

CHAPTER 17

NOISE

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17. NOISE

17-1 OVERVIEW

The noise analysis guidance provided in this chapter is based largely on the regulatory material that is found in ***Title 23 of the Code of Federal Regulations Part 772 (23 CFR 772)"Procedures for Abatement of Highway Traffic Noise and Construction Noise"*** (reference no. 1). In addition, ***Chapter 335.17, Florida Statute***, (reference no. 2) requires the use of ***23 CFR 772*** in the noise impact assessment process, regardless of funding. The following procedures are conducted by the District to assess traffic noise as a part of the Project Development and Environment (PD&E) process.

As per ***Part 1, Chapter 3***, the first step in the PD&E process is the determination of the Class of Action applicable to the project. These are ***Categorical Exclusion (CE – Type 1, Programmatic and Type 2), Environmental Assessment (EA), Environmental Impact Statement (EIS), or State Environmental Impact Report (SEIR)***. These are referred to as “environmental document” in this chapter.

The initial traffic noise assessment for all projects shall be a desk-top review. This review should determine if noise levels will be likely to increase, if noise sensitive receivers are (or may be) within the project area, and if noise impacts may occur. This review may include computer modeling, a review of land use plans, aerial photography and/or similar efforts. This will allow the reviewer to determine whether noise impacts will occur. Projects for which the Class of Action is determined to be a Type 1 or Programmatic CE, should be reviewed for possible noise impacts. If this possibility exists, a more detailed noise assessment should be performed to determine if the project can still be classified as a Type 1 or Programmatic CE. If this review indicates the possibility of a noise impact, then a detailed noise study is performed, consisting of field data collection and computer analysis. The computer analysis will use the latest version of the Federal Highway Administration’s (FHWA) Traffic Noise Model (TNM).

During or after data collection, the preparation of a ***Noise Study Report (NSR)*** is begun. The ***NSR*** contains the assumptions, data, procedures and results from the noise study, as well as the conclusions drawn from it. When the noise impact analysis and the ***NSR*** are completed, the ***NSR*** is forwarded to FHWA for review along with the EA or EIS, or maintained in the file with the Type 1, Programmatic, Type 2 CE’s or SEIR.

Finally, excerpts and summaries from the ***NSR*** are put into the environmental document. The Noise section of the environmental document should contain enough detail to convey the degree of noise impact which the proposed project will have, along with certain required statements. The environmental document will reference the ***NSR*** for additional details, using a statement similar to the following: "***The Noise Study Report*** for this project is available from the District Office, located at _____." After Location and Design Concept Acceptance has been received a copy of the ***NSR*** is sent to the appropriate local government officials within whose jurisdiction the highway project is located. Other information that will aid these officials in their efforts to minimize highway noise impacts in the future may be sent along with the ***NSR***.

17-2 DEFINITIONS

1. **Approach Criteria.** Approaching the criteria means within 1 decibel (dBA) of the appropriate Federal Highway Administration (FHWA) abatement criteria.
2. **Benefited Receiver.** A benefited receiver is a noise sensitive receiver that will obtain a minimum of 5 dBA of noise reduction as a result of the use of a specific noise abatement activity regardless of whether or not they are identified as impacted. Only benefited receivers will be included in the calculation needed to determine that any particular noise abatement scheme has a reasonable cost.
3. **Date of Public Knowledge.** This is the date that the Type 2 CE, Finding of No Significant Impact, Record of Decision, or SEIR was approved. For a Type 1 CE and Programmatic CE, this is the date on the **TYPE 1 AND PROGRAMMATIC CATEGORICAL EXCLUSION CHECKLIST OR DETERMINATION MEMO.**
4. **Decibel.** A unit of measure of sound level. The number of decibels is calculated as ten times the base-10 logarithm of the square of the ratio of the mean-square sound pressure (often frequency weighted), and the reference mean-square sound pressure of 20 μ Pa, the threshold of human hearing. For traffic noise purposes the A-weighted scale, which closely approximates the range of frequencies a human ear can hear, is used. The A-weighted decibel is abbreviated dBA.
5. **Design Year.** The future year used to estimate the probable traffic volume for which a highway is designed. A time (usually 20 years) from the start of construction is normally used.
6. **Impacted Receiver.** An impacted receiver is a noise sensitive receiver that will be subjected to highway traffic noise that approaches or exceeds the noise abatement criterion or substantially exceeds existing noise levels due to a proposed transportation project.
7. **Insertion Loss.** The reduction of traffic noise levels as a direct result of a specific type of abatement effort.
8. **L_{Aeq} .** The level (A-weighted) 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.
9. **L_{Aeq1h} .** This is the hourly value of L_{Aeq} .
10. **Noise Abatement Criteria (NAC).** The noise level, depending upon land use type, at which FDOT must consider noise abatement. The NAC can be found in Table 17.1.
11. **Noise Sensitive Receiver.** Any property (owner occupied, rented, or leased) where frequent exterior human use occurs and where a lowered noise level would be of benefit. In those situations where there are no exterior activities to be affected by the traffic noise,

the interior of the building shall be used to identify a noise sensitive receiver. Many commercial and/or industrial land uses are not particularly noise sensitive and may not require consideration of noise abatement. This determination must be made on a case-by-case basis. Undeveloped land is not considered to be noise sensitive.

12. **Planned, Designed, and Programmed.** Planned, designed, and programmed property must be evaluated in the noise analysis. Development will be deemed to be planned, designed, and programmed if a proposed noise sensitive land use such as a residence, school, church, hospital, library, etc., has received a building permit from the local agency with jurisdiction for each building at the time of the noise analysis.

13. **Reasonable and Feasible.** Reasonableness implies that common sense and good judgment were applied in a decision related to noise abatement while feasibility deals primarily with engineering considerations (e.g., can a barrier be built given the topography of the location; can a substantial noise reduction be achieved given certain access, drainage, safety, or maintenance requirements; are other noise sources present in the area, etc.).

14. **Special Land Use.** This refers to noise sensitive land uses such as schools, churches, parks and recreational areas such as golf courses, tennis courts, sports stadiums, and similar facilities.

15. **Substantial Noise Increase.** This is an increase of 15 or more decibels above the existing noise level as a direct result of the transportation improvement project in question. A substantial increase will normally occur only on new alignment projects.

16. **Substantial Noise Reduction.** This is an effort to reduce traffic noise impacts at benefited receptors by 10 decibels or more, if possible, with a minimal acceptable level of reduction at no less than 5 decibels.

17. **Traffic Noise Impacts.** Impacts which occur when the predicted traffic noise levels approach or exceed the noise abatement criteria, or when the predicted traffic noise levels substantially exceed existing noise levels due to a proposed transportation project.

18. **Type I Projects.** A proposed Federal-aid or state-funded project for the construction of a highway on new location or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment or increases the number of through-traffic lanes.

19. **Type II Projects.** A proposed Federal-aid or state funded highway project for noise abatement on an existing highway. Type II projects are commonly referred to as retrofit projects and are allowed (but not mandatory) under **23 CFR 772**. Florida does not have a Type II program (**Reference No. 3**).

17-3 PROCEDURE

The District will review the project and determine traffic noise effects on the environment. Three steps are used to determine any noise impacts:

1. Determine qualitatively how implementation of the project will result in changes in traffic and typical sections. All viable alternatives for all study years (existing and design) should be examined using approved procedures incorporating current professional judgment.
2. Determine if any of the factors listed above could cause noise levels to approach or exceed the NAC or a substantial increase in noise levels compared to the no-project alternative. If a noise impact is expected, prepare a **NSR** following the procedures in **Section 17-4**.
3. If, after following procedures in **Section 17-4**, it is determined that noise levels will approach or exceed the abatement criteria or the project will cause a substantial noise increase, then abatement must be considered.

17-4 NOISE ANALYSIS PROCESS FOR ENVIRONMENTAL DOCUMENTS

The noise analysis and documentation requirements for the environmental document are described below. They begin with the collection of field data, followed by the computer verification of field data and computer prediction of future noise levels. If a determination is made that future noise levels approach or exceed abatement criteria or substantially increase over the existing noise levels, then the next and final analytical step is to consider noise abatement. This is followed by documentation of the results of the noise investigation in the **NSR** and the environmental document.

17-4.1 Field Noise Measurements

Field noise measurements are typically conducted for two purposes: 1) to establish ambient noise levels along a new alignment where a highway currently does not exist; and 2) to verify that traffic noise is the primary source of noise in the area, which allows the validation of the accuracy of TNM under the existing highway conditions.

Field measurements are to be conducted along all existing or proposed roadway segments or links that may be affected by the proposed action. For example, one or more representative sites within each link or segment are to be sampled if traffic volumes, traffic mix, roadway geometry (number of lanes increase or decrease) or the terrain changes substantially enough to impact traffic noise levels. Field monitoring will generally be conducted in accordance with **FHWA's guidance document, "Measurement of Highway-Related Noise" (Reference No.4)**.

17-4.1.1 Field Measurements for Establishment of Ambient Noise Conditions

When field measurements are required along a new alignment where traffic noise does not exist or is only a minor element in the overall noise, noise monitoring is to be conducted generally following the FHWA procedures found in **Reference No. 4**. Measurements should be taken 5 feet above ground level and within 100 feet of the centerline of the proposed roadway alignment if possible. If possible, a location along the alignment should be chosen that represents a potential noise sensitive site and that has a noise environment similar to most areas along this section of the alignment. A minimum of 3 repetitions of 10 minutes worth of readings using an integrating Sound Level Meter shall be taken at each site (if possible), noting the pertinent field conditions. At least two sets of readings (if practical) at each location should be taken over a range of time. While it may not always be practical, it is recommended that one set of readings be taken during the morning hours and a second set taken during the afternoon hours. It is further recommended that these readings be taken over a period of two or more days if possible. The resultant noise level for each reading shall be noted and an average ambient reading for each site shall be obtained. The average ambient reading (from all sources) shall be used to determine the increase (if any) in the noise level that can be expected in the area as a result of the proposed project. The entire project corridor should be reviewed under these conditions to determine if any unusual noise sources (aircraft, industrial, electrical generators, etc.) exist that may influence the ambient readings. If any unusual noise sources are noted during the study, they must be identified in the field report so that potential controls or frequency of occurrence can be determined. Specific questions regarding ambient noise field measurements should be directed to the District Noise Specialist.

17-4.1.2 Field Measurements for Verification of the Computer Noise Model

The primary purpose of measuring existing traffic noise levels is to ensure that traffic noise is the main source of noise. Traffic noise monitoring is conducted in accordance with FHWA's measurement procedures found in **Reference No. 4** as supplemented with accepted professional judgment. If possible, monitor when worst case traffic noise levels are anticipated to occur. This will give the noise specialist better insight into the traffic noise conditions that are currently affecting the adjacent properties. If this is not practical, then monitor during any heavy traffic period. This does not necessarily have to be the peak period of the day, nor the peak traffic season of the year, which will vary from location to location.

Monitor for a minimum of 3 repetitions of 10 minutes using an integrating Sound Level Meter (if possible) noting the following:

1. Average vehicle speed for all classes of vehicles (using a radar unit or equivalent method for measuring speeds, such as electronic portable traffic speed and traffic counters);
2. Vehicle counts and class identification (automobiles, motorcycles, buses, medium trucks, heavy trucks);

3. Unusual noises (aircraft flyovers, trains, barking dogs, etc.);
4. All input parameters necessary to run the computer models, including:
 - a. Distance from center of each roadway to receptor;
 - b. Width of roadway and lanes;
 - c. Height of the receptor;
 - d. Barrier/buffer information including trees, berms, structures;
 - e. Type of propagation path (hard versus soft);
 - f. Variations in terrain between the receptor and the source; and
 - g. Grade, if any.

If the field data was gathered without unusual noise disturbances, such as barking dogs or aircraft flyovers, the field measurement study will be considered complete. If not, and a logical explanation for any unusual readings cannot be made, the field measurements at that location(s) should be repeated in accordance with the FHWA's current measurement procedures. Field measurements may also require repetition if the application of the TNM modeling process does not result in an acceptable level of accuracy as noted in **Section 17-4.2**.

17-4.2 Computer Verification of Measured Traffic Noise Levels

All new noise studies will require the use of the latest version of the TNM. Any project which was initiated using any computer model other than the latest version of TNM should use the latest version of TNM for all subsequent noise studies, including reevaluations and design noise studies (**Reference No. 5**). This will minimize public concern that the modeling did not use the most current and accurate model.

The user is reminded that the TNM model is a useful tool designed to help the noise specialist in assessing the potential for noise impacts and developing mitigation designs. Particular attention should be paid to the location of the edge of pavement (edge of the travel lanes versus paved shoulders, etc.), the use of hard sites (water, pavement, etc.) as a default value, and the assessment of distant receivers over 500 feet from the edge of pavement of the nearest roadway.

Using the latest version of TNM, predict the noise level for the same time period using the data gathered in **Section 17-4.1.2** above as input. This will give you an indication of the accuracy of the model under the existing conditions. If the predicted and measured levels are within + or - 3 dBA of one another, this is an indication that the model is within the accepted level of accuracy. If the difference between the measured and the predicted levels is greater than + or - 3 dBA, a careful examination of the field-measured and predicted data should be undertaken to determine the reason(s) for this margin of error. In the event that a logical explanation for the difference cannot be made, the field measurements and/or the computer modeling at that location(s) should be repeated.

17-4.3 Data Needs for the Prediction of Existing and Future Traffic Noise Levels

17-4.3.1 Traffic Data

Traffic data is collected for roadway segments of the project/no-project and other roadways that may contribute noise to receptors. Interim year data is not needed in the **NSR**. Noise analyses are performed for the noisiest hour of the day. Experience has shown that the highest traffic volume and the highest average speed usually create the noisiest conditions. This often occurs at peak-hour; however, conditions such as capacity effects on vehicle speed, higher than normal off peak truck percentages, and unusual hourly traffic distribution, may cause the noisiest hour to be different from the peak traffic hour. Maximum peak-hourly traffic representing Level of Service (LOS) "C" will be used (unless analysis shows that LOS C will not be reached or other conditions create a "worst-case" level). For ramp traffic, use the demand LOS. Consistent with the use of LOS C, the speed assigned to vehicles should be the posted speed limit. If the expected posted speed for the future build condition cannot be determined, the design speed established for the conceptual design can be used. The District Traffic Operations unit may be able to provide some guidance concerning posted speed for a particular roadway.

Noise level predictions will be required for the following conditions:

<u>ALTERNATIVE</u>	<u>YEAR</u>
no build	existing and design year
all build	design year only

17-4.3.2 Receptor Data

Unless the area of exterior frequent human use is identified elsewhere, residential receptor sites should be placed at the edge of the dwelling unit closest to the major traffic noise source or as dictated by professional judgment.

Where more than one unit is clustered together, a single site can be analyzed as representative of the group. Only exterior areas of frequent human use will be predicted unless no exterior activities are likely based on field observation. Interior predictions should be coordinated with the District Noise Specialist to insure proper application.

Other noise sensitive receptors include parks, schools, hospitals, and other sites where quiet is important for normal activities. The location of the receptor in these cases will be dictated by the location of the noise source and the exterior activity that will be impacted, if any.

Receptor heights for first floor receivers are always assumed to be 5 feet above ground and second story receivers at 15 feet above ground level. Higher story receivers will have to be determined on a case-by-case basis. Receptor sites in excess of 500 feet from the nearest edge of pavement of the project roadway will not require modeling. Nationwide research studies have indicated that traffic noise levels will not approach or exceed the NAC at distances greater than 500 feet. If there is any question concerning the modeling of a receptor location at a distance greater than 500 feet, contact the District

Noise Specialists for guidance.

Modeling of commercial and industrial sites will normally not be required if no exterior impacts are anticipated based on the specific use (area of frequent human use where a lowered noise level would be of benefit). This will be determined on a case-by-case basis.

17-4.3.3 Noise Descriptor

The noise level descriptor will be the hourly equivalent sound level, L_{Aeq1h} . L_{Aeq1h} is the steady-state, A-weighted sound level which contains the same amount of acoustic energy as the actual time-varying, A-weighted sound level over a one-hour period. All data will be reported to the nearest 1/10th of a decibel.

17-4.4 Computer Prediction of Existing and Future Traffic Noise Levels

Using the latest version of TNM, traffic noise levels are predicted for the existing and design year using the appropriate traffic data and roadway configurations. This prediction applies to those receptors selected as specified in **Section 17-4.3.2** above. When non-highway transportation noise sources (airport operations, transit lines, light commuter rail, etc.) impact the noise environment next to a highway, this impact should be noted in the **NSR**. Assessment of the magnitude of airport operation impacts should be done using the appropriate **regulatory guidelines** provided by the Federal Aviation Administration (FAA) (**Reference No. 6**). Assessment of the magnitude of noise impacts from rail and transit facilities shall be done using **Federal Transit Administration (FTA) guidance (Reference No.7)**.

17-4.5 Determining Future Traffic Noise Impacts

Calculate design year traffic noise impacts based on the difference between the future build and existing noise levels. If one or more noise sensitive receptors are affected by project related traffic noise levels which approach or exceed the abatement criteria or which substantially exceed existing noise levels, then abatement measures must be considered. If the abatement criteria is not approached or exceeded or if projected traffic noise levels do not substantially exceed existing noise levels, abatement measures normally will not be considered. Approaching the abatement criteria means within 1 dBA of the **FHWA NAC** (see **Table 17.1**).

If for example, the difference between the future build and existing condition predictions shows an increase of 1 dBA, from 66 dBA to 67 dBA, then the project can be stated to have no substantial increase on highway traffic noise. However, since the predicted level approaches or exceeds the **FHWA NAC** (assuming a Category B site), noise abatement must be considered. If the future increase was from 42 dBA (no-build) to 63 dBA (build), the project would be considered to have a substantial increase and would require abatement consideration. For a receiver site with a predicted future noise level of 66 dBA, the approach criterion would be met and abatement must be considered. However, a level of 65.9 dBA would not be considered to have approached or exceeded the abatement criterion and abatement consideration would not be required.

17-4.6 Traffic Noise Abatement Techniques

The noise abatement measures listed below may be incorporated in Type I projects to reduce traffic noise impacts.

1. Traffic management measures (e.g., traffic control devices and signing for prohibition of certain vehicle types, time-use restriction for certain vehicle types, modified speed limits, and exclusive lane designations).
2. Alteration of horizontal and vertical alignments.
3. Acquisition of property rights (either in fee or lesser interest) for construction of noise barriers.
4. Construction of noise barriers (including landscaping for aesthetic purposes) whether within or outside the highway right-of-way. Interstate construction funds may not participate in landscaping as an abatement measure.
5. Acquisition of real property or interests therein (predominately unimproved property) to serve as a buffer zones to preempt development which would be adversely impacted by traffic noise. This measure may be included in Type I projects only.

Sound proofing a building, while often appealing, is not to be considered due to constraints within **Chapter 339** of the **Florida Statutes**.

17-4.6.1 Noise Barrier Considerations

The most common type of traffic noise abatement methodology is the construction of some type of noise barrier. Traffic noise abatement is considered only if the predicted future "build" traffic noise level approaches or exceeds abatement levels in the **NAC** or if "build" traffic noise levels substantially exceed existing noise levels as determined in **Section 17-4.5** above; otherwise, proceed to **Section 17-4.7**.

Noise abatement will not be considered for commercial or industrial property unless there is an exterior use that is particularly noise sensitive (area of frequent human use where a lowered noise level would be of benefit). Many commercial and industrial properties desire visibility from existing roadways, and the placement of a noise barrier could have unintended economic impacts. Noise barriers will not be considered for recreational uses such as golf courses, isolated picnic tables, outdoor basketball or tennis courts, sports fields, walking trails and similar areas of less frequent human use. FDOT experience has shown that because of limited usage, sites like these will not meet the cost criteria for special use facilities. An exception to this condition could occur if the sports field or other use areas are part of a larger facility that has extensive use throughout the day. If this situation occurs, the application of the special use methodology established by FDOT for that purpose will be employed to determine if the construction of a noise barrier is

reasonable (**Reference No. 8**). A copy of the special use report may be obtained from the EMO or at the FHWA website: <http://www.fhwa.dot.gov/environment/met/index.htm>.

When considering noise barriers for noise abatement, the reasonableness and feasibility factors discussed in the following section must be evaluated relative to each alternative abatement measure. A brief explanation of each factor is provided.

17-4.6.1.1 Noise Barrier Reasonableness and Feasibility Consideration

The **feasibility** of providing noise abatement is focused on the ability of the noise barrier to provide a noticeable **insertion loss**. This is the lowering of the noise level as a result of some type of abatement effort. A normal design goal will be 10 dBA or more. However, the minimum insertion loss of impacted receivers shall be at least 5 dBA, where feasibility and reasonableness (see below) can be attained. The more insertion loss you can achieve the better the barrier, as long as the cost, visual impact, etc. of the barrier do not become too great. If a minimum of 5 dBA insertion loss cannot be achieved at a particular receiver, a noise barrier is not considered to be feasible for that particular receiver.

The **reasonableness** of constructing a noise barrier is focused on the **cost** of providing the proposed noise barrier. Cost factors include the cost of construction (material and labor), the cost of the ROW (including easements, etc.), and utilities (when they are outside of FDOT ROW). These cost elements do not include the cost of designing the barrier, relocation of utilities (above or below ground) that are permitted within the FDOT ROW, clearing and grubbing, mobilization, maintenance of traffic, construction engineering and inspection, and related activities that are considered as part of the total construction project. These costs must be incurred because of the installation of the noise barrier. For example, to extend a culvert that would not be necessary for roadway construction but would be required for construction of the noise barrier. If a noise barrier is proposed, only the latest version of TNM may be employed to determine the barrier's dimensions and location. Barrier costs should be calculated by multiplying the length of the barrier by the height to determine the surface area of the barrier and multiplying this by the current cost per square foot factor for cost estimating purposes. Noise studies will use a cost factor of \$30.00 per square foot. This value is based on an annual review of noise barrier construction cost estimates on a statewide basis and is adjusted as needed based on a periodic review. The use of the latest cost estimate factor is to be used on all noise studies, regardless of the value used in previous studies.

Cost reasonableness is based on a calculated cost per benefited receiver. A benefited receiver is defined as a noise sensitive receiver that will obtain a minimum reduction of 5 dBA as a result of the use of a specific noise abatement activity such as the construction of a noise barrier. Only benefited receivers will be included in the calculations needed to determine if a particular noise abatement method is reasonable. The cost per benefited receiver will be calculated by dividing the total noise barrier cost by the number of benefited receivers.

The lower the cost, the higher the economic benefit will be to the impacted area. Using a unit cost of \$30.00 per square foot, a reasonable cost of \$42,000 per benefited receiver is looked upon as an upper limit although a higher level of expenditure can be used if justified by other circumstances. Cost factor elements are reviewed annually by FDOT and adjusted every five (5) years. The relationship between unit costs and the upper limit for cost reasonableness will be based on maintaining a constant upper limit of 1,400 square feet of noise barrier per benefited receiver

It is important to note that a reasonable cost of abatement must be determined during the PD&E Study to enable the Department to make a commitment/recommendation in the environmental document to pursue this mitigation effort in the design phase. The **PD&E Noise Study** should also note that the reasonableness of providing noise abatement in the form of a noise barrier is subject to a detailed review in design and subsequent reevaluations.

The method of determining a reasonable cost for noise abatement may involve either of the following methods. Method One is to review the cost per benefited receiver for the construction of a noise barrier benefiting a single location such as a subdivision or contiguous impacted areas with each area being considered an independent area. Method Two is to review the cost per benefited receiver for the construction of noise barriers within the total project length. While either of the two methods may be used in making the determination of a cost reasonable noise barrier, the methods should not be used concurrently within a project and the method selected should not to be exclusive in nature. Selection of Method Two may be applied to a given project at the discretion of the District Office. A non-FDOT match will not be permitted to reduce the cost of a noise barrier for the purpose of making the noise barrier reasonable.

After determining the amount of insertion loss that can be provided and the cost of the abatement measure needed to provide that reduction, other factors to be considered in determining the reasonableness and feasibility of providing noise abatement are listed below in relative order of importance.

1. The **desire of the affected property owners** is extremely important in determining whether a noise barrier should be built at any location. This may require that a survey of some sort be conducted to assess the desires of the affected property owners. Normally these are the owners of the first row of homes and/or contiguous property owners throughout the length of the noise barrier. In an affected area which desires a noise barrier, informed judgment must be used to establish whether a numerical majority of the affected property owners are in favor of its construction. If the affected property owners are not in favor of the noise barrier, the Department may choose not to build the structure. If access rights are required, the Department should attempt to determine if the affected property owners are willing to trade those rights for the noise barrier without any exchange of money. This survey will usually be conducted during the design phase of the project although it is possible that a survey could be conducted during the environmental documentation stage.

2. **Right of Way (ROW)** needs, including access rights (air, light, view, ingress/egress), easements for construction and/or maintenance, and additional land must be considered as part of the feasibility of noise barrier construction since ROW impacts include the cost to obtain access rights, easements and land. It also includes the consideration of donation, purchase, etc. Normally ROW needs and costs will be determined early in the process. If access rights and easements are required for the installation of a noise barrier, donations of these property rights may be requested from the property owners. However, all owners must be advised of their rights to receive just and full compensation for the property necessary for the construction and maintenance of the noise barrier. If ROW must be obtained for the installation of a noise barrier, this cost must be considered in the cost reasonableness of providing abatement. Another important consideration in ROW is the potential to construct a noise barrier that might block the motorist's view of an existing legally permitted outdoor advertising sign. As early in the PD&E study as possible, the Outdoor Advertising section of the Office of Right of Way must be notified (consistent with the **ROW Manual Topic No. 575-000-000**) in order to identify outdoor advertising signs affected by any proposed barrier. At a minimum, the section number and milepost for each noise barrier, along with an estimated construction date, will be given to the Outdoor Advertising Section so notice of the possible screening of a sign can be provided to the affected sign permit holder(s). Additional information regarding this issue can be found in **Section 17-4.7.3**. Along the same lines, FHWA has determined that the construction of business names/logos on noise barrier walls would be in violation of **23 CFR Section 1.23**. For noise barriers in urban and suburban areas, imprinting of subdivision names or logos on the noise barrier can be considered only at the portion of the noise barrier at the legal entrance to the subdivision. If ROW issues in general cannot be overcome they may be considered a "fatal flaw."
3. **Safety** is a very critical factor in determining whether a particular abatement scheme is viable. Maintaining a clear recovery zone is very important, as is sight distance. While a barrier can be placed adjacent to the shoulder of the road in some locations, safety factors must be included in the design so that redirection of crash vehicles will occur, merging traffic can be seen, fire access and emergency vehicle needs, and disabled vehicles can be accommodated.
4. **Constructability** is an important consideration in the feasibility of providing noise abatement in a number of situations. Can the noise barrier conceived actually be constructed using routine construction methods and techniques? Factors affecting this will include terrain, utilities, safety (lane closures, etc.), bridges, overpasses, and similar difficulties. This implies that the site has been reviewed for impediments that may substantially increase construction costs, time, safety or impacts. For example, if a noise barrier is expected to be placed on an existing structure (such as a bridge or a mechanically stabilized earth wall (MSE) because of effectiveness or cost reasons, the ability of this structure to support the additional wind and dead loads safely must be established before a final commitment to build the noise barrier is made. If a new bridge is being designed and a noise barrier is contemplated for placement on the bridge, the extra costs associated with the construction of the bridge to support the load of the noise barrier should be considered as part of the cost to build the noise

barrier. Issues related to crash worthiness of a proposed noise barrier within the clear recovery zone must also be addressed. A noise barrier on structure or a MSE wall will not exceed 8 feet above the height of the bridge deck or MSE wall without an approved design exception while ground mounted barriers normally will not exceed 22 feet, unless a higher barrier is required by site conditions, and a design exception is approved as noted in the FDOT **Topic No. 625-000-007 Plans Preparation Manual, Volume 1, Chapter 32 (Reference No. 9)**

5. **Accessibility** refers to the ingress and egress to properties that would be effected by the noise abatement measure. Will the placement of a noise barrier deny access to a local sidewalk or normal route of travel? Could a driveway be relocated to make the construction of a noise barrier on FDOT right-of-way viable? These conditions are site specific and are to be given consideration in determining the feasibility of providing a noise barrier. When access to a local sidewalk is blocked by a noise barrier, alternatives for access should be coordinated with the property owners affected. One option to provide access needs is to provide doors at appropriate intervals. Doors need to be designed so as to be acoustically "sealed" when closed. Safety and aesthetics of access doors in relationship to the remainder of the barrier should be considered. Other options that do not affect the insertion loss may be considered at the discretion of the District Office.
6. **Maintainability** refers to issues related to how the noise barrier will be maintained following construction. Maintainability of a noise barrier could be hampered if the noise barrier is constructed in a location that is difficult for maintenance crews to access with either personnel or equipment. Graffiti can be a serious problem and consideration should be given as to how it can be reduced. It is recommended that extra quantities of the noise barrier material be purchased during construction (if practical) so that replacement of damaged sections will be less expensive in the future and delays in replacement can be kept to a minimum.
7. **Antiquity** addresses the question of who was there first, the noise sensitive site or the roadway? How long has the noise sensitive site been there relative to elevated noise levels? Is the Department dealing with original owners or recent purchasers? This implies that someone who builds or buys a noise sensitive site along an existing highway (or within the corridor where a road is planned for construction) probably doesn't consider noise a significant factor in location. The "Date of Public Knowledge" for planned highway construction cannot precede the date of approval of the appropriate environmental document since they are one and the same.
8. **Aesthetics** refers to the physical appearance of the noise barrier from both the highway side and the affected property side. It also incorporates the landscaping concept, the view of the property owners, and the local government requirements relative to color, height, style, materials, etc.
9. **Drainage** is an important element in the location and design of a noise barrier, but frequently overlooked. Directing water along, under, or away from a noise barrier can be expensive and cause construction and maintenance problems and therefore, must

be given adequate consideration.

10. **Utilities** issues, including the impact of noise barriers on utilities and the reverse must be assessed early in the process. Large overhead power lines, underground water, sewer, gas, or oil lines, etc., can have a significant impact on costs and design options. Additional factors that may influence the reasonableness and feasibility of providing noise abatement can include the items listed below.
 1. **Relationship of future levels to the abatement criterion** seeks to answer the question of whether or not the predicted future noise level from the project approach, exceed, or far surpass the appropriate abatement criterion. Will it approach or equal the criterion or is it more on the order of 5 dBA or more above the criterion? If the future levels are only expected to approach or just barely exceed (1 to 3 dBA above) the criterion, abatement may not be as desirable as it would be if the impact were to be greater.
 2. **Noise level increase from existing to future build conditions** is similar to factor number 1 above, suggesting that you also need to look at the magnitude of the noise level increase. If the difference between existing noise levels and the future build noise levels increase from 45 dBA to 64 dBA it will be far more noticeable than an increase from 63 dBA to 67 dBA, even though the abatement criterion is met in both cases.
 3. **Noise level changes from future build and no-build condition** implies that the noise levels may be very similar, whether or not the project is built. If the difference between the future no-build and the future build is 3 dBA or less, it has been established that most people would not notice the change. If the change is greater than 3 dBA, abatement consideration should be given more weight.
 4. **Land Use Stability** which questions as to whether the existing land use for this area expected to change in the future, and if so how? For example, are residential areas expected to be non-conforming uses in the future? Or is the area stable and noise sensitive land uses are likely to remain for an indefinite period of time.
 5. **Local Controls** seeks to identify what the local zoning and planning units have done to control noise sensitive land uses from building adjacent to the corridor? This implies that if no controls are used, noise abatement is not a very high priority within the community.
 6. **Views of officials with jurisdiction in the area** imply that consideration should be given to the views of the local politicians who may be asked to represent the views of concerned citizens within the area.
 7. **Environmental impacts and other considerations** refer to impacts of a noise barrier installation that should be considered on a site by site basis. Examples include animal migratory paths, bird/wall collisions, groundwater or surface water impacts, storm

water pond sites, wetland destruction, air quality, etc. It can also include consideration of the unanticipated contingencies that can determine if a noise barrier is reasonable as conceived at a given location. An example would be the impact of a noise barrier on a nearby hospital heli-pad for emergency medical transport.

23 CFR 772.11(d) states: "When noise abatement measures are being considered, every reasonable effort shall be made to achieve substantial noise reductions." **FHWA Noise Abatement Criteria** are contained in **Table 1 of 23 CFR 772 (Reference No. 1)**. FDOT considers "substantial noise reduction" to mean a minimum of 5 decibels of reduction with a desire to achieve a 10 decibel or more reduction if it can be done at a reasonable cost.

For Land Use Activity Category A (where quiet is very important), consideration of abatement will be required whenever the design year predicted noise levels equal or exceed 56 dBA (L_{Aeq1h}) or substantially exceed the existing noise levels. For Activity Category B (such as residences, parks, recreational vehicle (RV) parks, day care centers, etc.), the criteria depicted in **Table 17.1** shall be used in determining where abatement considerations are warranted. In the case of RV parks that also serve as a mobile home site, noise abatement will be considered when fifty (50) percent of the noise impacted spaces are occupied fifty (50) percent of the year or more by "permanent" residents. A permanent resident would be one who occupies the dwelling unit at least fifty (50) percent of the calendar year. Since **23 CFR 772** refers to "approaching or exceeding the noise abatement criteria", judgment will be necessary in instances where total predicted noise levels are close to, but below, the FHWA NAC. For Land Use Activity Categories C and D (which are commercial and undeveloped properties), abatement measures normally will not be implemented. Consultation with FHWA in these situations will be required (if appropriate) before abatement will be implemented.

In determining and abating traffic noise impacts, primary consideration for abatement is to be given to exterior areas where frequent human use occurs and where a lowered noise level would be of benefit. Therefore, application of criteria for Activity Category E (interior) should only be considered where there are no exterior activities to be affected by the traffic noise or where the exterior activities are far from or physically shielded from the roadway in a manner that prevents an impact on exterior activities. Activity Category E abatement considerations should be initiated only after consultation with FHWA.

17-4.7 Community Coordination

17-4.7.1 Community Coordination in PD&E

The degree and type of community coordination and participation will vary from project to project. For projects requiring consideration of abatement, the community involvement activities should allow for presentation and discussion of noise impacts related to the project. Opportunities for such involvement should be provided, as appropriate, during the environmental evaluation and documentation phase as part of the public involvement and/or public hearing process. Most community coordination will take place during the final design phase.

17-4.7.2 Community Coordination in Final Design

During the final design phase when noise abatement is anticipated, one phase of community coordination may include a survey of affected property owners to determine their desires regarding abatement. This can be done using any number of techniques. It may include door-to-door contact, telephone polls, a mailed survey form, a public workshop in the neighborhood, or a combination of these techniques.

The communities' desires related to abatement should be analyzed and given considerable weight in the decision-making process. Discussions should relate to issues, such as noise abatement options, partial abatement, and areas where abatement is not reasonable and/or feasible. It should also include a presentation of material options, physical dimensions, obtainable levels of reduction, and cost factors so the public can aid the Department in making a reasonable decision based on facts and not on suppositions.

In the event that some affected property owners desire noise abatement and others do not, further assessment may be necessary in order to determine what impact, if any, this will have on the reasonable cost issue as well as the social consequences. Consultation with FHWA (if appropriate) is recommended. When noise abatement measures are being developed in the final design, such measures will not be approved without documentation (letters in the file, public hearing transcripts, survey results, etc.) that the affected local community has been provided the opportunity to provide input into the final design. The local community is considered to consist of those individuals directly affected by the project-related noise as well as those affected aesthetically by the abatement measures. In the case of noise barriers, primary emphasis is to be given to the input of those affected property owners immediately adjacent to the noise barrier(s). If unanimous agreement cannot be reached by a neighborhood on the use of noise barriers, the decision to provide barriers or not will rest solely with FDOT.

17-4.7.3 Outdoor Advertising

As a result of the amendment of **Section 479.25, F.S.** related to "Outdoor Advertising", outdoor advertising signs that are legally permitted, conforming and erected may increase the height of the sign if visibility is blocked due to the construction of "noise attenuation" barriers (**Reference No. 10**). The amended statute requires the FDOT to notify a local government or local jurisdiction before erecting a noise barrier that will block a lawfully permitted sign. The local government or local jurisdiction is then required to notify the FDOT if increasing the height of an outdoor advertising sign will violate any local ordinance or land development regulation of the local government. When the notice has been received from the local government or local jurisdiction, and prior to the erection of the noise barrier, the FDOT shall inform all property owners identified as impacted by highway noise, and who may benefit from the proposed noise attenuation barrier, as part of the written survey, that:

1. Erection of a specific noise barrier may block the visibility of an existing outdoor advertising sign;
2. The local government or local jurisdiction may restrict or prohibit increasing the height of the existing outdoor advertising sign to make it visible over the barrier;
3. If a majority of the impacted property owners vote for the construction of the noise barrier, the local government or local jurisdiction will be required to:
 - a. Allow an increase in the height of the sign in violation of a local ordinance or land development regulation;
 - b. Allow the sign to be relocated or reconstructed at another location if the sign owner agrees; or
 - c. Pay the fair market value of the sign and its associated interest in the real property.

The amended statute also requires the FDOT to hold a public hearing within the boundaries of the affected local government or local jurisdiction to receive input on proposed noise barriers that may conflict with the local ordinances or land development regulations and to suggest or consider alternatives or modifications to the proposed noise barrier to alleviate or minimize the conflict with the local ordinances or land development regulations or minimize any costs associated with relocation, reconstructing, or pay for the affected outdoor advertising sign. Alternatives or modifications to proposed barriers that will not provide the minimum of 5 dBA will not be considered.

The written survey materials shall inform the affected property owners of the location, date, and time of the public hearing. The public hearing may be held concurrently with other public hearings scheduled for the project. A general notice of the public hearing shall also be published in a newspaper in accordance with the notice provision of **Section 335.02(1), F.S. 335.02(1)** and contain the same information provided in the written survey materials. The notice shall not be placed in that portion of a newspaper in which legal notices or classified advertisements appear. Please refer to **Part 1, Chapter 8 Public Involvement**, of the **PD&E Manual** for additional details about meeting notification requirements.

The FDOT shall not construct a noise barrier that screens or blocks the visibility of a lawfully permitted outdoor advertising sign until after the public hearing is held and the numerical majority of the impacted property owners have approved the construction of the barrier. If the construction of the noise barrier is approved, the FDOT shall notify the local governments or local jurisdictions. The local governments or local jurisdictions shall then exercise one of the options listed above.

17-4.7.4 Retrofitting (or Type II Projects)

23 CFR 772 provides for Federal participation in retrofitting existing highway facilities with noise abatement measures as long as certain criteria are met. The requirements for the construction of Type II (retrofit) noise barriers have changed as a result of **Section 339(b) of the National Highway System (NHS) Designation Act of 1995**. FHWA issued

a final rule on August 11, 1997 to make **23 CFR Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise**, consistent with the NHS legislation. **Section 772.13(b), F.S.**, was revised to read as follows:

“For Type II projects, noise abatement measures will only be approved for projects that were approved before November 28, 1995 or are proposed along lands where land development or substantial construction predated the existence of any highway. The granting of a building permit, filing of a plat plan, or a similar action must have occurred prior to right-of-way acquisition or construction approval for the original highway on new location. Noise abatement measures will not be approved at locations where such measures were previously determined not to be reasonable and feasible for a Type I project.”

Type II (retrofit) projects are not mandatory under **23 CFR 772**. The FDOT does not have a Type II program (**Reference No. 3**). Exceptions will require approval by the Secretary of FDOT (and FHWA for federally-funded projects).

17-4.8 Preparation of the Noise Study Report

17-4.8.1 Noise Study Report Contents

The results of the noise analyses shall be reported in a **NSR** and summarized in the environmental document. All feasible alternatives will be analyzed, including the no-build alternative.

The **NSR** should have a logical sequence which adequately describes the procedures used in developing the **NSR**, performing the required analyses, and arriving at the appropriate conclusions. Graphics and references should be utilized to make the report easily understood by both a technical reviewer and a layman. All noise readings should be reported to the nearest 1/10th of a decibel. Do not include coding sheets, however. Figure 17.1 illustrates a recommended outline for the **NSR**.

17-4.8.2 Methodology and Assumptions

The following information related to methodology and assumptions shall be included in the **NSR**:

1. Model(s) and methodology used;
2. Alternatives and years considered;
3. Existing and design year vehicle volumes, speeds, and composition data;
4. Receptor locations and descriptions, including land use category;
5. Basis for determination of existing and future noise levels; and

6. Noise descriptor used.

A reviewer should generally be able to replicate the results using the basic model with the input data reported in the **NSR**.

17-4.8.3 Application of FHWA Noise Standards

The **NSR** will include a comparison of each alternative's total noise levels with the appropriate noise abatement criteria and with existing noise levels. It will also identify all abatement considerations and commitments.

17-4.8.4 Coordination Requirements and Documentation

Summarize in the **NSR** any coordination or communications that may have taken place with other agencies and the public. Include their comments and pertinent responses to any negative comments. A statement should also indicate that a copy of the final **NSR** will be circulated to the appropriate local planning/zoning officials for their use in land use control once the Location and Design Concept Acceptance occurs.

When the **NSR** is finalized, and following Location and Design Concept Acceptance, copies shall be sent to the appropriate local government officials within whose jurisdiction the highway project is located. The following information should be transmitted along with the **NSR**:

1. The best estimation of distance from the project (typically the centerline or the Right of Way line) at which future noise levels for both developed and undeveloped Category B lands or properties in the immediate vicinity of the project will approach the FHWA abatement criterion of 67 dBA. Much of this information is likely to be included in the **NSR**.
2. After the "Date of Public Knowledge", FDOT is no longer responsible for providing noise abatement for new development which occurs adjacent to the proposed highway project. Provision of such noise abatement becomes the primary responsibility of local government(s) and private developers.
3. Other information and explanation that will aid the local officials in planning for future traffic noise impacts.

The above items are intended solely to assist local officials in promoting compatibility between land development and highways. Upon request, the Department may provide additional available material and technical guidance which may assist local officials in this respect.

17-4.8.5 Construction Noise and Vibration Impacts

The early identification of potential construction and/or vibration impacts that may result from the construction of the project is important. A list of example vibration sensitive

receivers has been developed and can be found in **Table 17.2**. This will allow avoidance and/or mitigation options to be developed during the final design phase. These options can then be placed in the construction plans and applied during the construction of the project by the Contractor.

The discussion of construction noise and vibration impacts is required for inclusion in the environmental document whether the noise abatement criteria are exceeded or not. It is generally not based on site specific predictions of noise levels but should, as a minimum, include a general reference to the **Standard Specifications for FDOT** construction to control noise and/or vibration impacts (**Reference No.11**) and any local ordinances that relate to construction noise and/or vibration levels allowed. It should be noted that revisions to **Section 335.02, F.S.**, in 2003 exempts FDOT from compliance with local ordinances (reference 12). FDOT policy is to follow the requirement of local ordinances to the extent that it is reasonable.

For projects anticipated to have substantial construction noise impacts, the noise and/or vibration analysis for the environmental document will include a detailed assessment of impacts. Any recommended special construction noise and/or vibration mitigation measures identified during the review of potential construction and/or vibration impacts will be described in the **NSR**. In considering construction noise and/or vibration mitigation, it should be noted that special provisions may be added as appropriate to the project's construction specifications. Any unique noise and/or vibration control efforts to be considered during construction shall be coordinated with the appropriate District management staff prior to inclusion in the **NSR**.

Note: *Only special provisions need to be detailed in the environmental document and the **NSR**.*

17-4.8.6 Noise Abatement Commitments

23 CFR 772.11 requires that "Before adoption of a final environmental impact statement or finding of no significant impact, the highway agency shall identify:

1. Noise abatement measures which are reasonable and feasible and which are likely to be incorporated in the project, and
2. Noise impacts for which no apparent solution is available".

Noise abatement commitments will be made two (2) times during a project's development. The first time will be during the time that the environmental document is being finalized. By then the noise studies will have progressed to the stage where noise-impacted areas have been identified. At this stage, it is unlikely that exact locations, abatement types, right-of-way requirements, etc., can be determined, although approximate barrier location and height information should be available. The second time will be prior to Plans, Specifications, and Estimates (PS & E) approval.

For noise impacted areas requiring abatement considerations in accordance with **23**

CFR 772, the environmental document should contain language similar to the following:

"The Florida Department of Transportation is committed to the construction of feasible noise abatement measures at the noise-impacted locations identified in (table, figure, chart, etc.) contingent upon the following conditions (You may select any or all of the items listed below, or, if appropriate, create contingencies of your own.) :

1. Detailed noise analyses during the final design process support the need for abatement;
2. Reasonable cost analysis indicates that the economic cost of the barrier(s) will not exceed the cost reasonable criterion;
3. Community input regarding types, heights, and locations of barriers is provided to the District Office;
4. Preferences regarding compatibility with adjacent land uses, particularly as addressed by officials having jurisdiction over such land uses have been addressed;
5. Safety and engineering aspects as related to the roadway user and the adjacent property owner have been reviewed and any conflicts or issues resolved; and
6. Any other mitigating circumstances found in **Section 17-4.6** have been analyzed and resolved."

If abatement is not reasonable and feasible then the following statement (or variation thereof) shall be used: "Based on the noise analyses performed to date, there appears to be no apparent solutions available to mitigate the noise impacts at the locations identified in (table, figure, chart, etc.)." If, during the final design phase, any of the contingency conditions listed above cause abatement to no longer be considered reasonable or feasible for a given location(s), such determination(s) will be made prior to requesting approval for construction advertisement. Commitments regarding the exact abatement measure locations, heights, and type (or approved alternatives) will be made during project reevaluation and at a time before the construction advertisement is approved.

As noted in **Section 17-4.6**, the normal noise abatement design goal will be 10 dBA or greater insertion loss. However, the minimum insertion loss should be 5 dBA or more. During the final design phase, exact barrier locations, heights, and types will be determined. Abatement commitments must be documented in the reevaluation prior to construction advertisement, regardless of project funding sources. It is the responsibility of the District environmental staff to insure that all noise abatement commitments that are made are provided to the projects design staff (in-house or consultant). This will include copies of the **NSR**, any pertinent design-related information gained from the public involvement process, and basic design information such as wall height, location, and

aesthetic treatment.

17-4.8.7 Noise Study Report Review

Once the **NSR** is completed, it will be reviewed by the District environmental staff, where the technical adequacy of the report will be determined. If necessary, a meeting and/or field review may be held to verify information and/or resolve conflicts. The **NSR** is to be considered complete at this point for purposes of proceeding with the environmental document. It may ultimately be revised during the final design phase and subsequent reevaluations to reflect details regarding exact abatement measures, their location, and types. If the **NSR** is substantially modified from the version previously distributed to the affected local governments, a revised version should be sent out to them.

17-4.9 Noise in the Type 2 Categorical Exclusion

For Type 2 Categorical Exclusions, include the following documentation with the appropriate forms:

1. If NONE is marked for noise, then a very brief summary of the **NSR** should be attached.
2. If MINIMAL is marked for noise, then a brief summary of the **NSR** should be attached with noise values presented in written form, including any noise abatement commitments.

If noise impacts occur, this will also be stated in summarized form, including noise abatement commitments.

17-4.10 Noise in the EA/FONSI

In FONSI, the **Summary Section** includes a brief statement indicating the effect of the project as related to the FHWA NAC (**Reference No. 1**). The availability of the **NSR** in the District Office should be noted. The Impacts section of the EA must reference and summarize the **NSR**. Specific references to the items discussed in **Section 17-4** are included as appropriate. Coordination which occurred during the noise study process must be documented. The Comments and Coordination section shall discuss the history of the noise process and include letters from agencies expressing comments on the **NSR**. Resolution of comments shall also be documented in this section.

17-4.11 Noise in the Environmental Consequences Section of the Draft and Final Environmental Impact Statement or State Environmental Impact Report

The Environmental Consequences section should summarize the **NSR** and include the following information:

1. A brief description of noise sensitive areas, including information on the numbers and types of activities which may be affected. The availability of the **NSR** in the District Office will be noted.
2. The extent of the impact (in decibels). This will include a comparison of the future predicted noise levels with both the **FHWA Noise Abatement Criteria** and the existing predicted noise levels.
3. Noise abatement measures which have been considered and those measures that would likely be incorporated into the proposed project.
4. Noise impacts for which no prudent solution is reasonably available and the reasons why.

17-4.12 Noise in the Reevaluation Process

The reevaluation of any environmental document that included a **NSR** shall also include an update of the noise analysis for any noise studies. Assumptions made and data used during the original noise analysis and documented in the **NSR** shall be reviewed and updated to ensure the assumptions and any preliminary commitments are still valid. This may include, but not necessarily limited to, current and future traffic data (volumes, speeds, composition), roadway alignment (horizontal and vertical), land use, propagation path, barriers/buffers (including new trees, berms, structures), variation in terrain between noise source and receivers, etc. The reevaluation may result in no change to the **NSR** or in a completely new **NSR** being required. As a minimum, it must be documented that the original noise study and analysis was reviewed and that the assumptions, project conditions and results are still valid. Computer modeling efforts will be conducted using the latest version of **TNM**, unless directed otherwise (if federally funded) by the FHWA Division Office for any required subsequent noise re-evaluation as a result of a design change. Coordination with the FHWA Division Office during the reevaluation process on federally funded projects is highly recommended.

17-5 REFERENCES

1. 23 CFR Part 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise", August 11, 1997; 6 pages. Available from: http://fhwa.dot.gov/environment/noise/mem_noise.htm .
2. Florida Statute 335.17, "State highway construction; means of noise abatement." 1989.1 page. Available from: <http://www.leg.state.fl.us/Statutes/index.cfm?mode=View%20Statutes&SubMenu=1&Appmode=DisplayStatute&SearchString=URL=CH0335/Sec17.htm>
3. Florida Department of Transportation Policy Number 000-360-005-e, Noise Abatement", September 15, 2005; 1 page. Available at: <http://www2.dot.state.fl.us/proceduraldocuments/procedures/bin/000360005.pdf>
4. Federal Highway Administration Report Number FHWA-PD-96-046, "Measurement of Highway-Related Noise." Cynthia S.Y. Lee and Gregg Fleming; May, 1996; 206 pages. Available from: <http://fhwa.dot.gov/environment/measure/index.htm>
5. Federal Highway Administration Report Number FHWA-PD-96-009, "FHWA Traffic Noise Model, Version 1.0 User's Guide." January 1998, 192 pages + supplements Available from McTrans Center, University of Florida, Gainesville, Florida. Also found at the official TNM website: <http://www.trafficnoisemodel.org>
6. 14 CFR Part 150, "Airport Noise Compatibility Planning." December 13, 1984 (as updated), Available from: <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=b43c26fba4352d3d4de968898fld5&rgn=div5&view=text&node=14:3.0>
7. Federal Transit Administration Report Number FTA-VA-90-1003-06, "Transit Noise and Vibration Impact Assessment." May 2006, 261 pages. Available from: http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf.
8. "A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations." Roger L. Wayson and John M. MacDonald. University of Central Florida; 1997; 63 pp. Available from: <http://www.fhwa.dot.gov/environment/met/index/htm>
9. Florida Department of Transportation Plans Preparation (Topic No. 625-000-007) Manual Volume 1, Chapter 32, "Sound Barrier Walls." January 2006; 16 pages. Available at: <http://www.dot.state.fl.us/rdesign/PPMManual /2006/Volume1/ZChap%2032.pdf>.
10. Florida Statute 479.25, "An act relating to outdoor advertising." 2006; 5 pages. Available at: http://election.dos.state.fl.us/laws/06laws/ch_2006-249.pdf.
11. Florida Department of Transportation "Standard Specifications for Road and Bridge

Construction." 2004; 974 pages. Available from:
<http://www.dot.state.fl.us/specificationsoffice/2004BK/toc.htm>

12. Florida Statute 335.02, "authority to designate transportation facilities and rights-of-way and establish lanes; procedures for redesignation and relocation; application of local regulations." 2003; 2 pages. Available from:
http://www.leg.state.fl.us/Statutes/index.cfm?mode=Display_Statute&Search_String=&URL=Ch0335/SEC02.HTM&Title=->2005->Ch0335->Section%2002#0335.02.

Note : "Available" does not necessarily mean "Free". Most agencies charge at least their reproduction costs for a document.

NOISE ABATEMENT CRITERIA (Hourly A-Weighted Sound Level-decibels (dBA))			
Activity Category	Abatement Level (in L_{Aeq1h})		Description of activity category
	FHWA	FDOT	
A	57	56 (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	66 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, RV parks, day care centers and hospitals.
C	72	71 (Exterior)	Developed lands, properties, or activities not included in Categories A and B above.
D			Undeveloped lands.
E	52	51 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

(Based on Table 1 of 23 CFR Part 772)

Note: FDOT defines that a substantial noise increase occurs when the existing noise level is predicted to be exceeded by 15 decibels or more as a result of the transportation improvement project. When this occurs, the requirement for abatement consideration will be followed.

TABLE 17.1 Noise Abatement Criteria

CONSTRUCTION NOISE AND VIBRATION SENSITIVE SITES (a partial listing of potential sites)	
Noise	Vibration
Eye Centers/Clinics Medical Centers Hospitals Geriatric Centers Sound Recording Studios TV/Radio Stations Residences Technical Laboratories Hearing Testing Centers Theaters Schools Motels/Hotels Funeral Homes Libraries Meditation Centers Churches/Shrines Parks Day Care Centers Outdoor Theaters	Eye Centers/Clinics Medical Centers Hospitals Geriatric Centers Sound Recording Studios TV/Radio Stations Residences Technical Laboratories Antiques Shops Museums Historic Buildings
<p>Note: This list is not meant to be all inclusive or exclusive, but rather an indication of the type of sites likely to be sensitive to construction noise and/or vibration.</p> <p>Source: FDOT Noise and Vibration Task Team; August 17, 1999.</p>	

TABLE 17.2 Construction Noise & Vibration Sensitive Sites

SUGGESTED NOISE STUDY REPORT OUTLINE
Executive Summary (optional)
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