic K-Factor:

		Segment Description and Location		Input										Output				
						Distance to Directional Centerline, (feet)$_4$		Traffic Distribution Characteristics						Ldn,	Distance to Contour, (feet)$_3$			
Number	Name	From	To	ADT	Speed (mph)	Near	Far	% Auto	% Medium	% Heavy	% Day	% Eve	% Night	(dBA)$_{5,6,7}$	70 dBA	65 dBA	60 dBA	55 dBA
Existing Conditions																		
1	State Route 3	Junction of Route 36, north		6,313	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	60.5	23	50	108	232
2	State Route 3	Morgan Hill Road, south		7,143	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	61.0	25	54	117	252
3	State Route 3	Morgan Hill Road, north		8,093	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	61.6	27	59	127	274
4	State Route 3	Hayfork		10,580	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	62.7	33	71	152	328
5	State Route 3	Weaverville, North Junction		7,082	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	61.0	25	54	116	251
6	State Route 3	Rush Creek Road, south		1,340	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	53.8	8	18	38	83
7	State Route 3	Rush Creek Road, north		1,050	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	52.7	7	15	33	70
8	State Route 3	Trinity Center Maintenance Station		660	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	50.7	5	11	24	52
9	State Route 3	Siskiyou County Line		330	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	47.7	3	7	15	32
10	State Route 36	Lower Mad River Road, west		2,469	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	56.4	12	27	58	124
11	State Route 36	Lower Mad River Road, east		1,839	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	55.1	10	22	47	102
12	State Route 36	Forest Glen Maintenance Station		1,769	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	55.0	10	21	46	99
13	State Route 36	Jct. of Route 3, east		3,171	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	57.5	15	32	68	147
14	State Route 299	East Limits Salyer, west		3,140	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	57.5	15	31	68	146
15	State Route 299	East Limits Salyer, east		4,180	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	58.7	18	38	82	176
16	State Route 299	Burnt Ranch Road, west		4,050	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	58.6	17	37	80	173
17	State Route 299	Del Loma, east		4,382	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	58.9	18	39	84	182
18	State Route 299	Weaverville, West City Limits, west		5,198	35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	55.3	10	22	48	104
19	State Route 299	Weaverville, Washington Street, east		11,046	35	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	58.5	17	37	80	172
20	State Route 299	Martin/Nugget Roads, west		8,990	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	62.0	29	63	136	294
21	State Route 299	Martin/Nugget Roads, east		6,790	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	60.8	24	52	113	244
22	State Route 299	East Junction SR 3, west		6,412	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	60.6	23	51	109	235
23	State Route 299	East Junction SR 3, east		5,812	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	60.1	22	47	102	220
24	State Route 299	Lewiston Road, east		5,612	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	60.0	21	46	100	215
25	State Route 299	Trinity Dam Road, east		4,090	50	100	100	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	58.6	17	37	81	174

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

Citation #	Citations	
1	Caltrans Technical Noise Supplement. 2009 (November). Table (5-11), Pg 5-60.	Caltrans Technical Noise Supplement. 2013 (September). Table (4-2), Pg 4-17.
2	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-26), Pg 5-60.	Caltrans Technical Noise Supplement. 2013 (September). Equation (4-5), Pg 4-17.
3	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-16), Pg 2-32.	FHWA 2004 TNM Version 2.5
4	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-11), Pg 5-47, 48.	FHWA 2004 TNM Version 2.5
5	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-26), Pg 2-55, 56.	Caltrans Technical Noise Supplement. 2013 (September). Equation (2-23), Pg 2-51, 52.
6	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-27), Pg 2-57.	Caltrans Technical Noise Supplement. 2013 (September). Equation (2-24), Pg 2-53.
7	Caltrans Technical Noise Supplement. 2009 (November). Pg 2-53.	Caltrans Technical Noise Supplement. 2013 (September). Pg 2-57.
8	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-7), Pg 5-45.	FHWA 2004 TNM Version 2.5
9	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-8), Pg 5-45.	FHWA 2004 TNM Version 2.5
10	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-9), Pg 5-45.	FHWA 2004 TNM Version 2.5
11	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-13), Pg 5-49.	FHWA 2004 TNM Version 2.5
12	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-14), Pg 5-49.	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	

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California Department of Transportation (Caltrans). 2009 (November). Technical Noise Supplement. Available: http://www.dot.ca.gov/hq/env/noise/pub/tens_complete.pdf. Accessed August 17, 2017.

California Department of Transportation (Caltrans). 2013 (September). Technical Noise Supplement. Available: http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013A.pdf. Accessed August 17, 2017.

Federal Highway Administration. 2004. Traffic Noise Model Version 2.5. Available: https://www.fhwa.dot.gov/environment/noise/traffic_noise_model/tnm_v25/. Accessed August 17, 2017.