
Appendix B

Noise Analysis Data and Modeling

Measured Outdoor Ambient Sound Level Data

Predicated Construction Noise Levels

noise level limit magnitude for construction at residence exterior, per FTA guidance = 80
 allowable hours over which Leq is to be averaged = 8

Source, receptor, and barrier all share same reference grade elevation; unless otherwise noted
 = Barrier of input height inserted between source and receptor

Comparable FHWA RCNM Construction Equipment Type	Quantity	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Equipment HP (each)	Source to NSR Distance (ft.)	Temporary Barrier Insertion Loss (dB)	Additional Noise Reduction	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq	Source	Receiver	Barrier	Source to	Rcvr. to Barr.	Source to	"A"	"B"	"C"	Path Length	Abarr (dB)	Heff (with barrier)	Heff (w/out barrier)	G (with barrier)	G (without barrier)	ILbarr (dB)
													Elevation (ft)	Elevation (ft)	Height (ft)	Barr. ("A") Horiz. (ft)	("B") Horiz. (ft)	Rcvr. ("C") Horiz. (ft)	(ft)	(ft)	(ft)	Diff. "P" (ft)						
backhoe	1	40	78	tractors/loaders/backhoes	97	325	0		57.1	8	480	53	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
grader	1	40	85	grader	187	325	0		64.1	8	480	60	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Site Preparation Phase																												
													61															
grader	1	40	85	grader	187	325	0		64.1	6	360	59	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
backhoe	1	40	78	tractors/loaders/backhoes	97	325	0		57.1	7	420	53	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
dozer	1	40	82	rubber-tired dozer	247	325	0		61.1	6	360	56	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Excavation Phase																												
													61															
crane	1	16	81	cranes	231	325	0		60.1	4	240	49	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
man lift	1	20	75	forklifts	89	325	0		54.1	6	360	46	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
backhoe	1	40	78	tractors/loaders/backhoes	97	325	0		57.1	8	480	53	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Building Construction Phase																												
													55															
concrete mixer truck	4	40	79	cement and mortar mixers	9	325	0		58.1	6	360	59	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
paver	1	50	77	pavers	130	325	0		56.1	7	420	53	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
roller	1	20	80	rollers	80	325	0		59.1	7	420	52	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
backhoe	1	40	78	tractors/loaders/backhoes	97	325	0		57.1	7	420	53	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Paving Phase																												
													59															
compressor (air)	1	40	78	air compressors	10	325	0		57.1	6	360	52	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Architectural Finishes Phase																												
													52															

noise level limit magnitude for construction at residence exterior, per FTA guidance = 80
 allowable hours over which Leq is to be averaged = 8

Source, receptor, and barrier all share same reference grade elevation; unless otherwise noted)
 = Barrier of input height inserted between source and receptor

Comparable FHWA RCNM Construction Equipment Type	Quantity	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Equipment HP (each)	Source to NSR Distance (ft.)	Temporary Barrier Insertion Loss (dB)	Additional Noise Reduction	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq	Source Elevation (ft)	Receiver Elevation (ft)	Barrier Height (ft)	Source to Barr. ("A") Horiz. (ft)	Rcvr. to Barr. ("B") Horiz. (ft)	Source to Rcvr. ("C") Horiz. (ft)	"A" (ft)	"B" (ft)	"C" (ft)	Path Length Diff. "P" (ft)	Abarr (dB)	Heff (with barrier)	Heff (w/out barrier)	G (with barrier)	G (without barrier)	ILbarr (dB)
backhoe	1	40	78	tractors/loaders/backhoes	97	325	1		56.4	8	480	52	4.5	5	7	240	85	325	240.0	85.0	325.0	0.04	1.8	11.8	4.8	0.5	0.7	0.8
grader	1	40	85	grader	187	325	1		63.4	8	480	59	4.5	5	7	240	85	325	240.0	85.0	325.0	0.04	1.8	11.8	4.8	0.5	0.7	0.8
Total Aggregate Noise Exposure from Site Preparation Phase																												
													60															
grader	1	40	85	grader	187	325	1		63.4	6	360	58	4.5	5	7	240	85	325	240.0	85.0	325.0	0.04	1.8	11.8	4.8	0.5	0.7	0.8
backhoe	1	40	78	tractors/loaders/backhoes	97	325	1		56.4	7	420	52	4.5	5	7	240	85	325	240.0	85.0	325.0	0.04	1.8	11.8	4.8	0.5	0.7	0.8
dozer	1	40	82	rubber-tired dozer	247	325	1		60.4	6	360	55	4.5	5	7	240	85	325	240.0	85.0	325.0	0.04	1.8	11.8	4.8	0.5	0.7	0.8
Total Aggregate Noise Exposure from Excavation Phase																												
													61															
crane	1	16	81	cranes	231	325	0		60.1	4	240	49	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
man lift	1	20	75	forklifts	89	325	0		54.1	6	360	46	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
backhoe	1	40	78	tractors/loaders/backhoes	97	325	0		57.1	8	480	53	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Building Construction Phase																												
													55															
concrete mixer truck	4	40	79	cement and mortar mixers	9	325	0		58.1	6	360	59	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
paver	1	50	77	pavers	130	325	0		56.1	7	420	53	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
roller	1	20	80	rollers	80	325	0		59.1	7	420	52	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
backhoe	1	40	78	tractors/loaders/backhoes	97	325	0		57.1	7	420	53	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Paving Phase																												
													59															
compressor (air)	1	40	78	air compressors	10	325	0		57.1	6	360	52	4.5	5	0	240	85	325	240.0	85.1	325.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Architectural Finishes Phase																												
													52															

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 = Barrier of input height inserted between source and receptor

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													Elevation (ft)	Elevation (ft)	Height (ft)	Barr. ("A") Horiz. (ft)	("B") Horiz. (ft)	Rcvr. ("C") Horiz. (ft)	Diff. "P" (ft)	dB	dB	dB	dB	dB	dB	dB		
backhoe	0	40	78	tractors/loaders/backhoes	97	90	0		70.9	8	480	0	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
grader	1	40	85	grader	187	90	0		77.9	8	480	74	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Site Preparation Phase																												
74																												
grader	1	40	85	grader	187	90	0		77.9	6	360	73	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
backhoe	0	40	78	tractors/loaders/backhoes	97	90	0		70.9	7	420	0	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
dozer	0	40	82	rubber-tired dozer	247	90	0		74.9	6	360	0	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Excavation Phase																												
73																												
crane	1	16	81	cranes	231	90	0		73.9	4	240	63	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
man lift	0	20	75	forklifts	89	90	0		67.9	6	360	0	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
backhoe	0	40	78	tractors/loaders/backhoes	97	90	0		70.9	8	480	0	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Building Construction Phase																												
63																												
concrete mixer truck	1	40	79	cement and mortar mixers	9	90	0		71.9	6	360	67	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
paver	0	50	77	pavers	130	90	0		69.9	7	420	0	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
roller	0	20	80	rollers	80	90	0		72.9	7	420	0	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
backhoe	0	40	78	tractors/loaders/backhoes	97	90	0		70.9	7	420	0	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Paving Phase																												
67																												
compressor (air)	1	40	78	air compressors	10	90	0		70.9	6	360	66	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Architectural Finishes Phase																												
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													Elevation (ft)	Elevation (ft)	Height (ft)	Barr. ("A") Horiz. (ft)	("B") Horiz. (ft)	Rcvr. ("C") Horiz. (ft)	Diff. "P" (ft)	dB	dB	dB	dB	dB	dB	dB		
backhoe	0	40	78	tractors/loaders/backhoes	97	90	11		60.4	8	480	0	4.5	5	7	5	85	90	5.6	85.0	90.0	0.61	10.9	11.8	4.8	0.5	0.7	10.6
grader	1	40	85	grader	187	90	11		67.4	8	480	63	4.5	5	7	5	85	90	5.6	85.0	90.0	0.61	10.9	11.8	4.8	0.5	0.7	10.6
Total Aggregate Noise Exposure from Site Preparation Phase																												
													63															
grader	1	40	85	grader	187	90	11		67.4	6	360	62	4.5	5	7	5	85	90	5.6	85.0	90.0	0.61	10.9	11.8	4.8	0.5	0.7	10.6
backhoe	0	40	78	tractors/loaders/backhoes	97	90	11		60.4	7	420	0	4.5	5	7	5	85	90	5.6	85.0	90.0	0.61	10.9	11.8	4.8	0.5	0.7	10.6
dozer	0	40	82	rubber-tired dozer	247	90	11		64.4	6	360	0	4.5	5	7	5	85	90	5.6	85.0	90.0	0.61	10.9	11.8	4.8	0.5	0.7	10.6
Total Aggregate Noise Exposure from Excavation Phase																												
													62															
crane	1	16	81	cranes	231	90	0		73.9	4	240	63	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
man lift	0	20	75	forklifts	89	90	0		67.9	6	360	0	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
backhoe	0	40	78	tractors/loaders/backhoes	97	90	0		70.9	8	480	0	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Building Construction Phase																												
													63															
concrete mixer truck	1	40	79	cement and mortar mixers	9	90	0		71.9	6	360	67	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
paver	0	50	77	pavers	130	90	0		69.9	7	420	0	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
roller	0	20	80	rollers	80	90	0		72.9	7	420	0	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
backhoe	0	40	78	tractors/loaders/backhoes	97	90	0		70.9	7	420	0	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Paving Phase																												
													67															
compressor (air)	1	40	78	air compressors	10	90	0		70.9	6	360	66	4.5	5	0	5	85	90	6.7	85.1	90.0	0.00	0.1	4.8	4.8	0.7	0.7	0.1
Total Aggregate Noise Exposure from Architectural Finishes Phase																												
													66															

Equipment Description	Impact Device?	Acoustical Use Factor (%)	Lesser of or available Lmax	Spec. 721 Lmax	Measured L _{max} @50ft (dBA, slow)
All Other Equipment > 5 HP	No	50	85	85	-- N/A --
Auger Drill Rig	No	20	84	85	84
Backhoe	No	40	78	80	78
Bar Bender	No	20	80	80	-- N/A --
Blasting	Yes	-- N/A --	94	94	-- N/A --
Boring Jack Power Unit	No	50	80	80	83
Chain Saw	No	20	84	85	84
Clam Shovel (dropping)	Yes	20	87	93	87
Compactor (ground)	No	20	80	80	83
Compressor (air)	No	40	78	80	78
Concrete Batch Plant	No	15	83	83	-- N/A --
Concrete Mixer Truck	No	40	79	85	79
Concrete Pump Truck	No	20	81	82	81
Concrete Saw	No	20	90	90	90
Crane	No	16	81	85	81
Dozer	No	40	82	85	82
Drill Rig Truck	No	20	79	84	79
Drum Mixer	No	50	80	80	80
Dump Truck	No	40	76	84	76
Excavator	No	40	81	85	81
Flat Bed Truck	No	40	74	84	74
Front End Loader	No	40	79	80	79
Generator	No	50	72	72	81
Generator (<25KVA, VMS signs)	No	50	70	70	73
Gradall	No	40	83	85	83
Grader	No	40	85	85	-- N/A --
Grapple (on backhoe)	No	40	85	85	87
Horizontal Boring Hydr. Jack	No	25	80	80	82
Hydra Break Ram	Yes	10	90	90	-- N/A --
Impact Pile Driver	Yes	20	95	95	101
Jackhammer	Yes	20	85	85	89
Man Lift	No	20	75	85	75
Mounted Impact Hammer (hoe ram)	Yes	20	90	90	90
Pavement Scarafier	No	20	85	85	90
Paver	No	50	77	85	77
Pickup Truck	No	40	55	55	75
Pneumatic Tools	No	50	85	85	85
Pumps	No	50	77	77	81
Refrigerator Unit	No	100	73	82	73
Rivit Buster/chipping gun	Yes	20	79	85	79
Rock Drill	No	20	81	85	81
Roller	No	20	80	85	80
Sand Blasting (Single Nozzle)	No	20	85	85	96
Scraper	No	40	84	85	84
Shears (on backhoe)	No	40	85	85	96
Skidsteer*	No	40	80	-- N/A --	-- N/A --
Slurry Plant	No	100	78	78	78
Slurry Trenching Machine	No	50	80	82	80
Soil Mix Drill Rig	No	50	80	80	-- N/A --
Tractor	No	40	84	84	-- N/A --
Vacuum Excavator (Vac-truck)	No	40	85	85	85
Vacuum Street Sweeper	No	10	80	80	82
Ventilation Fan	No	100	79	85	79
Vibrating Hopper	No	50	85	85	87
Vibratory Concrete Mixer	No	20	80	80	80
Vibratory Pile Driver	No	20	95	95	101
Warning Horn	No	5	83	85	83
Welder / Torch	No	40	73	73	74

Predicted Offsite Traffic Noise Levels

Roadway Traffic Noise Prediction (CNEL)
(FHWA RD-77-108, using Calveno curves)

Project:

User Inputs (boxed cells)	
Auto %	96.00%
MT (%)	3.00%
HT (%)	1.00%
Day	<input type="text" value="80.00%"/>
Evening	<input type="text" value="20.00%"/>
Nighttime	<input type="text" value="0.00%"/>

	Traffic Percentages by Vehicle Type			Equivalent
	Day	Evening	Nighttime	
Auto	76.80%	19.20%	0.00%	137.5%
MT	2.40%	0.60%	0.00%	4.3%
HT	0.80%	0.20%	0.00%	1.4%

Description	Roadway Segment and Direction of Traffic
Skatepark project trips	Camino del Avion

Average Weekday Traffic (AWT)	Speed (mph)	Auto Noise (at 15m)	MT Noise (at 15m)	HT Noise (at 15m)	CNEL Total (at 15m)
193	25	39.4	36.0	37.3	42.6
193	40	45.2	39.1	39.2	47.0

