Appendix C

Noise and Vibration Worksheets

Initial Study/Negative Declaration for Central Outfall Sewer at 59th Street and 4th Avenue Project

Receptor Noise Level from Construction Activities

Daytime Noise Levels

Receptor = House at 59th St/4th Ave Intersection

Time	Construction Noise @ 50 ft (dBA)	Construction Noise @ Receptor (dBA)	Construction Noise @ Receptor w/ CNEL penalty (dBA)
0:00	0	0	10
1:00	0	0	10
2:00	0	0	10
3:00	0	0	10
4:00	0	0	10
5:00	0	0	10
6:00	0	0	10
7:00	87	85	85
8:00	87	85	85
9:00	87	85	85
10:00	87	85	85
11:00	87	85	85
12:00	87	85	85
13:00	87	85	85
14:00	87	85	85
15:00	87	85	85
16:00	87	85	85
17:00	87	85	85
18:00	0	0	5
19:00	0	0	5
20:00	0	0	5
21:00	0	0	5
22:00	0	0	10
23:00	0	0	10
		Construction CNEL	82
		Existing CNEL	50
		Construction CNEL - Existing CNEL	**32**

Noise Reduction	**dBA**
Mufflers on Construction Equipment	2
Barrier at Construction Site	5
Light frame w/ ordinary sash window	20

Outdoor noise level with reduction

Construction CNEL	75
Level above existing CNEL	**25**

Indoor noise level	55

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Peak Day Construction Equipment Noise Level

Summaries

Range of Equipment Noise Levels

	min	max
Lmax	77	90
Leq	72	83

Phase	Leq at 50 ft (dBA)
Drilling + Excavation	87
Storm drain + COS Construction	85
Backfill + Additional storm drain work	84
Street Construction	83

1. Drilling Operations

Equipment Type	Lmax at 50 ft per Unit (dBA)	Leq at 50 ft per Unit (dBA)	Number of Equipment	Add to per Unit Level (dBA)	Total Leq at 50 ft (dBA)
Drill rig	79	72	1	0	72
Crane	81	73	1	0	73
Backhoe	78	74	1	0	74
Concrete trucks	79	75	1	0	75
Concrete pump truck	81	74	1	0	74
Telehandler	78	74	1	0	74
Concrete saw	90	83	1	0	83
Water truck	77	73	1	0	73
				TOTAL	85

2. Excavation

Equipment Type	Lmax at 50 ft per Unit (dBA)	Leq at 50 ft per Unit (dBA)	Number of Equipment	Add to per Unit Level (dBA)	Total Leq at 50 ft (dBA)
Excavator	81	77	1	0	77
Backhoe	78	74	1	0	74
Dump trucks	77	73	4	6	79
Water truck	77	73	1	0	73
				TOTAL	82

3. Major Storm Drain Construction

Equipment Type	Lmax at 50 ft per Unit (dBA)	Leq at 50 ft per Unit (dBA)	Number of Equipment	Add to per Unit Level (dBA)	Total Leq at 50 ft (dBA)
Concrete trucks	79	75	1	0	75
Concrete pump truck	81	74	1	0	74
Telehandler	78	74	1	0	74
Water truck	77	73	1	0	73
				TOTAL	80

4. COS Construction

Equipment Type	Lmax at 50 ft per Unit (dBA)	Leq at 50 ft per Unit (dBA)	Number of Equipment	Add to per Unit Level (dBA)	Total Leq at 50 ft (dBA)
Crane	81	73	1	0	73
Concrete saw	90	83	1	0	83
Telehandler	78	74	1	0	74
				TOTAL	83

5. Backfill

Equipment Type	Lmax at 50 ft per Unit (dBA)	Leq at 50 ft per Unit (dBA)	Number of Equipment	Add to per Unit Level (dBA)	Total Leq at 50 ft (dBA)
Excavator	81	77	1	0	77
Backhoe	78	74	1	0	74
Dump trucks	77	73	3	5	77
Telehandler	78	74	1	0	74
Compaction equipment	83	76	1	0	76
				TOTAL	83

6. Additional Storm Drain Work

Equipment Type	Lmax at 50 ft per Unit (dBA)	Leq at 50 ft per Unit (dBA)	Number of Equipment	Add to per Unit Level (dBA)	Total Leq at 50 ft (dBA)
Backhoe	78	74	1	0	74
Dump trucks	77	73	1	0	73
Telehandler	78	74	1	0	74
				TOTAL	78

7. Street Construction

Equipment Type	Lmax at 50 ft per Unit (dBA)	Leq at 50 ft per Unit (dBA)	Number of Equipment	Add to per Unit Level (dBA)	Total Leq at 50 ft (dBA)
Backhoe	78	74	1	0	74
Dump trucks	77	73	1	0	73
Grader	85	81	1	0	81
Paver	77	74	1	0	74
				TOTAL	83

Traffic Noise:

Traffic noise impacts include noise generated from an increase in local vehicle traffic due to construction workers commuting and trucks hauling waste and construction materials. The expected haul route for excavated materials from the 59th St/4th Ave intersection is to travel north on 59th St, east on W Slauson Ave onto 110 then I-10. There would be three to four dump trucks making 30-33 round-trips for excavated materials and backfill. Assuming each truck makes one one-way trip during the peak hour, four haul trucks are similar to 28 automobiles. Assuming construction worker commute occurs during the same peak hour on the same roads as the haul route, the project would add 32 automobiles; the maximum number of workers is estimated to be 32 during the drilling and exacavation phase. The project would add a total of 60 automobiles to the peak hour traffic.

Peak hour traffic on 59th Street is estimated to be approximately 100 vehicles. The rule of thumb for noise increase is that a doubling of the noise source results in a 3 dB increase,which is barely perceptible. According to the conservative estimate, the project would at most add an equivalent of 60 automobiles to 59th Street, which would not double the number of vehicles and therefore would not result in a significant increase. The remainder of the haul route is on more heavily traveled roads, therefore, there would be less than significant impacts to the ambient noise levels due to project traffic. Residual impact after mitigation would be significant and unavoidable.

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Equipment noise emissions and acoustical usage factors database

Equipment Description	Impact Device?	Acoustical Use Factor	RCNM Default Lmax @ 50ft (dBA, slow)	Leq @ 50ft (dBA)
Backhoe	No	40%	78	74
Compactor (ground)	No	20%	83	76
Concrete Mixer Truck	No	40%	79	75
Concrete Pump Truck	No	20%	81	74
Concrete Saw	No	20%	90	83
Crane	No	16%	81	73
Drill Rig Truck	No	20%	79	72
Dump Truck	No	40%	77	73
Excavator	No	40%	81	77
Front End Loader	No	40%	79	75
Grader	No	40%	85	81
Paver	No	50%	77	74

Usage factor is the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power. In case of construction blasting, the eqiupment gives a very short durationg blast and can be quantified by using a 1% usage factor in the RCNM to allow for some prediction.

FHWA. 2006. Roadway Construction Noise Model User's Guide. January.

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Attenuation Calculations

Receptor Name	House on 59th St/4th Ave
Distance from Source to Receptor (ft)	60
Distance Attenuation (dB)	2
Atmospheric Attenuation (dB)	0.0
Total Attenuation for Receptor (dB)	2

Distance Attenuation $A_{div} = 20 \times \log(d/50)$ d = distance

Atmospheric Attenuation $A_{air} = \alpha d$

Assumptions	
Ambient pressure (kPa)	101.3
Temperature (F)	68
Relative humidity (%)	50
Frequency of noise source (Hz)	500
Air Attenuation Coefficient (α, dB/km)	2.7
(dB/ft)	0.0008

Conversion: 0.3048 m/ft
1000 m/km

Weather in Los Angeles, CA
Average temperature 66.2
Average relative humidity 62%

Reference:

Harris, Cyril M. 1998. Handbook of Acoustical Measurements and Noise Control. 3rd ed. - Chapter 3 Calculation of Attenuation
Comparative Climatic Data - Los Angeles C.O. http://ggweather.com/ccd/meantemp.htm; http://ggweather.com/ccd/avgrh.htm

Initial Study/Negative Declaration for Central Outfall Sewer at 59th Street and 4th Avenue Project

Peak Day Construction Equipment Vibration Level

Significance Criteria

Continuous/frequent intermittent sources potentially damaging to older residential structures	0.3	in/sec
Human response to transient vibration - severe:	0.4	in/sec

Caltrans.2004.Transporation and Construction Induced Vibration Manual.

Summary of results at the receptor 60 ft from construction area

Phase	PPV (in/sec)
Drilling + Excavation	0.07
Storm drain + COS Construction	0.02
Backfill + Additional storm drain work	0.06
Street Construction	0.01

Drilling/Excavation

		Distance (ft):	At Source 25	At Receptor 60
Equipment Description	Equivalent Equipment Types	Number of Equipment	PPV (in/sec)	PPV (in/sec)
Drill rig	Large Bulldozer / Hoe Ram	1	0.0356	0.010
Excavator	N/A	1	0	0.000
Crane	N/A	1	0	0.000
Backhoe	N/A	2	0	0.000
Concrete trucks	Loaded Trucks	1	0.0304	0.008
Concrete pump truck	Loaded Trucks	1	0.0304	0.008
Dump trucks	Loaded Trucks	4	0.1216	0.033
Telehandler	N/A	1	0	0
Water truck	Loaded Trucks	1	0.0304	0.008
TOTAL		**N/A**	**N/A**	**0.067**

Storm Drain & COS Construction

		Distance (ft):	At Source 25	At Receptor 60
Equipment Description	Equivalent Equipment Types	Number of Equipment	PPV (in/sec)	PPV (in/sec)
Concrete trucks	Loaded Trucks	1	0.0304	0.008
Concrete pump truck	Loaded Trucks	1	0.0304	0.008
Telehandler	N/A	2	0	0
Water truck	Loaded Trucks	1	0.0304	0.008
Crane	N/A	1	0	0.000
Concrete saw	N/A	1	0	0.000
TOTAL		**N/A**	**N/A**	**0.025**

Backfill & Additional Storm Drain Construction

		Distance (ft):	At Source 25	At Receptor 60
Equipment Description	Equivalent Equipment Types	Number of Equipment	PPV (in/sec)	PPV (in/sec)
Excavator	N/A	1	0	0.000
Backhoe	N/A	2	0	0.000
Dump trucks	Loaded Trucks	3	0.0912	0.025
Telehandler	N/A	2	0	0
Compaction equipment	Vibratory Roller	1	0.042	0.011
Backhoe	N/A	2	0	0.000
Dump trucks	Loaded Trucks	3	0.0912	0.025
TOTAL		**N/A**	**N/A**	**0.060**

Street Construction

		Distance (ft):	At Source 25	At Receptor 60
Equipment Description	Equivalent Equipment Types	Number of Equipment	PPV (in/sec)	PPV (in/sec)
Backhoe	N/A	1	0	0.000
Dump trucks	Loaded Trucks	1	0.0304	0.008
Grader	N/A	1	0.000	0.000
Paver	N/A	1	0.000	0.000
TOTAL		**N/A**	**N/A**	**0.008**

Vibration Levels of Typical Construction Equipment

Equipment Types	PPV at 25 feet (in/sec)	L_v at 25 feet (VdB)	Usage Factor	Average PPV at 25 ft (in/sec)	Average Lv at 25 ft (VdB)
Clam Shovel Drop	0.202	94	20%	0.040	87
Vibratory Roller	0.21	94	20%	0.042	87
Large Bulldozer / Hoe Ram	0.089	87	40%	0.036	83
Caisson Drilling	0.089	87	20%	0.018	80
Loaded Trucks	0.076	86	40%	0.030	82
Jackhammer	0.035	79	20%	0.007	72

Lv approximated from PPV using a reference velocity of 1 micro-inch/sec

FTA, Transit Noise and Vibration Impact Assessment, 2006.

Usage factor from FHWA. 2006. Roadway Construction Noise Model User's Guide. January.