# APPENDIX P

## *Construction Noise Avoidance Alternative Calculation Worksheets*

*To User: bordered cells are inputs, unbordered cells have formulae*

noise level limit for construction phase at residential land use, City of San Diego = 75

allowable hours over which Leq is to be averaged = 12

= temporary barrier (TB) of input height inserted between source and receptor

| Construction Activity | Equipment | Total Equipment Qty | AUF % (from FHWA RCNM) | Reference Lmax @ 50 ft. from FHWA RCNM | Client Equipment Description, Data Source and/or Notes | 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 12-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 (wout barrier) | G (with barrier) | G (without barrier) | ILbarr (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site Preparation | dozer | 1 | 40 | 82 | | 70 | 0.1 | | 78.6 | 2 | 120 | 67 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | backhoe | 1 | 40 | 78 | | 70 | 0.1 | | 74.6 | 2 | 120 | 63 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | dozer | 2 | 40 | 82 | | 142 | 0.1 | | 69.6 | 12 | 720 | 69 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | backhoe | 3 | 40 | 78 | | 142 | 0.1 | | 65.6 | 12 | 720 | 66 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | | | | | | | | | Total for Site Preparation Phase: | | | **73** | | | | | | | | | | | | | | | | |
| Grading | grader | 1 | 40 | 85 | | 70 | 0.1 | | 81.6 | 1 | 60 | 67 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | dozer | 1 | 40 | 82 | | 70 | 0.1 | | 78.6 | 1 | 60 | 64 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | excavator | 1 | 40 | 81 | | 70 | 0.1 | | 77.6 | 1 | 60 | 63 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | backhoe | 1 | 40 | 78 | | 70 | 0.1 | | 74.6 | 1 | 60 | 60 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | scraper | 1 | 40 | 84 | | 70 | 0.1 | | 80.6 | 1 | 60 | 66 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | grader | 0 | 40 | 85 | | 142 | 0.1 | | 72.6 | 11 | 660 | 0 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | dozer | 0 | 40 | 82 | | 142 | 0.1 | | 69.6 | 11 | 660 | 0 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | excavator | 1 | 40 | 81 | | 142 | 0.1 | | 68.6 | 12 | 720 | 65 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | backhoe | 3 | 40 | 78 | | 142 | 0.1 | | 65.6 | 12 | 720 | 66 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | scraper | 1 | 40 | 84 | | 142 | 0.1 | | 71.6 | 12 | 720 | 68 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | | | | | | | | | Total for Grading Phase: | | | **74** | | | | | | | | | | | | | | | | |
| Building Erection | crane | 1 | 16 | 81 | | 70 | 0.1 | | 77.6 | 2 | 120 | 62 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | man lift | 1 | 20 | 75 | | 70 | 0.1 | | 71.6 | 2 | 120 | 57 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | generator | 1 | 50 | 72 | | 70 | 0.1 | | 68.6 | 2 | 120 | 58 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | backhoe | 1 | 40 | 78 | | 70 | 0.1 | | 74.6 | 2 | 120 | 63 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | welder / torch | 1 | 40 | 73 | | 70 | 0.1 | | 69.6 | 2 | 120 | 58 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | crane | 0 | 16 | 81 | | 170 | 0.1 | | 66.7 | 10 | 600 | 0 | 5 | 5 | 0 | 165 | 5 | 170 | 165.1 | 7.1 | 170.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | man lift | 2 | 20 | 75 | | 170 | 0.1 | | 60.7 | 12 | 720 | 57 | 5 | 5 | 0 | 165 | 5 | 170 | 165.1 | 7.1 | 170.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | generator | 0 | 50 | 72 | | 170 | 0.1 | | 57.7 | 10 | 600 | 0 | 5 | 5 | 0 | 165 | 5 | 170 | 165.1 | 7.1 | 170.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | backhoe | 2 | 40 | 78 | | 170 | 0.1 | | 63.7 | 12 | 720 | 63 | 5 | 5 | 0 | 165 | 5 | 170 | 165.1 | 7.1 | 170.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | welder / torch | 0 | 40 | 73 | | 170 | 0.1 | | 58.7 | 10 | 600 | 0 | 5 | 5 | 0 | 165 | 5 | 170 | 165.1 | 7.1 | 170.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | | | | | | | | | Total for Building Erection Phase: | | | **69** | | | | | | | | | | | | | | | | |
| Architectural Coating | compressor (air) | 1 | 40 | 78 | | 170 | 0.1 | | 63.7 | 12 | 720 | 60 | 5 | 5 | 0 | 165 | 5 | 170 | 165.1 | 7.1 | 170.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | | | | | | | | | Total for Architectural Coating Phase: | | | **60** | | | | | | | | | | | | | | | | |
| Paving | paver | 1 | 50 | 77 | | 70 | 0.1 | | 73.6 | 1.5 | 90 | 62 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | roller | 1 | 20 | 80 | | 70 | 0.1 | | 76.6 | 1.5 | 90 | 61 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | concrete mixer truck | 1 | 40 | 79 | | 70 | 0.1 | | 75.6 | 1.5 | 90 | 63 | 5 | 5 | 0 | 65 | 5 | 70 | 65.2 | 7.1 | 70.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | paver | 1 | 50 | 77 | | 142 | 0.1 | | 64.6 | 12 | 720 | 62 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | roller | 0 | 20 | 80 | | 142 | 0.1 | | 67.6 | 10.5 | 630 | 0 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | concrete mixer truck | 1 | 40 | 79 | | 142 | 0.1 | | 66.6 | 12 | 720 | 63 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | | | | | | | | | Total for Paving Phase: | | | **69** | | | | | | | | | | | | | | | | |

*To User: bordered cells are inputs, unbordered cells have formulae*

noise level limit for construction phase at residential land use, City of San Diego = 75

allowable hours over which Leq is to be averaged = 12

= temporary barrier (TB) of input height inserted between source and receptor

| Construction Activity | Equipment | Total Equipment Qty | AUF % (from FHWA RCNM) | Reference Lmax @ 50 ft. from FHWA RCNM | Client Equipment Description, Data Source and/or Notes | 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 12-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 (wout barrier) | G (with barrier) | G (without barrier) | ILbarr (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site Preparation | dozer | 3 | 40 | 82 | | 142 | 0.1 | | 69.6 | 12 | 720 | 70 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | backhoe | 4 | 40 | 78 | | 142 | 0.1 | | 65.6 | 12 | 720 | 68 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | | | | | | | | Total for Site Preparation Phase: | | | | **72.3** | | | | | | | | | | | | | | | | |
| Grading | grader | 1 | 40 | 85 | | 142 | 0.1 | | 72.6 | 12 | 720 | 69 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | dozer | 1 | 40 | 82 | | 142 | 0.1 | | 69.6 | 12 | 720 | 66 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | excavator | 2 | 40 | 81 | | 142 | 0.1 | | 68.6 | 12 | 720 | 68 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | backhoe | 4 | 40 | 78 | | 142 | 0.1 | | 65.6 | 12 | 720 | 68 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | scraper | 2 | 40 | 84 | | 142 | 0.1 | | 71.6 | 12 | 720 | 71 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | | | | | | | | Total for Grading Phase: | | | | **75.3** | | | | | | | | | | | | | | | | |
| Building Erection | crane | 1 | 16 | 81 | | 170 | 0.1 | | 66.7 | 12 | 720 | 59 | 5 | 5 | 0 | 165 | 5 | 170 | 165.1 | 7.1 | 170.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | man lift | 3 | 20 | 75 | | 170 | 0.1 | | 60.7 | 12 | 720 | 58 | 5 | 5 | 0 | 165 | 5 | 170 | 165.1 | 7.1 | 170.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | generator | 1 | 50 | 72 | | 170 | 0.1 | | 57.7 | 12 | 720 | 55 | 5 | 5 | 0 | 165 | 5 | 170 | 165.1 | 7.1 | 170.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | backhoe | 3 | 40 | 78 | | 170 | 0.1 | | 63.7 | 12 | 720 | 64 | 5 | 5 | 0 | 165 | 5 | 170 | 165.1 | 7.1 | 170.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | welder / torch | 1 | 40 | 73 | | 170 | 0.1 | | 58.7 | 12 | 720 | 55 | 5 | 5 | 0 | 165 | 5 | 170 | 165.1 | 7.1 | 170.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | | | | | | | | Total for Building Erection Phase: | | | | **66.8** | | | | | | | | | | | | | | | | |
| Architectural Coating | compressor (air) | 1 | 40 | 78 | | 170 | 0.1 | | 63.7 | 12 | 720 | 60 | 5 | 5 | 0 | 165 | 5 | 170 | 165.1 | 7.1 | 170.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | | | | | | | | Total for Architectural Coating Phase: | | | | **59.7** | | | | | | | | | | | | | | | | |
| Paving | paver | 2 | 50 | 77 | | 142 | 0.1 | | 64.6 | 12 | 720 | 65 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | roller | 1 | 20 | 80 | | 142 | 0.1 | | 67.6 | 12 | 720 | 61 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | concrete mixer truck | 2 | 40 | 79 | | 142 | 0.1 | | 66.6 | 12 | 720 | 66 | 5 | 5 | 0 | 137 | 5 | 142 | 137.1 | 7.1 | 142.0 | 0.00 | 0.1 | 5.0 | 5.0 | 0.7 | 0.7 | 0.1 |
| | | | | | | | | Total for Paving Phase: | | | | **68.9** | | | | | | | | | | | | | | | | |