

## **APPENDIX 4.9**

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### **Noise Modeling Data**

Via Princessa Extension Project  
Off-Site Noise Contours  
Existing (2010) Conditions

Roadway Number	ROADWAY NAME	Number of Lanes in Each Direction	Median Width	ADT Volume	Design Speed (mph)	Alpha Factor (1)	Vehicle Mix		Distance from Center of Roadway				
							Medium Trucks	Heavy Trucks	CNEL at 75 Feet	DISTANCE TO CONTOUR			
										75 CNEL	70 CNEL	65 CNEL	60 CNEL
144	Soledad Canyon west of Whites Canyon	3	12	44,000	65	0	1.8%	0.7%	76.4	103	319	991	3,079
145	Soledad Canyon east of Whites Canyon	3	12	43,000	65	0	1.8%	0.7%	76.3	100	312	969	3,010
150	Whites Canyon south of Soledad Canyon	3	12	27,000	65	0	1.8%	0.7%	74.3	-	197	613	1,903
151	Via Princessa east of Golden Valley	3	12	N/A	65	0	1.8%	0.7%	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
152	Via Princessa east of Rainbow Glen	2	12	8,000	65	0	1.8%	0.7%	69.0	-	-	185	575
153	Via Princessa south of Whites Canyon	3	12	34,000	65	0	1.8%	0.7%	75.3	80	247	769	2,389
156	Golden Valley south of Via Princessa	2	12	24,000	65	0	1.8%	0.7%	73.8	-	176	545	1,695
160	Sierra Highway south of Golden Valley	3	12	21,000	65	0	1.8%	0.7%	73.2	-	154	478	1,486
161	Sierra Highway north of Golden Valley	2	12	24,000	65	0	1.8%	0.7%	73.8	-	176	545	1,695
162	Sierra Highway south of Soledad Canyon	3	12	25,000	65	0	1.8%	0.7%	73.9	-	183	568	1,765
199	Golden Valley south of Center Pointe	2	12	24,000	65	0	1.8%	0.7%	73.8	-	176	545	1,695
229	Rainbow Glen north of Via Princessa	1	12	7,000	65	0	1.8%	0.7%	68.4	-	-	162	504
364	Rainbow Glen south of Via Princessa	1	12	2,000	40	0	1.8%	0.7%	57.4	-	-	-	-
365	Isabella north of Princessa	1	12	2,000	30	0	1.8%	0.7%	54.7	-	-	-	-

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site, such as asphalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such, as heavily vegetated ground cover.

"-" = contour is located within the roadway lanes or within 75 feet of the roadway centerline.

Noise levels and distances to contours do not assume any natural or constructed barriers that may attenuate noise.

N/A: Roadway does not exist under existing conditions.

**Assumed 24-Hour Traffic Distribution:**

	Day	Evening	Night	Total
Total ADT Volumes	77.70%	12.70%	9.60%	100.00%
Medium-Duty Trucks	87.43%	5.05%	7.52%	100.00%
Heavy-Duty Trucks	89.10%	2.84%	8.06%	100.00%

Notes to Modeler: The 24-hour traffic distribution and vehicle mix percentages are defaults. For project-specific numbers, obtain the 24-hour traffic distribution, vehicle mix percentages, and traffic volumes from the traffic engineer. For state and federal highways, obtain this information from the Caltrans website. Column G under Notes: should total 100%. Some jurisdictions have different distributions by roadway type, so check with that jurisdiction. An example is Riverside County.

**Via Princessa Extension Project  
Off-Site Noise Contours  
Interim Conditions**

		Number of Lanes in Each Direction	Median Width	ADT Volume	Design Speed (mph)	Alpha Factor (1)	Vehicle Mix		Distance from Center of Roadway				
Roadway	ROADWAY NAME						Medium Trucks	Heavy Trucks	CNEL at 75 Feet	DISTANCE TO CONTOUR			
Number										75 CNEL	70 CNEL	65 CNEL	60 CNEL
	Interim without Project												
144	Soledad Canyon east of Whites Canyon	3	12	53,000	65	0	1.8%	0.7%	77.2	123	383	1,190	3,698
145	Soledad Canyon west of Whites Canyon	3	12	53,000	65	0	1.8%	0.7%	77.2	123	383	1,190	3,698
150	Whites Canyon south of Soledad Canyon	3	12	40,000	65	0	1.8%	0.7%	76.0	93	290	902	2,803
151	Via Princessa east of Golden Valley	3	12	na	65	0	1.8%	0.7%	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
152	Via Princessa east of Rainbow Glen	2	12	10,000	65	0	1.8%	0.7%	69.9	-	-	230	716
153	Via Princessa south of Whites Canyon	3	12	48,000	65	0	1.8%	0.7%	76.8	112	347	1,080	3,354
156	Golden Valley south of Via Princessa	2	12	46,000	65	0	1.8%	0.7%	76.6	107	333	1,035	3,217
160	Sierra Highway south of Golden Valley	3	12	41,000	65	0	1.8%	0.7%	76.1	96	297	924	2,872
161	Sierra Highway noth of Golden Valley	2	12	34,000	65	0	1.8%	0.7%	75.3	80	247	769	2,389
162	Sierra Highway south of Soledad Canyon	3	12	34,000	65	0	1.8%	0.7%	75.3	80	247	769	2,389
199	Golden Valley south of Center Pointe	2	12	46,000	65	0	1.8%	0.7%	76.6	107	333	1,035	3,217
229	Rainbow Glen north of Via Princessa	1	12	11,000	65	0	1.8%	0.7%	70.4	-	81	253	786
364	Rainbow Glen south of Via Princessa	1	12	2,000	40	0	1.8%	0.7%	57.4	-	-	-	-
365	Isabella north of Princessa	1	12		30	0	1.8%	0.7%	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
	Interim with Project												
144	Soledad Canyon east of Whites Canyon	3	12	52,000	65	0	1.8%	0.7%	77.1	121	376	1,168	3,629
145	Soledad Canyon west of Whites Canyon	3	12	54,000	65	0	1.8%	0.7%	77.3	126	390	1,212	3,767
150	Whites Canyon south of Soledad Canyon	3	12	42,000	65	0	1.8%	0.7%	76.2	98	305	947	2,941
151	Via Princessa east of Golden Valley	3	12	5,000	65	0	1.8%	0.7%	66.9	-	-	116	362
152	Via Princessa east of Rainbow Glen	2	12	12,000	65	0	1.8%	0.7%	70.7	-	89	276	857
153	Via Princessa south of Whites Canyon	3	12	47,000	65	0	1.8%	0.7%	76.7	110	340	1,057	3,285
156	Golden Valley south of Via Princessa	2	12	47,000	65	0	1.8%	0.7%	76.7	110	340	1,057	3,285
160	Sierra Highway south of Golden Valley	3	12	42,000	65	0	1.8%	0.7%	76.2	98	305	947	2,941
161	Sierra Highway noth of Golden Valley	2	12	32,000	65	0	1.8%	0.7%	75.0	75	233	724	2,250
162	Sierra Highway south of Soledad Canyon	3	12	33,000	65	0	1.8%	0.7%	75.1	77	240	746	2,319
199	Golden Valley south of Center Pointe	2	12	47,000	65	0	1.8%	0.7%	76.7	110	340	1,057	3,285
229	Rainbow Glen north of Via Princessa	1	12	10,000	65	0	1.8%	0.7%	69.9	-	-	230	716
364	Rainbow Glen south of Via Princessa	1	12	2,000	40	0	1.8%	0.7%	57.4	-	-	-	-
365	Isabella north of Princessa	1	12	2,000	30	0	1.8%	0.7%	54.7	-	-	-	-
	N/A: Roadway does not exist under existing conditions.												
	Assumed 24-Hour Traffic Distribution:												
			Day	Evening	Night	Total							
	Total ADT Volumes		77.70%	12.70%	9.60%	100.00%							
	Medium-Duty Trucks		87.43%	5.05%	7.52%	100.00%							
	Heavy-Duty Trucks		89.10%	2.84%	8.06%	100.00%							

Notes to Modeler: The 24-hour traffic distribution and vehicle mix percentages are defaults. For project-specific numbers, obtain the 24-hour traffic distribution, vehicle mix percentages, and traffic volumes from the traffic engineer. For state and federal highways, obtain this information from the Caltrans website. Column G under Notes: should total 100%. Some jurisdictions have different distributions by roadway type, so check with that jurisdiction. An example is Riverside County.

**Via Princessa Extension Project  
Off-Site Noise Contours  
Long-term Conditions**

Roadway Number	ROADWAY NAME	Number of Lanes in Each Direction	Median Width	ADT Volume	Design Speed (mph)	Alpha Factor (1)	Vehicle Mix		Distance from Center of Roadway				
							Medium Trucks	Heavy Trucks	CNEL at 75 Feet	DISTANCE TO CONTOUR			
										75 CNEL	70 CNEL	65 CNEL	60 CNEL
144	Soledad Canyon west of Whites Canyon	3	12	38,000	65	0	1.8%	0.7%	75.7	89	276	858	2,665
145	Soledad Canyon east of Whites Canyon	3	12	44,000	65	0	1.8%	0.7%	76.4	103	319	991	3,079
150	Whites Canyon south of Soledad Canyon	3	12	48,000	65	0	1.8%	0.7%	76.8	112	347	1,080	3,354
151	Via Princessa east of Golden Valley	3	12	27,000	65	0	1.8%	0.7%	74.3	-	197	613	1,903
152	Via Princessa east of Rainbow Glen	2	12	29,000	65	0	1.8%	0.7%	74.6	-	212	657	2,042
153	Via Princessa south of Whites Canyon	3	12	52,000	65	0	1.8%	0.7%	77.1	121	376	1,168	3,629
156	Golden Valley south of Via Princessa	2	12	51,000	65	0	1.8%	0.7%	77.0	119	369	1,146	3,561
160	Sierra Highway south of Golden Valley	3	12	25,000	65	0	1.8%	0.7%	73.9	-	183	568	1,765
161	Sierra Highway north of Golden Valley	2	12	30,000	65	0	1.8%	0.7%	74.7	-	219	680	2,112
162	Sierra Highway south of Soledad Canyon	3	12	36,000	65	0	1.8%	0.7%	75.5	84	262	813	2,527
199	Golden Valley south of Center Pointe	2	12	39,000	65	0	1.8%	0.7%	75.9	91	283	880	2,734
229	Rainbow Glen north of Via Princessa	1	12	11,000	65	0	1.8%	0.7%	70.4	-	81	253	786
364	Rainbow Glen south of Via Princessa	1	12	2,000	40	0	1.8%	0.7%	57.4	-	-	-	-
365	Isabella north of Princessa	1	12	2,000	30	0	1.8%	0.7%	54.7	-	-	-	-

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site, such as asphalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such, as heavily vegetated ground cover.

"-" = contour is located within the roadway lanes or within 75 feet of the roadway centerline.

Noise levels and distances to contours do not assume any natural or constructed barriers that may attenuate noise.

N/A: Roadway does not exist under existing conditions.

**Assumed 24-Hour Traffic Distribution:**

	Day	Evening	Night	Total
Total ADT Volumes	77.70%	12.70%	9.60%	100.00%
Medium-Duty Trucks	87.43%	5.05%	7.52%	100.00%
Heavy-Duty Trucks	89.10%	2.84%	8.06%	100.00%

Notes to Modeler: The 24-hour traffic distribution and vehicle mix percentages are defaults. For project-specific numbers, obtain the 24-hour traffic distribution, vehicle mix percentages, and traffic volumes from the traffic engineer. For state and federal highways, obtain this information from the Caltrans website. Column G under Notes: should total 100%. Some jurisdictions have different distributions by roadway type, so check with that jurisdiction. An example is Riverside County.

**Via Princessa  
Construction Equipment Noise Model  
Phase 1**

Assumed Attenuation: 6 dBA per doubling of distance

NOISE SOURCE	NUMBER OF UNITS	ASSUMED USE FACTOR	L <sub>max</sub> Noise LEVEL @ 50 FT (dBA)	DISTANCE (Feet)	NOISE LEVEL Leq (dBA)
All Other Equipment > 5 HP	0	0	85	80	#N/A
Auger Drill Rig	0	0	85	80	#N/A
Backhoe	0	0	80	80	#N/A
Bar Bender	0	0	80	80	#N/A
Blasting	0	0	94	80	#N/A
Boring Jack Powe Unit	0	0	80	80	#N/A
Chain Saw	0	0	85	80	#N/A
Clam Shovel (dropping)	0	0	93	80	#N/A
Compactor (ground)	0	0	80	80	#N/A
Compressor (air)	0	0	80	80	#N/A
Concrete Batch Plant	0	0	83	80	#N/A
Concrete Mixer Truck	0	0	85	80	#N/A
Concrete Pump Truck	0	0	82	80	#N/A
Concrete Saw	0	0	90	80	#N/A
Crane	0	0	85	80	#N/A
Dozer	2	1	85	80	84
Drill Rig Truck	0	0	84	80	#N/A
Drum Mixer	0	0	80	80	#N/A
Dump Truck	0	0	84	80	#N/A
Excavator	0	0	85	80	#N/A
Flat Bed Truck	0	0	84	80	#N/A
Front End Loader	0	0	80	80	#N/A
Generator	0	0	82	80	#N/A
Generator (< 25KVA, VMS Signs)	0	0	70	80	#N/A
Gradall	0	0	85	80	#N/A
Grader	2	1	85	80	84
Grapple (on backhoe)	0	0	85	80	#N/A
Horizontal Boring Hydraulic Jack	0	0	80	80	#N/A
Hydra Break Ram	0	0	90	80	#N/A
Impact Pile Driver	0	0	95	80	#N/A
Jackhammer	0	0	85	80	#N/A
Man Lift	0	0	85	80	#N/A
Mounted Impact Hammer (hoe ram)	0	0	90	80	#N/A
Pavement Scarifier	0	0	85	80	#N/A
Paver	1	1	85	80	81
Pickup Truck	0	0	55	80	#N/A
Pneumatic Tools	0	0	85	80	#N/A
Pumps	0	0	77	80	#N/A
Refrigerator Unit	0	0	82	80	#N/A
Rivit Buster/Chipping Gun	0	0	85	80	#N/A
Rock Drill	0	0	85	80	#N/A
Roller	0	0	85	80	#N/A
Sand Blasting (single nozzle)	0	0	85	80	#N/A
Scraper	2	1	85	80	84
Sheers (on backhoe)	0	0	85	80	#N/A
Slurry Plant	0	0	78	80	#N/A
Slurry Trenching Machine	0	0	82	80	#N/A
Soil Mix Drill Rig	0	0	80	80	#N/A
Tractor	0	0	84	80	#N/A
Vacuum Excavator (Vac-Truck)	0	0	85	80	#N/A
Vacuum Street Sweeper	0	0	80	80	#N/A
Ventilation Fan	0	0	85	80	#N/A
Vibrating Hopper	0	0	85	80	#N/A
Vibratory Concrete Mixer	0	0	80	80	#N/A
Vibratory Pile Driver	0	0	95	80	#N/A
Warning Horn	0	0	85	80	#N/A
Welder/Torch	0	0	73	80	#N/A
TOTAL Leq DURING NORMAL OPERATIONS:					88

Note: NA = Not Applicable  
Sources: Federal Transit Administration (April 1995), *Transit Noise and Vibration*  
Impact Assessment, p. 12-3, and FHWA Construction Equipment Noise Levels and Ranges -  
Highway Construction Noise Handbook

**Via Princessa  
Construction Equipment  
Noise Model  
Phase 1**

Assumed Attenuation: 6 dBA per doubling of distance

NOISE SOURCE	NUMBER OF UNITS	ASSUMED USE FACTOR	L <sub>max</sub> Noise LEVEL @ 50 FT (dBA)	DISTANCE (Feet)	NOISE LEVEL Leq (dBA)
All Other Equipment > 5 HP	0	0	85	720	#N/A
Auger Drill Rig	0	0	85	720	#N/A
Backhoe	0	0	80	720	#N/A
Bar Bender	0	0	80	720	#N/A
Blasting	0	0	94	720	#N/A
Boring Jack Powe Unit	0	0	80	720	#N/A
Chain Saw	0	0	85	720	#N/A
Clam Shovel (dropping)	0	0	93	720	#N/A
Compactor (ground)	0	0	80	720	#N/A
Compressor (air)	0	0	80	720	#N/A
Concrete Batch Plant	0	0	83	720	#N/A
Concrete Mixer Truck	0	0	85	720	#N/A
Concrete Pump Truck	0	0	82	720	#N/A
Concrete Saw	0	0	90	720	#N/A
Crane	0	0	85	720	#N/A
Dozer	2	1	85	720	65
Drill Rig Truck	0	0	84	720	#N/A
Drum Mixer	0	0	80	720	#N/A
Dump Truck	0	0	84	720	#N/A
Excavator	0	0	85	720	#N/A
Flat Bed Truck	0	0	84	720	#N/A
Front End Loader	0	0	80	720	#N/A
Generator	0	0	82	720	#N/A
Generator (< 25KVA, VMS Signs)	0	0	70	720	#N/A
Gradall	0	0	85	720	#N/A
Grader	2	1	85	720	65
Grapple (on backhoe)	0	0	85	720	#N/A
Horizontal Boring Hydraulic Jack	0	0	80	720	#N/A
Hydra Break Ram	0	0	90	720	#N/A
Impact Pile Driver	0	0	95	720	#N/A
Jackhammer	0	0	85	720	#N/A
Man Lift	0	0	85	720	#N/A
Mounted Impact Hammer (hoc ram)	0	0	90	720	#N/A
Pavement Scarifier	0	0	85	720	#N/A
Paver	1	1	85	720	62
Pickup Truck	0	0	55	720	#N/A
Pneumatic Tools	0	0	85	720	#N/A
Pumps	0	0	77	720	#N/A
Refrigerator Unit	0	0	82	720	#N/A
Rivit Buster/Chipping Gun	0	0	85	720	#N/A
Rock Drill	0	0	85	720	#N/A
Roller	0	0	85	720	#N/A
Sand Blasting (single nozzel)	0	0	85	720	#N/A
Scraper	2	1	85	720	65
Sheers (on backhoe)	0	0	85	720	#N/A
Slurry Plant	0	0	78	720	#N/A
Slurry Trenching Machine	0	0	82	720	#N/A
Soil Mix Drill Rig	0	0	80	720	#N/A
Tractor	0	0	84	720	#N/A
Vacuum Excavator (Vac-Truck)	0	0	85	720	#N/A
Vacuum Street Sweeper	0	0	80	720	#N/A
Ventilation Fan	0	0	85	720	#N/A
Vibrating Hopper	0	0	85	720	#N/A
Vibratory Concrete Mixer	0	0	80	720	#N/A
Vibratory Pile Driver	0	0	95	720	#N/A
Warning Horn	0	0	85	720	#N/A
Welder/Torch	0	0	73	720	#N/A

**TOTAL Leq DURING NORMAL OPERATIONS: 69**

Note: NA = Not Applicable

Sources: Federal Transit Adminidstration (April 1995), *Transit Noise and Vibration*  
Impact Assessment, p. 12-3, and FWWA Construction Equipment Noise Levels and Ranges -  
Highway Construction Noise Handbook

**Via Princessa  
Construction Equipment Noise Model  
Phase 2**

Assumed Attenuation: 6 dBA per doubling of distance

NOISE SOURCE	NUMBER OF UNITS	ASSUMED USE FACTOR	L <sub>max</sub> Noise LEVEL @ 50 FT (dBA)	DISTANCE (Feet)	NOISE LEVEL Leq (dBA)
All Other Equipment > 5 HP	0	0	85	80	#N/A
Auger Drill Rig	0	0	85	80	#N/A
Backhoe	1	1	80	80	76
Bar Bender	0	0	80	80	#N/A
Blasting	0	0	94	80	#N/A
Boring Jack Powe Unit	0	0	80	80	#N/A
Chain Saw	0	0	85	80	#N/A
Clam Shovel (dropping)	0	0	93	80	#N/A
Compactor (ground)	0	0	80	80	#N/A
Compressor (air)	0	0	80	80	#N/A
Concrete Batch Plant	0	0	83	80	#N/A
Concrete Mixer Truck	0	0	85	80	#N/A
Concrete Pump Truck	0	0	82	80	#N/A
Concrete Saw	0	0	90	80	#N/A
Crane	0	0	85	80	#N/A
Dozer	3	1	85	80	86
Drill Rig Truck	0	0	84	80	#N/A
Drum Mixer	0	0	80	80	#N/A
Water Truck	1	1	84	80	80
Excavator	0	0	85	80	#N/A
Flat Bed Truck	0	0	84	80	#N/A
Front End Loader	0	0	80	80	#N/A
Generator	0	0	82	80	#N/A
Generator (< 25KVA, VMS Signs)	0	0	70	80	#N/A
Gradall	0	0	85	80	#N/A
Grader	3	1	85	80	86
Grapple (on backhoe)	0	0	85	80	#N/A
Horizontal Boring Hydraulic Jack	0	0	80	80	#N/A
Hydra Break Ram	0	0	90	80	#N/A
Impact Pile Driver	0	0	95	80	#N/A
Jackhammer	0	0	85	80	#N/A
Lift	0	0	85	80	#N/A
Mounted Impact Hammer (hoe ram)	0	0	90	80	#N/A
Pavement Scarifier	0	0	85	80	#N/A
Paver	1	1	85	80	81
Pickup Truck	0	0	55	80	#N/A
Pneumatic Tools	0	0	85	80	#N/A
Pumps	0	0	77	80	#N/A
Refrigerator Unit	0	0	82	80	#N/A
Rivit Buster/Chipping Gun	0	0	85	80	#N/A
Rock Drill	0	0	85	80	#N/A
Roller	0	0	85	80	#N/A
Sand Blasting (single nozzle)	0	0	85	80	#N/A
Scraper	2	1	85	80	84
Sheers (on backhoe)	0	0	85	80	#N/A
Slurry Plant	0	0	78	80	#N/A
Slurry Trenching Machine	0	0	82	80	#N/A
Soil Mix Drill Rig	0	0	80	80	#N/A
Tractor	0	0	84	80	#N/A
Vacuum Excavator (Vac-Truck)	0	0	85	80	#N/A
Vacuum Street Sweeper	0	0	80	80	#N/A
Ventilation Fan	0	0	85	80	#N/A
Vibrating Hopper	0	0	85	80	#N/A
Vibratory Concrete Mixer	0	0	80	80	#N/A
Vibratory Pile Driver	0	0	95	80	#N/A
Warning Horn	0	0	85	80	#N/A
Welder/Torch	0	0	73	80	#N/A
TOTAL Leq DURING NORMAL OPERATIONS:					90

Note: NA = Not Applicable

Sources: Federal Transit Administration (April 1995), *Transit Noise and Vibration Impact Assessment*, p. 12-3, and FWWA Construction Equipment Noise Levels and Ranges - Highway Construction Noise Handbook

**Via Princessa  
Construction Equipment  
Noise Model  
Phase 2**

Assumed Attenuation: 6 dBA per doubling of distance

NOISE SOURCE	NUMBER OF UNITS	ASSUMED USE FACTOR	Lmax Noise LEVEL @ 50 FT (dBA)	DISTANCE (Feet)	NOISE LEVEL Leq (dBA)
All Other Equipment > 5 HP	0	0	85	720	#N/A
Auger Drill Rig	0	0	85	720	#N/A
Backhoe	1	1	80	720	57
Bar Bender	0	0	80	720	#N/A
Blasting	0	0	94	720	#N/A
Boring Jack Powe Unit	0	0	80	720	#N/A
Chain Saw	0	0	85	720	#N/A
Clam Shovel (dropping)	0	0	93	720	#N/A
Compactor (ground)	0	0	80	720	#N/A
Compressor (air)	0	0	80	720	#N/A
Concrete Batch Plant	0	0	83	720	#N/A
Concrete Mixer Truck	0	0	85	720	#N/A
Concrete Pump Truck	0	0	82	720	#N/A
Concrete Saw	0	0	90	720	#N/A
Crane	0	0	85	720	#N/A
Dozer	3	1	85	720	67
Drill Rig Truck	0	0	84	720	#N/A
Drum Mixer	0	0	80	720	#N/A
Water Truck	1	1	84	720	61
Excavator	0	0	85	720	#N/A
Flat Bed Truck	0	0	84	720	#N/A
Front End Loader	0	0	80	720	#N/A
Generator	0	0	82	720	#N/A
Generator (< 25KVA, VMS Signs)	0	0	70	720	#N/A
Gradall	0	0	85	720	#N/A
Grader	2	1	85	720	65
Grapple (on backhoe)	0	0	85	720	#N/A
Horizontal Boring Hydraulic Jack	0	0	80	720	#N/A
Hydra Break Ram	0	0	90	720	#N/A
Impact Pile Driver	0	0	95	720	#N/A
Jackhammer	0	0	85	720	#N/A
Man Lift	0	0	85	720	#N/A
Mounted Impact Hammer (hoe ram)	0	0	90	720	#N/A
Pavement Scarifier	0	0	85	720	#N/A
Paver	1	1	85	720	62
Pickup Truck	0	0	55	720	#N/A
Pneumatic Tools	0	0	85	720	#N/A
Pumps	0	0	77	720	#N/A
Refrigerator Unit	0	0	82	720	#N/A
Rivit Buster/Chipping Gun	0	0	85	720	#N/A
Rock Drill	0	0	85	720	#N/A
Roller	0	0	85	720	#N/A
Sand Blasting (single nozzle)	0	0	85	720	#N/A
Scraper	2	1	85	720	65
Sheers (on backhoe)	0	0	85	720	#N/A
Slurry Plant	0	0	78	720	#N/A
Slurry Trenching Machine	0	0	82	720	#N/A
Soil Mix Drill Rig	0	0	80	720	#N/A
Tractor	0	0	84	720	#N/A
Vacuum Excavator (Vac-Truck)	0	0	85	720	#N/A
Vacuum Street Sweeper	0	0	80	720	#N/A
Ventilation Fan	0	0	85	720	#N/A
Vibrating Hopper	0	0	85	720	#N/A
Vibratory Concrete Mixer	0	0	80	720	#N/A
Vibratory Pile Driver	0	0	95	720	#N/A
Warning Horn	0	0	85	720	#N/A
Welder/Torch	0	0	73	720	#N/A

**TOTAL Leq DURING NORMAL OPERATIONS: 70**

Note: NA = Not Applicable

Sources: Federal Transit Administration (April 1995), *Transit Noise and Vibration Impact Assessment*, p. 12-3. and FWWA Construction Equipment Noise Levels and Ranges - Highway Construction Noise Handbook

**Via Princessa  
Construction Equipment Noise Model  
Phase 3**

Assumed Attenuation: 6 dBA per doubling of distance

NOISE SOURCE	NUMBER OF UNITS	ASSUMED USE FACTOR	Lmax Noise LEVEL @ 50 FT (dBA)	DISTANCE (Feet)	NOISE LEVEL Leq (dBA)
All Other Equipment > 5 HP	0	0	85	80	#N/A
Auger Drill Rig	0	0	85	80	#N/A
Backhoe	0	0	80	80	#N/A
Bar Bender	0	0	80	80	#N/A
Blasting	0	0	94	80	#N/A
Boring Jack Powe Unit	0	0	80	80	#N/A
Chain Saw	0	0	85	80	#N/A
Clam Shovel (dropping)	0	0	93	80	#N/A
Compactor (ground)	1	1	80	80	76
Compressor (air)	0	0	80	80	#N/A
Concrete Batch Plant	0	0	83	80	#N/A
Concrete Mixer Truck	0	0	85	80	#N/A
Concrete Pump Truck	0	0	82	80	#N/A
Concrete Saw	0	0	90	80	#N/A
Crane	0	0	85	80	#N/A
Dozer	0	0	85	80	#N/A
Drill Rig Truck	0	0	84	80	#N/A
Drum Mixer	0	0	80	80	#N/A
Water Truck	0	0	84	80	#N/A
Excavator	0	0	85	80	#N/A
Flat Bed Truck	0	0	84	80	#N/A
Front End Loader	0	0	80	80	#N/A
Generator	0	0	82	80	#N/A
Generator (< 25KVA, VMS Signs)	0	0	70	80	#N/A
Gradall	0	0	85	80	#N/A
Grader	1	1	85	80	81
Grapple (on backhoe)	0	0	85	80	#N/A
Horizontal Boring Hydraulic Jack	0	0	80	80	#N/A
Hydra Break Ram	0	0	90	80	#N/A
Impact Pile Driver	0	0	95	80	#N/A
Jackhammer	0	0	85	80	#N/A
Man Lift	0	0	85	80	#N/A
Mounted Impact Hammer (hoe ram)	0	0	90	80	#N/A
Pavement Scarifier	0	0	85	80	#N/A
Paver	0	0	85	80	#N/A
Pickup Truck	0	0	55	80	#N/A
Pneumatic Tools	0	0	85	80	#N/A
Pumps	0	0	77	80	#N/A
Refrigerator Unit	0	0	82	80	#N/A
Rivit Buster/Chipping Gun	0	0	85	80	#N/A
Rock Drill	0	0	85	80	#N/A
Roller	0	0	85	80	#N/A
Sand Blasting (single nozzle)	0	0	85	80	#N/A
Scraper	1	1	85	80	81
Sheers (on backhoe)	0	0	85	80	#N/A
Slurry Plant	0	0	78	80	#N/A
Trenching Machine	1	1	82	80	78
Soil Mix Drill Rig	0	0	80	80	#N/A
Tractor	0	0	84	80	#N/A
Vacuum Excavator (Vac-Truck)	0	0	85	80	#N/A
Vacuum Street Sweeper	0	0	80	80	#N/A
Ventilation Fan	0	0	85	80	#N/A
Vibrating Hopper	0	0	85	80	#N/A
Vibratory Concrete Mixer	0	0	80	80	#N/A
Vibratory Pile Driver	0	0	95	80	#N/A
Warning Horn	0	0	85	80	#N/A
Welder/Torch	0	0	73	80	#N/A

**TOTAL Leq DURING NORMAL OPERATIONS: 82**

Note: NA = Not Applicable  
Sources: Federal Transit Adminidstrution (April 1995), *Transit Noise and Vibration*  
Impact Assessment, p. 12-3, and FWWA Construction Equipment Noise Levels and Ranges -  
Highway Construction Noise Handbook

**Via Princessa  
Construction Equipment Noise Model  
Phase 3**

Assumed Attenuation: 6 dBA per doubling of distance

NOISE SOURCE	NUMBER OF UNITS	ASSUMED USE FACTOR	L <sub>max</sub> Noise LEVEL @ 50 FT (dBA)	DISTANCE (Feet)	NOISE LEVEL Leq (dBA)
All Other Equipment > 5 HP	0	0	85	720	#N/A
Auger Drill Rig	0	0	85	720	#N/A
Backhoe	0	0	80	720	#N/A
Bar Bender	0	0	80	720	#N/A
Blasting	0	0	94	720	#N/A
Boring Jack Powe Unit	0	0	80	720	#N/A
Chain Saw	0	0	85	720	#N/A
Clam Shovel (dropping)	0	0	93	720	#N/A
Compactor (ground)	1	1	80	720	57
Compressor (air)	0	0	80	720	#N/A
Concrete Batch Plant	0	0	83	720	#N/A
Concrete Mixer Truck	0	0	85	720	#N/A
Concrete Pump Truck	0	0	82	720	#N/A
Concrete Saw	0	0	90	720	#N/A
Crane	0	0	85	720	#N/A
Dozer	0	0	85	720	#N/A
Drill Rig Truck	0	0	84	720	#N/A
Drum Mixer	0	0	80	720	#N/A
Dump Truck	0	0	84	720	#N/A
Excavator	0	0	85	720	#N/A
Flat Bed Truck	0	0	84	720	#N/A
Front End Loader	0	0	80	720	#N/A
Generator	0	0	82	720	#N/A
Generator (< 25KVA, VMS Signs)	0	0	70	720	#N/A
Gradall	0	0	85	720	#N/A
Grader	1	1	85	720	62
Grapple (on backhoe)	0	0	85	720	#N/A
Horizontal Boring Hydraulic Jack	0	0	80	720	#N/A
Hydra Break Ram	0	0	90	720	#N/A
Impact Pile Driver	0	0	95	720	#N/A
Jackhammer	0	0	85	720	#N/A
Man Lift	0	0	85	720	#N/A
Mounted Impact Hamner (hoe ram)	0	0	90	720	#N/A
Pavement Scarifier	0	0	85	720	#N/A
Paver	0	0	85	720	#N/A
Pickup Truck	0	0	55	720	#N/A
Pneumatic Tools	0	0	85	720	#N/A
Pumps	0	0	77	720	#N/A
Refrigerator Unit	0	0	82	720	#N/A
Rivit Buster/Chipping Gun	0	0	85	720	#N/A
Rock Drill	0	0	85	720	#N/A
Roller	0	0	85	720	#N/A
Sand Blasting (single nozzle)	0	0	85	720	#N/A
Scraper	1	1	85	720	62
Sheers (on backhoe)	0	0	85	720	#N/A
Slurry Plant	0	0	78	720	#N/A
Trenching Machine	1	1	82	720	59
Soil Mix Drill Rig	0	0	80	720	#N/A
Tractor	0	0	84	720	#N/A
Vacuum Excavator (Vac-Truck)	0	0	85	720	#N/A
Vacuum Street Sweeper	0	0	80	720	#N/A
Ventilation Fan	0	0	85	720	#N/A
Vibrating Hopper	0	0	85	720	#N/A
Vibratory Concrete Mixer	0	0	80	720	#N/A
Vibratory Pile Driver	0	0	95	720	#N/A
Warning Horn	0	0	85	720	#N/A
Welder/Torch	0	0	73	720	#N/A

**TOTAL Leq DURING NORMAL OPERATIONS:** 63

Note: NA = Not Applicable

Sources: Federal Transit Administration (April 1995), *Transit Noise and Vibration Impact Assessment*, p. 12-3. and FHWA Construction Equipment Noise Levels and Ranges - Highway Construction Noise Handbook

**Via Princessa  
Construction Equipment Noise Model  
Phase 4**

Assumed Attenuation: 6 dBA per doubling of distance

NOISE SOURCE	NUMBER OF UNITS	ASSUMED USE FACTOR	Lmax Noise LEVEL @ 50 FT (dBA)	DISTANCE (Feet)	NOISE LEVEL Leq (dBA)
All Other Equipment > 5 HP	0	0	85	80	#N/A
Auger Drill Rig	0	0	85	80	#N/A
Backhoe	0	0	80	80	#N/A
Bar Bender	0	0	80	80	#N/A
Blasting	0	0	94	80	#N/A
Boring Jack Powe Unit	0	0	80	80	#N/A
Chain Saw	0	0	85	80	#N/A
Clam Shovel (dropping)	0	0	93	80	#N/A
Compactor (ground)	0	0	80	80	#N/A
Compressor (air)	0	0	80	80	#N/A
Concrete Batch Plant	0	0	83	80	#N/A
Concrete Mixer Truck	0	0	85	80	#N/A
Concrete Pump Truck	0	0	82	80	#N/A
Concrete Saw	0	0	90	80	#N/A
Crane	0	0	85	80	#N/A
Dozer	0	0	85	80	#N/A
Drill Rig Truck	0	0	84	80	#N/A
Drum Mixer	0	0	80	80	#N/A
Dump Truck	0	0	84	80	#N/A
Excavator	0	0	85	80	#N/A
Flat Bed Truck	0	0	84	80	#N/A
Front End Loader	0	0	80	80	#N/A
Generator	0	0	82	80	#N/A
Generator (< 25KVA, VMS Signs)	0	0	70	80	#N/A
Gradall	0	0	85	80	#N/A
Grader	0	0	85	80	#N/A
Grapple (on backhoe)	0	0	85	80	#N/A
Horizontal Boring Hydraulic Jack	0	0	80	80	#N/A
Hydra Break Ram	0	0	90	80	#N/A
Impact Pile Driver	0	0	95	80	#N/A
Jackhammer	0	0	85	80	#N/A
Man Lift	0	0	85	80	#N/A
Mounted Impact Hammer (hoe ram)	0	0	90	80	#N/A
Pavement Scarifier	0	0	85	80	#N/A
Paver	2	1	85	80	84
Pickup Truck	0	0	55	80	#N/A
Pneumatic Tools	0	0	85	80	#N/A
Pumps	0	0	77	80	#N/A
Refrigerator Unit	0	0	82	80	#N/A
Rivit Buster/Chipping Gun	0	0	85	80	#N/A
Rock Drill	0	0	85	80	#N/A
Roller	0	0	85	80	#N/A
Sand Blasting (single nozzle)	0	0	85	80	#N/A
Scraper	0	0	85	80	#N/A
Sheers (on backhoe)	0	0	85	80	#N/A
Slurry Plant	0	0	78	80	#N/A
Slurry Trenching Machine	0	0	82	80	#N/A
Soil Mix Drill Rig	0	0	80	80	#N/A
Tractor	0	0	84	80	#N/A
Vacuum Excavator (Vac-Truck)	0	0	85	80	#N/A
Vacuum Street Sweeper	0	0	80	80	#N/A
Ventilation Fan	0	0	85	80	#N/A
Vibrating Hopper	0	0	85	80	#N/A
Vibratory Concrete Mixer	0	0	80	80	#N/A
Vibratory Pile Driver	0	0	95	80	#N/A
Warning Horn	0	0	85	80	#N/A
Welder/Torch	0	0	73	80	#N/A

**TOTAL Leq DURING NORMAL OPERATIONS: 84**

Note: NA = Not Applicable

Sources: Federal Transit Administration (April 1995), *Transit Noise and Vibration*

Impact Assessment, p. 12-3. and FHWA Construction Equipment Noise Levels and Ranges - Highway Construction Noise Handbook

Via Princessa  
Construction Equipment  
Noise Model  
Phase 4

Assumed Attenuation: 6 dBA per doubling of distance

NOISE SOURCE	NUMBER OF UNITS	ASSUMED USE FACTOR	L <sub>max</sub> Noise LEVEL @ 50 FT (dBA)	DISTANCE (Feet)	NOISE LEVEL Leq (dBA)
All Other Equipment > 5 HP	0	0	85	720	#N/A
Auger Drill Rig	0	0	85	720	#N/A
Backhoe	0	0	80	720	#N/A
Bar Bender	0	0	80	720	#N/A
Blasting	0	0	94	720	#N/A
Boring Jack Powe Unit	0	0	80	720	#N/A
Chain Saw	0	0	85	720	#N/A
Clam Shovel (dropping)	0	0	93	720	#N/A
Compactor (ground)	0	0	80	720	#N/A
Compressor (air)	0	0	80	720	#N/A
Concrete Batch Plant	0	0	83	720	#N/A
Concrete Mixer Truck	0	0	85	720	#N/A
Concrete Pump Truck	0	0	82	720	#N/A
Concrete Saw	0	0	90	720	#N/A
Crane	0	0	85	720	#N/A
Dozer	0	0	85	720	#N/A
Drill Rig Truck	0	0	84	720	#N/A
Drum Mixer	0	0	80	720	#N/A
Dump Truck	0	0	84	720	#N/A
Excavator	0	0	85	720	#N/A
Flat Bed Truck	0	0	84	720	#N/A
Front End Loader	0	0	80	720	#N/A
Generator	0	0	82	720	#N/A
Generator (< 25KVA, VMS Signs)	0	0	70	720	#N/A
Gradall	0	0	85	720	#N/A
Grader	0	0	85	720	#N/A
Grapple (on backhoe)	0	0	85	720	#N/A
Horizontal Boring Hydraulic Jack	0	0	80	720	#N/A
Hydra Break Ram	0	0	90	720	#N/A
Impact Pile Driver	0	0	95	720	#N/A
Jackhammer	0	0	85	720	#N/A
Man Lift	0	0	85	720	#N/A
Mounted Impact Hammer (hoe ram)	0	0	90	720	#N/A
Pavement Scarifier	0	0	85	720	#N/A
Paver	2	1	85	720	65
Pickup Truck	0	0	55	720	#N/A
Pneumatic Tools	0	0	85	720	#N/A
Pumps	0	0	77	720	#N/A
Refrigerator Unit	0	0	82	720	#N/A
Rivit Buster/Chipping Gun	0	0	85	720	#N/A
Rock Drill	0	0	85	720	#N/A
Roller	0	0	85	720	#N/A
Sand Blasting (single nozzle)	0	0	85	720	#N/A
Scraper	0	0	85	720	#N/A
Sheers (on backhoe)	0	0	85	720	#N/A
Slurry Plant	0	0	78	720	#N/A
Slurry Trenching Machine	0	0	82	720	#N/A
Soil Mix Drill Rig	0	0	80	720	#N/A
Tractor	0	0	84	720	#N/A
Vacuum Excavator (Vac-Truck)	0	0	85	720	#N/A
Vacuum Street Sweeper	0	0	80	720	#N/A
Ventilation Fan	0	0	85	720	#N/A
Vibrating Hopper	0	0	85	720	#N/A
Vibratory Concrete Mixer	0	0	80	720	#N/A
Vibratory Pile Driver	0	0	95	720	#N/A
Warning Horn	0	0	85	720	#N/A
Welder/Torch	0	0	73	720	#N/A

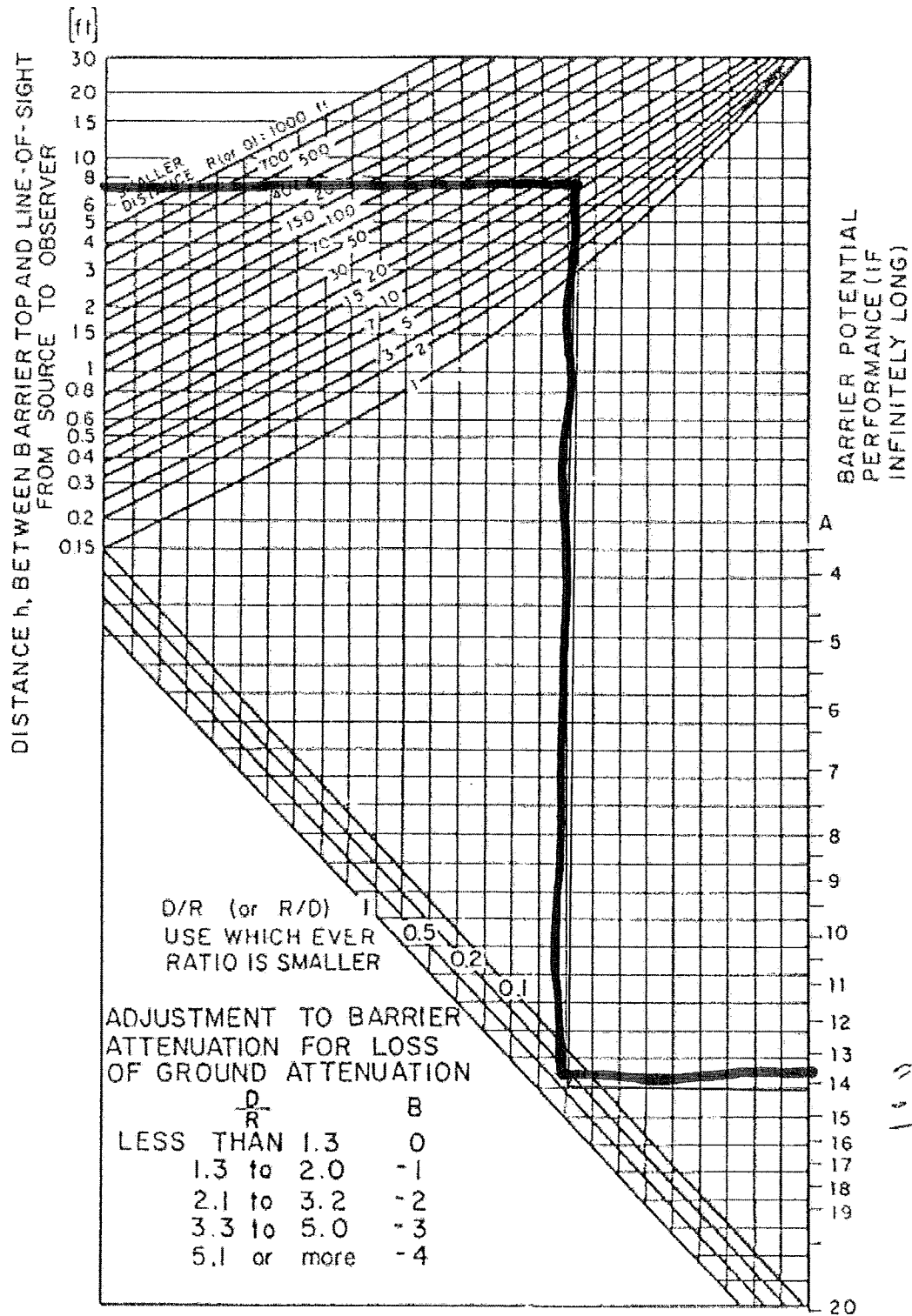
TOTAL Leq DURING NORMAL OPERATIONS:

65

Note: NA = Not Applicable

Sources: Federal Transit Administration (April 1995), *Transit Noise and Vibration Impact Assessment*, p. 12-3. and FHWA Construction Equipment Noise Levels and Ranges - Highway Construction Noise Handbook

Workchart 6  
Noise Barrier



$$h = 7.5$$

$$R = 14$$

$$D = 31$$

$$\frac{R}{D} = 0.45$$

$$\frac{D}{R} = 2.2$$

$$\begin{array}{r} 17.8 \\ - 2.0 \\ \hline 15.8 \end{array}$$

**Via Princessa  
Noise Barrier Calculations Model**

Enter the values for:                      Values  
H = Elevation of top of barrier            1554  
S = Elevation of the source                1545  
O = Elevation of the observer            1550  
R = Map distances from barrier to source    13  
D = Map distances from barrier to observer    32

1. Elevation of barrier top minus elevation of source	9	
2. Elevation of observer minus elevation of source	5	
3. Map distance between source and observer	45	
4. Map distance between barrier and source	13	
5. Line 2 divided by line 3	0.11	
6. Square the quantity on line 5	0.01	
7. 40 percent of line 6	0.005	
8. One minus line 7	0.995	
9. Line 5 times line 4 (will be negative if line 2 is negative)	1.4	
10. Line 1 minus line 9	7.6	
11. Line 10 times line 8	7.5	h
12. Line 5 times line 10	0.84	
13. Line 4 divided by line 8.	13	
14. Line 13 plus line 12	14	R
15. Line 3 minus line 4	32	
16. Line 15 divided by line 8.	32	
17. Line 16 minus line 12	31	D

Note to modelers: Only input data under "Values" (Column H).  
Source: U.S. Department of Housing and Urban Development, Office of Community Planning and Development, The Noise Guidebook, pgs. 58 to 60.

11.8 dB(A) reduction

**Via Princessa Project  
Construction Vibration Model  
Phase 1**

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance <sup>a</sup>	RMS Vibration level in VdB at adjusted distance
Air Compressor		0	0.090	80	0.000	0.000	0.0
Backhoe		0	0.040	80	0.000	0.000	0.0
Caisson drilling		0	0.089	80	0.000	0.000	0.0
Clam shovel drop (slurry wall)		0	0.202	80	0.000	0.000	0.0
Compactor		0	0.050	80	0.000	0.000	0.0
Compressor		0	0.045	80	0.000	0.000	0.0
Concrete Mixer		0	0.040	80	0.000	0.000	0.0
Concrete Pump		0	0.028	80	0.000	0.000	0.0
Concrete Vibrator		0	0.014	80	0.000	0.000	0.0
Crane (Derrick)		0	0.057	80	0.000	0.000	0.0
Crane (Mobile)		0	0.057	80	0.000	0.000	0.0
Generator		0	0.018	80	0.000	0.000	0.0
Excavator		0	0.040	80	0.000	0.000	0.0
Hydromill (slurry wall)	in soil	0	0.008	80	0.000	0.000	0.0
	in rock	0	0.017	80	0.000	0.000	0.0
Jackhammer		0	0.035	80	0.000	0.000	0.0
Large bulldozer		2	0.089	80	0.031	0.008	77.8
Loaded trucks		0	0.076	80	0.000	0.000	0.0
Water trucks		0	0.076	80	0.000	0.000	0.0
Loader		0	0.071	80	0.000	0.000	0.0
Pavement Breaker		0	0.100	80	0.000	0.000	0.0
Paver		1	0.063	80	0.011	0.003	68.8
Pile Driver (impact)	upper rang	0	1.518	80	0.000	0.000	0.0
	typical	0	0.644	80	0.000	0.000	0.0
Pile Driver (sonic)	upper rang	0	0.734	80	0.000	0.000	0.0
	typical	0	0.170	80	0.000	0.000	0.0
Pneumatic Tool		0	0.040	80	0.000	0.000	0.0
Pump		0	0.014	80	0.000	0.000	0.0
Roller		0	0.020	80	0.000	0.000	0.0
Saw		0	0.018	80	0.000	0.000	0.0
Scraper		2	0.057	80	0.020	0.005	73.9
Shovel		0	0.028	80	0.000	0.000	0.0
Tub Grinder		0	0.252	80	0.000	0.000	0.0
Small bulldozer		0	0.003	80	0.000	0.000	0.0

**\* Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), May 2006, pg. 12-12.**

**-Fragile Buildings- 0.20 in/sec**

Via Princessa  
Construction Vibration Model  
Phase 1

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance <sup>a</sup>	RMS Vibration level in VdB at adjusted distance
Air Compressor		0	0.090	720	0.000	0.000	0.0
Backhoe		0	0.040	720	0.000	0.000	0.0
Caisson drilling		0	0.089	720	0.000	0.000	0.0
Clam shovel drop (slurry wall)		0	0.202	720	0.000	0.000	0.0
Compactor		0	0.050	720	0.000	0.000	0.0
Compressor		0	0.045	720	0.000	0.000	0.0
Concrete Mixer		0	0.040	720	0.000	0.000	0.0
Concrete Pump		0	0.028	720	0.000	0.000	0.0
Concrete Vibrator		0	0.014	720	0.000	0.000	0.0
Crane (Derrick)		0	0.057	720	0.000	0.000	0.0
Crane (Mobile)		0	0.057	720	0.000	0.000	0.0
Generator		0	0.018	720	0.000	0.000	0.0
Excavator		0	0.040	720	0.000	0.000	0.0
Hydromill (slurry wall)	in soil	0	0.008	720	0.000	0.000	0.0
	in rock	0	0.017	720	0.000	0.000	0.0
Jackhammer		0	0.035	720	0.000	0.000	0.0
Large bulldozer		2	0.089	720	0.001	0.000	49.2
Loaded trucks		0	0.076	720	0.000	0.000	0.0
Water trucks		0	0.076	720	0.000	0.000	0.0
Loader		0	0.071	720	0.000	0.000	0.0
Pavement Breaker		0	0.100	720	0.000	0.000	0.0
Paver		1	0.063	720	0.000	0.000	40.2
Pile Driver (impact)	upper range	0	1.518	720	0.000	0.000	0.0
	typical	0	0.644	720	0.000	0.000	0.0
Pile Driver (sonic)	upper range	0	0.734	720	0.000	0.000	0.0
	typical	0	0.170	720	0.000	0.000	0.0
Pneumatic Tool		0	0.040	720	0.000	0.000	0.0
Pump		0	0.014	720	0.000	0.000	0.0
Roller		0	0.020	720	0.000	0.000	0.0
Saw		0	0.018	720	0.000	0.000	0.0
Scraper		2	0.057	720	0.001	0.000	45.2
Shovel		0	0.028	720	0.000	0.000	0.0
Tub Grinder		0	0.252	720	0.000	0.000	0.0
Small bulldozer		0	0.003	720	0.000	0.000	0.0

\* Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), May 2006, pg. 12-12.

-Fragile Buildings- 0.20 in/sec

-Extremely Fragile Buildings- 0.12 in/sec

a. PPV is typically a factor of 1.7 to 6 times greater than RMS vibration velocity. In this analysis a factor of 4 has been used to calculate the approximate RMS vibration velocity levels above.

**Via Princessa Project  
Construction Vibration Model  
Phase 2**

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance <sup>a</sup>	RMS Vibration level in VdB at adjusted distance
Air Compressor		0	0.090	80	0.000	0.000	0.0
Backhoe		1	0.040	80	0.007	0.002	64.8
Caisson drilling		0	0.089	80	0.000	0.000	0.0
Clam shovel drop (slurry wall)		0	0.202	80	0.000	0.000	0.0
Compactor		0	0.050	80	0.000	0.000	0.0
Compressor		0	0.045	80	0.000	0.000	0.0
Concrete Mixer		0	0.040	80	0.000	0.000	0.0
Concrete Pump		0	0.028	80	0.000	0.000	0.0
Concrete Vibrator		0	0.014	80	0.000	0.000	0.0
Crane (Derrick)		0	0.057	80	0.000	0.000	0.0
Crane (Mobile)		0	0.057	80	0.000	0.000	0.0
Generator		0	0.018	80	0.000	0.000	0.0
Excavator		0	0.040	80	0.000	0.000	0.0
Hydromill (slurry wall)	in soil	0	0.008	80	0.000	0.000	0.0
	in rock	0	0.017	80	0.000	0.000	0.0
Jackhammer		0	0.035	80	0.000	0.000	0.0
Large bulldozer		3	0.089	80	0.047	0.012	81.3
Loaded trucks		0	0.076	80	0.000	0.000	0.0
Water trucks		1	0.076	80	0.013	0.003	70.4
Loader		0	0.071	80	0.000	0.000	0.0
Pavement Breaker		0	0.100	80	0.000	0.000	0.0
Paver		1	0.063	80	0.011	0.003	68.8
Pile Driver (impact)	upper rang	0	1.518	80	0.000	0.000	0.0
	typical	0	0.644	80	0.000	0.000	0.0
Pile Driver (sonic)	upper rang	0	0.734	80	0.000	0.000	0.0
	typical	0	0.170	80	0.000	0.000	0.0
Pneumatic Tool		0	0.040	80	0.000	0.000	0.0
Pump		0	0.014	80	0.000	0.000	0.0
Roller		0	0.020	80	0.000	0.000	0.0
Saw		0	0.018	80	0.000	0.000	0.0
Scraper		2	0.057	80	0.020	0.005	73.9
Shovel		0	0.028	80	0.000	0.000	0.0
Tub Grinder		0	0.252	80	0.000	0.000	0.0
Small bulldozer		0	0.003	80	0.000	0.000	0.0

**\* Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), May 2006, pg. 12-12.**

**-Fragile Buildings- 0.20 in/sec**

**Via Princessa  
Construction Vibration Model  
Phase 2**

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance <sup>a</sup>	RMS Vibration level in VdB at adjusted distance
Air Compressor		0	0.090	720	0.000	0.000	0.0
Backhoe		1	0.040	720	0.000	0.000	36.2
Caisson drilling		0	0.089	720	0.000	0.000	0.0
Clam shovel drop (slurry wall)		0	0.202	720	0.000	0.000	0.0
Compactor		0	0.050	720	0.000	0.000	0.0
Compressor		0	0.045	720	0.000	0.000	0.0
Concrete Mixer		0	0.040	720	0.000	0.000	0.0
Concrete Pump		0	0.028	720	0.000	0.000	0.0
Concrete Vibrator		0	0.014	720	0.000	0.000	0.0
Crane (Derrick)		0	0.057	720	0.000	0.000	0.0
Crane (Mobile)		0	0.057	720	0.000	0.000	0.0
Generator		0	0.018	720	0.000	0.000	0.0
Excavator		0	0.040	720	0.000	0.000	0.0
Hydromill (slurry wall)	in soil	0	0.008	720	0.000	0.000	0.0
	in rock	0	0.017	720	0.000	0.000	0.0
Jackhammer		0	0.035	720	0.000	0.000	0.0
Large bulldozer		3	0.089	720	0.002	0.000	52.7
Loaded trucks		0	0.076	720	0.000	0.000	0.0
Water trucks		1	0.076	720	0.000	0.000	41.8
Loader		0	0.071	720	0.000	0.000	0.0
Pavement Breaker		0	0.100	720	0.000	0.000	0.0
Paver		1	0.063	720	0.000	0.000	40.2
Pile Driver (impact)	upper range	0	1.518	720	0.000	0.000	0.0
	typical	0	0.644	720	0.000	0.000	0.0
Pile Driver (sonic)	upper range	0	0.734	720	0.000	0.000	0.0
	typical	0	0.170	720	0.000	0.000	0.0
Pneumatic Tool		0	0.040	720	0.000	0.000	0.0
Pump		0	0.014	720	0.000	0.000	0.0
Roller		0	0.020	720	0.000	0.000	0.0
Saw		0	0.018	720	0.000	0.000	0.0
Scraper		2	0.057	720	0.001	0.000	45.2
Shovel		0	0.028	720	0.000	0.000	0.0
Tub Grinder		0	0.252	720	0.000	0.000	0.0
Small bulldozer		0	0.003	720	0.000	0.000	0.0

\* Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), May 2006, pg. 12-12.

-Fragile Buildings- 0.20 in/sec

-Extremely Fragile Buildings- 0.12 in/sec

a. PPV is typically a factor of 1.7 to 6 times greater than RMS vibration velocity. In this analysis a factor of 4 has been used to calculate the approximate RMS vibration velocity levels above.

**Via Princessa Project  
Construction Vibration Model  
Phase 3**

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance <sup>a</sup>	RMS Vibration level in VdB at adjusted distance
Air Compressor		0	0.090	80	0.000	0.000	0.0
Backhoe		0	0.040	80	0.000	0.000	0.0
Caisson drilling		0	0.089	80	0.000	0.000	0.0
Clam shovel drop (slurry wall)		0	0.202	80	0.000	0.000	0.0
Compactor		1	0.050	80	0.009	0.002	66.8
Compressor		0	0.045	80	0.000	0.000	0.0
Concrete Mixer		0	0.040	80	0.000	0.000	0.0
Concrete Pump		0	0.028	80	0.000	0.000	0.0
Concrete Vibrator		0	0.014	80	0.000	0.000	0.0
Crane (Derrick)		0	0.057	80	0.000	0.000	0.0
Crane (Mobile)		0	0.057	80	0.000	0.000	0.0
Generator		0	0.018	80	0.000	0.000	0.0
Excavator		1	0.040	80	0.007	0.002	64.8
Hydromill (slurry wall)	in soil	0	0.008	80	0.000	0.000	0.0
	in rock	0	0.017	80	0.000	0.000	0.0
Jackhammer		0	0.035	80	0.000	0.000	0.0
Large bulldozer		0	0.089	80	0.000	0.000	0.0
Loaded trucks		0	0.076	80	0.000	0.000	0.0
Water trucks		0	0.076	80	0.000	0.000	0.0
Loader		0	0.071	80	0.000	0.000	0.0
Pavement Breaker		0	0.100	80	0.000	0.000	0.0
Paver		0	0.063	80	0.000	0.000	0.0
Pile Driver (impact)	upper rang	0	1.518	80	0.000	0.000	0.0
	typical	0	0.644	80	0.000	0.000	0.0
Pile Driver (sonic)	upper rang	0	0.734	80	0.000	0.000	0.0
	typical	0	0.170	80	0.000	0.000	0.0
Pneumatic Tool		0	0.040	80	0.000	0.000	0.0
Pump		0	0.014	80	0.000	0.000	0.0
Roller		0	0.020	80	0.000	0.000	0.0
Saw		0	0.018	80	0.000	0.000	0.0
Scraper		1	0.057	80	0.010	0.002	67.8
Shovel		0	0.028	80	0.000	0.000	0.0
Tub Grinder		0	0.252	80	0.000	0.000	0.0
Small bulldozer		0	0.003	80	0.000	0.000	0.0

**\* Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), May 2006, pg. 12-12.**

**-Fragile Buildings- 0.20 in/sec**

Via Princessa  
Construction Vibration Model  
Phase 3

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance <sup>a</sup>	RMS Vibration level in VdB at adjusted distance
Air Compressor		0	0.090	720	0.000	0.000	0.0
Backhoe		0	0.040	720	0.000	0.000	0.0
Caisson drilling		0	0.089	720	0.000	0.000	0.0
Clam shovel drop (slurry wall)		0	0.202	720	0.000	0.000	0.0
Compactor		1	0.050	720	0.000	0.000	38.2
Compressor		0	0.045	720	0.000	0.000	0.0
Concrete Mixer		0	0.040	720	0.000	0.000	0.0
Concrete Pump		0	0.028	720	0.000	0.000	0.0
Concrete Vibrator		0	0.014	720	0.000	0.000	0.0
Crane (Derrick)		0	0.057	720	0.000	0.000	0.0
Crane (Mobile)		0	0.057	720	0.000	0.000	0.0
Generator		0	0.018	720	0.000	0.000	0.0
Excavator		1	0.040	720	0.000	0.000	36.2
Hydromill (slurry wall)	in soil	0	0.008	720	0.000	0.000	0.0
	in rock	0	0.017	720	0.000	0.000	0.0
Jackhammer		0	0.035	720	0.000	0.000	0.0
Large bulldozer		0	0.089	720	0.000	0.000	0.0
Loaded trucks		0	0.076	720	0.000	0.000	0.0
Water trucks		0	0.076	720	0.000	0.000	0.0
Loader		0	0.071	720	0.000	0.000	0.0
Pavement Breaker		0	0.100	720	0.000	0.000	0.0
Paver		0	0.063	720	0.000	0.000	0.0
Pile Driver (impact)	upper range	0	1.518	720	0.000	0.000	0.0
	typical	0	0.644	720	0.000	0.000	0.0
Pile Driver (sonic)	upper range	0	0.734	720	0.000	0.000	0.0
	typical	0	0.170	720	0.000	0.000	0.0
Pneumatic Tool		0	0.040	720	0.000	0.000	0.0
Pump		0	0.014	720	0.000	0.000	0.0
Roller		0	0.020	720	0.000	0.000	0.0
Saw		0	0.018	720	0.000	0.000	0.0
Scraper		1	0.057	720	0.000	0.000	39.2
Shovel		0	0.028	720	0.000	0.000	0.0
Tub Grinder		0	0.252	720	0.000	0.000	0.0
Small bulldozer		0	0.003	720	0.000	0.000	0.0

\* Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), May 2006, pg. 12-12.

-Fragile Buildings- 0.20 in/sec

-Extremely Fragile Buildings- 0.12 in/sec

a. PPV is typically a factor of 1.7 to 6 times greater than RMS vibration velocity. In this analysis a factor of 4 has been used to calculate the approximate RMS vibration velocity levels above.

**Via Princessa Project  
Construction Vibration Model  
Phase 4**

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance <sup>a</sup>	RMS Vibration level in VdB at adjusted distance
Air Compressor		0	0.090	80	0.000	0.000	0.0
Backhoe		0	0.040	80	0.000	0.000	0.0
Caisson drilling		0	0.089	80	0.000	0.000	0.0
Clam shovel drop (slurry wall)		0	0.202	80	0.000	0.000	0.0
Compactor		0	0.050	80	0.000	0.000	0.0
Compressor		0	0.045	80	0.000	0.000	0.0
Concrete Mixer		0	0.040	80	0.000	0.000	0.0
Concrete Pump		0	0.028	80	0.000	0.000	0.0
Concrete Vibrator		0	0.014	80	0.000	0.000	0.0
Crane (Derrick)		0	0.057	80	0.000	0.000	0.0
Crane (Mobile)		0	0.057	80	0.000	0.000	0.0
Generator		0	0.018	80	0.000	0.000	0.0
Excavator		0	0.040	80	0.000	0.000	0.0
Hydromill (slurry wall)	in soil	0	0.008	80	0.000	0.000	0.0
	in rock	0	0.017	80	0.000	0.000	0.0
Jackhammer		0	0.035	80	0.000	0.000	0.0
Large bulldozer		0	0.089	80	0.000	0.000	0.0
Loaded trucks		0	0.076	80	0.000	0.000	0.0
Water trucks		0	0.076	80	0.000	0.000	0.0
Loader		0	0.071	80	0.000	0.000	0.0
Pavement Breaker		0	0.100	80	0.000	0.000	0.0
Paver		2	0.063	80	0.022	0.006	74.9
Pile Driver (impact)	upper rang	0	1.518	80	0.000	0.000	0.0
	typical	0	0.644	80	0.000	0.000	0.0
Pile Driver (sonic)	upper rang	0	0.734	80	0.000	0.000	0.0
	typical	0	0.170	80	0.000	0.000	0.0
Pneumatic Tool		0	0.040	80	0.000	0.000	0.0
Pump		0	0.014	80	0.000	0.000	0.0
Roller		0	0.020	80	0.000	0.000	0.0
Saw		0	0.018	80	0.000	0.000	0.0
Scraper		0	0.057	80	0.000	0.000	0.0
Shovel		0	0.028	80	0.000	0.000	0.0
Tub Grinder		0	0.252	80	0.000	0.000	0.0
Small bulldozer		0	0.003	80	0.000	0.000	0.0

**\* Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), May 2006, pg. 12-12.**

**-Fragile Buildings- 0.20 in/sec**

Via Princessa  
Construction Vibration Model  
Phase 4

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance <sup>a</sup>	RMS Vibration level in VdB at adjusted distance
Air Compressor		0	0.090	720	0.000	0.000	0.0
Backhoe		0	0.040	720	0.000	0.000	0.0
Caisson drilling		0	0.089	720	0.000	0.000	0.0
Clam shovel drop (slurry wall)		0	0.202	720	0.000	0.000	0.0
Compactor		0	0.050	720	0.000	0.000	0.0
Compressor		0	0.045	720	0.000	0.000	0.0
Concrete Mixer		0	0.040	720	0.000	0.000	0.0
Concrete Pump		0	0.028	720	0.000	0.000	0.0
Concrete Vibrator		0	0.014	720	0.000	0.000	0.0
Crane (Derrick)		0	0.057	720	0.000	0.000	0.0
Crane (Mobile)		0	0.057	720	0.000	0.000	0.0
Generator		0	0.018	720	0.000	0.000	0.0
Excavator		0	0.040	720	0.000	0.000	0.0
Hydromill (slurry wall)	in soil	0	0.008	720	0.000	0.000	0.0
	in rock	0	0.017	720	0.000	0.000	0.0
Jackhammer		0	0.035	720	0.000	0.000	0.0
Large bulldozer		0	0.089	720	0.000	0.000	0.0
Loaded trucks		0	0.076	720	0.000	0.000	0.0
Water trucks		0	0.076	720	0.000	0.000	0.0
Loader		0	0.071	720	0.000	0.000	0.0
Pavement Breaker		0	0.100	720	0.000	0.000	0.0
Paver		2	0.063	720	0.001	0.000	46.2
Pile Driver (impact)	upper range	0	1.518	720	0.000	0.000	0.0
	typical	0	0.644	720	0.000	0.000	0.0
Pile Driver (sonic)	upper range	0	0.734	720	0.000	0.000	0.0
	typical	0	0.170	720	0.000	0.000	0.0
Pneumatic Tool		0	0.040	720	0.000	0.000	0.0
Pump		0	0.014	720	0.000	0.000	0.0
Roller		0	0.020	720	0.000	0.000	0.0
Saw		0	0.018	720	0.000	0.000	0.0
Scraper		0	0.057	720	0.000	0.000	0.0
Shovel		0	0.028	720	0.000	0.000	0.0
Tub Grinder		0	0.252	720	0.000	0.000	0.0
Small bulldozer		0	0.003	720	0.000	0.000	0.0

\* Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), May 2006, pg. 12-12.

-Fragile Buildings- 0.20 in/sec

-Extremely Fragile Buildings- 0.12 in/sec

a. PPV is typically a factor of 1.7 to 6 times greater than RMS vibration velocity. In this analysis a factor of 4 has been used to calculate the approximate RMS vibration velocity levels above.