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Helicopter Noise Exposure Curves

for Use in

Environmental Impact Assessment

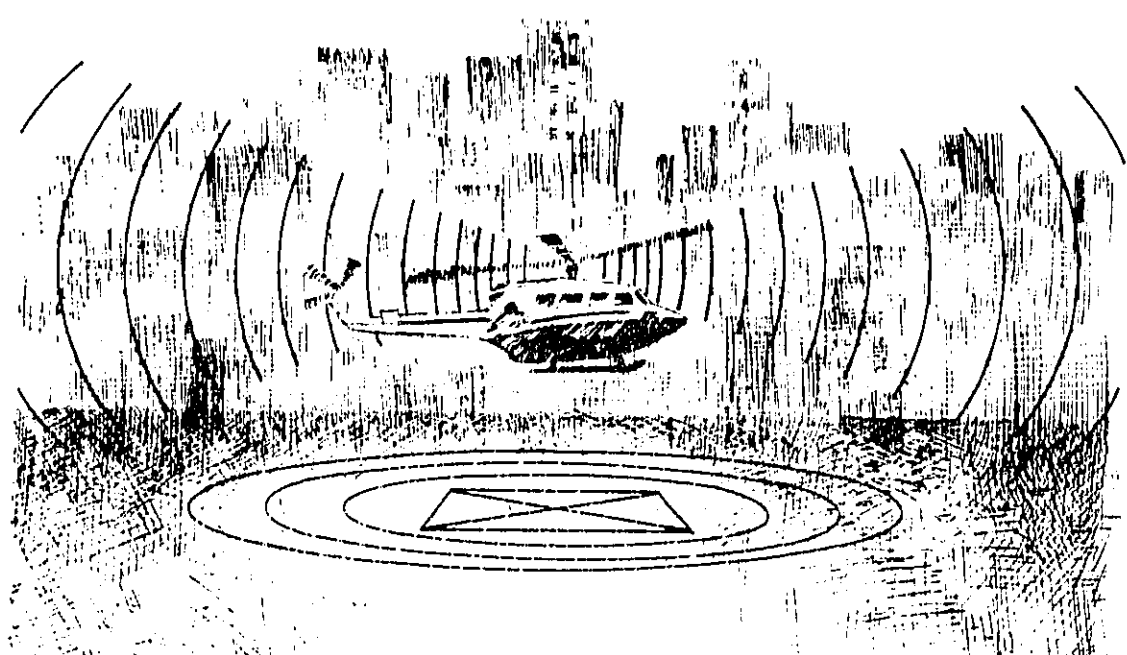
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Final Report

U.S. Department of Transportation
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Washington, D.C. 20591

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FOREWARD

The FAA has been conducting controlled helicopter noise measurement programs since 1976. The data have been used for a variety of purposes, including evaluation of proposed U.S. and international noise standards and validation of helicopter noise prediction methodologies.

This report documents the results of FAA measurement programs conducted in 1976, 1978, and 1980 in a single report with data formatted specifically for environmental impact analyses. In recognition of growing public concern over potentially adverse noise impact associated with helicopter operations, the FAA encourages helicopter and heliport operators to analyze noise impact as part of the normal heliport planning process. The data base contained in this report provides the noise input information necessary to develop helicopter noise exposure footprints or contours using a computer model such as the FAA Integrated Noise Model (INM).



U.S. Department of Transportation
Federal Aviation Administration
Office of Environment & Energy
Washington D.C. 20591
FAA-EE-85-3

HELICOPTER NOISE SURVEY FOR SELECTED CITIES IN THE CONTIGUOUS UNITED STATES



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CHAPTER 1

INTRODUCTION

Civilian helicopter traffic is growing rapidly and the resulting noise is becoming increasingly noticeable, especially in major urban areas. The frequency of complaints about helicopter noise has remained relatively low, probably because of the efforts of helicopter operators, heliport operators, urban planning officials and the FAA to keep community noise impacts at a minimum through such measures as routing helicopters away from noise-sensitive land uses and operating helicopters so as to minimize the levels of noise emitted and transmitted to the ground.

The FAA has instituted a series of surveys to enable it to keep abreast of the noise performance of the various helicopter models and to assemble a body of data for use in estimating the community noise contributions of actual and projected helicopter operations and facilities. Extensive surveys have been performed in New York City and in Phoenix, Arizona, and smaller surveys have been performed in several other places.

This report describes surveys of non-military helicopter noise at and near helipads in five metropolitan areas: Chicago, IL; Long Beach, CA; New Orleans, LA; Portland, OR; and Seattle, WA. In each metropolitan area, noise measurements were made at three or four heliports or helipads. At each heliport or helipad, three noise monitoring stations were set up in a linear array at distances of approximately 150 feet, 300 feet and 450 feet from the helipad along a suitable approach or departure flight path. (Where possible, a commonly used flight path was selected. In some cases, it was not feasible to set up stations along a commonly used path.) The stations were used to measure and record noise levels during the performance of a standard series

located at airports the effect of helicopter noise on the residential areas around airports comes primarily from helicopter overflights into, not from helipad operations.

Each metropolitan area surveyed is the subject of a separate chapter of this report. In addition to the noise measurement data obtained, each chapter provides data on location, frequency of helicopter operations, and type of helicopter operations at every identifiable helipad or heliport in regular civilian use in the metropolitan area. Information is also provided on any helicopter noise abatement procedures in effect and any available noise complaint statistics. For each helipad or heliport where noise measurements were made, the land use in the vicinity is described.

In all, noise measurements were obtained at 18 helipads for eight helicopter models. The measurements are summarized in Table 1 which reports the highest value of Lmax (Maximum Noise Level) recorded at Station 1, for each test site.

Values of Lmax at Station 1 ranged from 89.1 to 103.4 dB(A). This wide range is attributable to several factors: the use of different helicopter models in the tests; differences in the distance from Station 1 to the helipad; differences between the elevation of Station 1 and the helipad; differences in the helicopter angle of approach or take-off; deviation of approach or departure path from the direction of the line of measurement stations; and differences in ground surface and structures affecting sound propagation. Two other reasons for variation are indicated in the table: the maneuver being performed when the largest Lmax value was recorded, and the distance from the helipad to Station 1. (This distance is greater than the distance from the helicopter to Station 1 when the longest Lmax occurs during an approach or take-off.)

published by the Helicopter Association International as guidelines to be used by helicopter pilots operating in the state. [Source: 1984 - 85 Illinois Airport Directory, Illinois Department of Transportation, pp. 153 - 154.]. These include:

- Following high ambient noise routes (highways, railroads, etc.);
- Following unpopulated routes (waterways, etc.);
- Maintaining altitude (1000 ft.) where possible;
- Reducing speed;
- Observing low noise speed/descent settings;
- Avoiding sharp maneuvers;
- Varying flight routes; and
- Using steep takeoff/descent profiles.

According to information obtained from helicopter operators and airport and city officials, there are currently 14 helipads located in the Chicago metropolitan area. Eight of the helipads are located in the downtown Central Business District (CBD), four in the southern part of the city, and two in the northern part of the city. Figure 7.1 shows the street map locations of these helipads. Noise measurements were obtained for standardized helicopter maneuvers at locations 1 through 4.

The eight helipads located in the CBD include one at the Continental Bank corporate office, one at Cook County Hospital, two at Chicago Fire Department locations, and four public use helipads at Meigs Field Airport.

The Continental Bank helipad is at street level and is used mainly for transporting bank executive personnel. Occasionally it is used by non-bank helicopter operators transporting executives to and from the CBD. The number of operations at this helipad averages between two and three per day. The helipad is at the intersection of two large downtown streets adjacent to railroad tracks. Other land use in the vicinity consists of commercial and light manufacturing businesses.

a small residential neighborhood located south of the Lakefront Airport which is located on the Lake Ponchartrain shore in the northern part of the city.

Many of the helicopter operations at the Lakefront Airport involve flying over this neighborhood at an altitude of between 300 and 500 feet. (Section 8.3 contains noise level data obtained from several flights over this neighborhood.) In an effort to minimize the noise impact from helicopter operations on residential neighborhoods near the airport, the FAA and the Lakefront Airport Manager have established recommended noise abatement procedures for helicopter pilots. These procedures require that:

- All helicopter pilots maintain an altitude of at least 300 feet before beginning their descent into the airport;
- Helicopter pilots depart and approach the airport from the east and west over Lake Ponchartrain whenever possible;
- Pilots fly over major highways and waterways whenever possible;
- Pilots use operational procedures recommended in the "Fly Neighborly Program" ["Fly Neighborly Program", Helicopter Association International, February 1982].

According to operations data obtained from helicopter operators and the FAA, there are currently 9 operational helipad facilities located in the New Orleans area. Figure 8.1 shows their locations. Five of the facilities are located at Lakefront Airport. Four of these are operated by private helicopter companies: Pumpkin Helicopter, Inc. (Location 1), Chevron Oil (Location 2), Sue West Airways, Inc. (Location 5) and Jet America (Location 6). The fifth is operated by the Louisiana National Guard (Location 3). Noise measurements for the standardized helicopter noise test maneuvers were obtained at Locations 1 and 2.

(1.)

6/30/95

| HELICOPTERS TESTED | | | FAA-EE-85-3 | | | |
|--------------------|----------------------|--------------------------|-------------|---------------------|-------------|----------|
| Brand | Twin S ^{ns} | HP | Max TQWT | Crane 3rd KTS | Ceiling, Ft | Range nm |
| Aerospatiale | 355 F | 2x420 | 5,071 | 129 | 14,800 | 400 |
| Agusta | 109 A | 2 Allison (420 HP) | 5,730 | 150 | 15,000 | 341 |
| Bell | 206 B Jet Ranger III | 1 x 420 HP | 3,200 | 111 | 13,500 | 386 |
| Bell | 206 L Long Range | 1 x 400 | 4,150 | 110 | 20,000 | 383 |
| Boeing | F 28 | 1 x 205 | 2,350 | ? | 12,000 | 386 |
| Hughes | 300 B | (1 - Lycoming 420 HP) | 1,300 | 94 | 14,000 | 209 |
| Hughes | 500 D | (1 Allison x 420 HP) | 3,000 | 139 | 15,000 | 287 |
| Messerschmitt | Bo 105 | 2 (Allison) | 5,291 | 137 | 20,000 | 290 |

Table 1
SUMMARY OF MAXIMUM NOISE LEVELS RECORDED IN TESTS

| City | Helipad | Helicopter Model | Type of Maneuver | Station 1 to Helipad (feet) | Lmax At Station 1 | Altitude ft |
|-----------------|-----------------------------|------------------------|------------------|-----------------------------|-------------------|-------------|
| Long Beach, CA | LA Sheriff's Aero Bureau | Hughes 300B | takeoff | 174 | 96.0 | 100 |
| | Air Logistics | Bell 206-L | approach | 188 | 95.2 | 50 |
| | Pacific Wing and Rotor | Robinson 22 | takeoff | 254 | 92.3 | 100 |
| Seattle, WA | Aerocopter, Inc. | Bell 206B | hover | 100 | 101.2 | ? |
| | Rooftop A | Hughes 500D | takeoff | 110 | 100.4 | 70? |
| | Weyerhaeuser | Bell 206B | approach | 150 | 100.9 | 50? |
| | Rooftop B | Bell 206B | takeoff | 119 | 94.0 | 50+? |
| Portland, OR | Emanuel Hospital | Messerschmitt B105 | hover | 227 | 90.3 | ? |
| | Portland Public Use Helipad | Bell 206B | approach | 112 | 95.0 | 90 |
| | Floating Point Systems | Agusta A109A | approach* | 150 | 103.4 | 70? |
| | KATU-TV | Hughes 500D | takeoff* | 150 | 89.4 | 200+? |
| Chicago, IL | Executive Helicopter | Bell 206B | takeoff* | 145 | 94.7 | 60+? |
| | WGN-TV | Enstrom F28 | approach* | 150 | 89.1 | 50? |
| | Meigs Field | Hughes 500D | hover | 155 | 93.4 | ? |
| | U. of Chicago Hospital | Aerospatiale Twin Star | approach | 108 | 101.4 | 125? |
| New Orleans, LA | Pumpkin Helicopters, Inc. | Bell 206L | takeoff* | 300 | 94.5 | 50? |
| | Chevron Oil | Bell 206B | hover + | 150 | 90.0 | ? |
| | Petroleum Helicopters, Inc. | Bell 206B | takeoff | 140 | 96.4 | <50 |

* = Maneuver was not performed directly over measurement array.
 Helicopter approach was performed at this test site.

Table 2

EQUIVALENT AND MAXIMUM NOISE LEVELS AT STATION 3
WITH AND WITHOUT HELICOPTER TESTING

| | City/ Helipad | Station 3 Land Use | Distance To Helipad (feet) | Sample Period (min) | Community noise at Station 3 | | | | Source of Non-test Lmax |
|-----------------|-----------------------------------|--------------------------------------|-------------------------------------|---------------------------|---------------------------------|-----------------|----------------------------------|-----------------|-------------------------------|
| | | | | | With Helicopter Testing | | Without Helicopter Testing | | |
| | | | | | Leq (dB(A)) | Lmax (dB(A)) | Leq (dB(A)) | Lmax (dB(A)) | |
| Long Beach, CA: | | | | | | | | | |
| > 100' | LA Sheriff's Aero Bureau | open space | 685 | 30 | 65 | 82 | 61/65 | 85 | helicopter flyover |
| | Air Logistics | airport | 626 | 60 | 63 | -- | 62 | -- | -- |
| Seattle, WA: | | | | | | | | | |
| | Aerocopter, Inc. | airport | 480 | 60 | 84 | -- | 77/73 | 114 | Lear Jet warm-up |
| | Rooftop A | CBD | 665 | 60 | 69 | 85 | 68 | 87 | truck brakes |
| | Weyerhaeuser | airport | 452 | 30 | 71 | 91 | 73 | 92 | commercial Jet takeoff |
| Portland, OR: | | | | | | | | | |
| | Emanuel Hospital | resi- dential | 516 | 60 | 85 | 68 | 58/62 | 80 | heavy truck |
| | Portland Public Use Helipad | open space | 435 | 60 | 66 | 85 | 60 | 74 | Bell 206B landing |
| | Floating Point Systems | commer- cial/ resi- dential | 474 | 60 | 74 | 97 | 52/61 | 81 | helicopter flyover |
| | KATU-TV | CBD | 500 | 60 | 68 | 88 | 63/64 | 94 | heavy truck |
| Chicago, IL: | | | | | | | | | |
| | Executive Helicopter | airport | 445 | 60 | 80 | 105 | 68/79 | 101 | Commercial Jet takeoff |

Table 2 (continued)

| City/ Helipad | Station 3 Land Use | Distance To Helipad (feet) | Sample Period (min.) | Community noise at Station 3 | | | | Source of Non-test Lmax |
|--------------------------------------|-----------------------|---|--------------------------------|---------------------------------|----------------------------------|----------------|-----------------|-----------------------------------|
| | | | | With Helicopter Testing | Without Helicopter Testing | Leq (dB(A)) | Lmax (dB(A)) | |
| W.G.N-T.V. | open space | 450 | 60 | 64 | 88 | 57/63 | 89 | helicopter approach |
| Meigs Field | airport | 455 | 60 | 76 | 102 | 73/74 | 98 | GA plane taxiling ambulance |
| University of Chicago Hospital | open space | 588 | 60 | 67 | 85 | 57/61 | 87 | |
| New Orleans, LA: | | | | | | | | |
| Pumpkin Helicopters | airport | 621 | 60 | 85 | 112 | 70/61 | 89 | helicopter takeoff |
| Chevron Oil | airport | 450 | 60 | 68 | 86 | 70 | 97 | helicopter at 30 feet |
| Petroleum Helicopters | open space | 440 | 60 | 67 | 84 | 66/68 | 91 | helicopter approach |

-- = No data obtained due to equipment malfunction.

TABLE 4.10 NOISE DATA FOR ACTUAL IN-SERVICE HELICOPTER OPERATION IN THE VICINITY OF LONG BEACH

| Event Description | Location* | Estimated | Measurement | L ₉₀ | SEL | L _{max} |
|--|------------------|-----------------------|-----------------------|-----------------|------|------------------|
| | | Altitude (in feet) | Duration (seconds) | | | |
| Helicopter flyover. | 1 (Station 3) | 500 | [1] | [1] | [1] | 62 |
| Helicopter flyover. | 1 (Station 3) | 500 | [1] | [1] | [1] | 62 |
| Hughes 300B approach overhead and looped behind Station 1. | 1 (Station 1) | 500 | 19 | 65.3 | 76.1 | 68.4 |
| Same as above. | 1 (Station 2) | 500 | 19 | 61.7 | 74.3 | 64.1 |
| Same as above. | 1 (Station 3) | 500 | [1] | [1] | [1] | 62 |
| Hughes 300B approach overhead and looped behind Station 1. | 1 (Station 1) | 500 | 29 | 65.5 | 80.1 | 70.5 |
| Same as above. | 1 (Station 2) | 500 | 29 | 62.2 | 77.1 | 67.3 |
| Same as above. | 1 (Station 3) | 500 | [1] | [1] | [1] | 62 |
| Hughes 300B approach overhead and looped behind Station 1. | 1 (Station 1) | 500 | 24 | 65.3 | 79.1 | 70.2 |
| Same as above. | 1 (Station 2) | 500 | 24 | 64.2 | 77.8 | 67.4 |
| Same as above. | 1 (Station 3) | 500 | [1] | [1] | [1] | 64 |
| Hughes 300B approach overhead and looped behind Station 1. | 1 (Station 1) | 500 | 38 | 65.8 | 81.4 | 69.6 |
| Same as above. | 1 (Station 2) | 500 | 38 | 65.3 | 80.9 | 69.8 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figures 4.14 and 4.15 for station locations.

[1] Noise levels measured with CNA which is not capable of recording measurement duration, L₉₀, and SEL for single-events.

(continued next page)

TABLE 4.10 (continued)

| Event Description | Location* | Estimated Altitude (in feet) | Measurement Duration (seconds) | Leq | SEL | Lmax |
|---|------------------|------------------------------------|--------------------------------------|------|------|------|
| Same as above. | 1 (Station 3) | 500 | (1) | (1) | (1) | 64 |
| Hughes 300B approach overhead and looped behind Station 1. | 1 (Station 3) | 500 | (1) | (1) | (1) | 60 |
| Helo looped around Station 3 and flew parallel to measure- ment array. | 2 (Station 1) | 500 | 70 | 63.9 | 82.4 | 68.8 |
| Same as above. | 2 (Station 2) | 500 | 24 | 68.0 | 81.8 | 70.0 |
| Same as above. | 2 (Station 3) | 500 | (1) | (1) | (1) | 67 |
| Helo looped 1000' in front of Sta- tion 1. | 2 (Station 2) | 500 | 20 | 68.3 | 81.3 | 70.6 |
| Same as above. | 2 (Station 3) | 500 | (1) | (1) | (1) | 72 |
| Helo over golf course, landed at Air Logistics. | 2 (Station 2) | 500 | 13 | 60.9 | 81.0 | 72.6 |
| Helo over golf course, landed at Air Logistics. | 2 (Station 1) | 500 | 26 | 58.2 | 72.3 | 63.4 |
| Same as above. | 2 (Station 2) | 500 | 27 | 63.8 | 78.1 | 66.0 |
| Helo looped over Station 1. | 2 (Station 1) | 500 | 63 | 64.7 | 82.7 | 69.3 |
| Same as above. | 2 (Station 2) | 500 | 59 | 66.2 | 83.9 | 71.3 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figures 4.14 and 4.15 for station locations.

(1) Noise levels measured with CNA which is not capable of recording measurement duration, Leq, and SEL for single-events.

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TABLE 4.10 (continued)

| Event Description | Location* | Estimated Altitude (in feet) | Measurement Duration (seconds) | Leq | SEL | Leax |
|--|------------------|------------------------------------|--------------------------------------|------|------|------|
| Same as above. | 2 (Station 3) | 500 | [1] | [1] | [1] | 75 |
| Helicopter flyover. | 2 (Station 3) | 500 | [1] | [1] | [1] | 71 |
| Helicopter flyover. | 2 (Station 3) | 500 | [1] | [1] | [1] | 66 |
| Flyover east to west. | 3 | 500 | 36 | 71.6 | 86.7 | 75.4 |
| Two helos circling. | 3 | 500 | 92 | 68.8 | 88.4 | 75.2 |
| Helicopter flyover. | 3 | 500 | 72 | 71.3 | 88.9 | 78.1 |
| Helo turned at tower. | 3 | 350 | 80 | 68.5 | 87.5 | 73.5 |
| Helo flyover north to south. | 3 | 350 | 68 | 68.4 | 86.7 | 74.1 |
| Helo from north, then circled tower. | 3 | 350 | 22 | 70.6 | 84.0 | 73.9 |
| Helo north, looped over tower, 2nd helo followed, twin engine plane took off. | 3 | 500 | 92 | 71.1 | 90.7 | 75.7 |
| Helo looped tower. | 3 | 500 | 34 | 68.9 | 84.1 | 74.9 |
| Helo looped over site and landed. | 4 | 500 | 50 | 68.1 | 86.1 | 77.3 |
| Helo looped and landed directly over station. | 4 | 150 | 58 | 81.3 | 98.9 | 91.0 |
| Helo overhead at right angle to station. | 5 | 500 | 22 | 71.2 | 84.6 | 76.4 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figures 4.14 and 4.15 for station locations.

[1] Noise Levels measured with CNA which is not capable of recording measurement duration, Leq, and SEL for single-events.

(continued next page)

TABLE 4.10 (continued)

| Event Description | Location* | Estimated | Measurement | L ₉₀ | SEL | L _{max} |
|---|-----------|-----------------------|-----------------------|-----------------|------|------------------|
| | | Altitude [in feet] | Duration [seconds] | | | |
| Helio directly over-head. | 5 | 500 | 13 | 70.0 | 81.1 | 74.7 |
| Helio looped over-head. | 5 | 350 | 28 | 78.2 | 90.7 | 83.9 |
| Helio turned behind site. | 6 | 500 | [1] | [1] | [1] | 72 |
| Helio turned over site. | 6 | 500 | [1] | [1] | [1] | 73 |
| Hughes 500-C turned behind site. | 6 | 500 | [1] | [1] | [1] | 76 |
| Helio turned over site. | 6 | 500 | [1] | [1] | [1] | 75 |
| Helio turned over site. | 6 | 500 | [1] | [1] | [1] | 75 |
| Medium helio approach at 10:00. | 7 | 1000 | 33 | 65.9 | 81.1 | 71.4 |
| Helio looped around site. | 7 | 1000 | 85 | 64.1 | 82.1 | 69.1 |
| Medium helio approach at 1:00. | 7 | 1500 | 43 | 59.7 | 76.0 | 62.9 |
| Helio passed from 10:00 to 3:00. | 7 | 1500 | 35 | 62.0 | 77.4 | 61.1 |
| Helio passed from 4:00 to 7:00. | 7 | 1500 | 19 | 58.9 | 72.7 | 64.3 |
| Helio approached at 8:00 circled behind station and departed at 1:00. | 7 | 1200 | 33 | 61.3 | 76.5 | 66.0 |

ALL noise data recorded with A-frequency weighting and slow response time averaging.

* See Figures 4.14 and 4.15 for station locations.

[1] Noise levels measured with CNA which is not capable of recording measurement duration, L₉₀, and SEL for single-events.

(continued next page)

TABLE 4.10 (continued)

| Event Description | Location* | Estimated | Measurement | Leq | SEL | Lmax |
|--|-----------|-----------------------|-----------------------|------|------|------|
| | | Altitude (in feet) | Duration (seconds) | | | |
| Helo looped at 4:00, two cars passed. | 7 | 1500 | 131 | 64.2 | 85.4 | 71.2 |
| Helo approached and looped. | 8 | 1000 | 72 | 64.1 | 82.7 | 72.9 |
| Single rotor helo circled station. | 9 | 250 | 17 | 73.1 | 85.4 | 78.5 |
| Single rotor helo circled station. | 9 | 250 | 16 | 73.9 | 85.9 | 77.0 |
| Tandem rotor helo circled station. | 9 | 250 | 25 | 68.5 | 82.5 | 71.0 |
| Single rotor helo circled station. | 9 | 250 | 21 | 73.7 | 86.8 | 78.7 |
| Single rotor helo circled station. | 9 | 250 | 15 | 62.1 | 83.8 | 88.6 |
| Helicopter flyover. | 9 | 250 | 20 | 63.5 | 86.4 | 80.1 |
| Helicopter flyover. | 9 | 250 | 20 | 60.9 | 83.9 | 87.2 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figures 4.14 and 4.15 for station locations.

[1] Noise levels measured with CNA which is not capable of recording measurement duration, Leq, and SEL for single-events.

TABLE 5.13 NOISE DATA FOR ACTUAL IN-SERVICE HELICOPTER OPERATIONS

| Event Description | Location* | Estimated Altitude (in feet) | Measurement Duration (seconds) | Leq | SEL | Lmax |
|--|-----------|---------------------------------|-----------------------------------|------|------|------|
| Helicopter flyover 300-500 ft away, a Hughes 5000 | 1 | 300-400 | 20 | 68.9 | 83.4 | 72.2 |
| 208 Bell running east to west perpen- dicular to station. | 1 | 500 | 10 | 60.8 | 70.6 | 62.4 |
| Helicopter flyover | 1 | [2] | 20 | 77.8 | 90.8 | 81.7 |
| Helicopter flew 400 ft behind station 2 | 1 | 300 | 13 | 70.8 | 81.9 | 72.1 |
| Helicopter flew in front of Space Needle 500 ft from station | 1 | 300 | 30 | 68.5 | 83.2 | 75.8 |
| Helicopter over KING T.V. | 1 | 250 | 20 | 68.5 | 81.5 | 70.7 |
| Helicopter flyover | 2 | [2] | 40 | 65.0 | 81.8 | 69.1 |
| Helicopter 800' perpendicular to Terry St. | 2 | 500 | 8 | 63.7 | 72.7 | 70.4 |
| Helicopter S. to N. close to station. | 3 | 500 | [1] | [1] | [1] | 66 |
| Helicopter N. to S. close to station. | 3 | 500 | [1] | [1] | [1] | 64 |
| Helicopter from seat without traffic. | 3 | 500 | [1] | [1] | [1] | 60 |

All noise data were recorded with A-frequency weighting and slow response time averaging.
 * = See Figure 5.18 for station locations.
 [1] = Noise levels measured with the CNA which is not capable of recording measurement duration, Leq, and SEL readings for single events.
 [2] = Not able to estimate altitude.

(Table continued)

(Table 5.13 continued)

| Event Description | Location* | Estimated | Measurement | | | |
|---|-----------|-----------------------|-----------------------|------|------|------|
| | | Altitude (in feet) | Duration (seconds) | Leq | SEL | Leax |
| Bell 208B ground idle 110' away. | 4 | NA | 25 | 67.4 | 81.3 | 69.1 |
| Bell 208B takeoff beginning 110' away and heading away from station. | 4 | 30 | 14 | 78.6 | 88.1 | 82.1 |
| Same operation as above beginning 250' away, flying toward station, then turning back in opposite direction. | 4 | 30 | [1] | [1] | [1] | 84 |
| Bell 208B Jet- ranger III(modified from Jetranger II) takeoff beginning 110' away and heading away from station. | 4 | 30 | 19 | 84.4 | 87.2 | 81.3 |

All noise data were recorded with A-frequency weighting and slow response time averaging.

* = See Figure 5.10 for station locations.

[1] = Noise levels measured with the CNA which is not capable of recording measurement duration, Leq, and SEL readings for single events.

[2] = Not able to estimate altitude.

TABLE 8.13 NOISE DATA FOR ACTUAL IN-SERVICE HELICOPTER OPERATIONS MONITORED HELIPAD TEST SITES

| Event Description | Location* | Estimated | Measurement | L _{eq} | SEL | L _{max} |
|--|-------------------|-----------------------|-----------------------|-----------------|------|------------------|
| | | Altitude [in feet] | Duration [seconds] | | | |
| Hesserschmitt BO 105 flyover northeast to southeast 700' away. | 1 (Station 2) | 300 | 5 | 57.1 | 64.1 | 58.8 |
| Hesserschmitt BO105 approach from south 227 ft. away. | 1 (Station 2) | 75 (at touchdown) | 41 | 75.1 | 91.2 | 80.5 |
| Same as above, 372 ft. away. | 1 (Station 2) | 75 (at touchdown) | 14 | 75.4 | 64.8 | 77.4 |
| Same as above, 518 ft. away. | 1 (Station 3) | 75 (at touchdown) | [1] | [1] | [1] | 72 |
| Small helicopter flyover from south to north 800' away. | 2 (Station 3) | 500 | [1] | [1] | [1] | 68 |
| Bell 208B approach from south to north and landed 435' away. | 2 (Station 3) | 10 | [1] | [1] | [1] | 82 |
| Medium size helo flyover east to west overhead. | 2 (Station 3) | 500 | [1] | [1] | [1] | 74 |
| Medium size helo flyover 800' away. | 2 (Station 3) | 500 | [1] | [1] | [1] | 65 |
| Bell 208B landing 435 ft. away from east to west. | 2 (Station 3) | 10 | [1] | [1] | [1] | 74 |
| Bell 208B flyover south to north 700 ft. away. | 2 (Station 3) | 500 | [1] | [1] | [1] | 61 |
| Same as above, 185 ft. away. | 2 (Station 3) | 300 | [1] | [1] | [1] | 65 |
| Bell 208B north to south 800' away. | 13 (Station 1) | 500 | 15 | 55.8 | 67.5 | 59.6 |

All noise data recorded with A-frequency weighting
and slow response time averaging.

* See Figures 8.1 and 8.2 for station locations.

[1] Noise levels measured with the CNA which is not capable
of recording measurement duration, L_{eq}, and SEL for single-event.

(continued on next page)

TABLE 6.13 (continued)

| Event Description | Location* | Estimated | Measurement | Leq | SEL | Lmax |
|---|-------------------|-----------------------|-----------------------|------|------|------|
| | | Altitude [in feet] | Duration [seconds] | | | |
| Agusta A109A approach and landing 150 ft. away. | 13 (Station 1) | 40 | 20 | 83.8 | 96.8 | 88.1 |
| Same as above, 324 ft. away. | 13 (Station 2) | 40 | 28 | 78.0 | 93.4 | 83.1 |
| Agusta A109A flyover 300' away. | 13 (Station 1) | 300 | 11 | 77.4 | 87.8 | 80.2 |
| Same as above. | 13 (Station 2) | 300 | 20 | 75.8 | 88.5 | 80.8 |
| Agusta A109A hovering facing east 800' away. | 13 (Station 1) | 300 | 21 | 82.7 | 75.9 | 88.1 |
| Agusta A109A hovering facing west 400 ft. away. | 13 (Station 1) | 30 | 28 | 71.7 | 86.1 | 77.9 |
| Agusta A109A approach from north to south and landed 150 ft. away. | 13 (Station 1) | 40 | 29 | 84.8 | 98.2 | 88.2 |
| Same as above, 324 ft. away. | 13 (Station 2) | 40 | 51 | 78.9 | 96.3 | 83.6 |
| Hughes 5000 takeoff to east 800' away. | 3 (Station 3) | 50 | [1] | [1] | [1] | 78 |
| Hughes 5000 warmup 500 ft. away. | 3 (Station 3) | N/A | [1] | [1] | [1] | 80 |
| Hughes 5000 100% takeoff idle 500' away. | 3 (Station 3) | N/A | [1] | [1] | [1] | 71 |
| Hughes 5000 flyover from west to east. | 3 (Station 3) | 150 | [1] | [1] | [1] | 74 |
| Hughes 5000 approach 500 ft. away west to east. | 3 (Station 3) | 150 | [1] | [1] | [1] | 80 |

All noise data recorded with A-frequency weighting
and slow response time averaging.

* See Figures 6.1 and 6.2 for station locations.

[1] Noise levels measured with QNA which is not capable
of recording measurement duration, Leq, and SEL for single-event.

(continued next page)

TABLE 8.13 (continued)

| Event Description | Location | Estimated Altitude [in feet] | Measurement Duration [seconds] | L _{eq} | SEL | L _{max} |
|--|------------------|------------------------------------|--------------------------------------|-----------------|------|------------------|
| Same as above. | 3 (Station 2) | 150 | 30 | 73.8 | 88.3 | 84.8 |
| Hughes 5000 flyover 300 ft. away. | 3 (Station 2) | 500 | 11 | 81.0 | 71.4 | 83.5 |
| Same as above. | 3 (Station 2) | 500 | 8 | 60.9 | 69.9 | 83.8 |
| Hughes 5000 flyover east to west 600' away. | 3 (Station 1) | 500 | 8 | 60.9 | 69.9 | 83.8 |
| Hughes 5000 flyover south to north 600 ft. away. | 3 (Station 1) | 500 | 7 | 66.8 | 75.4 | 69.8 |

All noise data recorded with A-frequency weighting

TABLE 7.13 NOISE DATA FOR IN-SERVICE HELICOPTER OPERATIONS AT PUBLIC USE HELIPORT MEIGS FIELD AIRPORT

| Event Description | Location* | Estimated | Measurement | Leq | SEL | Lmax |
|---|-----------|-----------------------|-----------------------|------|------|------|
| | | Altitude (in feet) | Duration (seconds) | | | |
| Bell 206B approach, | 1 | 40 | 25 | 04.2 | 90.2 | 90.0 |
| Same as above, | 2 | 50 | 25 | 00.7 | 94.7 | 96.3 |
| Same as above, | 3 | 50 | [1] | [1] | [1] | 98 |
| Hughes 500D approach, | 1 | 40 | 38 | 03.7 | 90.4 | 90.5 |
| Same as above, | 2 | 50 | 38 | 01.2 | 96.7 | 97.7 |
| Same as above, | 3 | 50 | [1] | [1] | [1] | 90 |
| Hughes 500D idle(north) 50' away, | 1 | NA | 10 | 70.2 | 90.2 | 79.3 |
| Same as above 200' away, | 2 | NA | 33 | 67.9 | 93.1 | 70.1 |
| Hughes 500D idle(north) 50' away, | 1 | NA | 13 | 78.5 | 90.7 | 70.5 |
| Same as above 200' away, | 2 | NA | 19 | 60.7 | 91.4 | 71.2 |
| Hughes 500D and Bell 206B at ground idle within 25' of each other and 50' away from microphone, | 1 | NA | 18 | 78.8 | 91.8 | 90.1 |
| Same as above 200' away, | 2 | NA | 12 | 77.5 | 90.3 | 70.5 |
| Same two helicopters as above at flight idle 50' away from microphone, | 1 | NA | 14 | 63.7 | 95.1 | 95.7 |
| Hughes 500D flyover, | 1 | 500 | 23 | 60.0 | 90.4 | 90.0 |
| Same as above, | 2 | 500 | 27 | 66.5 | 90.8 | 90.0 |
| Bell 206B approach to airport, | 4 | 500 | 32 | 60.7 | 91.7 | 90.0 |

All noise data were recorded with A-frequency weighting and slow response time averaging.

* Location numbers refer to location numbers on Figure 7.22.

[1] Noise Levels measured with the CNA which is not capable of recording measurement duration, Leq, and SEL for single events.

TABLE 7.14 NOISE DATA FOR ACTUAL IN-SERVICE HELICOPTER OPERATIONS

| Event Description | Location* | Estimated Altitude [in feet] | Measurement Duration [seconds] | Leq | SEL | Lmax |
|--|------------------|------------------------------------|--------------------------------------|------|------|------|
| Bell 208B approach from east 20' east & parallel to array. | 1 (Station 1) | 40 | 25 | 80.7 | 94.2 | 85.4 |
| Bell 208B takeoff to west 30' south and parallel to array. | 1 (Station 1) | 30 | 13 | 82.5 | 93.8 | 87.8 |
| Same as above. | 1 (Station 2) | 40 | 14 | 83.8 | 95.1 | 88.1 |
| Same as above. | 1 (Station 3) | 30 | [1] | [1] | [1] | 85 |
| Bell 208B Flyby 500' away. | 1 (Station 1) | 500 | 12 | 88.1 | 78.8 | 88.2 |
| Same as above. | 1 (Station 2) | 500 | 14 | 85.2 | 78.7 | 88.8 |
| Same as above. | 1 (Station 3) | 500 | [1] | [1] | [1] | 88 |
| Bell 208B approach from east. | 1 (Station 1) | 40 | 14 | 83.8 | 85.1 | 88.1 |
| Same as above. | 1 (Station 2) | 40 | 20 | 87.3 | 88.3 | 74.0 |
| Same as above. | 1 (Station 3) | 40 | [1] | [1] | [1] | 71 |
| Enstrom F2B warmup 450' away. | 1 (Station 3) | NA | [1] | [1] | [1] | 85 |
| Enstrom F2B hovering 450' away. | 1 (Station 3) | 30 | [1] | [1] | [1] | 72 |
| Same as above. | 1 (Station 3) | 30 | [1] | [1] | [1] | 88 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figure 7.23 for station locations.

[1] Noise levels measured with the CNA which is not capable
of recording measurement duration, Leq, and SEL for single-event.

(continued on next page)

TABLE 7.14 (continued)

| Event Description | Location* | Estimated | Measurement | Leq | SEL | Lmax |
|---|------------------|-----------------------|-----------------------|------|------|------|
| | | Altitude [in feet] | Duration [seconds] | | | |
| Bell 208B approach. | 1 (Station 3) | 150 | [1] | [1] | [1] | 83 |
| Bell 208D Idle (East) 400' away. | 1 (Station 3) | NA | [1] | [1] | [1] | 81 |
| Enstrom F28 flyby 1000' away. | 2 (Station 1) | 500 | 8 | 53.4 | 82.4 | 55.8 |
| Same as above but 800' away. | 2 (Station 1) | 500 | 15 | 57.0 | 80.8 | 62.8 |
| Same as above 1000' away. | 2 (Station 2) | 500 | 20 | 56.2 | 80.1 | 55.8 |
| Enstrom F28 approach from south over station. | 2 (Station 3) | 50 | [1] | [1] | [1] | 80 |
| Enstrom F28 takeoff to north 450' away. | 2 (Station 3) | 50 | [1] | [1] | [1] | 78 |
| Enstrom F28 flyby 500' away. | 2 (Station 3) | 500 | [1] | [1] | [1] | 70 |
| Medium helicopter flyover 1000' away. | 3 (Station 3) | 500 | [1] | [1] | [1] | 83 |
| Aerospatiale Twinstar approach directly over station. | 3 (Station 3) | 50 | [1] | [1] | [1] | 88 |
| Aerospatiale Twinstar 100% Idle(North) 100' away. | 3 (Station 2) | NA | 18 | 74.3 | 88.8 | 77.8 |
| Same as above 500' away. | 3 (Station 3) | NA | [1] | [1] | [1] | 88 |
| Aerospatiale Twinstar cooldown 500' away. | 3 (Station 3) | NA | [1] | [1] | [1] | 85 |
| Bell 208B 100% Idle(East). | 4 | NA | 30 | 74.3 | 80.8 | 78.0 |
| Bell 208B takeoff (East). | 4 | NA | 10 | 80.0 | 82.7 | 83.3 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figure 7.23 for station locations.

[1] Noise levels measured with CNA which is not capable of recording measurement duration, Leq, and SEL for single-event.

TABLE 8.10 NOISE DATA FOR ACTUAL IN-SERVICE HELICOPTER OPERATIONS

| Event Description | Location* | Estimated | Measurement | Leq | SEL | Lmax |
|---|------------------|-----------------------|-----------------------|------|------|------|
| | | Altitude (in feet) | Duration (seconds) | | | |
| Bell 206L takeoff 30' from array. | 1 (Station 1) | 70 | 17 | 87.3 | 98.6 | 91.4 |
| Bell 206L 82% Idle (West) 345' away. | 1 (Station 1) | N/A | 28 | 71.0 | 85.4 | 72.2 |
| Same as above 500' away. | 1 (Station 2) | N/A | 28 | 68.2 | 82.8 | 69.3 |
| Same as above 600' away. | 1 (Station 3) | N/A | [1] | [1] | [1] | 67 |
| Bell 206B approach 30' away. | 1 (Station 1) | 40 | 24 | 84.1 | 87.9 | 81.3 |
| Same as above 104' away. | 1 (Station 2) | 40 | 25 | 77.0 | 81.8 | 84.4 |
| Same as above 350' away. | 1 (Station 3) | 40 | [1] | [1] | [1] | 83 |
| Bell 206B Hover (West) 25' away. | 1 (Station 1) | 25 | 12 | 78.5 | 88.8 | 79.8 |
| Same as above 100' away. | 1 (Station 2) | 25 | 14 | 69.7 | 81.1 | 74.0 |
| Same as above 340' away. | 1 (Station 3) | 25 | [1] | [1] | [1] | 68 |
| Bell 206L takeoff 40' parallel to array, turned west between Station 2 & 3. | 1 (Station 1) | 40 | 18 | 86.4 | 88.4 | 82.4 |
| Same as above. | 1 (Station 2) | 40 | 16 | 84.9 | 88.9 | 81.8 |
| Same as above. | 1 (Station 3) | 40 | [1] | [1] | [1] | 81 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figure 8.10 for station locations.

[1] Noise levels measured with the CNA which is not capable of recording measurement duration, Leq, and SEL for single-event.

(continued on next page)

TABLE 8.10 (continued)

| Event Description | Location* | Estimated Altitude (in feet) | Measurement Duration (seconds) | Leq | SEL | Leax |
|---|------------------|------------------------------------|--------------------------------------|------|------|------|
| Bell 206B 62% Idle 200' away. | 1 (Station 1) | N/A | 38 | 73.2 | 88.7 | 74.8 |
| Same as above 350' away. | 1 (Station 2) | N/A | 38 | 68.2 | 83.7 | 70.1 |
| Same as above 500' away. | 1 (Station 3) | N/A | [1] | [1] | [1] | 68 |
| Bell 206B takeoff 50' away parallel to array. | 1 (Station 1) | 40 | 15 | 83.5 | 85.2 | 80.1 |
| Same as above. | 1 (Station 2) | 40 | 17 | 82.5 | 84.8 | 80.5 |
| Same as above. | 1 (Station 3) | 40 | [1] | [1] | [1] | 80 |
| Bell 206B flyby 100' away. | 1 (Station 1) | 500 | 21 | 58.7 | 68.8 | 58.7 |
| Same as above. | 1 (Station 2) | 500 | 23 | 53.5 | 67.2 | 58.3 |
| Medium size helo landing 2000' away. | 1 (Station 3) | N/A | [1] | [1] | [1] | 63 |
| Bell 206B warm-up 300' away. | 2 (Station 2) | N/A | 18 | 87.0 | 78.8 | 88.8 |
| Bell 214 Idle 800' away. | 2 (Station 3) | N/A | [1] | [1] | [1] | 78 |
| Bell 214 Idle [North] 800' away. | 2 (Station 3) | N/A | [1] | [1] | [1] | 68 |
| Small helicopter landing 1000' away. | 2 (Station 3) | N/A | [1] | [1] | [1] | 68 |
| Medium helicopter hover 800' away. | 2 (Station 3) | 30 | [1] | [1] | [1] | 68 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figure 8.10 for station locations.

[1] Noise levels measured with CNA which is not capable
of recording measurement duration, Leq, and SEL for single-event.

(continued next page)

TABLE 8.10 (continued)

| Event Description | Location | Estimated Altitude (in feet) | Measurement Duration (seconds) | Loq | SEL | Leq |
|---|------------------|------------------------------|--------------------------------|-----|-----|-----|
| Medium size helo Idle(North) 800' away. | 2 (Station 3) | N/A | [1] | [1] | [1] | 68 |
| Medium size helo hover(west) 400' away. | 2 (Station 3) | 30 | [1] | [1] | [1] | 76 |
| Same as above 500' away. | 2 (Station 3) | 30 | [1] | [1] | [1] | 74 |
| Bell 208B Flyover 60' away. | 2 (Station 3) | 20 | [1] | [1] | [1] | 83 |
| Bell 208B Flyover 50' away. | 2 (Station 3) | 30 | [1] | [1] | [1] | 88 |
| S76 Idle 400' away. | 2 (Station 3) | NA | [1] | [1] | [1] | 71 |
| S76 taxi 400' away. | 2 (Station 3) | NA | [1] | [1] | [1] | 67 |
| S76 takeoff 80' away. | 2 (Station 3) | NA | [1] | [1] | [1] | 67 |
| Medium helo landing 1500' away. | 2 (Station 3) | NA | [1] | [1] | [1] | 62 |
| Same as above 500' away. | 2 (Station 3) | NA | [1] | [1] | [1] | 62 |
| Bell 214 takeoff 200' away. | 2 (Station 3) | NA | [1] | [1] | [1] | 77 |
| S76 takeoff 300' away. | 2 (Station 3) | NA | [1] | [1] | [1] | 80 |
| Small helo flyby directly overhead. | 2 (Station 3) | 80 | [1] | [1] | [1] | 80 |
| Small helo takeoff 800' away. | 2 (Station 3) | NA | [1] | [1] | [1] | 73 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figure 8.10 for station locations.

[1] = Noise levels measured with CNA which is not capable of recording duration, Loq, or SEL for single-event.

(continued on next page)

TABLE B.10 (continued)

| Event Description | Location* | Estimated Altitude (in feet) | Measurement Duration (seconds) | Leq | SEL | Leax |
|---|------------------|------------------------------------|--------------------------------------|-----|-----|------|
| Small helo landing 600' away. | 2 (Station 3) | NA | [1] | [1] | [1] | 77 |
| Small helo 02X idle 600' away. | 2 (Station 3) | NA | [1] | [1] | [1] | 80 |
| Small helo takeoff 50' away. | 2 (Station 3) | 50 | [1] | [1] | [1] | 87 |
| Bell 214 landing 000' away. | 2 (Station 3) | NA | [1] | [1] | [1] | 74 |
| Medium size helo flyover directly overhead. | 2 (Station 3) | 50 | [1] | [1] | [1] | 80 |
| Medium size helo takeoff 000' to west. | 2 (Station 3) | NA | [1] | [1] | [1] | 80 |
| S76 takeoff 500' away. | 2 (Station 3) | 10 | [1] | [1] | [1] | 80 |
| Bell 208B flyover 80' away. | 2 (Station 3) | 30 | [1] | [1] | [1] | 80. |
| S76 landing 30' away. | 2 (Station 3) | 10 | [1] | [1] | [1] | 87 |
| Medium size helo takeoff 80' away. | 2 (Station 3) | 20 | [1] | [1] | [1] | 83 |
| Bell 214 approach 200' away. | 2 (Station 3) | 15 | [1] | [1] | [1] | 87 |
| Medium size helo idle 400' away. | 2 (Station 3) | NA | [1] | [1] | [1] | 83 |
| Bell 214 hover taxi 500' away. | 2 (Station 3) | NA | [1] | [1] | [1] | 82 |
| Bell 214 takeoff to west 600' away. | 2 (Station 3) | NA | [1] | [1] | [1] | 78 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figure B.1B for station locations.

[1] = Noise levels measured with CNA which is not capable
of recording duration, Leq, or SEL for single-event.

(continued on next page)

Table B.10(cont)

| Event Description | Location* | Estimated Altitude (in feet) | Measurement Duration (seconds) | Leq | SEL | LAeq |
|---|-----------|------------------------------------|--------------------------------------|-----|-----|------|
| Bell 208L takeoff 150' away. | 3 | 30 | [1] | [1] | [1] | 81 |
| Medium size helo approach 200' away. | 3 | 100 | [1] | [1] | [1] | 80 |
| Medium size helo flyby 300' away. | 3 | 700 | [1] | [1] | [1] | 87 |
| Medium size helo 82% idle 800' away. | 3 | NA | [1] | [1] | [1] | 57 |
| Same as above 100% idle. | 3 | NA | [1] | [1] | [1] | 84 |
| Medium size helo idle 300' away. | 3 | NA | [1] | [1] | [1] | 73 |
| Same as above 450' away. | 3 | NA | [1] | [1] | [1] | 81 |
| Same as above 300' away. | 3 | NA | [1] | [1] | [1] | 57 |
| Military Bell 214 idle 500' away. | 3 | NA | [1] | [1] | [1] | 70 |
| Medium size helo hovering 300' away. | 3 | NA | [1] | [1] | [1] | 83 |
| Same as above. | 3 | NA | [1] | [1] | [1] | 81 |
| Medium size helo takeoff overhead. | 3 | NA | [1] | [1] | [1] | 80 |
| Bell 208D takeoff 150' away. | 3 | NA | [1] | [1] | [1] | 84 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figure B.10 for station locations.

[1] Noise Levels measured with CNA which is not capable
of recording measurement duration, Leq, and SEL for single-event.

(continued on next page)

TABLE B.10 (continued)

| Event Description | Location* | Estimated | Measurement | | SEL | Lmax |
|--|------------------|-----------------------|-----------------------|------|-------|------|
| | | Altitude (in feet) | Duration (seconds) | Leq | | |
| Medium size helo flyover overhead. | 3 | NA | [1] | [1] | [1] | 78 |
| Medium size helo flyover 150' away. | 3 | NA | [1] | [1] | [1] | 82 |
| Bell 206B approach west of station. | 4 (Station 3) | 150 | [1] | [1] | [1] | 84 |
| Same as above 30' west of station. | 4 (Station 2) | 40 | 43 | 82.4 | 98.7 | 90.8 |
| Same as above directly over station. | 4 (Station 1) | 40 | 44 | 89.7 | 100.1 | 90.3 |
| Bell 206B 82% idle 121' away. | 4 (Station 1) | NA | 14 | 75.3 | 86.7 | 77.0 |
| Bell 206B takeoff (south) 80' west of array. | 4 (Station 1) | 200 | 15 | 75.1 | 86.8 | 78.1 |
| Same as above. | 4 (Station 2) | 250 | 15 | 74.5 | 86.2 | 77.8 |
| Same as above. | 4 (Station 3) | 300 | [1] | [1] | [1] | 78 |
| Bell 206B 82% idle 250' away. | 4 (Station 1) | NA | 28 | 77.9 | 92.1 | 70.0 |
| Same as above 400' away. | 4 (Station 2) | NA | 28 | 88.3 | 82.4 | 88.1 |
| Same as above 550' away. | 4 (Station 3) | NA | [1] | [1] | [1] | 58 |
| Bell 206B 100% idle 257' away. | 4 (Station 1) | NA | 12 | 83.0 | 84.7 | 85.7 |
| Same as above 400' away. | 4 (Station 2) | NA | 12 | 75.8 | 88.5 | 77.2 |
| Same as above | 4 | | | | | |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figure Q.16 for station locations.

[1] Noise levels measured with CNA which is not capable of recording measurement duration, Leq, and SEL for single-event.

(continued on next page)

TABLE 8.10 (continued)

| Event Description | Location* | Estimated | Measurement | | SEL | L _{max} |
|---|------------------|-----------------------|-----------------------|------|------|------------------|
| | | Altitude (in feet) | Duration (seconds) | Leq | | |
| 447' away. | (Station 3) | NA | [1] | [1] | [1] | 87 |
| Bell 208B takeoff (south) 800' away. | 4 (Station 1) | 200 | 28 | 71.1 | 85.5 | 73.7 |
| Same as above. | 4 (Station 2) | 250 | 29 | 69.2 | 83.8 | 72.3 |
| Same as above. | 4 (Station 3) | 250 | [1] | [1] | [1] | 71 |
| Bell 208B 100% idle 207' away. | 4 (Station 1) | NA | 23 | 80.4 | 94 | 81.3 |
| Same as above 348' away. | 4 (Station 2) | NA | 23 | 72.8 | 86.4 | 73.7 |
| Same as above 404' away. | 4 (Station 3) | NA | [1] | [1] | [1] | 86 |
| Bell 208B takeoff (south) 50' west. | 4 (Station 1) | 250 | 48 | 73.4 | 90 | 83.8 |
| Same as above. | 4 (Station 2) | 300 | 48 | 70.0 | 86.8 | 78.4 |
| Same as above. | 4 (Station 3) | 500 | [1] | [1] | [1] | 73 |
| Bell 208B flyover 800' west. | 4 (Station 1) | 500 | 27 | 80.9 | 75.2 | 83.9 |
| Same as above. | 4 (Station 2) | 500 | 27 | 80.3 | 74.5 | 83.0 |
| Same as above. | 4 (Station 3) | 500 | [1] | [1] | [1] | 84 |
| Bell 208B 82% idle 223' away. | 4 (Station 1) | NA | 20 | 65.5 | 78.7 | 67.0 |
| Same as above 382' away. | 4 (Station 2) | NA | 28 | 65.5 | 78.7 | 67.0 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figure 8.18 for station locations.

[1] Noise levels measured with CNA which is not capable of recording measurement duration, Leq, and SEL for single-event.

(continued on next page)

TABLE 8.10 (continued)

| Event Description | Location* | Estimated Altitude [in feet] | Measurement Duration [seconds] | Leq | SEL | Leax |
|--|------------------|------------------------------------|--------------------------------------|------|------|---------|
| Same as above 507' away. | 4 (Station 3) | NA | [1] | [1] | [1] | 83 |
| Same Bell 208 at 1005' idle 223' away. | 4 (Station 1) | NA | 21 | 78.3 | 82.4 | 80.8 |
| Same as above 382' away. | 4 (Station 2) | NA | 21 | 72.4 | 85.8 | 73.8 |
| Bell 208B 82X idle 280' away. | 4 (Station 1) | NA | 38 | 70.4 | 85.9 | 72.3 |
| Same as above 410' away. | 4 (Station 2) | NA | 37 | 81.4 | 77.1 | 84.8 |
| Same Bell 208B at 1005' idle 200' away. | 4 (Station 1) | NA | 19 | 75.0 | 87.8 | 77.4 |
| Same as above 410' away. | 4 (Station 2) | NA | 20 | 87.4 | 80.4 | 88.1 |
| Same as above 500' away. | 4 (Station 3) | NA | [1] | [1] | [1] | 84 |
| Same Bell 208 takeoff 50' west. | 4 (Station 1) | 75 | 20 | 82.7 | 86.7 | 88.8 |
| Same as above. | 4 (Station 3) | 75 | 20 | 81.1 | 84.0 | 87.1 87 |
| Same as above. | 4 (Station 3) | 75 | [1] | [1] | [1] | 87 |
| Bell 208 82X idle 177' away. | 4 (Station 1) | NA | 18 | 73.8 | 86.2 | 74.8 |
| Same as above 310' away. | 4 (Station 2) | NA | 18 | 87.2 | 78.7 | 88.3 |
| Same as above 483' away. | 4 (Station 2) | NA | [1] | [1] | [1] | 80 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figure 8.18 for station locations.

[1] Noise levels measured with CNA which is not capable
of recording measurement duration, Leq, and SEL for single-event.

(continued on next page)

Table B.10 (continued)

| Event Description | Location* | Estimated | Measurement | Leq | SEL | Lmax |
|--|------------------|-----------------------|-----------------------|------|-------|------|
| | | Altitude [in feet] | Duration [seconds] | | | |
| Same Bell 208B at 100X idle 177' away. | 4 (Station 1) | NA | 18 | 80.8 | 83.3 | 82.5 |
| Same as above 310' away. | 4 (Station 2) | NA | 18 | 77.2 | 80.7 | 78.6 |
| Same as above 453' away. | 4 (Station 3) | NA | [1] | [1] | [1] | 72 |
| Bell 208B 62X idle 207' away. | 4 (Station 1) | NA | 45 | 71.1 | 87.6 | 72.3 |
| Same as above 340' away. | 4 (Station 2) | NA | 45 | 63.2 | 79.7 | 84.3 |
| Bell 208B flyover 800' west. | 4 (Station 1) | 500 | 18 | 65.7 | 78.4 | 68.2 |
| Same as above. | 4 (Station 2) | 500 | 20 | 65.4 | 78.3 | 68.5 |
| Same as above. | 4 (Station 3) | 500 | [1] | [1] | [1] | 68 |
| Bell 208B takeoff [south] overhead. | 4 (Station 1) | 40 | 16 | 88.0 | 100.0 | 90.0 |
| Same as above 50' west. | 4 (Station 2) | 50 | 16 | 83.4 | 95.4 | 80.0 |
| Same as above 75' west. | 4 (Station 3) | 75 | [1] | [1] | [1] | 80 |
| Bell 208B 62X idle 145' away. | 4 (Station 1) | NA | 27 | 78.7 | 81.0 | 77.7 |
| Same as above 280' away. | 4 (Station 2) | NA | 28 | 68.8 | 83.2 | 70.8 |
| Same as above 444' away. | 4 (Station 3) | NA | [1] | [1] | [1] | 82 |
| Same Bell 208 at 100X idle 147' away. | 4 (Station 1) | NA | 18 | 83.0 | 85.7 | 83.0 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figure B.10 for station locations.

[1] Noise Levels measured with CNA which is not capable of recording measurement duration, Leq, and SEL for single-event.

(continued on next page)

TABLE B.10 (continued)

| Event Description | Location* | Estimated | Measurement | Leq | SEL | Lmax |
|---|------------------|-----------------------|-----------------------|------|------|------|
| | | Altitude [in feet] | Duration [seconds] | | | |
| Same as above 200' away. | 4 (Station 2) | NA | 20 | 74.0 | 87.0 | 76.0 |
| Same as above 444' away. | 4 (Station 3) | NA | [1] | [1] | [1] | 80 |
| Same Bell 200 takeoff[south] 50' west. | 4 (Station 1) | 30 | 18 | 65.0 | 87.0 | 81.5 |
| Same as above. | 4 (Station 2) | 75 | 18 | 62.1 | 84.1 | 87.3 |
| Same as above. | 4 (Station 3) | 100 | [1] | [1] | [1] | 88 |
| Bell 200 flyover north to south 600' away. | 4 (Station 1) | 500 | 23 | 65.8 | 79.2 | 80.3 |
| Same as above. | 4 (Station 2) | 500 | 10 | 66.1 | 76.8 | 80.5 |
| Same as above. | 4 (Station 3) | 500 | [1] | [1] | [1] | 89 |
| Bell 206B flyover south to north 800' east. | 4 (Station 1) | 500 | 10 | 65.2 | 77.0 | 80.1 |
| Same as above. | 4 (Station 2) | 500 | 18 | 63.8 | 78.4 | 88.0 |
| Same as above. | 4 (Station 3) | 500 | [1] | [1] | [1] | 87 |
| Bell 206B 100X idle 257' away. | 4 (Station 1) | NA | 20 | 60.1 | 83.1 | 81.0 |
| Same as above 400' away. | 4 (Station 2) | NA | 21 | 73.4 | 86.5 | 76.1 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figure B.10 for station locations.

[1] Noise levels measured with CNA which is not capable of recording measurement duration, Leq, and SEL for single-event.

[continued on next page]

TABLE B.10 (continued)

| Event Description | Location* | Estimated Altitude (in feet) | Measurement Duration (seconds) | Leq | SEL | Lmax |
|---|------------------|------------------------------------|--------------------------------------|------|-------|------|
| Same as above 547' away. | 4 (Station 3) | NA | [1] | [1] | [1] | 88 |
| Same Bell 208B takeoff (south) overhead. | 4 (Station 1) | 40 | 22 | 83.8 | 97.2 | 91.0 |
| Same as above. | 4 (Station 2) | 50 | 20 | 78.7 | 93.0 | 87.2 |
| Same as above. | 4 (Station 3) | 75 | [1] | [1] | [1] | 85 |
| Bell 208 approach south to north overhead. | 4 (Station 3) | 50 | [1] | [1] | [1] | 81 |
| Same as above. | 4 (Station 2) | 50 | 37 | 84.3 | 100.2 | 91.3 |
| Same as above. | 4 (Station 1) | 50 | 38 | 88.5 | 102.2 | 91.8 |
| Bell 208B takeoff (south) overhead. | 4 (Station 3) | 75 | [1] | [1] | [1] | 86 |
| Bell 208B flyover directly overhead flying north to south. | 5 | 500 | 78 | 61.1 | 80.0 | 80.5 |
| Bell 208B flyover 1500' away. | 5 | 500 | 22 | 80.8 | 74.2 | 83.8 |
| Bell 214 flyover east to west 1200' away. | 5 | 300 | 84 | 61.2 | 80.3 | 80.1 |
| Bell 206L 100' north of station. | 5 | 200 | 44 | 70.5 | 86.9 | 70.7 |
| Large helicopter flyover 800' away east to west. | 5 | 300 | 27 | 83.3 | 77.5 | 87.4 |

All noise data recorded with A-frequency weighting and slow response time averaging.

* See Figure B.10 for station locations.

[1] Noise levels measured with CNA which is not capable of recording measurement duration, Leq, and SEL for single-event.

(Table continued on next page)

Table 8.10(cont.)

| Event Description | Location* | Estimated Altitude (in feet) | Measurement Duration (seconds) | Leq | SEL | Lmax |
|---|-----------|------------------------------------|--------------------------------------|------|------|------|
| Large helicopter flyover 500' away east to west. | 5 | 300 | 41 | 68.1 | 82.2 | 71.5 |
| Bell 208B flyover 400' away east to west. | 5 | 300 | 40 | 67.1 | 83.0 | 72.4 |
| Bell 208B flyover to south 500' away. | 5 | 400 | 52 | 68.8 | 77.8 | 85.5 |
| Large helicopter flyover 500' away. | 5 | 300 | 39 | 68.8 | 82.7 | 73.0 |
| Bell 208B flyover 1000' west of station heading south. | 6 | 300 | 44 | 57.8 | 74.1 | 62.8 |
| Bell 208B flyover 1200' north of station flying west to east. | 6 | 500 | 18 | 62.3 | 75.1 | 65.1 |
| Bell 214 flying east to west 1200' away. | 6 | 300 | 68 | 63.4 | 81.6 | 70.2 |
| Bell 208L 100' south of station flying east to west. | 6 | 200 | 23 | 78.7 | 88.3 | 81.5 |
| Large helicopter flyover 1000' away. | 6 | 300 | 25 | 63.7 | 77.8 | 68.0 |
| Large helicopter directly overhead. | 6 | 300 | 21 | 78.3 | 88.5 | 82.8 |
| Bell 208B flyover 300' away. | 6 | 300 | 28 | 67.3 | 81.4 | 71.4 |
| Bell 208B flyover 800' away. | 6 | 300 | 21 | 61.2 | 74.3 | 63.8 |
| Large helicopter directly overhead. | 6 | 250 | 21 | 73.2 | 88.4 | 78.0 |

All noise data were recorded with A-frequency weighting and slow response time averaging.

* See Figure 8.10 for station locations.

[1] Noise levels measured with the CNA which is not capable of recording measurement duration, Leq, and SEL for single events.