Federal Railroad Administration
High-Speed Rail Initial Noise Evaluation version 2.0, January 2012

DESCRIPTION OF THE FRA HSR INITIAL NOISE EVALUATION SPREADSHEET

PURPOSE

Chapter 4 of "High-Speed Ground Transportation Noise and Vibration Impact Assessment" (FRA, 2012) describes procedures for performing an initial noise evaluation for a high-speed rail project. For each of three types of high-speed rail sources (electric, fossil fueled, and maglev), reference noise levels and equations are given along with appropriate adjustments for factors such as attenuation of noise as a function of distance and geometry, and shielding from intervening rows of buildings.

HSR_NOISE_2 allows the user to apply the initial noise evaluation methods to model noise from a high-speed rail project for one receiver. The user specifies the land use category for the receiver of interest, selects the type of noise source from a list of options, and provides additional information, such as the number of operations, distance from the near track to the receiver, the track separation between the two tracks and other factors, necessary for predicting the noise exposure at the receiver location. Given the predicted noise exposure and existing noise conditions, the program assesses potential impact at the reciver of interest according to the noise impact criterion.

IMPLEMENTATION

HSR_NOISE_2 is a spreadsheet consisting of two input tables (Receiver Data and Train and Operational Data) and one results table. There are three tables showing the values to enter for the following parameters; land use category (from Table 3-2), train technology (from Table 4-3) and track geometry (from Table 4-4). If input data are not valid, the model displays ERRORS or WARNINGS.

RECEIVER DATA INPUT

1) Enter the land use category from Table 3-2 of "High-Speed Ground Transportation Noise and Vibration Impact Assessment". The model will then use Leq as the noise descriptor for this hour of rail activity. For Land Use Category 2, the descriptor of interest is the Ldn.
2) Enter the existing noise exposure based on procedures in Chapters 4 and 5 of the "High-Speed Ground Transportation Noise and Vibration Impact Assessment" manual.
3) Enter the distance of the receptor to the near track centerline (feet). The model is based on a two-track alignment, so also enter the track separation. The model will calculate the noise contributions from each track based on their distances.
4) Enter the number of intervening buildings between the receiver of interest and the track (0 for first row receivers). The pull-down menu allows entries between 0 and 6 rows. No further noise attenuation is modeled for more than 6 intervening building rows.

TRAIN & OPERATIONAL DATA INPUT

1) Enter the train type (Electric, Fossil Fuel, or Maglev).
2) Enter the train speed (mph). The model is limited to train speed up to 220 mph for electric trains, 150 mph for fossil fuel trains and 250 mph for maglev. As shown in Table type (Electric, Fossil Fuel, or Maglev).

3) Enter the lengths and number of powered and non-powered cars.
4) Enter the track geometry as shown in Table 4-4 of the "High-Speed Ground Transportation Noise and Vibration Impact Assessment" manual to calculate shielding from terrain or barriers.

5) Enter the number of trains operating in one direction of travel. The same volume of trains is modeled for both tracks. For Land Use Categories 1 and 3, the user must determine the operating conditions during the noisiest hour of high-speed rail-related activity during hours of noise sensitivity. For Land Use Category 2, the user must enter the total number of trains during the daytime (7 A.M. to 10 P.M.) and nighttime (10 P.M. to 7 A.M.).

CALCULATIONS (REFERENCE ONLY)

The calculations sheet includes the following tables; Reference Parameters (Table 4-3), Shielding Corrections for Track Geometry (Table 4-4), Impact Criteria and a table of model values.

RESULTS

The results table presents the impact criteria, Ldn from project noise sources with and without intervening building rows, daytime and nighttime Leqs, future Ldn from project and existing noise sources, future increase in noise and assesses whether there is moderate or severe impact.
A Project Noise Exposure versus the Existing Noise Exposure plot is displayed underneath the results.

IMPACT PLOTS

The Impact Plots page presents the user with two figures; 1) Project Noise Exposure versus the Existing Noise Exposure and 2) Noise Exposure Increase versus the Existing Noise Exposure. These two plots include the Noise Impact Criteria in tables 3-1 and 3-2 of the FRA "High-Speed Ground Transportation Noise and Vibration Impact Assessment" manual.

INTERPRETATION

The FRA high-speed rail initial noise evaluation procedures are indispensable for their discussion of the more subtle elements of the noise assessment, and for interpreting the noise assessment results. The user is referred to Chapter 4 of the FRA "High-Speed Ground Transportation Noise and Vibration Impact Assessment" manual for a detailed discussion of these issues. The following points apply specifically to using HSR_NOISE_2 for performing a general noise assessment:

- Although the results of a noise assessment should be the same, regardless of whether the manual method or HSR_NOISE_2 is used, it is advisable to perform a test case using the manual method to verify the reasonableness of the results and to ensure consistency with HSR_NOISE_2.

- If necessary parameters are omitted or entered incorrectly, HSR_NOISE_2 may report an error or give unexpected results.
- The user is advised to set aside an extra copy of the original spreadsheet before making changes to the spreadsheet. Copies of the spreadsheet applying to different assessments or noise receivers may be saved as desired.

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Enter Receiver Data Below

Model Input Errors/Warnings

	RECEIVER DATA	
	Receiver	Receiver 1
(See Table 3-2 below) -->	Land Use Category (1-3) --> Residences	2
	Existing Noise Exposure (Ldn, dBA)	60.0
	Distance to Near Track Centerline (ft)	500
	Track Separation (ft)	15
(Maximum of 6) -->	# of Intervening Building Rows	0

Enter Train Data Below

	TRAIN & OPERATIONAL DATA	
(See Table 4-3 below) -->	Train Type (1-3) --> Electric	1
	Speed (mph)	150
	Length of each Powered Car (ft)	75
	Length of each Non-Powered Car (ft)	75
	# of Powered Cars in Train Consist	6
	# of Non-Powered Cars in Train Consist	2
(See Table 4-4 below) -->	Track Geometry (0-5) --> At-grade	0
	Enter Train Volumes for One Direction of Travel	
	Total # of Daytime (7 A.M. to 10 P.M.) Trains	40
	Total # of Nighttime (10 P.M. to 7 A.M.)Trains	10

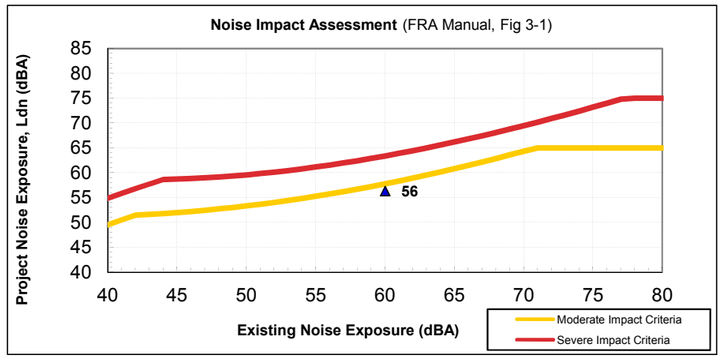
Land Use Categories (from Table 3-2)		
1	Outdoor Quiet	Leq
2	Residences	Ldn
3	Institutional	Leq

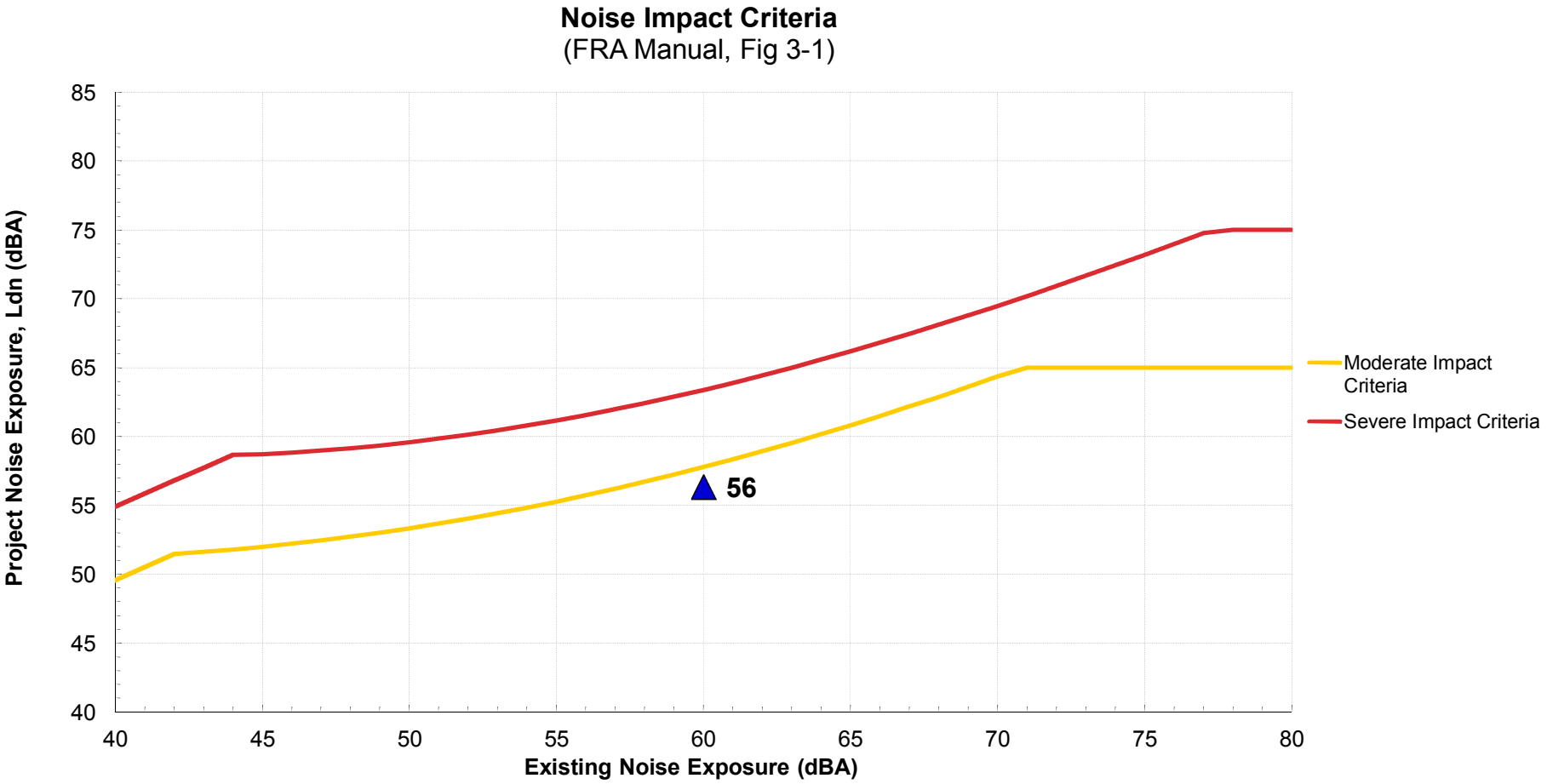
Train Types (from Table 4-3)	
1	Electric - Electric Locomotive and EMU Trains (up to 220 mph)
2	Fossil Fuel* - Gas-Turbine Locomotive Trains (up to 150 mph)
3	Maglev (up to 250 mph)

Track Geometry (from Table 4-4)	
0	Tracks at Grade
1	Tracks in Shallow Cut
2	Tracks in Deep Trench/Cut
3	Tracks on Aerial Structure
4	Tracks on Embankment
5	Noise Barrier

Model Result Warnings

MODEL RESULTS		
Metric	**Description**	**Level**
Ldn	Moderate Impact Criterion (dBA)	**57.8**
Ldn	Severe Impact Criterion (dBA)	**63.4**
Ldn	Ldn at 500 ft (w/ no intervening building rows),dBA	**56.3**
	Results below include 0 intervening building rows	
Ldn	Ldn at 500 ft, dBA	**56.3**
Leq	Daytime Leq at 500 ft, dBA	**52.9**
Leq	Nighttime Leq at 500 ft, dBA	**49.1**
Leq	Future Noise Level (Existing and Project Sources), (dBA)	**61.6**
	Future Increase in Noise Level (dB)	**1.6**
	Potential Impact ?	**No**




Noise Impact Criteria
(FRA Manual, Fig 3-1)
Project Noise Exposure, Ldn (dBA)
85
80
75
70
65
60
55
50
45
40
40
45
50
55
60
65
70
75
80
Existing Noise Exposure (dBA)
56
Moderate Impact Criteria
Severe Impact Criteria

Increase in Cumulative Noise Levels Allowed
(FRA Manual, Fig 3-2)