REFERENCE

DDOT NOISE POLICY

District Department of Transportation

NOISE POLICY

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District of Columbia Department of Transportation

NOISE POLICY

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NOISE POLICY

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TABLE OF CONTENT

DISTRICT DEPARTMENT OF TRANSPORTATION NOISE POLICY

1. INTRODUCTION:

This document provides the procedural guidelines for assessing noise impacts associated with the construction and operation of highway improvements. These procedures are based on the Federal Highway Administration's (FHWA) noise policy at Part 772 of Title 23 of the Code of Federal Regulations (23 CFR 772) (Appendix B). The procedures described in this document require compliance with the National Environmental Policy Act (NEPA) of 1969, FHWA environmental regulations as described in 23 CFR 771, sec 4f of the U.S DOT Act, Sec 106 of the National Historic Preservation Act, and other laws as applicable.

During the rapid expansion of the Interstate Highway System and other roadways in the 20th century, communities began to recognize that highway traffic noise and construction noise had become important environmental impacts. In the 1972 Federal-aid Highway Act, Congress required FHWA to develop a noise standard for new Federal-aid highway projects. While providing national criteria and requirements for all highway agencies, the FHWA Noise Standard gives highway agencies flexibility that reflects state-specific attitudes and objectives in approaching the problem of highway traffic and construction noise. This policy contains DDOT's policy on how highway traffic noise impacts are defined, how noise abatement is evaluated, and how noise abatement decisions are made. In addition to defining traffic noise impacts, the FHWA Noise Standard requires that noise abatement measures be considered when traffic noise impacts are identified for Type I Federal projects. Noise abatement measures that are found to be feasible and reasonable must be constructed for such projects. Feasible and reasonable noise abatement measures are eligible for Federal-aid participation at the same ratio or percentage as other eligible project costs.

2. PURPOSE:

This policy describes DDOT program to implement 23 CFR 772. Where FHWA has given DDOT the flexibility in implementing the standard, this policy describes DDOT's approach to implementation. Protection of the public health and welfare is an important responsibility that FHWA and DDOT help to accomplish during the planning and design of a highway project. In the 1970 Federal-Aid Highway Act, the U.S. Congress directed FHWA to develop noise standards. The District of Columbia Noise Control Act of 1977

(DC Law 2-53) as amended, by the DC Noise Control Act Amendment of 1996 (DC Law 11-161) and its implementing regulations declared it a policy of the District of Columbia (District) to reduce the ambient noise level in the District to promote public health, safety, welfare, and the peace and quiet of the inhabitants of the District, and to facilitate the enjoyment of the natural attraction of the District.

3. DEFINITIONS:

Abatement: Any mitigation technique that results in lower noise levels.

"Approach" NAC: 1.0 db(A) less than NAC.

Barrier: A natural or man-made object that interrupts the path of sound from the sound source to the sound receptor.

Benefited Receptor: The recipient of an abatement measure that receives a noise reduction at or above the minimum threshold of 5 dB(A), but not to exceed the highway agency's reasonableness design goal. DDOT defines a benefited receptor as any receptor predicted to receive a 7 dB(A) reduction from the proposed noise abatement measure.

Common Noise Environment: A group of receptors within the same Activity Category in Table 1 that are exposed to similar noise sources and levels; traffic volumes, traffic mix, and speed; and topographic features. Generally, common noise environments occur between two secondary noise sources, such as interchanges, intersections, cross-roads.

Date of Public Knowledge: The date of approval of the Categorical Exclusion (CE), the Finding of No Significant Impact (FONSI), or the Record of Decision (ROD), as defined in 23 CFR 771.

Descriptors, acoustical: The following descriptors are often used:
i. dBA: A-weighted sound level measured in decibels
ii. Leq: The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with Leq(h) being the hourly value of Leq.

Design Year: The future year used to estimate the probable traffic volume for which a highway is designed.

Existing Noise Levels: The worst noise hour resulting from the combination of natural and mechanical sources and human activity usually present in a particular area.

Feasibility: The combination of acoustical and engineering factors considered in the evaluation of a noise abatement measure.

Impacted Receptor: The recipient that has a traffic noise impact.

Multifamily Dwelling: A residential structure containing more than one residence. Each residence in a multifamily dwelling shall be counted as one receptor when determining impacted and benefited receptors.

Noise Barrier: A physical obstruction that is constructed between the highway noise source and the noise sensitive receptor(s) that lowers the noise level, including stand alone noise walls, noise berms (earth or other material), and combination berm/wall systems.

Noise Reduction Design Goal: The optimum desired dB(A) noise reduction determined from calculating the difference between future build noise levels with abatement, to future build noise levels without abatement. The noise reduction design goal shall be at least 7 dB(A), but not more than 10 dB(A). The DDOT reasonable design goal is 7 dB(A).

Permitted: A definite commitment to develop land with an approved specific design of land use activities as evidenced by the issuance of a building permit.

Property Owner: An individual or group of individuals that holds a title, deed, or other legal documentation of ownership of a property or a residence.

Reasonableness: The combination of social, economic, and environmental factors considered in the evaluation of a noise abatement measure.

Receptor: A discrete or representative location of a noise sensitive area(s), for any of the land uses listed in Table 1.

Residence: A dwelling unit. Either a single family residence or each dwelling unit in a multifamily dwelling.

Statement of Likelihood: A statement provided in the environmental clearance document based on the feasibility and reasonableness analysis completed at the time the environmental document is being approved.

Substantial Construction: The granting of a building permit, prior to right-of-way acquisition or construction approval for the highway.

Substantial noise increase: One of two types of highway traffic noise impacts. For a Type I project, in DDOT an increase in noise levels of 10.0 dB(A) or more in the design

year over the existing noise level.

Traffic Noise Impacts: Design year build condition noise levels that approach or exceed the NAC listed in Table 1 for the future build condition; or design year build condition noise levels that create a substantial noise increase over existing noise levels.

Type I Project: Following projects are considered Type 1 projects:

1. The construction of a highway on new location; or,
2. The physical alteration of an existing highway where there is either:
    a. Substantial Horizontal Alteration. A project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition; or,
    b. Substantial Vertical Alteration. A project that removes shielding therefore exposing the line-of-sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and the receptor; or,
3. The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a HOV lane, High-Occupancy Toll (HOT) lane, bus lane, or truck climbing lane; or,
4. The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane; or,
5. The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange; or,
6. Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane; or,
7. The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza.
8. If a project is determined to be a Type I project per § 772.5 then the entire project area as defined in the environmental document is a Type I project.

Type II Project: A Federal or Federal-aid highway project for noise abatement on an existing highway. For a Type II project to be eligible for Federal-aid funding, the highway agency must develop and implement a Type II program in accordance with section 772.7(e). The Type II program is optional for participation by highway agencies. Currently DDOT does not participate in Type II program.

Type III Project: A Federal or Federal-aid highway project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis

4. APPLICABILITY:

This policy applies to all Federal highway projects in the District of Columbia; that is, any projects that receive Federal-aid highway funds or are otherwise subject to FHWA approval. These procedures are applicable to federally funded projects and are based on the Federal Highway Administration's (FHWA) noise policy at Part 772 of Title 23 of the Code of Federal Regulations (23 CFR 772) (see Appendix A) and are applicable to all Type I and Type II projects.

5. SUMMARY OF KEY LEGISLATION, REGULATIONS & GUIDANCE:

Relative to noise, two principal sources are considered:

1. The impacts associated with vehicular traffic using a new or improved roadway (highway traffic noise)
2. The impacts associated with building a new roadway or improving an existing roadway (construction noise)

5.1. Highway Traffic Noise:

As noted earlier, 23 CFR 772 contains the FHWA noise policy. This policy is further defined in *Highway Traffic Noise: Analysis and Abatement Guidance* (FHWA 2010). All federal-aid highway projects must be developed in conformance with these directives. The FHWA process for evaluating traffic-related noise impacts is often summarized by the following steps:

1. Identify existing activities (sensitive receptors)
2. Determine existing noise levels
3. Predict future noise levels
4. Identify potential impacts
5. Evaluate abatement measures
6. Include feasible and reasonable abatement measures in the project plans, specifications and estimates

These steps apply to only Type I projects (as defined in the definition section). Type II projects are noise abatement activities along existing federal-aid highways. Currently, DDOT does not have a Type II program.

5.2. Construction Noise:

Construction noise analysis related to transportation projects is typically documented in conjunction with the project's highway traffic noise analysis. At each point in project development where highway traffic noise data are produced, a complementary construction noise subsection will be included in the documentation. Most projects will not require modeling of construction noise. In many cases, construction noise analyses may be adequately addressed through the narrative discussion or an application of a simplified manual calculation technique. The use of sophisticated modeling techniques is typically only required for the most complex projects.

In the District of Columbia, construction noise is regulated by Title 20 of the District of Columbia Code of Municipal Regulations (DCMR). These regulations are the appropriate standards to use when assessing project-related impacts.

6. GENERAL METHODOLOGY OF EVALUATION:

This section summarizes the general methodology associated with investigating highway traffic noise and construction noise. Section 6.1 explains the DDOT policy regarding noise impact and abatement measures, and relates the analysis of noise to the DDOT Project Development Process. The technical procedures for analyzing noise according to the FHWA methods are explained later in this document.

Table 1: Noise Abatement Criteria (NAC)

(Hourly A-Weighted Sound Level decibels (dBA)*)
Source: 23 CFR, Part 772

Activity Category	Activity Criteria Leq (h	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67	Exterior	Residential
C	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools , television studios, trails, and trail crossings
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	--	--	Undeveloped lands that are not permitted

6.1. DDOT Highway Traffic Noise Analysis and Policy:

It is DDOT policy that noise mitigation should be considered whenever a project-related highway traffic noise impact is expected to occur. A highway traffic noise impact is deemed to occur when predicted (design-year) noise levels either approach or exceed the applicable NAC or substantially increase the existing noise levels. Generally, an effective noise abatement treatment is reasonable if its cost per benefited residential unit is no more than $40,000 and it meets all of the other reasonableness criteria (see Section 7.3).Work related to the highway traffic noise analysis is conducted at three points within the DDOT Project Development process.

Preliminary investigations are conducted during the early planning steps, before the DDOT Environmental Compliance review meeting. Important background data are collected that will assist in the planning process. The key question is: *are there sensitive receptors in the project area?* If there are, the distribution of the sensitive receptors within the project area will be valuable information for the planning study. If no sensitive receptors are present, no further noise analysis may be necessary. The data collected at this stage will be presented in a Sensitive Receptor Identification Technical Memorandum. The bulk of a project's highway traffic noise analysis will be conducted during the development of the NEPA document. Two deliverables are expected:

- The preliminary noise report documents the evaluation of the project's feasible alternatives. The key question will be to determine: *is a highway traffic noise impact expected to occur?* The answer will be obtained by determining existing noise levels, modeling to predict future noise levels, and evaluating the results against the appropriate standards. These data will be useful in evaluating the feasible alternatives and selecting a preferred alternative.

- The final noise report provides an update of the noise analysis for the preferred alternative. The important questions answered in this report are: *has the preferred alternative been modified materially since the preliminary noise analysis? And, if a highway traffic noise impact is predicted, is mitigation feasible and reasonable?* The answers to these questions will be essential to developing appropriate mitigation measures.

The final component of a highway traffic noise analysis will be conducted during project design. If mitigation is required, the analysis will be updated, as necessary, and the mitigation (typically noise barriers) will be designed and included in the construction plans.

6.2. FHWA Highway Traffic Noise Analysis:

The steps involved in the FHWA process for evaluating traffic-related noise impacts are described below:

1. Identify Existing Activities
2. Measure Existing Noise Levels
3. Predict Future Noise Levels
4. Identify Potential Impacts
5. Evaluate Appropriate Abatement Measures

6.2.1. Identify Existing Activities (Sensitive Receptors)

To inform the planning process and develop the information necessary for scoping future noise-related activities, the following data will be required:

- Assigning land use activities
- Identifying sensitive receptors
- Establishing representative monitoring locations and modeling sites

Assign Land Use Activities:
Because NACs are categorized by land use activity (see Table 1), the land uses within the project area must be identified. This can be accomplished through a review of existing materials. An inventory of existing/planned land uses and existing/planned zoning classifications are available through Title 10 and 11 of the DCMR. Where land adjacent to the project boundaries is undeveloped, the analysis shall consider whether there is a commitment to develop the property. A commitment is denoted by the issuance of a building permit, which serves to demonstrate a reasonable vested financial interest in developing the property.

Identify Sensitive Receptors:
Based on the land use assignments, noise- sensitive land uses (sensitive receptors) can be established. A sensitive receptor is a noise- sensitive location registering measurable sound levels as described in 23 CFR 772 – typically a residence or other use that would be negatively affected by noise. In a noise model, a modeling site may represent one or more noise-sensitive locations/residences.

Establish Representative Monitoring Locations and Modeling Sites:
Using the preceding information, representative locations for monitoring existing noise conditions can be established (monitoring locations). Monitoring locations should be representative of the land uses they are meant to represent. A photolog and project mapping should document the monitoring locations proposed. Because their primary use will be the calibration of the traffic noise model, the distribution and number of field monitoring locations should be adequate for that purpose.

Similarly, representative sites for noise prediction (modeling sites) can be established. It is not necessary to have modeling sites for each residence. However, sufficient noise modeling sites must be used to adequately represent the entire population of sensitive receptors. A photolog and project mapping should document the modeling sites proposed. Monitoring locations and modeling sites should be placed in areas of outdoor activity and at least 3 meters away from buildings. Also, it is often helpful for monitoring locations and modeling sites to be distributed such that front row and second row receptor evaluation is possible. Monitoring locations and modeling sites are typically limited to within 600 feet of the proposed improvements.

6.2.2. Measure Existing Noise Levels:

At the representative monitoring locations, existing noise levels will be measured using a noise meter during peak noise hour traffic conditions. The field measurements must be consistent with the guidelines contained in the FHWA *Highway Traffic Noise: Analysis and Abatement Guidance (June 2010- Revised January 2011,* FHWA's *Measurement of Highway Related Noise (1996)* and DCMR Chapter 29, Noise Measuring Test Procedures.

The field measurements will be used to validate the traffic noise model. As the noise level is dependent on traffic volumes at the time of the measurement, traffic counts must also be taken during the measurement period to properly populate the validation run. If the difference between the field measurements and the validation run is less than 3 dBA, the model can be said to be properly validated. If the difference between field measurements and validation run is more than 3 dBA, then model should be calibrated (or re-run) accordingly until the difference is less than 3 dBA. In instances involving new roadways on new alignments, the measured noise levels will represent the existing noise levels. In all other cases, the validated model (using peak hour certified/project traffic volumes) will be used to produce the existing noise levels against which the future noise levels will be compared to determine impacts.

6.2.3. Predict Future Noise Levels:

The prediction of future noise levels relies on the certified/project traffic volumes for the peak noise hour in the design-year. The peak noise hour is often the peak truck hour. Future noise-level predictions are required for all build alternatives under consideration and for the no-build alternative. Noise prediction methodologies should be consistent with current FHWA approved methods. Currently, this involves the use of TNM version 2.5. The construction of an adequate model requires three-dimensional coordinates for the existing conditions and for the proposed alternatives. The methods used to create the model require documentation, adequate to ensure that the stakeholders can assess its robustness. Typically, the engineering data available with which to construct noise models improves as the project advances through the project development process. The prediction of noise levels should use the posted speed limit or the highest overall speed

that a driver can travel on a given road, under favorable conditions.

6.2.4. Identify Potential Impacts:

As noted earlier, a highway traffic noise impact is deemed to occur when predicted (design-year) noise levels either approach or exceed the applicable NAC listed in Table 1 or substantially increase over existing noise levels. If either of these conditions exists, a highway traffic noise impact occurs and noise abatement must be considered. Please see "definition" section of this document for definitions of "approach" and "substantial noise increase".

6.2.5. Evaluate Appropriate Abatement Measures:

At a minimum, potential traffic noise abatement measures include the following:

- Constructing noise barriers within the proposed right-of-way
- Modifying the proposed horizontal and/or vertical alignment of the roadway
- Acquiring property to serve as a buffer zone
- Modifying speed limits
- Restricting truck traffic
- Providing noise insulation

Of these abatement measures, the noise barrier option is usually the most practical and effective choice, however, the District of Columbia (District) is a dense urban area. Most of the District has existing roadways with a narrow right of way. The District also has a historic character with view sheds of national importance. The addition of noise walls in such areas can cause severe impacts to the historic character of the area and to views to the national monuments. Nevertheless, for all *possible* abatement measures, a cost/benefit analysis is required. In most cases, this will focus on the practicality of the abatement method. In order for a noise abatement option to be selected, it must be both feasible and reasonable.

6.3. Traffic Noise Mitigation Feasibility and Reasonableness Criteria:

Feasibility:

For a noise abatement technique to be considered feasible, all of the following must be true:

1. Achievement of at least a 5 dB(A) highway traffic noise reduction at impacted receptors. Per 23 CFR 772, FHWA requires the highway agency to determine the number of impacted receptors required to achieve at least 5 dB(A) of reduction. DDOT requires that fifty percent (50%) or more of the impacted receptors experience 5 dB(A) or more of insertion loss to be feasible; and

2. The determination that it is possible to design and construct the noise abatement measure. The factors related to the design and construction include: safety, barrier height, topography, drainage, utilities, geometry, structural integrity of the facilities, and maintenance of the abatement measure, maintenance access to adjacent properties, and general access to adjacent properties (i.e. arterial widening projects). Accepted engineering practices shall be exercised and AASHTO and DDOT Standards shall be used when considering the factors associated with the design and construction of a noise abatement measure. All conflict(s) must be analyzed thoroughly and documented before a determination is made.
3. Placement of a barrier will not restrict pedestrian or vehicular access
4. Construction of a barrier will not cause safety or maintenance problems

Reasonableness:

For a noise abatement technique to be considered reasonable the factors given below must be considered. The parameters used during the NEPA process are also used during the Final Design Phase when making a determination of noise barrier reasonableness. When performing a reasonableness analysis for the NEPA document, some parameters (e.g., desires of the benefiting receptors) will not yet be quantifiable. Questions relating to these parameters will be answered in the Warranted, Feasible, and Reasonable Worksheets in order to determine the proposed noise barrier's reasonableness.

All of the reasonableness factors listed below must collectively be achieved in order for a noise abatement measure to be deemed reasonable.

Viewpoints of the benefited receptors:

The FHWA highway traffic noise regulation requires DDOT to consider the viewpoints of the benefited receptors in determining the reasonableness of noise abatement. A final survey and determination shall occur after the approved final design noise analysis; however, comments will be considered throughout the entire design process. DDOT shall solicit the viewpoints of all benefited receptors through certified mailings and obtain enough responses to document a decision as to whether or not there is a desire for the proposed noise abatement measure. Fifty percent (50%) or more of the respondents shall be required to favor the noise abatement measure in determining reasonableness.

Cost-effectiveness:

Cost of an abatement measure is an important consideration but only one of a number of factors to consider. The FHWA allows DDOT to consider the actual construction cost of noise abatement. The construction of a noise barrier is not reasonable if the cost is more than $40,000 per benefited receptor. The barrier cost will include the cost of construction (material and labor), the cost of additional right-of-way, the additional cost of relocating utilities and any other costs associated with the barrier. The estimated cost of construction (material and labor) will be $25 per square foot. All receptors with noise

reductions of 5 dBA or more will be counted. Each house will be counted as one receptor. The reasonableness calculation for Category C, D and E receptors are given in Appendix A.

Noise Reduction Design Goals:
The design goal is a reasonableness factor indicating a specific reduction in noise levels that DDOT uses to identify that a noise abatement measure effectively reduces noise. It is a comparison of the design year noise level with the abatement measure to the design year noise level without the abatement measure. The design goal establishes a criterion, selected by DDOT that noise abatement must achieve. The design goal is not the same as acoustic feasibility, which is the minimum level of effectiveness of a noise abatement measure. Acoustic feasibility indicates that the noise abatement measure can, at a minimum, achieve a discernible reduction in noise levels. As required by FHWA, DDOT shall define the design goal of at least 7 dB(A) but not more than 10 dB(A), and shall define the number of benefited receptors that must achieve this design goal. DDOT's design goal is 7 dB(A) of insertion loss for at least one benefited receptor.

7. CONSTRUCTION NOISE EVALUATION METHODOLOGY:

There is nothing particularly unique about construction noise. It is produced by construction equipment or activities with sufficient magnitude (loudness) and within a certain frequency range (audible spectrum) such that human beings can hear it. While mostly annoying at night, construction noise can be equally unwelcome during the daytime. For instance, in commercial areas it can interfere with the ability to conduct business. Consequently, if not properly addressed, public concerns related to a project's construction noise impacts can unnecessarily affect/delay project development. The general steps associated with a construction noise analysis are:

- Identifying activities that may be negatively affected by construction noise
- Identifying the measures needed to minimize adverse construction noise impacts
- Incorporating appropriate abatement measures into the project's plans

Data regarding construction noise should be assessed in conjunction with the project's highway traffic noise analysis.

7.1. Identifying Activities That May Be Negatively Affected by Construction Noise:

The identification of activities that may be negatively affected by construction noise should mirror the process described in Section 6.

7.2. Identifying the Measures Needed to Minimize Adverse Construction Noise Impacts:

Most projects will not require modeling. In many cases, construction noise may be adequately evaluated through a narrative discussion or an application of a simplified manual calculation technique. The use of sophisticated modeling techniques is typically only required for the most complex projects. The state-of-the-art model is the FHWA Roadway Construction Noise Model (RCNM). The RCNM enables the prediction of construction noise levels for various construction operations based on a compilation of empirical data and the application of acoustical propagation formulas. If a construction noise impact is anticipated at a particular sensitive receptor, the use of the model contained in FHWA's *Highway Construction Noise Measurement, Prediction and Mitigation* is generally acceptable. The scope of needed construction-related noise analysis should be delineated during the project's planning steps.

In the District of Columbia, construction noise is regulated by Title 20 of the District of Columbia Municipal Regulations (DCMR). These regulations are the appropriate standards to use when assessing project-related impacts. The basic protocol under the DCMR is the establishment of maximum noise levels for the District's various land uses. Chapter 27 of Title 20 addresses general provisions, exemptions, and other procedural issues. Chapter 28 establishes maximum noise levels. Chapter 29 establishes noise measuring procedures. The DCMR provides construction-timing limitations as well as sound-level limitations. Both are typically distributed by land use type.

7.3. Incorporate needed abatement measures into the project's plans:

Abatement measures to minimize construction noise impacts, in accordance with the DCMR, should be incorporated into the project's environmental commitments. Typically, adherence with the DDOT construction and material specifications is adequate to comply with the DCMR limitations. A common sense approach to noise mitigation should be implemented. Low-cost and easy-to-implement measures are usually adequate. Environmental commitments should avoid unnecessarily constraining construction activities. Only in unusual circumstances should specific techniques be mandated.

8. APPENDICES:

- Appendix A: Activity Category C, D & E Calculations
- Appendix B: 23 CFR 772. 2010. Procedures for Abatement of Highway Traffic Noise and Construction Noise.
- Appendix C. FHWA Highway Traffic Noise Analysis and Abatement Guidance. June 2010 (Revised January 2011).

9. ADDITIONAL INFORMATION:

a. DDOT. 2010. DDOT *Environmental Policy and Process Manual.*
b. DDOT. 2005. *Design and Engineering Manual.*
c. District of Columbia. *District of Columbia Municipal Regulations.*
d. FHWA. 2006. *FHWA Roadway Construction Noise Model User's Guide. Report No. FHWA-HEP-05-054.* Washington DC. January.
e. FHWA. 1998. *Traffic Noise Model (Look-Up Tables). Report No. FHWA-PD-98-047*. Washington DC. July.
f. FHWA. 1998. *Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010*. Washington DC. February.
g. FHWA. 1998. *Traffic Noise Model User's Guide. Report No. FHWA-PD-96-009*. Washington DC. January.
h. FHWA. 1996. *Measurement of Highway Related Noise*.

Appendix A

Activity Category C, D and E Calculation

Activity Category C Calculation

Activity Category C in FHWA noise abatement criteria includes Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools , television studios, trails, and trail crossings. The activity category is for exterior noise levels.

FHWA has required that states and agencies using Federal-aid highway funds develop feasibility and reasonableness criteria for noise barriers. The emphasis of such criteria focused primarily on residential sites since they represent the vast majority of noise-sensitive sites benefited by noise barriers. No formal or standard quantitative procedures for evaluating such land uses that would minimize the judgment needed to make those barrier decisions have been developed for the District of Columbia or the majority of states. For a barrier to be determined to be cost effective (one of the reasonableness criteria), DDOT requires that the maximum square foot per benefited residence not exceed 1,600 square feet. For a one mile long, average height barrier, protecting a single row of residences, this limiting value would be obtained with residential dwellings spaced at approximately 96 feet as calculated below:

87,804 s.f. per mile/1,600 s.f. per residence = 55 residences per mile
5,280 feet per mile/55 residences per mile = 96 feet per residence; round to 100 feet.

Assuming that park lands and other outdoor activities within Activity Category C will be treated in a similar manner as Activity Category B residential areas, the following procedure is presented for consideration:

1. Locate closest active area of park at each border of park closest to highway. Mark these points.

2. Draw a line connecting the above points and continue the line to the park boundaries.

3. Treat this line as the first row of receptors and space points at every 96 feet along this line beginning at the left side park boundary.

4. Using the above line and point as a base, establish a perpendicular grid with points spaced at 96 foot intervals in both directions. Mark only those points with areas that are publicly used.

5. Model all marked points and determine which ones are impacted (Leq noise levels greater than or equal to 66 dBA or substantial increase over existing noise levels). Consider only these points in further analysis. Treat each site as one residence for all areas of public use.

6. Determine parameters (height, length, cost, benefited receptors, etc.) of the barrier system required to protect the park. If part of the barrier also protects adjacent residential areas, treat the entire barrier by adding benefited homes with qualifying park receptor points.

7. Calculate square feet per benefited receptor values.

Other factors which may be considered in the above evaluation include:

1. Adding value to sites (by treating as more than one residence each) based on park usage.

2. Adjusting value to sites based on existing noise level; quiet parks may warrant use of higher site values than parks with high existing levels.

This process is to be used for exterior uses at public use facilities, as listed in Category C. However, it is not intended to be used for calculating the cost effectiveness of a noise barrier for the non-public use facilities listed in that category, such as radio studios and recording studios. These facilities are to be counted as a single receptor only.

Activity Category D Calculation:

To address interior noise mitigation, a one to one conversion of the maximum square feet per benefited receptor to cost per benefited receptor is recommended using current engineering costs for noise barriers. A sample calculation is provided below. The sample equation assumes a cost of $25 per square feet for noise barrier materials and installation.

Example: if one receptor is predicted to experience interior noise level impacts, multiply the 1,600 maximum square feet by $25 per square feet for a total of $40,000 per benefited resident.

Activity Category E Calculation:

Category E includes the exterior impact criteria for developed lands that are less sensitive to highway noise. Highway traffic noise abatement shall be considered for hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in Activity Categories A, D or F whenever the exterior design year predicted noise levels

approach or exceed 72 dB(A) (Leq). These facilities are to be counted as a single receptor only to determine reasonableness. For Activity Category E, if exterior areas of frequent human use are identified and noise mitigation is feasible and reasonable, owners of these establishments will be contacted to ascertain their desire to have a noise barrier constructed. The construction of a noise barrier is not reasonable if the cost is more than $40,000 per benefited receptor. The barrier cost will include the cost of construction (material and labor), the cost of additional right-of-way, the additional cost of relocating utilities and any other costs associated with the barrier. All receptors with noise reductions of 5 dBA or more will be counted.