CHAPTER 17. NOISE

1. INTRODUCTION AND DEFINITIONS.

a. Airport noise. When evaluating proposed airport projects, airport noise is often the most controversial environmental impact FAA examines. Airport development actions that change airport runway configurations, aircraft operations and/or movements, aircraft types using the airport, or aircraft flight characteristics may affect existing and future noise levels. FAA's noise analysis primarily focuses on how proposed airport actions would change the cumulative noise exposure of individuals to aircraft noise in areas surrounding the airport.

Besides using noise levels to determine compatible land use, airport noise may be a concern when determining potential effects on several other environmental resources as well. As noted later in this chapter, these resources may include, but are not limited to, Section 4(f)-protected resources and historic and cultural sites. Therefore, the supplemental noise analysis may be appropriate on a case-by-case basis depending upon resource affected. Use the noise results from this chapter, and instructions in the chapter specifically addressing a particular resource to determine the severity of noise impacts on the resource of concern.

b. Day Night Average Sound Level (DNL). DNL is the standard Federal metric for determining cumulative exposure of individuals to noise. In 1981, FAA formally adopted DNL as its primary metric to evaluate cumulative noise effects on people due to aviation activities.

(1) Past and present research by the Federal Interagency Committee on Noise (FICON) verified that the DNL metric provides an excellent correlation between the noise level an aircraft generates and community annoyance to that noise level;[1]

(2) DNL is the 24-hour average sound level in decibels (dB). This average is derived from all aircraft operations during a 24-hour period that represents an airport's average annual operational day;

(3) It is important to note that due to the logarithmic nature of noise, the *loudest* noise levels control the 24-hour average; and

(4) DNL adds a 10 dB noise penalty to *each* aircraft operation occurring during nighttime hours (10 p.m. to 7 a.m.). DNL includes that penalty to compensate for people's

[1] *Federal Interagency Review of Selected Airport Noise Analysis Issues*, 1992, page 3-1.

heightened sensitivity to noise during this period.[2] This penalty contributes heavily to an airport's overall noise profile.

c. Community Noise Equivalent Level (CNEL). While DNL is the primary metric FAA uses to determine noise impacts. FAA accepts the CNEL when a state requires that metric to assess noise effects.

(1) Only California requires use of CNEL;

(2) Like DNL, CNEL adds a 10 dB penalty to each aircraft operation between 10:00 p.m. and 7:00 a.m.; and

(3) CNEL adds a 5 dB penalty for each aircraft operation during evening hours (7:00 p.m. to 10:00 p.m.). This evening noise penalty accounts for people's sensitivity to noise during evening hours when they may be outside and fewer noise producing activities occur.

d. The Schultz Curve. The Schultz Curve relates specific DNL levels to the percent of people in a community whom those noise levels highly annoy. The Curve provides a widely-accepted dose-response relationship between cumulative environmental noise and a health and welfare parameter, annoyance (Federal Interagency Committee on Noise FICON, 1992). Like other Federal agencies that have established Federal land use guidelines for noise, FAA used the Schultz curve, when it designated the DNL 65 dB contour as the cumulative noise exposure level above which residential land uses are not compatible.

e. Supplemental metrics. FAA uses supplemental metrics chiefly in EISs to help describe noise impacts for specific noise sensitive locations or situations. Section 8.d. of this chapter describes supplemental metrics.

f. 14 CFR Part 150 land use compatibility guidelines. FAA established land use compatibility guidelines relative to certain DNL noise levels in 14 Code of Federal Regulations (CFR) Part 150. Chapter 5, Table 1 of this Desk Reference provides a copy of the Part 150 Land Use Compatibility guidelines.

(1) Different local land use compatibility standards. Although residential land uses are considered compatible with noise exposure levels below DNL 65 dB under 14 CFR Part 150:

> "The responsibility for determining the acceptable and permissible land uses …rests with the local authorities...Part 150 is not intended to substitute federally determined land uses for

[2] The 10 dB penalty in the Integrated Noise Model means that noise from 1 aircraft operating between 10:00 p.m. and 7:00 a.m. counts as 10 operations.

> those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses. " -14 CFR Part 150, Table 1.

As a result, environmental documents may include noise contours below DNL 65 dB in addition to the required contours of DNL 65, 70, and 75 dB resulting from aircraft operations. Lower noise contours may be included for purposes of identifying proposed mitigation measures, provided the local land use planning jurisdiction has adopted a land use compatibility standard less than DNL 65 dB. (An airport sponsor's action to adopt such standards is sufficient where the sponsor has land use control jurisdiction). Absent a local standard, these contours may be included in the environmental document for informational/disclosure purposes, if the airport sponsor desires.

(2) Additional analysis under 1992 Federal Interagency Committee on noise recommendations. Where an airport development project has a potentially significant impact on noise sensitive areas in the DNL 65 dB and greater noise contours, the EIS noise analysis must also consider the DNL 60 dB contour. Further analysis is required in these circumstances to evaluate potential increases of DNL 3 dB and greater over noise sensitive areas between DNL 65 and 60 dB and potential mitigation measures. See, paragraph 8(b)(2), below for more details.

(3) Use of supplemental noise analysis. When planning and conducting the noise analysis for an airport development action, environmental specialists must consider the full context in which the airport action is occurring. Environmental specialists must be cognizant that Part 150 guidelines are not relevant and supplemental noise analysis is appropriate in the following circumstances.

(a) Areas within a historic site or national park or wildlife refuge where non-aircraft noise is very low and a quiet setting is a generally recognized feature or attribute of the site's significance. The DNL 65 dB level at which residential land uses are compatible does not adequately address noise impacts on visitors to unique areas characterized by low ambient noise levels and where quiet settings are a generally recognized feature and attribute of their significance. As a result, supplemental noise analysis is appropriate in certain circumstances. For example, environmental specialists must be cognizant that Part 150 guidelines do not adequately address the effects of noise on visitors to areas within a historic site or national park or wildlife refuge protected under Section 4(f) of the DOT Act where non-aircraft noise is very low and a quiet setting is a generally recognized feature or attribute of the site's significance. See Chapter 7 of this Desk Reference for information on Section 4(f), recodified as 49 USC Section 303.

(b) Aviation effects on wildlife. The responsible FAA officials should not use Part 150 guidelines to determine aviation noise impacts on wildlife. This is because those guidelines focus on human responses to noise. Instead, the officials, whenever possible, should use available, published information that addresses the effects of noise on the species of concern.

2. APPLICABLE STATUTES AND IMPLEMENTING REGULATIONS.

APPLICABLE STATUTES AND IMPLEMENTING REGULATION	SUMMARY DESCRIPTION	OVERSIGHT AGENCY
49 USC Section 44715, Controlling Aircraft Noise and Sonic Boom	Authorizes FAA, after consulting with the U.S. Environmental Protection Agency (EPA), to prescribe standards and regulations to measure, control, and reduce aircraft noise.	FAA and EPA
49 USC Sections 47101 (a)(2), (c) and (h), Airport Improvement Policies.	Establishes a national policy to minimize current and projected noise impacts on nearby communities resulting from building and operating aviation facilities. This section also states it is in the public interest to recognize the effects of airport capacity expansion projects on aircraft noise and to reduce noncompatible land uses around airports. This section also requires the Secretary of Transportation to consult with the Secretary of the Interior and the EPA Administrator about projects involving new airports, new runways or major runway extensions that may cause significant environmental impacts.	FAA
49 USC Sections 47501-47510, Noise Abatement	Requires the Secretary of Transportation to issue regulations establishing a system for measuring and assessing noise impacts on individuals near airports. The regulations must also identify land uses normally compatible with various exposures of individuals to noise. FAA published these regulations at 14 CFR Part 150.	FAA

3. APPLICABILITY TO AIRPORT DEVELOPMENT ACTIONS. A proposed airport development action's environmental analysis normally addresses potential noise impacts. Typical airport actions that could cause noise impacts include: new or extended runways and taxiways; navigational aid (NAVAID) installation; land purchases for airport-related uses; substantial amounts of airport construction or demolition activities; and substantial changes in aircraft operations involving numbers of aircraft, aircraft types, new or revised approach or departure profiles or tracks; or new or relocated airport access roadways.

a. Applicability. Research has shown aircraft noise may exceed levels that make certain noise sensitive land uses noncompatible with airport operations (e.g., residences, schools, churches, hospitals, etc.; (see FAA Order 5050.4B, paragraph 9.n)). As a result, FAA assesses the effects of airport development that has the potential to cause aircraft noise outside an airport's boundaries. For most actions, FAA need not do a noise analysis for airport actions whose DNL 65 dB contour lies entirely within airport boundaries. However, as noted above, context should be considered in determining what type of noise

analysis is appropriate. In these instances, the responsible FAA Official should contact the Planning and Environmental Division (APP-400) for further guidance.

b. Airport actions FAA must assess. FAA must conduct a noise analysis for the airport actions listed below.[3]

(1) General aviation-related actions. Projects that would involve more than:

(a) 90,000 annual (247 average daily operations) piston-powered aircraft operations in Approach Categories A through D (i.e., landing speed < 166 knots); or

(b) 700 annual jet-powered aircraft operations (about 2 average daily operations) during the period the environmental document covers.

Note: These levels of piston-powered or jet-powered general aviation operations have been shown to produce a DNL 60 dB contour less than 1.1 square miles in area and extending no more than 12,500 feet from the start of takeoff roll. The resulting maximum DNL 65 dB contour would be 0.5 square mile and would not extend more than 10,000 feet from the start of takeoff roll. The Cessna Citation 500 and other jet aircraft producing noise levels less than or equal to the Beech Baron 58P may be counted as propeller aircraft, not jets.

(2) Actions involving a new airport location, a new runway, a major runway extension, or runway strengthening. A noise analysis is needed for these projects when they would:

(a) serve Airplane Design Groups I and II, if forecast operations exceed those noted in section 3.b(1) of this chapter;

(b) serve Airplane Design Groups III through VI;

(c) be highly controversial because of noise; or

(d) would serve special aircraft (e.g., helicopters) and those aircraft would fly over noise sensitive areas.

(3) Actions at existing heliports or airports. A noise analysis is needed at these facilities when forecasted helicopter operations for the period the analysis covers would exceed 10 operations per day (annual basis) and hover times exceed 2 minutes.

Note: Helicopter operations typically cause a DNL 60 dB contour having an area less than 0.10 square mile and not extending more than 1,000 feet from the helicopter pad. This finding applies to Sikorsky S-70 models having a maximum gross takeoff weight of 20,244 pounds, or any other helicopter of less weight or causing equal or lower noise levels.

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[3] FAA Order 1050.1E, Appendix A, paragraph 14.6a

4. PERMITS, CERTIFICATES, AND APPROVALS. No permits, certificates, or approvals are needed.

5. ENVIRONMENTAL COMPLIANCE PROCEDURES – ENVIRONMENTAL ANALYSIS.

a. Required consultation. As needed, the responsible FAA official should ensure consultation with the entities noted below occurs. An appendix to the environmental document should include proof of that coordination.

(1) Federal or state agencies, Federally-recognized tribes or Native Hawaiian organizations that have expressed noise concerns;

(2) local governments having jurisdiction over land uses and having concerns about project-related noise.

(3) aviation entities (e.g., airport users, pilots, owners of on-airport businesses, etc.) who have expressed concerns about noise due to project-related changes in airport operations or flight procedures;

(4) citizen groups having an interest in aircraft noise issues and who have expressed concerns about airport development (see *Community Involvement Manual*, FAA-AEE-90-03, August 1990, if needed); or

(5) the National Park Service (NPS), U.S. Fish and Wildlife Service (FWS), and the Bureau of Land Management (BLM), as needed, to coordinate the issue of project-related noise over resources these agencies manage.

6. DETERMINING IMPACTS. The responsible FAA official needs to consider how airport actions may change future operations and the levels of aircraft noise affecting communities in areas surrounding the airport. The official must also consider noise from non-aviation sources for purposes of cumulative impacts analyses. Those noise sources include, but are not limited to, project-related construction activities and/or surface transportation, other projects in the area. To determine surface transportation impacts, the Federal Highway Administration's (FHWA) *Procedures for Abatement of Highway Traffic Noise and Construction* Noise (23 CFR Part 772) or a method a state transportation agency recommends may be used.

a. Aircraft noise. FAA has established a standard process to evaluate aircraft noise impacts. The responsible FAA official must use that process to assess an airport action meeting one of the criterion in section 3.b.(1)-(3) of this chapter. This process includes noise models, land use compatibility, noise impact thresholds, and supplemental noise analysis. The following sections discuss those issues.

b. Noise screening models. FAA has identified the following two noise screening models to help determine if a detailed noise analysis using the Integrated Noise Model

(INM) is needed to properly assess a proposed action's noise effects (see section 6.c of this chapter).

(1) Area Equivalent Method (AEM). The AEM is a mathematical process that estimates changes in the area of the existing DNL 65 dB contour. It is a screening tool used to determine if further analysis using the more detailed INM is needed. Review the following information to determine if using the AEM is appropriate for a proposed action.

(a) The AEM may be used for proposed actions that would change the *area*, but not the *shape* of the DNL 65 dB contour. Such actions typically include those that would not require:

(1) a change in existing air traffic ground tracks or flight profiles;

(2) an increase numbers of daily operations;

(3) changes in fleet mix; or

(4) changes in operation times.

(b) Do not use the AEM for actions that would change the *shape* of the noise contour that would result from changes to *existing* air traffic flight tracks or flight profiles.

(c) If the AEM is appropriate for use, the AEM analysis should compare the future condition without the proposed action (i.e., no action/no build alternatives) to the future condition with the proposed action and reasonable alternatives.

(d) If the AEM calculation shows an increase of *17 percent or more* in the area within the DNL 65 dB contour, or if the proposed action or reasonable alternative is not suitable for AEM, then the proposed action or reasonable alternative must be analyzed using the INM to determine if significant noise impacts would result.

(2) Air Traffic Noise Screening Model (ATNS). When the AEM is not appropriate, the ATNS may be a usable screening tool to quantify project-related changes in noise exposure that air traffic changes above 3,000 feet above ground level (AGL) would cause. Air traffic changes above this altitude are normally categorically excluded, but when they occur over noise sensitive areas they may be highly controversial on environmental grounds. That controversy may constitute an extraordinary circumstance requiring FAA to prepare an environmental assessment (EA). ATNS results showing noise sensitive areas receiving a 5 dB change due to a proposed action or reasonable alternative are helpful in determining the magnitude of change over those areas when use of the AEM is not allowed. Contact the Office of Environment and Energy (AEE) for ATNS software and user manuals.

c. The Integrated Noise Model, the model for detailed noise analysis. FAA requires the use of the Integrated Noise Model (INM) for airport development actions requiring a detailed noise analysis. INM is an average-value-model designed to estimate long-term average effects using average annual input conditions. It also provides information on other, pre-defined supplemental noise metrics (see sections 8.d.(1)-(4) of this chapter).

(1) INM input. INM model input data vary by project. Airport-specific data are needed to accurately represent factors that are critical to a proposed action's noise analysis (i.e., project-specific flight tracks, aircraft fleet mix, standard and user defined aircraft profiles, and terrain characteristics). AEE manages the INM. Therefore, AEE *must* provide written approval for requested changes to INM input files, procedures, aircraft substitutes, any standard, or default data (see footnote 6 for further information).

(2) INM, the required model. INM is FAA's *required* noise model for assessing airport development] projects when:

(a) the AEM or ATNS shows more detailed information is needed; or

(b) based on experience, the responsible FAA official knows that a particular airport project requires a detailed noise analysis (i.e., new airport, new runway, changed runway configurations, highly controversial).

(3) Model version. The INM is the model FAA requires for all noise analysis. The data and model version used should be the latest and most currently available when the responsible FAA official begins preparing the analysis for a proposed action. If FAA issues a new version of INM after a project's noise analysis has begun, the updated version may be used to provide additional disclosure concerning noise, but use of the new model version is not required. However, the official should carefully consider using the new version when there is a major revision or addition to the analysis or project (e.g., if baseline and/or forecast years are updated, thereby creating the potential for different impacts).

(4) INM output. The INM produces noise contours used to prepare noise graphics for NEPA analyses.[4] The INM program includes tools for comparing contours and commercial Geographic Information Systems (GIS) to show various land uses relative to current, future no action, and future project noise levels.

(5) Grid points. INM calculates project-induced noise changes at a specific site or "grid point." Grid points help the responsible FAA official determine if project noise at a specific location would occur over noise sensitive land uses (e.g., hospitals, schools,

[4] INM is also used to generate noise exposure maps for Noise Compatibility Programs under 49 USC Section 47503, which addresses those maps.

churches, etc.) and the level of that noise impact. Such information is often helpful in designing mitigation or improving the public's understanding of a project's noise effect.

Note: The Noise Integrated Routing System (NIRS) is a model that provides information to evaluate aviation noise changes over large areas that result from *regional air traffic changes*. Those changes affect expansive areas and are not normally due to an airport project. Do ***not*** use NIRS for airport projects.

f. Noise analysis. The responsible FAA official should determine the data needed to accurately predict a project's noise impacts. The following sections address the information needed to accurately estimate those impacts.

(1) Study years. FAA should coordinate appropriate timeframes for the noise study with the airport sponsor before the noise analysis begins. The study years must be consistent with the timeframes FAA will examine for other environmental impact categories in the NEPA study. Sometimes those study years may be the same as those used in available a Noise Compatibility study conducted under Part 150 or in the airport sponsor's planning document (e.g., Master Plan). Normally, time frames assessed in NEPA documents include:

(a) The existing condition (normally the last 12 consecutive months of available data);

(b) Future year without the proposed project (i.e., no action/no build alternative);

(c) The future year of anticipated project implementation (project opening year);

(d) Another future year, normally, 5 to 10 years beyond the projected year of project implementation. In some cases, this may be the outer year of an airport sponsor's Master Plan. Additional timeframes may be desirable for a particular project.

(2) Noise contours analyzed. Use the INM to develop the DNL 65, 70, and 75- dB noise contours. Normally, the following noise contour sets are needed as discussed below:

(a) the existing DNL 65, 70, and 75 dB contours;

(b) the future DNL 65, 70, and 75 dB contours without the proposed action (i.e., the no action/no build alternative);

(c) the future DNL 65, 70, and 75 dB contours for the proposed action; and

(d) the future DNL 65, 70, and 75 dB contours for each reasonable alternative.

Note: In some circumstances, additional contours may be shown

(3) Noise compatibility evaluation. The noise contours developed should be compared to land use information and population data. This provides information on potential noise levels people in the affected area would experience. Normally, the following information should be quantified for each set of contours described above. The contours should be depicted on maps to show noise sensitive areas and other land uses within the action's noise impact area.

(a) The number of residences or people living within each noise contour at or above DNL 65 dB. Per FICON, in some circumstances, an evaluation of the 60 DNL may be needed as discussed in section 6.f.(4) of this chapter. This includes the net increase or decrease in the number of residences or people exposed to that noise level.

(b) The locations and numbers of noise-sensitive land uses (e.g., schools, churches, hospitals, and parks) within each contour at or above DNL 65 dB.

(c) The area (square miles or acres) of general land use classifications within each of the above noise contours (optional).

(d) Mitigation measures in effect or proposed and their relationship to the alternatives analyzed.

g. Noise monitoring. Noise monitoring data may be included in an EA or EIS at the discretion of the responsible FAA official for information or disclosure purposes only. Noise monitoring is *not* required for FAA NEPA noise evaluations. FAA does *not* use monitoring data to calibrate the INM.

h. Surface transportation noise. Some airport development has the potential to cause surface transportation noise impacts. Those impacts may result from:

(1) new, expanded, or re-aligned airport access roads;

(2) increased airport automobile or truck activity;

(3) increased vehicle speeds; or

(4) other surface-transportation related actions.

Therefore, a proposed action's surface transportation plan should be reviewed to determine if it would change traffic noise in the affected area. If any of surface transportation impacts potentially exist, conduct a noise analysis using accepted highway noise methodologies (i.e., FHWA's *Procedures for Abatement of Highway Traffic Noise and Construction* Noise (23 CFR Part 772)).

i. Construction noise. Review the proposed airport development to determine if potential construction noise impacts would occur. Activities that may cause construction noise impacts include blasting, demolition, construction equipment operation, use of

temporary haul routes, and temporary re-routing of vehicles. If a construction noise analysis is needed, the FHWA method noted in paragraph 6.h. of this chapter may be appropriate.

j. Environmental document information. The environmental document must contain information to enable reviewers to understand the basic assumptions and results of the noise analysis. Use tables and figures to help summarize information. Place the details about the analysis (model input detailed assumptions, etc.) in an appendix to the EA or EIS. Generally, the environmental document's text should include the following information:

(1) Forecast activity data. Airport sponsors provide these data. They address forecast aircraft activity, for the alternatives being analyzed.

(a) The data must be for the periods noted in section 6.f.(1)(a)-(d) of this chapter;

(b) The sponsor's forecast must be consistent with the Terminal Area Forecast (TAF). To be consistent with the TAF, the sponsor's 5-year forecast should be within 10% of the TAF. A 10-year forecast should be within 15% of the TAF (per FAA Order 5050.4B, paragraph 706.b.(3)); and

(c) FAA must approve the forecasts.

(2) Base maps. These maps show the existing airport, the proposed airport development's runway alignments and designations, and the area near the airport. Usually, the Airport Layout Plan (ALP) is sufficient, but a 7.5-minute "quadrangle map" overlain with the airport's facilities provides a useful base map. This information should also include a noise and land use inventory that satisfies the FAA guidelines in Program Guidance Letter 03-02, *Determining Justification of Projects for the Noise Set-Aside Based on Currency of Noise Exposure Maps*.[5]

(3) Flight track maps. These maps show generalized arrival and departure tracks on noise contour maps. They depict aircraft positions relative to land uses or other features in the airport vicinity.

(4) Noise exposure maps. These maps show DNL contours superimposed on land uses in the airport vicinity. The maps must clearly and prominently show noise sensitive land uses such as residences, schools, hospitals, churches, etc., relative to the DNL 65, 70, and 75 dB contours. The environmental documents should provide separate maps for each of the following airport layouts:

(a) the existing airport;

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[5] http://www.faa.gov/airports_airtraffic/airports/aip/guidance_letters/media/PGL_03-02.doc

(b) the future airport without the proposed action;

(c) the future airport with the proposed action; and

(d) the future airport for each reasonable alternative.

ARP recommends using data that are no more than 3 years old to ensure model input data accurately reflect conditions at the airport. The responsible FAA official must independently and periodically review these files during the environmental review process to verify they accurately reflect the airport's current and forecast: activity, aircraft fleet mix, runway use, and flight track use. Sensitivity analyses may be necessary to assure the accuracy and validity of the data used.

(5) Noise exposure data tables. These tables describe land uses and provide the number of noise sensitive land uses in each contour (DNL 65, 70, and 75 dB) for the scenarios mentioned in sections 6.j.(4)(a)–(d) of this chapter. The responsible FAA official uses these data and data concerning the level of projected noise increase to determine if any alternative would cause a significant noise increase (DNL 1.5 dB or greater) over noise sensitive land uses.

Note: Due to the physics of sound energy, a clearly perceptible noise change normally occurs when a DNL 3 dB increase occurs within the DNL 60 to 65 dB contour or a DNL 5 dB increase occurs in the DNL 45–60 dB contour.

k. Noise analysis duties of the responsible FAA official. The responsible FAA official must complete the following duties to provide an acceptable noise analysis:

(1) Ensure AEE approves changes to INM input data files or changes in flight profiles for noise abatement departure procedures (NADPs). The environmental document must include a copy of AEE's approval if the sponsor proposes use of modifications to the INM.[6] If noise abatement take-off procedures are proposed, the two recognized noise abatement departure profiles (NADPs) are the "Close-in Community NADP" and "Distant Community NADP." FAA Advisory Circular 91-53A, *Noise Abatement Departure Profiles*, provides information on these NADPs.

(2) Ensure the administrative record includes an electronic copy of model input files and input documentation.

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[6] INM users should review Appendix B of the INM Users Guide for detailed instructions on submitting requests to modify INM input files, flight profiles, or other factors. Users should send their requests to the responsible FAA official in the regional Airports Division Office or the Airports Planning and Programming Division, APP-400. The official or APP-400 will forward the request to AEE. AEE will send its response to the FAA office (the regional Airports office or APP-400) that sent the request. This ensures proper coordination occurs between the model user and FAA.

7. DETERMINING IMPACT SIGNIFICANCE.

a. Significant impact. Use the information obtained during the analysis completed to meet other sections of this chapter and the thresholds in the following table to determine if an action would cause a significant effect. Local land use compatibility standards do not alter this threshold for NEPA purposes.

ORDER 1050.1E THRESHOLD	FACTORS TO CONSIDER
- **For most areas:** When an action, compared to the no action alternative for the same timeframe, would cause noise sensitive areas located at or above DNL 65 dB to experience a noise increase of at least DNL 1.5 dB. An increase from DNL 63.5 dB to DNL 65 dB over a noise sensitive area is a significant impact.	ARP reminds the responsible FAA official that for NEPA purposes, DNL 3 dB impacts over residential areas between the DNL 60 and 65 dB contours do not cause significant adverse noise impacts. However, the potential for mitigating noise in those areas should be weighed, including consideration of the same range of mitigation options available at DNL 65 dB and higher and eligibility for Federal funding.
- For national parks, national wildlife refuges and historic sites, including traditional cultural properties where a quiet setting is a generally recognized feature: The DNL 65 dB level at which residential land uses are compatible does not adequately address noise impacts on visitors to these areas. As a result, relevant and/or supplemental noise analysis is appropriate in certain circumstances. Responsible FAA officials must be cognizant that Part 150 guidelines do not adequately address the effects of noise on visitors to areas within a historic site or national park or wildlife refuge protected under Section 4(f) of the DOT Act (see Chapter 7 of this Desk Reference for information on Section 4(f), recodified as 49 USC Section 303) and where non-aircraft noise is very low and a quiet setting is a generally recognized feature or attribute of the site's significance.	

From: Table 7-1, FAA Order 5050.4B

b. Mitigated Finding of No Significant Impact (FONSI). If sufficient mitigation that would reduce all potentially significant noise impacts below threshold levels measures is included as part of a project and the sponsor has made binding commitments to carry out those measures within its authority, then an EIS is not necessary (absent significant impacts in other categories). In such cases, FAA may conclude the action by issuing a FONSI. The FONSI or FONSI/Record of Decision (ROD) must list the measures FAA has made a condition

of project approval, including those the sponsor will be required to carry out through grant assurances or other means.

8. ENVIRONMENTAL IMPACT STATEMENT CONTENT.

a. General. A potentially significant noise impact often has corresponding impacts on land uses. FAA must prepare an EIS, if mitigation will not reduce impacts below the noise thresholds in section 7 of this chapter. Preparers should avoid repeating information presented in the EIS's Compatible Land Use chapter. As appropriate, preparers should refer the reader to either the EIS's Noise chapter or the Compatible Land Use chapter, depending on how the preparers have addressed noise and compatible land use issues.

b. Information needed when FAA determines a significant noise impact. The EIS should include information discussed in earlier sections of this chapter in the EIS. It should also include the following information as needed.

(1) Refined information. If the sponsor prepared an EA, revise the text and graphics as needed to meet EIS requirements. The EIS must thoroughly explain significant noise impacts. Sometimes, a more complete description of the noise events contributing to the DNL contours with added tables charts, aerial photographs, maps, or metrics is sufficient. In other cases, supplemental analyses may include using metrics other than DNL (see section 8.d of this chapter for supplemental analysis information).

(2) The DNL 60 dB contour. Where an airport development project has a potentially significant impact on noise sensitive areas (i.e., a DNL 1.5 dB or more noise increase within the DNL 65 dB noise contour), the EIS noise analysis must depict the DNL 60 dB contour as well. Further analysis is required in this circumstance to evaluate potential increases of DNL 3 dB and greater between DNL 65 and 60 dB and potential mitigation measures.

This information helps to further disclose potential project-related noise changes in the airport area.[7] Additional contours are optional, as discussed in paragraph 1f, above. Provide figures showing noise sensitive land uses within the DNL 60 dB contour and the DNL exposure level for each of the following scenarios.

[7] FAA has adopted the recommendation of FICON to examine DNL 3 dB or greater noise increases within the DNL 60-65 dB contour where a project has significant impacts. A DNL 3 dB increase in this contour causes a 3 percent increase in the percentage of people highly annoyed (FICON, 1992, Technical Report, Section 3, pg. 3-17.

(a) the future no action alternative;

(b) the proposed action; and

(c) each reasonable alternative.

Information on addressing the following items for each of the scenarios noted above is helpful.

(1) The locations and numbers of other noise-sensitive land uses such as homes, schools, churches, hospitals, or public parks in the DNL 60 to 65 dB contour where a DNL 3 dB noise increase could occur. [Also include the number of residences or people living within the DNL 60-65 dB contour where the project would cause a DNL 3 dB increase.

(2) To the extent appropriate and practicable FAA should consider the same range of mitigation options that are potentially available at DNL 65 dB, including eligibility for federal funding for mitigation. Where possible, FAA and the airport sponsor should consider operational noise abatement measures. The environmental document should describe the operational noise abatement measures and their benefits. An airport sponsor's or FAA's consideration of measures to mitigate impacts within the DNL 60 to 65 dB contour does not mean either party is committing to carrying out that mitigation.

(3) **Impacts on people.** As needed, discuss designated land uses that might contribute noise impacts higher than airport-related noise, on the affected population.

(a) include information on climate and how it affects the types of housing construction in the affected area and how that construction affects the housings' sound insulation capabilities;

(b) include information on lifestyles of affected populations and how projected airport-induced noise would affect their indoor and outdoor activities (i.e., would noise interfere with speech or sleep).

(c) include information on background or ambient noise levels that may be helpful when addressing noise in rural areas.

(4) **Non-aviation noise.** Include an analysis of non-aviation noise sources such as project-related construction or roadway noise. Give special attention to construction noise near noise sensitive areas.

c. **Supplemental noise analysis.** FICON (1992) noted that supplemental metrics are useful in addressing various public concerns and to help the public better understand noise impacts. As a result, FAA sometimes uses supplemental noise information to describe aircraft noise impacts for specific noise-sensitive locations or situations. The responsible FAA official should consider the following factors when developing a supplemental noise

analysis. However, *before* making a decision about the supplemental metrics or the analysis, the responsible FAA official *must* consult the Office of Environment and Energy (AEE) and obtain AEE's approval on the appropriate supplemental noise analysis.

(1) Community concerns. When designing a supplemental noise analysis, consider community concerns and the types and nature of community activities potentially affected. Tailor the analysis to enhance reader understanding of important facts concerning noise affecting populations. The analysis designed depends on the circumstances for each project. No single supplemental analysis is preferred. Based on prior analyses, the following issues may concern a community.

(a) Sleep disturbance. FICON's 1992 report focused on a dose-response relationship the U.S. Air Force's Armstrong Laboratories developed. The following equation provides an estimated percentage of people awakened at a particular SEL.[8]

$$\% \text{ awakening} = 0.0087 \times (\text{SEL} - 30)^{1.79}$$

Note: SEL is the sound exposure level. See section 8.d.(1) of this chapter for more information.

(b) Speech interference. FICON recommends using a cumulative A-weighted metric limited to the affected time period (L_{eq}) or time-above (TA) (see section 8.d.(2) of this chapter). FICON also provides a table addressing noise levels and speech interference (see FICON, 1992, Technical Appendix, Section 3, pg. 3-9).

(c) Parks, wildlife refuges, and historic properties. The responsible FAA official should, in consultation with appropriate land management agencies, consider using a supplemental noise analysis for locations within a proposed action's study area. Such locations may include segments of or entire reaches of a national park, a national wildlife refuge, and a historic property (including traditional cultural properties) that is characterized by a low noise setting and where a quiet setting is a generally recognized purpose and attribute of the resource of concern.

(2) Data to use. The INM provides supplemental metric data. When the responsible FAA official determines supplemental analyses are needed, use the same database and INM model version used to develop DNL contours.

d. Supplemental noise metrics. FAA uses supplemental metrics chiefly in EISs to help further describe aircraft noise impacts for specific noise-sensitive locations or situations experiencing a significant noise effect. The metrics are also helpful in developing

[8] Federal Interagency Committee on Aviation Noise (FICAN). 1997. *Effects of Aviation Noise on Sleep Disturbance.*

mitigation for that effect. FAA also uses supplemental metrics to aid the public's understanding of significant noise impacts. The following metrics may be used to provide more information to help the public understand project noise on issues of community concern (see section 8.c.(a)-(c) of this chapter). Review Table 17.1 at the end of this chapter for guidance on the metric to use when evaluating the activity or response of concern.

(1) SEL (sound exposure level). This is a measure of a noise event's physical energy. It takes into account the noise's level and duration and is referenced to a standard duration of one second.

(2) TA (Time Above). This is a single event metric. It provides the number of minutes an aircraft's noise level is louder than another noise level during a given period, Examples include the duration an aircraft is louder than the ambient noise or louder than the level above which speech interference may occur. TA may include information ranging from time above a specific noise level at a specific point, to the time above multiple levels (in 10 dB increments) throughout an area at specified grid points.

(3) L_{max} (maximum sound level). This is the loudest sound measured at a location during an aircraft's operation. It is useful for determining detectable noise changes. A 3 dB increase in L_{max} is "barely perceptible," while a 5dB increase in L_{max} is "clearly perceptible." L_{max} may also be used to assess noise on animals.[9]

(4) L_{eq} (equivalent sound level). This is the average noise level during a designated period (normally less than 24 hours). For example, L_{eq8} is used to determine the level of total noise during an 8-hour school day. It is helpful in determining if aircraft noise would or would not disturb classroom instruction, and, consequently, a need to include noise level reduction measures as project mitigation.

(5) Audibility. This is a time-based metric developed the National Park Service developed to evaluate effects of aircraft noise on natural quiet in Grand Canyon National Park and other units of the National Park System. The Integrated Noise Model now has the capability to model audibility.

b. Mitigation. Any mitigation measures to be taken in addition to those associated with other land use controls should be discussed. FAA Advisory Circular 150/5020-1, *Noise Control and Compatibility Planning for Airports*, presents guidance for airport operators and planners to help achieve compatibility between airports and their surrounding areas. The EIS should describe proposed mitigation when land management agencies provide that

[9] Federal Interagency Committee on Noise (FICON), 1992, *Federal Agency Review of Selected Airport Noise Analysis Issues*, Technical Appendix B, page B-10.

information. FAA or the sponsor should fully consider the mitigation and balance its benefits against those of the proposed action.

NEPA requires a Federal agency preparing an EIS to discuss mitigation in sufficient detail to disclose that that the agency has fairly evaluated environmental consequences (*Robertson vs. Methow Valley*, 490 U.S. 332 (1989)). In addition, under 49 USC Section 47106(c)(1)(B), FAA may not approve Federal funding for major airport development projects, unless the agency determines that no possible and prudent alternative to the project exists and that every reasonable step has been taken to minimize the adverse effect. Major airport development projects are those that involve the location of a runway, new airport, or major runway extension. For more information about the mitigation required, see FAA Order 5050.4B, paragraph 1203(b)(4). In accordance with NEPA and 49 USC Section 47106(c)(1)(B), an EIS must discuss and adopt mitigation measures recommended by the agencies that a State authorizes to plan for the area surrounding the airport. Sections 8.b(1)-(3) of this chapter provide examples of noise mitigation measures for a proposed airport action. If feasible, provide an estimated schedule for undertaking accepted mitigation. Where there is a DNL 1.5 dB or more increase in noise over noise sensitive areas within the DNL 65 dB or greater noise level, there should be further analysis. This analysis is needed to determine whether there noise increase of DNL 3 dB or higher over noise sensitive areas within the DNL 60–65 dB noise contour. Measures to mitigate these impacts should be considered for purposes of NEPA, including:

(1) Operational measures. Some common operational mitigation measures include:

(a) changes in flight tracks or runway usage;

Note: New or revised flight procedure changes at less than 3,000 feet AGL may route air traffic over noise-sensitive areas not previously overflown. These procedures must be examined, even if they affect fewer people than the no action. This analysis is needed to determine if the proposed procedures would cause a significant impact to the newly affected community. Mitigation to the area newly affected should be included where appropriate. Be sure to assess impacts due to the mitigation. This analysis is needed to ensure mitigation does cause more severe impacts than unmitigated impacts.

(b) voluntary noise abatement procedures; or

(c) changes in airport operations acceptable to airport users that do not interfere with interstate commerce.

(2) Land-use related measures. Some common land use mitigation measures include:

(a) Buying land or land interests such as air rights, easements, and development rights. These measures establish airport-compatible uses of the affected properties;

(b) Building noise barriers or acoustic shielding that does not attract wildlife hazardous to aviation. (See FAA Advisory Circular 150/5200-33A, *Hazardous Wildlife Attractants on or near Airports;* or.

(c) Sound insulating affected structures having noise sensitive uses (i.e., private residences, hospitals, churches, public buildings, or other structures accommodating those uses)

(3) **Construction measures.** Common construction mitigation measures include:

(a) limiting the time of day when machinery may operate, blasting may occur, or trucks operate on streets traversing noise sensitive areas; or

(b) recommending the use of muffled heavy equipment.

TABLE 17.1 Suggested Metrics to Determine or Describe Noise Impacts. This table is intended to guide analysts who evaluate a project's noise effects. In addition to DNL, the table provides information on other metrics that may further disclose and explain those effects.

POSSIBLE HUMAN RESPONSE	CORRESPONDING AVERAGE, CUMULATIVE NOISE METRIC	CORRESPONDING SINGLE EVENT METRIC	TIME AIRCRAFT HEARD ABOVE A PARTICULAR NOISE LEVEL	THE NUMBER OF EVENTS THAT WILL OCCUR ABOVE PARTICULAR NOISE METRIC
Community annoyance – How people psychologically respond to a given noise.	**DNL** - Average Day-Night Sound Level. ***L_{eq}** - Equivalent Sound Level.	***Lmax** – Maximum Sound Level. ***SEL** - Single Exposure Level.	***Time Above** - Typically, 60 or 65 dB. Above these levels, noise would interfere with normal conversational levels.	***N_x –** Numbers of events specified at each sound level.
Sleep disturbance - Sound levels causing sleep arousal.	***Nighttime L_{eq}** (10:00 p.m. - 7:00 a.m.= typical sleeping hours)	***SEL -** (Federal Interagency Committee on Aviation Noise (FICAN), 1997, uses SEL to predict the percentage of people an SEL would awaken.		
Speech interference - Intruding noise levels that may mask normal conversational speech levels and reduces listener understanding.	***L_{eq} daytime** (7:00 a.m. to 10:00 p.m. = typical activity hours)	***L_{max} or SEL**		
School learning –Noise level and that could adversely affect classroom activities. This information is used to determine the level of noise level reduction needed to reduce or	***School hour L_{eq}** (vary) ***L_{eq}** - 45 dB interior sound level goal.	***SEL** used to determine the interior noise level reduction (NLR). The minimum standard is 5 dB SEL. SEL is favored for analytical		

eliminate that interference.	goal.	purposes over Preferred Speech Interference Level[2]		
Park visitor annoyance – Noise level that would interfere with visitor enjoyment and appreciation of natural quiet. May vary by season or time of day.	***L_{eq}** (based on of park operation or visitor hours. (varies)	**Lmax**	**TAA** - Time Above Ambient sound levels.[3]	

* = Supplemental metrics used to further explain and disclose noise impacts. See section 8.d. of this chapter for more information.

[1] No required supplemental metrics. Selecting supplemental metrics is done case-by-case

[2] PSIL is arithmetic average sound pressure levels for the 500, 1,000, and 2,000-hertz octave bands.

[3] Often, local ambient (background) measurements are helpful.