



**TECHNICAL MEMORANDUM #19**

**NOISE AND VIBRATION IMPACTS**



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From: URS Consultant Team

To: CATA Project Staff and Technical Committee

Topic: Noise and Vibration Impacts

## 1.0 Introduction

This is a preliminary evaluation of each Build alternative to assess its potential impact on noise- and vibration-sensitive areas. The scope of this analysis includes the identification of noise- and vibration-sensitive land uses within the Michigan/Grand River Avenue Corridor, using definitions from the Federal Transit Administration (FTA). This analysis does not include noise and vibration monitoring or modeling, but will instead identify locations that should be addressed by the noise and vibration modeling and analysis that would be conducted as part of the National Environmental Policy Act (NEPA) and Michigan Environmental Protection Act (MEPA) review for the Locally Preferred Alternative.

## 2.0 Methodology

The implementation of new transit mode types and service in the Michigan/Grand River Avenue Corridor could introduce new noise and vibration. This can affect both individuals who live along the Corridor and certain businesses along the Corridor. The FTA has defined three land use categories for the assessment of noise impacts, and has assigned noise metrics based on these uses. Categories 1 and 3 include noise-sensitive non-residential land uses; Category 2 includes noise-sensitive residential land uses. Table 1 summarizes the land use categories and associated noise metrics.

The FTA recognizes two measures for noise depending on the type of land use. Land use categories 1 and 3 are measured for the noise produced during the noisiest hour of transit-related activity during hours of noise sensitivity. Category 2, which are primarily land uses where people sleep, is measured over a 24-hour period, with a 10 dBA increase for noises that occur during the nighttime (10:00 p.m. to 7:00 a.m.) to account for increased sensitivity to noise during the night.



**Table 1: Land Use Categories and Metrics for Transit Noise Impact Criteria<sup>1</sup>**

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor $L_{eq}(h)^*$	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheatres and concert pavilions, as well as National Historic Landmarks with significant outdoor use. Also included are recording studios and concert halls.
2	Outdoor $L_{dn}$	Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor $L_{eq}(h)^2$	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

As shown in Table 2, each of the three Build alternatives (Bus Rapid Transit, Light Rail and Modern Streetcar) was evaluated based on its potential to impact the land uses the FTA has defined as noise- and vibration-sensitive. The Baseline alternative is not evaluated under this criterion because it would present no change relative to existing conditions, i.e. Route 1 operations.

**Table 2: Evaluation Criteria: Potential to Impact the Natural Environment and Historic Resources**

Rating		Definition
●	Good	Alternative would not significantly impact on noise- and vibration-sensitive land uses, as defined by the FTA.
◉	Fair	Alternative may have moderate impact on noise- and vibration-sensitive land uses, as defined by the FTA.
○	Poor	Alternative would significantly impact on noise- and vibration-sensitive land uses, as defined by the FTA.

<sup>1</sup> Source: Harris Miller Miller & Hanson, 2006.

<sup>2</sup>  $L_{eq}$  for the noisiest hour of transit-related activity during hours of noise sensitivity



### 3.0 Findings and Conclusions

Operation of new transit mode types and service within the Michigan/Grand River Avenue Corridor has the potential to introduce additional noise and vibrations. This can affect individuals who live along the Corridor. Table 3 shows the population within 100 feet of the proposed alignment. The proposed alternatives will have the greatest impact on residents in East Lansing and Lansing due to denser populations along the proposed alignment, particularly in the vicinity of Michigan State University (MSU). These areas are classified by the FTA as Land Use Type 2 and should be modeled for the potential noise impact over a 24-hour period.

**Table 3: Year 2000 Population within 100 feet of Alignment<sup>3</sup>**

City/Township	Population within 100 feet of alignment
Lansing	300
East Lansing	900
Meridian Township	75
Lansing Township	25
<b>Total</b>	<b>1,300</b>

In addition to residences certain businesses, non-profits and institutions are also subject to noise and vibration sensitivity due to the nature of the activities at the location. Table 4 identifies businesses, non-profits and institutions located in the Michigan/Grand River Corridor that may potentially be impacted by the introduction of new transit mode types and service. Modeling should be performed for these properties as part of the NEPA and MEPA documentation.

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<sup>3</sup> Year 2000 Census block data are used as they are most current available at this level of analysis. Analysis assumes uniform population distribution within Census block.



**Table 4: Potential Noise- and Vibration-Sensitive Sites  
along the Michigan/Grand River Avenue Corridor**

Site	FTA Land Use Category
Riverwalk Theatre	1
WLNZ	1
Glen Brown Productions	1
Lansing Label	1
G-N-S TV	1
Cooley Law School Stadium (Michael Patrick Shiels, radio studio)	1
Sparrow Hospital	2
Super 8	2
East Lansing Marriott at University Place	2
Kellogg Hotel and Conference Center	2
Radisson Hotel Lansing	2
The Gateway	2
CADL - Downtown Lansing Library	3
Greater Lansing Ballet Company	3
Lansing Civic Players Guild	3
Barefoot Christian Church	3
Central United Methodist Church	3
Christ Lutheran Church	3
Community of Christ	3
First Baptist Church	3
First Church of Christ Science	3
Immanuel's Temple Community Church	3
Lansing Spanish Seventh-Day Adventist	3
Liberty Christian Church	3



Site	FTA Land Use Category
Mount Hope Church in the City	3
Peoples Church of East Lansing	3
Pilgrim Congregational Church	3
Resurrection Church	3
Thomas M. Cooley Law School	3
Lansing Center	3
MSU	2, 3

Table 3 identifies 1,300 residents while Table 4 identifies 32 businesses, non-profits, and institutions which may be impacted by noise and vibration. This is equivalent to more than 150 residences and more than three businesses, non-profits and institutions per mile of the Build alternatives. Based on the presence of noise- and vibration sensitive land uses, within 100 feet of the proposed alignment the Build alternatives were determined to potentially have a moderate impact on these land uses, as shown in Table 5.

**Table 5: Summary Evaluation of Potential -Noise and Vibration Impacts**

Alternative	Rating of Alternative
Bus Rapid Transit	⊙
Light Rail Transit	⊙
Streetcar	⊙

Buildings on the MSU campus that are located along Michigan and Grand River Avenues were reviewed and identified as either FTA Land Use Category 2 or 3. Activities within each of these buildings were examined from a broad perspective. Any research facilities that are noise- and/or vibration-sensitive would be identified fully during the environmental review process associated with the LPA. On the whole and for purposes of this Alternatives Analysis, each of the Build alternatives would appear to have moderate noise and vibration impacts.