
Appendix F:

Noise Supporting Information

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Mobile Construction Activity Noise Calculation

Receiving residential land use	Reference (dBA) 50 ft	Quantity	Usage factor[1]	Distance to Receptor [2]	Ground Effect[3]	Shielding (dBA)[4]	Calculated (dBA)		Energy
Equipment Description	Lmax						Lmax	Leq	
Grader	85	1	40	110	1	0	74.7	70.7	11879330.1
Excavator	85	1	40	135	1	0	72.1	68.1	6426413.98
Dozer	85	1	40	135	1	0	72.1	68.1	6426413.98
Front End Loader	80	1	40	135	1	0	67.1	63.1	2032210.54
Backhoe	80	1	40	135	1	0	67.1	63.1	2032210.54
Notes:							Lmax[5]	75	Leq 75

- Notes:
- [1] Percentage of time activity occurs each hour based on FHWA usage factors
 - [2] Distance assumes one piece of equipment adjacent to project boundary and others at the closest reasonable operating distance away
 - [3] Soft ground terrain between project site and receptor.
 - [4] Shielding due to terrain or structures
 - [5] Calculated Lmax is the loudest value.

Distance to Receptor (feet)		8 Hour Average Calculation					
		Time	Hourly Leq	Leq'	0.1*Leq	antiLog	
Notes: *Equipment is measured as operating across the project site	Night	12:00 AM	0.0	10.0	1	10	
		1:00 AM	0.0	10.0	1	10	
		2:00 AM	0.0	10.0	1	10	
		3:00 AM	0.0	10.0	1	10	
		4:00 AM	0.0	10.0	1	10	
		5:00 AM	0.0	10.0	1	10	
		6:00 AM	0.0	10.0	1	10	
	Day	7:00 AM	0.0	0.0	0	1	
		8:00 AM	74.6	74.6	7.459340899	28796579.1	
		9:00 AM	73.7	73.7	7.368169005	23343663	
		10:00 AM	69.6	69.6	6.957655126	9070999.14	
		11:00 AM	66.5	66.5	6.645966724	4425544.62	
		12:00 PM	0.0	0.0	0	1	
		1:00 PM	63.9	63.9	6.394635731	2481051.22	
		2:00 PM	61.8	61.8	6.18403589	1527692.3	
		3:00 PM	66.5	66.5	6.645966724	4425544.62	
		4:00 PM	66.5	66.5	6.645966724	4425544.62	
		5:00 PM	0.0	0.0	0	1	
		6:00 PM	0.0	0.0	0	1	
	Evening	7:00 PM	0.0	5.0	0.5	3.16227766	
		8:00 PM	0.0	5.0	0.5	3.16227766	
		9:00 PM	0.0	5.0	0.5	3.16227766	
	Night	10:00 PM	0.0	10.0	1	10	
		11:00 PM	0.0	10.0	1	10	
				Sum	78496722.1		
				Sum/8	9812090.27		
				Log10(Sum/8)	6.99176153		
				10*Log10(Sum/8)	69.9176153		
				8 Hour Average	70		

Receiving residential land use	Reference (dBA) 50 ft	Quantity	Usage factor[1]	Distance to Receptor [2]	Ground Effect[3]	Shielding (dBA)[4]	Calculated (dBA)		Energy
Equipment Description	Lmax						Lmax	Leq	
Grader	85	1	40	135	1	0	76.4	68.1	6426413.98
Excavator	85	1	40	135	1	0	76.4	68.1	6426413.98
Dozer	85	1	40	135	1	0	76.4	68.1	6426413.98
Front End Loader	80	1	40	135	1	0	71.4	63.1	2032210.54
Backhoe	80	1	40	135	1	0	71.4	63.1	2032210.54
							Leq		74

Receiving residential land use	Reference (dBA) 50 ft	Quantity	Usage factor[1]	Distance to Receptor [2]	Ground Effect[3]	Shielding (dBA)[4]	Calculated (dBA)		Energy
Equipment Description	Lmax						Lmax	Leq	
Grader	85	1	40	185	1	0	73.6	64.0	2497208.58
Excavator	85	1	40	185	1	0	73.6	64.0	2497208.58
Dozer	85	1	40	185	1	0	73.6	64.0	2497208.58
Front End Loader	80	1	40	185	1	0	68.6	59.0	789686.692
Backhoe	80	1	40	185	1	0	68.6	59.0	789686.692
							Leq		70

Receiving residential land use									
	Reference (dBA) 50 ft	Quantity	Usage factor[1]	Distance to Receptor [2]	Ground Effect[3]	Shielding (dBA)[4]	Calculated (dBA)		Energy
							Lmax	Leq	
Equipment Description	Lmax								
Grader	85	1	40	235	1	0	71.6	60.9	1218334.15
Excavator	85	1	40	235	1	0	71.6	60.9	1218334.15
Dozer	85	1	40	235	1	0	71.6	60.9	1218334.15
Front End Loader	80	1	40	235	1	0	66.6	55.9	385271.086
Backhoe	80	1	40	235	1	0	66.6	55.9	385271.086

Mobile Construction Activity Noise Calculation

Receiving commercial/office land use								
	Reference (dBA) 50 ft						Calculated (dBA)	
Equipment Description	Lmax	Quantity	Usage factor[1]	Distance to Receptor [2]	Ground Effect[3]	Shielding (dBA)[4]	Lmax	Leq
Grader	85	1	40	160	1	0	69.8	65.9
Excavator	85	1	40	185	1	0	68.0	64.0
Dozer	85	1	40	185	1	0	68.0	64.0
Front End Loader	80	1	40	185	1	0	63.0	59.0
Backhoe	80	1	40	185	1	0	63.0	59.0
							Lmax[5]	70
							Leq	70

Notes:

[1] Percentage of time activity occurs each hour based on FHWA usage factors

[2] Distance assumes one piece of equipment adjacent to project boundary and others at the closest reasonable operating distance away

[3] Soft ground terrain between project site and receptor.

[4] Shielding due to terrain or structures

[5] Calculated Lmax is the loudest value.

Distance to Receptor (feet)		8 Hour Average Calculation					
		Time	Hourly Leq	Leq'	0.1*Leq	antiLog	
Notes: *Equipment is measured as operating across the project site	Night	12:00 AM	0.0	10.0	1	10	
		1:00 AM	0.0	10.0	1	10	
		2:00 AM	0.0	10.0	1	10	
		3:00 AM	0.0	10.0	1	10	
		4:00 AM	0.0	10.0	1	10	
		5:00 AM	0.0	10.0	1	10	
		6:00 AM	0.0	10.0	1	10	
	Day	7:00 AM	0.0	0.0	0	1	
		8:00 AM	70.2	70.2	7.018450532	10433992.8	
		9:00 AM	69.6	69.6	6.957655126	9070999.14	
		10:00 AM	66.5	66.5	6.645966724	4425544.62	
		11:00 AM	63.9	63.9	6.394635731	2481051.22	
		12:00 PM	0.0	0.0	0	1	
		1:00 PM	61.8	61.8	6.18403589	1527692.3	
		2:00 PM	60.0	60.0	6.002788122	1006440.54	
		3:00 PM	63.9	63.9	6.394635731	2481051.22	
		4:00 PM	63.9	63.9	6.394635731	2481051.22	
		5:00 PM	0.0	0.0	0	1	
		6:00 PM	0.0	0.0	0	1	
	Evening	7:00 PM	0.0	5.0	0.5	3.16227766	
		8:00 PM	0.0	5.0	0.5	3.16227766	
		9:00 PM	0.0	5.0	0.5	3.16227766	
	Night	10:00 PM	0.0	10.0	1	10	
		11:00 PM	0.0	10.0	1	10	
				Sum	33907926.5		
				Sum/8	4238490.82		
				Log10(Sum/8)	6.62721125		
				10*Log10(Sum/8)	66.2721125		
				8 Hour Average	66		

Notes: *Equipment is measured as operating across the project site

Receiving commercial/office land use								
	Reference (dBA) 50 ft						Calculated (dBA)	
Equipment Description	Lmax	Quantity	Usage factor[1]	Distance to Receptor [2]	Ground Effect[3]	Shielding (dBA)[4]	Lmax	Leq
Grader	85	1	40	185	1	0	73.6	64.0
Excavator	85	1	40	185	1	0	73.6	64.0
Dozer	85	1	40	185	1	0	73.6	64.0
Front End Loader	80	1	40	185	1	0	68.6	59.0
Backhoe	80	1	40	185	1	0	68.6	59.0
							Leq	70

Receiving commercial/office land use								
	Reference (dBA) 50 ft						Calculated (dBA)	
Equipment Description	Lmax	Quantity	Usage factor[1]	Distance to Receptor [2]	Ground Effect[3]	Shielding (dBA)[4]	Lmax	Leq
Grader	85	1	40	235	1	0	71.6	60.9
Excavator	85	1	40	235	1	0	71.6	60.9
Dozer	85	1	40	235	1	0	71.6	60.9
Front End Loader	80	1	40	235	1	0	66.6	55.9
Backhoe	80	1	40	235	1	0	66.6	55.9

										Leq	66
Receiving commercial/office land use	Reference (dBA) 50 ft	Quantity	Usage factor[1]	Distance to Receptor [2]	Ground Effect[3]	Shielding (dBA)[4]	Calculated (dBA)		Energy		
	Lmax						Leq				
Equipment Description											
Grader	85	1	40	285	1	0	69.9	58.3	683023.151		
Excavator	85	1	40	285	1	0	69.9	58.3	683023.151		
Dozer	85	1	40	285	1	0	69.9	58.3	683023.151		
Front End Loader	80	1	40	285	1	0	64.9	53.3	215990.885		
Backhoe	80	1	40	285	1	0	64.9	53.3	215990.885		
										Leq	64

Receiving commercial/office land use										
	Reference (dBA) 50 ft	Quantity	Usage factor[1]	Distance to Receptor [2]	Ground Effect[3]	Shielding (dBA)[4]	Calculated (dBA)		Energy	
							Lmax	Leq		
Equipment Description										
Grader	85	1	40	335	1	0	68.5	56.2	420567.378	
Excavator	85	1	40	335	1	0	68.5	56.2	420567.378	
Dozer	85	1	40	335	1	0	68.5	56.2	420567.378	
Front End Loader	80	1	40	335	1	0	63.5	51.2	132995.083	
Backhoe	80	1	40	335	1	0	63.5	51.2	132995.083	
								Leq	62	

Receiving commercial/office land use									
	Reference (dBA) 50 ft	Quantity	Usage factor[1]	Distance to Receptor [2]	Ground Effect[3]	Shielding (dBA)[4]	Calculated (dBA)		Energy
							Lmax	Leq	
Equipment Description									
Grader	85	1	40	385	1	0	67.3	54.4	277068.923
Excavator	85	1	40	385	1	0	67.3	54.4	277068.923
Dozer	85	1	40	385	1	0	67.3	54.4	277068.923
Front End Loader	80	1	40	385	1	0	62.3	49.4	87616.8864
Backhoe	80	1	40	385	1	0	62.3	49.4	87616.8864
								Leq	60

Receiving commercial/office land use									
	Reference (dBA) 50 ft	Quantity	Usage factor[1]	Distance to Receptor [2]	Ground Effect[3]	Shielding (dBA)[4]	Calculated (dBA)		Energy
							Lmax	Leq	
Equipment Description	Lmax	Quantity	factor[1]	Distance to Receptor [2]	Ground Effect[3]	Shielding (dBA)[4]	Lmax	Leq	Energy
Grader	85	1	40	285	1	0	69.9	58.3	683023.151
Excavator	85	1	40	285	1	0	69.9	58.3	683023.151
Dozer	85	1	40	285	1	0	69.9	58.3	683023.151
Front End Loader	80	1	40	285	1	0	64.9	53.3	215990.885
Backhoe	80	1	40	285	1	0	64.9	53.3	215990.885
							Leq		64

Receiving commercial/office land use										
	Reference (dBA) 50 ft	Quantity	Usage factor[1]	Distance to Receptor [2]	Ground Effect[3]	Shielding (dBA)[4]	Calculated (dBA)		Energy	
							Lmax	Leq		
Equipment Description	Lmax	Quantity	Usage factor[1]	Distance to Receptor [2]	Ground Effect[3]	Shielding (dBA)[4]	Lmax	Leq	Energy	
Grader	85	1	40	285	1	0	69.9	58.3	683023.151	
Excavator	85	1	40	285	1	0	69.9	58.3	683023.151	
Dozer	85	1	40	285	1	0	69.9	58.3	683023.151	
Front End Loader	80	1	40	285	1	0	64.9	53.3	215990.885	
Backhoe	80	1	40	285	1	0	64.9	53.3	215990.885	
								Leq	64	

$$PPV_{\text{equip}} = PPV_{\text{ref}} \times (25/D)^{1.5}$$

Input the desired calculation distance into "yellow" cells

	"D"	PPV _{equip}	L _{equip}
Vibratory roller	110	0.023	74.7
Large bulldozer	110	0.010	67.7
Loaded trucks	110	0.008	66.7
Small bulldozer	110	0.000	38.7

$$L_{\text{vequip}} = L_{\text{vref}} - 30 \cdot \log(D/25)$$

(Note: $L_v = \text{rms } V_{\text{dB}}$)

Reference Typical Vibration Source Levels for Construction Equipment

	PPV at 25 ft	Aproximate L_v at 25 ft
Vibratory roller	0.21	94
Large bulldozer	0.089	87
Loaded trucks	0.076	86
Small bulldozer	0.003	58