1. INTRODUCTION

1.1 PURPOSE

Noise and vibration assessments are key elements of the environmental impact assessment process for mass transit projects. Experience has shown that noise and vibration are among the major concerns with regard to the effects of a transit project on the surrounding community. A transit system is of necessity placed near population centers and often causes significant noise and vibration at nearby residences and other sensitive types of land use.

This manual is intended to provide guidance in preparing and reviewing the noise and vibration sections of environmental submittals from grant applicants. In the interests of promoting quality and uniformity in assessments, the manual will be used by project sponsors and consultants in performing noise and vibration analyses for inclusion in environmental documents. The manual sets forth the methods and procedures for determining the level of noise and vibration impact resulting from most federally-funded transit projects and for determining what can be done to mitigate such impact. Since the methods have been developed to assess typical transit projects, there will be some situations not explicitly covered in this manual. The exercise of professional judgment may be required to extend the basic methods in these cases.

1.2 THE ENVIRONMENTAL REVIEW PROCESS

The Federal Transit Administration (FTA) provides capital assistance for a wide range of mass transit projects – from completely new rail rapid transit systems to bus maintenance facilities and vehicle purchases. The extent of environmental analysis and review will depend on the scope and complexity of the proposed project and the associated environmental impacts. FTA's environmental impact regulation classifies the most common projects according to the different levels of environmental analysis required, ranging from an Environmental Impact Statement (EIS) to little or no environmental documentation (Categorical Exclusion). FTA's

environmental impact regulation is codified in Title 23, Code of Federal Regulations, Part 771.[(1)*]

1.2.1 Environmental Impact Statements

Large fixed-guideway projects, such as heavy rail, light rail, commuter rail and automated guideway transit systems, normally require environmental impact statements including an in-depth noise and vibration assessment. While there may be exceptions to the EIS requirement, in the great majority of cases new rail starts or extensions to existing systems involve environmental effects which are significant in the context of the National Environmental Policy Act (NEPA). Because they are located in dense urban areas, noise and vibration impacts are a frequent concern; thus it is likely that for the large infrastructure projects requiring an EIS, the most detailed treatment of noise and/or vibration impacts will also be required.

There are other projects as well which may require a detailed analysis of noise and vibration impacts even if an EIS is not required to comply with NEPA. These could be bus/high-occupancy-vehicle (HOV) lanes built on existing highways or construction of certain bus or rail terminals and storage and maintenance facilities. If the project is proposed to be located in or very close to a sensitive area or site, it is prudent to use the most detailed procedures contained in the manual to predict noise and/or vibration levels since this will provide the most reliable basis for considering measures to mitigate excessive noise/vibration at a specific site.

1.2.2 Categorical Exclusions

At the other extreme is a host of smaller transit improvement projects which normally do not cause significant environmental impacts and do not require noise and vibration assessment. These projects are listed as "categorical exclusions" in FTA's environmental regulation, meaning that FTA has predetermined that there are no significant environmental impacts for those types of projects and no environmental document is required. Examples are: vehicle purchases; track and railbed maintenance; installation of maintenance equipment within the facility, etc. Section 771.117(c) contains a list of transit projects predetermined to be categorical exclusions.

Other types of projects may also qualify as categorical exclusions, for example, certain transit terminals, transfer facilities, bus and rail storage and maintenance facilities (see 23 CFR 771.117(d)). These projects usually involve more construction and a greater potential for off-site impacts. They are presented in the regulation with conditions or criteria which must be met in order to qualify for categorical exclusion. The projects are reviewed individually by FTA to assure that off-site impacts are properly mitigated. Depending on the proposed project site and the surrounding land use, a noise and vibration assessment may be needed even though the project may ultimately qualify as a categorical exclusion. The screening process in Chapters 4 and 9 will be helpful in pointing out potential noise and vibration concerns and the general assessment procedures may then be used to define the level of impact.

*References are located at the end of each chapter.

1.2.3 Environmental Assessments

When a proposed project is presented to FTA, if it is uncertain whether the project requires an EIS or qualifies as a categorical exclusion, FTA will direct the applicant to prepare an Environmental Assessment (EA). Generally, an EA is selected (rather than trying to process the project as a categorical exclusion) if the FTA reviewer feels that several types of impacts need further investigation, for example, air quality, noise, wetlands, historic sites, traffic, etc. An EA is a relatively brief environmental study undertaken to determine the magnitude of the impacts that will likely be caused by the project. If, during the analysis, it appears that any impacts are significant, an EIS will be prepared. If the analysis shows that none of the impacts is significant or if mitigation measures are incorporated in the project to adequately deal with adverse impact, the Environmental Assessment will fully document this and serve as the basis for a Finding of No Significant Impact issued by FTA. It is important to note that when mitigation measures are relied on, they must be described in detail in the Environmental Assessment since FTA's finding is conditioned on the inclusion of these measures as an integral part of the project.

FTA's environmental regulation does not list typical projects that require Environmental Assessments. An EA may be prepared for any type of project if uncertainty exists about the magnitude or extent of the impacts. Experience has shown that most of the EA's prepared for transit projects require an assessment of noise and/or vibration effects.

1.3 RELATIONSHIP OF NOISE AND VIBRATION ANALYSIS TO TRANSPORTATION PLANNING AND PROJECT DEVELOPMENT

The above discussion on how transit noise and vibration analysis fits into the environmental review process assumes that environmental analysis is focused on a single preferred alternative (with respect to mode, location/alignment, and operating features). This narrow focus is appropriate where reasonable alternatives are limited or non-existent, for example, extension of a rapid transit line on an abandoned railroad right-of-way. However, major infrastructure projects usually evolve from different levels of study which, first, help to define the need for additional capacity and then provide the framework for comparing and contrasting alternative infrastructure investments.

At the early systems planning level, the focus is on predicting future travel demand and identifying the need for additional capacity on segments of the regional transportation network. Environmental concerns may be a consideration at this stage, particularly long-range land-use and development impacts, but noise and vibration assessments are not typically conducted since alternative strategies lack the necessary detail. Once the need for some type of major infrastructure improvement* is established and if there is the potential for federal

* Major mass transportation investments are defined as new fixed-guideway facilities (rapid rail, light rail, commuter rail, busways, automated guideway transit, and people movers) or substantial changes to existing fixed-guideway facilities, such as the addition of lanes or tracks. Extensions of one mile or more to existing systems will generally fit under this definition. Other types of projects may also fit the definition (e.g., large multi-modal terminals) if they are high-cost infrastructure improvements expected to significantly affect capacity, traffic flow, level of service, or mode

funding, the metropolitan area will undertake a Major Investment Study. As set out in the joint Federal Highway Administration (FHWA)/FTA metropolitan planning regulation,[2] the Major Investment Study is essentially a structured examination of alternative strategies for the purpose of identifying the best course of action in a specific corridor or subarea. The study is broad-ranging to the extent that it often covers "transportation systems management" actions and multimodal alternatives in addition to traditional highway and transit infrastructure investments.

Provisions in the metropolitan planning regulation describing corridor or sub-area studies make it clear that environmental considerations are an essential part of the analysis of alternatives. These studies will be used as significant input to the federal environmental document (EIS or EA), or the option is given to have the corridor or sub-area study itself serve as the Draft EIS or EA. While there is no requirement that noise and vibration be one of the environmental factors considered, local sponsoring agencies will often elect to address this subject. The screening and general assessment procedures described in this manual are well-suited to compare and contrast noise/vibration effects across different modes and alignments without getting into the detailed analytical procedures which are usually reserved for a single preferred alternative. In fact, the general assessment procedures were developed, in part, to respond to this need. In addition, they can be used for any specific project where the screening procedure indicates the potential for noise/vibration impacts.

The Major Investment Study leads to the selection of a preferred alternative by the state and local agencies involved in the study. If a major infrastructure investment is proposed, the project moves into the preliminary engineering phase. This is the stage at which detailed, site-specific noise and/or vibration analysis is conducted, if it is needed. If federal funding for construction will be sought, the results of this analysis will be reported in the federal environmental document (EIS or EA). The main objectives of the NEPA process are to give a full and accurate reporting of the project's likely impacts and also to describe in specific terms how the federal agency and project sponsor will avoid or mitigate those adverse effects caused by the project. Thus, in the preliminary engineering phase, the emphasis shifts toward refining information for the proposed project. The detailed analysis procedures in this manual depend on the type of information and the level of design produced during preliminary engineering for a major transit project. After the NEPA process is completed for a major project, federal funding for final design and construction may be granted. During the final design phase, more detailed studies may be undertaken, particularly for vibration impacts, in order to further refine the measures which will be used to limit excessive noise/vibration levels.

Considering that transit projects must, of necessity, be located amidst or close to concentrations of people, noise and vibration impacts can be a concern throughout the planning and project development phases. This manual offers the flexibility to address noise and vibration at different stages in the development of a project and in different levels of detail depending on the types of decisions which need to be made.

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share in the corridor or sub-area.

There are three levels of analysis which may be employed, depending on the type and scale of the project, the stage of project development, and the environmental setting. The technical content of each of the three levels is specified in the body of this document, but a summary of each level is given in the following paragraphs:

- **Screening Procedure –** Identifies noise- and vibration-sensitive land uses in the vicinity of a project and whether there is likely to be impact. It also serves to determine the noise and vibration study areas for further analysis when sensitive locations are present. The screening process may be all that is required for many of the smaller transit projects which qualify for categorical exclusion. When noise/vibration-sensitive receivers are found to be present, there are two levels of quantitative analysis available to predict impact and assess the need for mitigation measures.

- **General Assessment –** Identifies location and estimated severity of noise and vibration impacts in the noise and vibration study areas identified in the Screening Procedure. For major capital investments, the General Assessment provides the appropriate level of detail to compare alternative modes and alignments. It can be used in conjunction with established highway noise prediction procedures to compare and contrast highway, transit and multimodal alternatives. For other types of transit projects, this level is used for a closer examination of projects which show possible impacts as a result of screening. For many smaller projects, this level may be sufficient to define impacts and prepare mitigation as necessary.

- **Detailed Analysis –** Quantifies impacts through an in-depth analysis usually only performed for a single alternative. Delineates site-specific impacts and mitigation measures for the preferred alternative in major investment projects during preliminary engineering. For other smaller projects, detailed analysis may be warranted as part of the initial environmental assessment if there are potentially severe impacts due to close proximity of sensitive land uses.

The three levels of noise and vibration assessment are described in the chapters which follow.

1.4 ORGANIZATION OF THE MANUAL

The Guidance Manual is divided into two parts, noise and vibration, with a common introduction. Each part has parallel organization according to the following subjects:

Noise/Vibration

- Basic Concepts
- Criteria
- Screening Procedure
- General Assessment
- Detailed Analysis

Construction Noise/Vibration

Documentation

Appendices

- Background for Transit Noise Impact Criteria
- Receiver Selection
- Existing Noise Determination
- Noise Source Level Determination
- Maximum Noise Level Computation

REFERENCES

1. U.S. Department of Transportation, Federal Transit Administration and Federal Highway Administration, "Environmental Impact and Related Procedures." Final Rule, 52 Federal Register 32646 -32669; August 28, 1987 (23 Code of Federal Regulations 771).

2. U.S. Department of Transportation, Federal Transit Administration and Federal Highway Administration, "Statewide Planning; Metropolitan Planning." Final Rule, 58 Federal Register 58040-58079; Octoer 28, 1993 (23 Code of Federal Regulations 450). Refer especially to section 450.318 on major metropolitan transportation investments.