Appendix F

Noise Modeling

Attachment 1

Construction Noise & Vibration Calculations

Construction Noise

	Noise Level @ 50 ft	Sonoma County Day School (S)	FedEx Facility (SW)	Industrial (W)
Distance		670	610	385
Demolition	83	60.458	61.273	65.270
Site Preparation	86	63.458	64.273	68.270
Grading	83	60.458	61.273	65.270
Building Construction	87	64.458	65.273	69.270
Paving	85	62.458	63.273	67.270

Construction Vibration

	Vibration @ 25 ft	Sonoma County Day School (S)	FedEx Facility (SW)	Industrial (W)
		40	105	55
Vibratory Roller	0.21	0.104	0.024	0.064
Large Bulldozer	0.089	0.044	0.010	0.027
Loaded Trucks	0.076	0.038	0.009	0.023
Small Bulldozer	0.003	0.001	0.000	0.001

	Vibration @ 25 ft	Sonoma County Day School (S)	FedEx Facility (SW)	Industrial (W)
		40	105	55
Vibratory Roller	0.21	0.104	0.024	0.064

Vibration Annoyance

MTSJ-02	Vibration @ 25 ft	Sonoma County Day School (S)	FedEx Facility (SW)	Industrial (W)
Phase 1	VdB	670	105	55
Vibratory Roller	94	51.156	75.303	83.727
Large Bulldozer	87	44.156	68.303	76.727
Loaded Trucks	86	43.156	67.303	75.727
Small Bulldozer	58	15.156	39.303	47.727

Attachment 2

RCNM

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/30/2023
Case Description: Demolition

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Demolition	Residential	55.0	55.0	50.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	50.0	0.0
Dozer	No	40		81.7	50.0	0.0
Man Lift	No	20		74.7	50.0	0.0
Man Lift	No	20		74.7	50.0	0.0
Generator	No	50		80.6	50.0	0.0

Results

Noise Limits (dBA)

Noise Limit Exceedance (dBA)

Equipment	Calculated (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	74.7	67.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	74.7	67.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Generator	80.6	77.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Total	81.7	82.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/30/2023
Case Description: Site Preparation

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Site Preparation	Residential	55.0	55.0	50.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	50.0	0.0
Dozer	No	40		81.7	50.0	0.0
Grader	No	40	85.0		50.0	0.0
Dozer	No	40		81.7	50.0	0.0
Dozer	No	40		81.7	50.0	0.0

Results

Noise Limits (dBA)

Noise Limit Exceedance (dBA)

Equipment	Calculated (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	85.0	81.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Total	85.0	85.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/30/2023
Case Description: Grading

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Grading	Residential	55.0	55.0	50.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	50.0	0.0
Dozer	No	40		81.7	50.0	0.0
Dozer	No	40		81.7	50.0	0.0
Roller	No	20		80.0	50.0	0.0
Roller	No	20		80.0	50.0	0.0

Results

Noise Limits (dBA)

Noise Limit Exceedance (dBA)

Equipment	Calculated (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	80.0	73.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	80.0	73.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Total	81.7	83.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/30/2023
Case Description: Building Construction

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Building Construction	Residential	55.0	55.0	50.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	50.0	0.0
Concrete Saw	No	20		89.6	50.0	0.0
Excavator	No	40		80.7	50.0	0.0
Excavator	No	40		80.7	50.0	0.0
Excavator	No	40		80.7	50.0	0.0

Results

Noise Limits (dBA)

Noise Limit Exceedance (dBA)

Equipment	Calculated (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Concrete Saw	89.6	82.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Concrete Saw	89.6	82.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	80.7	76.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	80.7	76.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	80.7	76.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Total	89.6	87.0	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A			

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/30/2023
Case Description: Paving

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Paving	Residential	55.0	55.0	50.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Roller	No	20		80.0	50.0	0.0
Roller	No	20		80.0	50.0	0.0
Scraper	No	40		83.6	50.0	0.0
Paver	No	50		77.2	50.0	0.0
Grader	No	40	85.0		50.0	0.0

Results

Noise Limits (dBA)

Noise Limit Exceedance (dBA)

Equipment	Calculated (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Roller	80.0	73.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	80.0	73.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper	83.6	79.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	77.2	74.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	85.0	81.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Total	85.0	84.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Attachment 3

Operational & Barrier Calculations

Barrier Calculation

Project No. 22-12968									Loading Dock/Truck Noise Calculations			
Receptor: Sonoma County Day School												
		Number of Truck Docks Per Building			Distance Attenuation (Feet)			Barrier Attenuation				
Metric	Ref @ 50 ft	9	9	9	445	520	1000	0	0	0		**Total (dBA)**
L50	40.0	49.5	59.1	68.6	30.6	38.7	42.6	30.6	38.7	42.6		**44.3**
L25	42.0	51.5	61.1	70.6	32.6	40.7	44.6	32.6	40.7	44.6		**46.3**
L8	53.0	62.5	72.1	81.6	43.6	51.7	55.6	43.6	51.7	55.6		**57.3**
L2	54.0	63.5	73.1	82.6	44.6	52.7	56.6	44.6	52.7	56.6		**58.3**
Lmax	75.0	75.0	84.5	94.1	56.0	64.2	68.1	56.0	64.2	68.1		**69.7**
Receptor: XX												
		Number of Truck Docks Per Building			Distance Attenuation (Feet)			Barrier Attenuation				
Metric	Ref @ 50 ft	9			340			0				**Total (dBA)**
L50	40.0	49.5			30.6			30.6				**30.6**
L25	42.0	51.5			32.6			32.6				**32.6**
L8	53.0	62.5			43.6			43.6				**43.6**
L2	54.0	63.5			44.6			44.6				**44.6**
Lmax	75.0	75.0			56.0			56.0				**56.0**

RCNM Appendix A: Practices for Calculating Estimated Shielding (fwha.dot.gov)

Atten (dB)	Instance
3	If a noise barrier or other obstruction (like a dirt mound) just barely breaks the line-of-sight between the noise source and the receptor
5	If the noise source is in a enclosure and/or barrier that has some gaps in it
5	If a noise source is enclosed or shielded with heavy vinyl noise curtain material (e.g., SoundSeal BBC-13-2" or equivalent)
8	If the noise source is completely enclosed OR completely shielded with a solid barrier located close to the source
10	If the noise source is completely enclosed AND completely shielded with a solid barrier located close to the source

References

1. Roadway Construction Noise Model User's Guide. Federal Highway Administration. FHWA-HEP-05-054 January 2006
2. Construction Noise Control Specification 721.560, Central Artery/Tunnel Project, Massachusetts Turnpike Authority, Boston, MA, 2002.
3. Thalheimer, Erich. "Construction Noise Control Program and Mitigation Strategy at the Central Artery/Tunnel Project". Noise Control Engineering Journal, Vol. 48, No. 5, pp 157-165, September - October 2000.
4. "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety", Environmental Protection Agency, ONAC 550/9-74-004. Washington, DC, March 1974.
5. "Power Plant Construction Noise Guide". Bolt, Beranek, and Newman Inc. and Empire State Electric Energy Research Corp., Report No. 3321. New York, NY May 1977.

Operational Noise

	Noise Level @ 3 ft	Sonoma County Day School (S)	Residences across US 101 (E)
Distance	3	150	1,720
HVAC	**61**	**27.021**	**5.832**

	Noise Level @ 3 ft	Sonoma County Day School (S)	FedEx Facility (SW)
Distance	23	700	1,720
Generator	**95**	**65.333**	**57.524**