June 2022 (Amended January 2023)

Lihue Airport | Lihue, Kauai, Hawaii

Title 14 Code of Federal Regulations Part 150,
Airport Noise Compatibility Planning

Noise Exposure Map Update

Prepared for:

State of Hawaii, Department of Transportation – Airports Division

JUNE 2022 (AMENDED JANUARY 2023)

Lihue Airport

Title 14 Code of Federal Regulations Part 150, Airport Noise Compatibility Planning

Noise Exposure Map Update

Prepared for:

State of Hawaii, Department of Transportation – Airports Division

Prepared by:

RICONDO

AMENDMENT TO THE NOISE EXPOSURE MAP UPDATE REPORT

The Title 14 Code of Federal Regulations Part 150, Airport Noise Compatibility Planning, Noise Exposure Map (NEM) Update for Lihue Airport (NEM Update Report) was originally submitted to the Federal Aviation Administration (FAA) on June 16, 2022. The FAA has conducted a formal review and provided comments to the NEM Update Report. In response to the FAA's comments, the NEMs have been amended, and the Sponsor's Certification has subsequently been updated. This NEM Update Report includes updated content in response to FAA's formal review comments. **Appendix F** includes the FAA's formal review comments and responses to those comments.

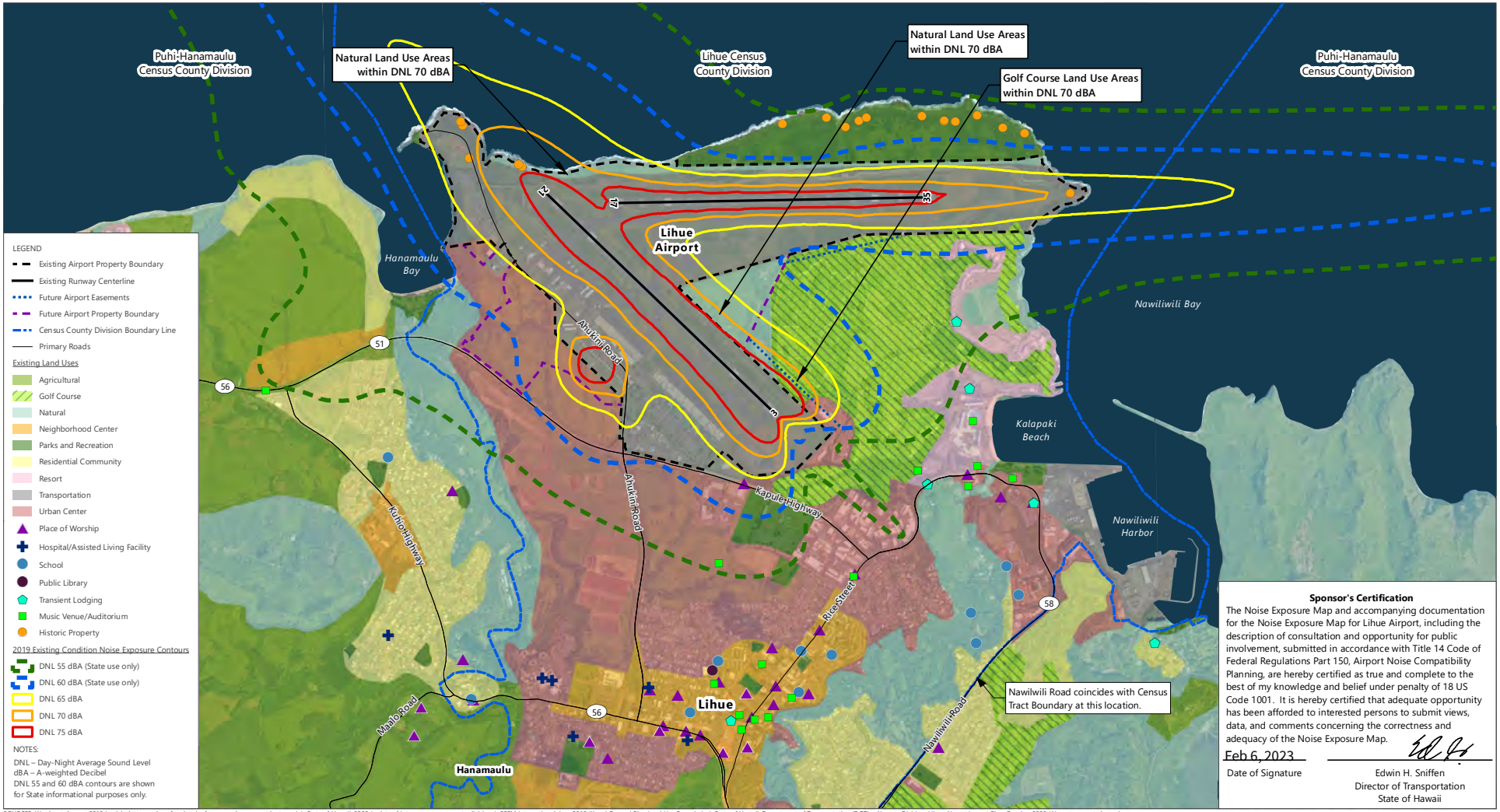
SPONSOR'S CERTIFICATION

The Noise Exposure Maps and accompanying documentation for the Noise Exposure Maps for Lihue Airport, including the description of consultation and opportunity for public involvement, submitted in accordance with Title 14 Code of Federal Regulations Part 150, *Airport Noise Compatibility Planning*, are hereby certified as true and complete to the best of my knowledge and belief under penalty of 18 US Code 1001. It is hereby certified that adequate opportunity has been afforded to interested persons to submit views, data, and comments concerning the correctness and adequacy of the Noise Exposure Maps and descriptions of forecast aircraft operations.

Feb 6, 2023

Edwin H. Sniffen
Director of Transportation
State of Hawaii

Date



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Feb 6, 2023
Date of Signature

Edwin H. Sniffen
Director of Transportation
State of Hawaii

SOURCES: Woolpert, August 2019 (aerial photography – for visual reference only, may not be to scale); State of Hawaii, 2020 (points of interest, census county divisions); SSFM International, Inc., 2018 (Kauai General Plan Land Use Boundaries); State of Hawaii, Department of Transportation (DOT) – Airports Division, Lihue Airport Layout Plan, October 2020 (Airport property boundary, future Airport property boundary, and future Airport easements); County of Kauai, https://kauai.gov/Government/Departments-Agencies/Public-Works/Building-Division/Projects/Bike-Path-Project/Nawiliwili-Ahukini-Bike-Path (accessed May 19, 2021); Wilson Okamoto Corporation and State of Hawaii DOT – Airports Division, *Final Environmental Impact Statement: Lihue Airport Improvements Appendix D*, November 2007 (historic properties); US Census Bureau, 2021 (roads); Ricondo & Associates, Inc., based on Federal Aviation Administration (FAA) Aviation Environmental Design Tool (AEDT), Version 3d, November 2021 (noise contours).

EXHIBIT NEM-1

2019 EXISTING CONDITION
NOISE EXPOSURE MAP

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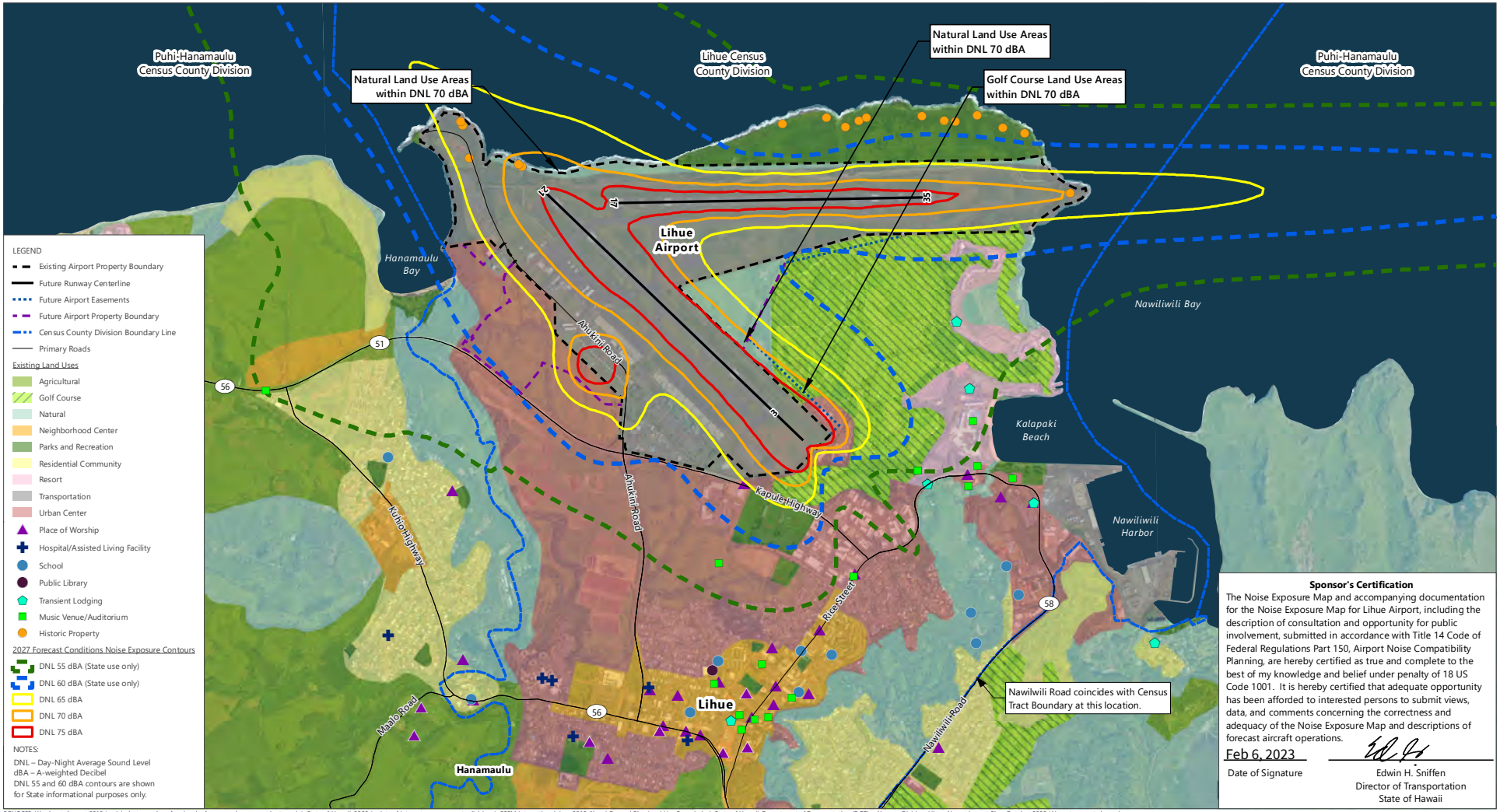

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EXHIBIT NEM-2

2027 FORECAST CONDITIONS
NOISE EXPOSURE MAP

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1. INTRODUCTION

This report documents the methodology, data, and results used to prepare the Title 14 Code of Federal Regulations (CFR) Part 150, *Airport Noise Compatibility Planning*, Noise Exposure Map (NEM) Update study (Part 150 NEM Update study or the Study) for Lihue Airport (LIH or the Airport). The update process requires a reasonable representation of the existing condition and forecast conditions; the forecast year should be at least five years from the date of submittal of the NEMs to the FAA.[1]

The impacts of the Coronavirus Disease 2019 (COVID-19) pandemic affected operations in 2020 and 2021. The Study timeline was also affected as traveling and face-to-face meetings were significantly reduced. The Study was submitted to the FAA in 2022, with forecast conditions for 2027 and using the year 2019 to represent the existing conditions. Section 1.3.1.1 further explains the use of 2019, rather than 2021 or 2022, to represent existing conditions.

1.1 TITLE 14 CODE OF FEDERAL REGULATIONS PART 150

14 CFR Part 150 sets forth the regulations and guidelines for airport sponsors to undertake airport noise compatibility planning. The 14 CFR Part 150 regulations were promulgated by the FAA pursuant to the Aviation Safety and Noise Abatement Act of 1979 (ASNA), Public Law 96-193, which required the establishment of a single methodology for measuring aircraft noise (noise), determining noise exposure, and identifying land uses that are normally compatible with various levels of noise exposure. Under ASNA, airport operators can voluntarily submit NEMs and noise compatibility programs (NCPs) to the FAA for review and acceptance. The two required NEMs provide information on the existing and forecast areas of various levels of annual average noise exposure surrounding an airport. The NCP provides measures intended to mitigate the impacts of the significant noise exposure on residential areas near an airport and to restrict the introduction of new incompatible land uses into locations exposed to significant noise levels.

Through 14 CFR Part 150, the FAA established regulations to govern the technical aspects of aircraft noise analysis and the public participation process for airport sponsors to prepare airport NCPs. As previously noted, the 14 CFR Part 150 program is a voluntary program; it provides flexibility for an airport sponsor to choose to prepare an NEM only. This is often done in cases such as LIH, where complete 14 CFR Part 150 studies, including an NCP, have been developed in the past.

1.2 BACKGROUND

The State of Hawaii, Department of Transportation – Airports Division (DOT-A) completed the last 14 CFR Part 150 NEM and NCP Study for LIH in 1989. The FAA accepted the NEMs in May 1990 and approved the NCP in January 1992. DOT-A decided to update the NEMs to reflect current and forecast operations, changes in the aircraft used by operators, and changes to the airfield, such as the runway safety area (RSA) improvements described in the *Lihue Airport Runway 3-21 Runway Safety Area Improvements Final Environmental Assessment* (EA).[2]

[1] 14 CFR 150.21.

[2] US Department of Transportation, Federal; Aviation Administration, *Lihue Airport Runway 3-21 Runway Safety Area Improvements Final Environmental Assessment*, March 2018.

1.3 STUDY APPROACH

This section describes the approach to developing the updated NEMs for LIH. The NEM component of a 14 CFR Part 150 study presents aircraft noise exposure contours (contours) that provide a reasonable representation of the existing condition and forecast conditions at least five years from the date of submittal of the NEMs to the FAA. A noise contour is a line on a map that represents equal levels of noise exposure. The methodology, noise metric, and land use data applied to develop the NEMs are described in the following subsections.

1.3.1 METHODOLOGY

14 CFR Part 150 requires the use of standard methodologies and metrics for analyzing and describing noise. The standard methodology begins with the noise model. The FAA requires that NEMs are developed using an approved noise model. The noise levels computed for the Study were prepared using Version 3d of the FAA's Aviation Environmental Design Tool (AEDT), which is the FAA-approved model for determining aircraft noise exposure around airports. At the time the Study started, AEDT Version 3d was the most current. The AEDT was developed under the guidance of the FAA and is the only model generally approved by the FAA for use in 14 CFR Part 150 studies. The noise pattern calculated by the AEDT for an airport is a function of several factors, including the definition of the airfield (runways/helipads), the number of aircraft operations during the period evaluated (operations), the types of aircraft flown (fleet mix), the time of day when aircraft are flown, the way aircraft are flown (performance), the frequency of runway landing and takeoff (runway use), and the routes followed to and from the runways (noise model tracks). Substantial variations in any one of these factors, when extended over a long period of time, may cause marked changes to the noise pattern. The following subsections summarize the data used to develop the NEMs.

1.3.1.1 EXISTING CONDITION

The first step is to develop the NEM that depicts existing noise exposure and land uses in the vicinity of an airport. The data collection and preliminary analysis for the Study were initiated in mid-2020, using data for the previous calendar year—2019. Since the most recently complete calendar year at the time the Study started was 2019, the data-gathering effort focused on 2019.

Following the onset of the COVID-19 pandemic in March 2020, operations decreased substantially at LIH. The decrease in operations is assumed to be temporary, similar to the sudden declines in aviation activity caused by prior shocks to the economy and aviation industry, such as the September 11, 2001 terrorist attacks. The post–COVID-19 pandemic growth in operations is expected to occur at a higher rate than normal over the short-term as the aviation system recovers. The 2020 FAA Terminal Area Forecast (TAF)[3] released in May 2021 focuses on the forecast recovery from the COVID-19 pandemic. The FAA forecast a 13 percent compound annual growth rate (CAGR)[4] between 2020 and 2025 at LIH, a high growth rate compared to typical historical growth rates. The 2021 TAF released by the FAA in March 2022 indicates a similar high short-term growth rate at LIH as the aviation system recovers to 2019 levels between 2021 and 2024. Based on the FAA's TAF, recovery is expected to occur within the next four years.

Due to the temporary nature of the effects from the COVID-19 pandemic and the potential for substantial growth to pre–COVID-19 pandemic levels between 2021 and 2025, it was determined that 2019, rather than 2021 or 2022, remains a reasonable representation of the existing condition for the NEM Update land use compatibility analysis.

[3] US Department of Transportation, Federal Aviation Administration, *2020 Terminal Area Forecast*, May 2021.

[4] The CAGR represents the annual growth rate experienced over a specified period of time.

This approach of applying a different year to represent the existing condition has also been applied when short-term conditions, such as a runway closure, occur at an airport during a given year. A runway closure impacts runway usage, flight track use, and potentially operations levels. If a runway closure occurred for a long period of time in a year, then the year is determined not to be a reasonable representation of existing conditions; therefore, a prior year is considered. Use of 2019 data to represent the existing condition follows the same logic. Therefore, DOT-A concluded that 2019 serves as a reasonable representation of the existing condition. A request to consider 2019 as a reasonable representation of existing conditions was sent to the FAA in December 2021. In their response on January 21, 2022, the FAA concurred with the use of 2019 to represent existing conditions for the Part 150 NEM Update study (see **Appendix B.1**).

The following describe the data used for each noise model input:

- **Airfield:** The primary source for the runway dimensions is the current FAA-approved Airport Layout Plan (ALP).[5]
- **Operation counts:** LIH airport traffic control tower (ATCT) counts by user category provided in the FAA's Distributed Operations Network (OPSNET) were used to derive a representative average annual day (AAD) level of operations. The AAD total count was divided by 2 to derive an operation count for arrivals and departures.
- **Time of day:** Air carrier published flight schedules, US Department of Transportation (US DOT) T-100 data, and the FAA's Distributed OPSNET for 2019 were used for scheduled service time-of-day distributions. There were no data related to time-of-day available for unscheduled operations (general aviation, military, and air tour); therefore, the time-of-day distributions reported in the FAA's Distributed OPSNET report for 2019 served as the primary source, with some refinements to helicopter day/night distributions based on the 1989 Lihue Airport 14 CFR Part 150 NEM and NCP and the 2008 Lihue Airport 14 CFR Part 150 NCP Update reports. Consultation with DOT-A and LIH ATCT confirmed the time-of-day distributions for unscheduled operations developed from the listed sources reasonably represent the 2019 existing condition. The data and information were used to develop a day/night proportion by user category to distribute total operations by user category by time of day.
- **Fleet mix:** Air carrier published flight schedules were used to identify commercial aircraft service by aircraft type. The FAA's Traffic Flow Management System Counts (TFMSC) data for 2019 and based aircraft were used to develop a representative AAD fleet mix for unscheduled operations. An internet survey was conducted related to air tour operators to refine the fleet mix for air tour operations, including helicopters. Consultation with DOT-A and LIH ATCT confirmed the unscheduled aircraft-type assumptions reasonably represent the 2019 existing condition. The data was used to develop a fleet mix proportion by user category to distribute total operations by user category by aircraft type.
- **Flight tracks:** Radar track data that would typically be used to develop modeled flight tracks were not available; therefore, the generalized noise model tracks representing routes for fixed-wing and helicopter aircraft were developed based on previous noise model assessments and input from the LIH ATCT.
- **Runway use:** Runway use was based on a wind analysis using National Oceanic and Atmospheric Administration (NOAA) data from January 1, 2009, to December 31, 2018, at LIH and was compared to previous 14 CFR Part 150 assessments and the *Lihue Airport Runway 3-21 Runway Safety Area Improvements Final EA* to confirm the wind analysis results were reasonable. Consultation with DOT-A and LIH ATCT confirmed the runway-use assumptions reasonably represent the 2019 existing condition. The Study assumes a continuation of the current informal Preferential Runway Use Program:

[5] State of Hawaii, Department of Transportation – Airports Division, *Conditional Airport Layout Plan Approval*, October 2020.

- Runways 3, 17, and 35 are the noise abatement departure runways for large (over 12,500 pounds gross weight) propeller and jet-powered aircraft. Upon departure from these three runways, the noise abatement procedure is to climb and initiate turns toward the ocean (if practicable) following liftoff.
- Runways 17, 21, and 35 are the noise abatement arrival runways for large (over 12,500 pounds gross weight) propeller and jet-powered aircraft. All noise abatement approaches to these runways are from a seaward direction.
- Runway 3-21 is the preferred noise abatement runway for local general aviation operations. Military training operations using military aircraft based on Oahu are the primary training operations conducted on Runway 17-35.

- **Aircraft performance:** To model aircraft performance and arrival and departure noise, the AEDT provides standard aircraft performance data. The standard AEDT performance profiles were used. The AEDT accounts for the departure weight of fixed-wing aircraft when modeling performance based on how far the destination is from an airport and the associated fuel required for the trip. The ranges are broken into stage lengths. Departure stage lengths for fixed-wing aircraft departures were assigned based on the great circle distance from LIH to the destination.

Refer to Chapter 2 for more information on the data inputs for the 2019 existing condition AEDT model.

1.3.1.2 FORECAST CONDITIONS

The 2027 Forecast Conditions NEM depicts noise exposure levels anticipated for at least five years from the date the Part 150 NEM Update is submitted to the FAA (forecast conditions) for review, which is 2022. The 2027 Forecast Conditions NEM was developed using forecast aircraft activity at LIH for 2027, as derived from the *Lihue Airport Master Plan and Noise Exposure Map Update – Aviation Activity Forecasts* report (the Master Plan Forecast Report) that was approved by the FAA on September 30, 2020.[6] Comparison to both the 2020 TAF and 2021 TAF indicate that the *Lihue Airport Master Plan and Noise Exposure Map Update – Aviation Activity Forecast* operation levels for 2027 are within 10 percent of the FAA TAF. Details of the forecast and FAA approval letter can be found in **Appendix B**. The following describe the data used for the 2027 forecast conditions:

- **Airfield:** The departure end location of Runway 3 and the displaced landing thresholds for Runway 3 and Runway 21 were changed to reflect the runway safety area improvements as presented in the *Lihue Airport Runway 3-21 Runway Safety Area Improvements Final EA*. The future dimensions were based on the current FAA-approved ALP depicting future conditions.[7]
- **Operation counts:** Based on the FAA-approved Lihue Airport Master Plan Forecast (Master Plan Forecast), the AAD total count was divided by 2 to derive an operation count for arrivals and departures.
- **Time of day:** Scheduled operations were based on a forecast flight schedule developed for the Lihue Airport Master Plan Update (Master Plan Update) that includes time of day. For unscheduled operations, the 2019 time-of-day distributions were held constant for 2027. The time of day for 2027 scheduled service is different compared to 2019 based on scheduled flight adjustments based on forecast analysis.
- **Fleet mix:** The forecast fleet mix for scheduled operations was developed based on the published airline aircraft orders and forecast aircraft sizes needed to accommodate passenger demand. The unscheduled operations

[6] US Department of Transportation, Federal Aviation Administration, *Aviation Forecast Approval-Lihue Master Plan,* September 30, 2020.

[7] State of Hawaii, Department of Transportation – Airports Division, *Conditional Airport Layout Plan Approval*, October 2020.

fleet mix was based on the 2019 aircraft types. The percentage use of unscheduled operations aircraft types for 2019 was maintained for 2027.

- **Flight tracks:** Changes to the flight tracks are not expected in the forecast year; therefore, definition and use of noise model tracks from the 2019 existing condition AEDT model were applied.
- **Runway use:** Changes to runway use are not expected in the forecast year; therefore, definition and use of noise model tracks from the 2019 existing condition AEDT model were applied.
- **Aircraft performance:** Standard performance profiles were used, and departure stage lengths for fixed-wing aircraft departures were assigned based on great-circle distance from LIH to the expected destinations. Markets identified in the forecast were accounted for in the 2027 departure stage length assessment.

Refer to Chapter 2 for more information on the data inputs for the 2027 forecast conditions AEDT model.

The LIH aviation activity forecasts prepared for the Master Plan Update and Part 150 NEM Update study were completed in March 2020, at the beginning of the COVID-19 pandemic. The uncertainties documented in Master Plan Forecast Report (refer to Appendix B) related to the severity and duration of the contraction in aviation activity resulting from the COVID-19 pandemic remain pertinent. While the United States has shown signs of recovery, other countries and economies in the world remain affected by widespread infections and slower vaccination rates.

In the FAA's 2020 TAF, the FAA noted the following: "There is uncertainty associated with the forecasts because of the uncertainty regarding the path of the [COVID-19] pandemic and its economic impacts. Particular attention was spent on forecasting the near-term recovery back to 2019 activity." According to the FAA and as noted earlier, the forecast demand for passengers and aircraft operations documented in the Master Plan Forecast Report will be delayed by approximately four years (with LIH reaching 2019 levels in 2025). A comparison between the Master Plan Forecast and the FAA's 2020 TAF for the years between 2025 and 2027 indicates that the Master Plan Forecast is within 10 percent of the FAA's 2020 TAF and therefore within the FAA's variance criteria considered to be consistent with the TAF.[8] **Table 1.3-1** lists the total annual operations for LIH as stated in the Master Plan Forecast and the FAA's TAF, as well as the variance between the two forecasts.

TABLE 1.3-1 LIHUE AIRPORT MASTER PLAN FORECAST AND FEDERAL AVIATION ADMINISTRATION 2020 TERMINAL AREA FORECAST COMPARISON

YEAR	MASTER PLAN FORECAST	FAA 2020 TAF	VARIANCE (%)
2025	143,020	132,270	8
2026	144,198	136,168	6
2027	145,378	138,792	5

NOTES:
FAA – Federal Aviation Administration
TAF – Terminal Area Forecast
SOURCES: Ricondo & Associates, Inc., *Lihue Airport Master Plan and Noise Exposure Map Update – Aviation Activity Forecasts*, March 2020; US Department of Transportation, Federal Aviation Administration, *2020 Terminal Area Forecast*, May 2021.

[8] US Department of Transportation, Federal Aviation Administration, https://www.faa.gov/airports/planning_capacity/media/approval_local_forecasts_2008.pdf (accessed October 11, 2021).

The number of aircraft operations reported in the Master Plan Forecast for 2027 was used to develop the operations levels for the 2027 forecast conditions and have the potential to be higher than what might actually occur post–COVID-19 pandemic recovery. However, the Master Plan Forecast 2027 operations are not more than 10 percent higher than the number of operations reported in the FAA's TAF for 2027. Due to the difficulty in determining the forecast impacts caused by the COVID-19 pandemic, it is uncertain as to what year the forecast operation levels will occur; however, based on both forecasts, it is reasonable to assume the Master Plan Forecast operation levels for 2027 represent operation levels at least five years from the year when the Study is submitted to the FAA for review. Therefore, the calculated noise exposure for 2027 represents conditions at least five years in the future.

1.3.2 NOISE METRICS

The FAA has stipulated that NEMs prepared under 14 CFR Part 150 be based on the annual day-night average sound level (DNL) noise metric. This metric was developed under the auspices of the US Environmental Protection Agency (EPA); it embodies extensive information regarding the physical description of transportation noise as related to human annoyance in residential areas.

DNL represents average noise levels over a 24-hour period, which are expressed in A-weighted decibels (dBA),[9] a sound pressure level metric that emphasizes sound at the frequency range over which the human ear is most sensitive. In the calculation of DNL, sound events occurring during the nighttime hours (10:00 p.m. to 7:00 a.m.) are increased by a 10-decibel weighting to represent the increased sensitivity of people to noise that occurs at night and the lower ambient noise levels during those hours. Aircraft DNL values represent the cumulative effects of all aircraft operations occurring during an average 24-hour period, referred to as the AAD, derived from aircraft operations data for an entire calendar year. The noise exposure contours depicted on NEMs are lines connecting points of equal noise level; for the Part 150 NEM Update study, the FAA-required levels are DNL 65 dBA, DNL 70 dBA, and DNL 75 dBA. Airport sponsors can opt to show noise contours at lower levels, but these must be differentiated from the levels required by the FAA if they have not been adopted as a planning standard by the local communities. The Part 150 NEM Update study includes noise contours for the DNL 55 dBA and DNL 60 dBA levels to assess the State of Hawaii's (State's) land use compatibility guidelines, as described in Section 1.3.4.

1.3.3 FEDERAL AVIATION ADMINISTRATION AIRCRAFT NOISE AND LAND USE COMPATIBILITY

To understand the relationship between land uses and noise exposure associated with arriving and departing flights at an airport, 14 CFR Part 150 requires that land uses in the airport environs be reviewed. This includes delineation of land uses within the DNL contours and the identification of noise-sensitive uses that may be incompatible with the various levels of noise exposure.

Guidelines regarding the compatibility of land uses within various DNL contour intervals are specified in Appendix A of 14 CFR Part 150 (Table 1, "Land Use Compatibility with Yearly Day-Night Average Sound Level"). These guidelines are consistent with land use guidelines developed by other federal agencies, such as the US EPA and the US Department of Housing and Urban Development (HUD) and will be used in the Part 150 NEM Update study. The guidelines are provided in **Table A.2-2** of **Appendix A** of this document.

[9] US Department of Transportation, Federal Aviation Administration, https://www.faa.gov/regulations_policies/policy_guidance/noise/glossary/ (accessed August 30, 2021). In studying the impact of airport noise on humans, decibels on the "A" weighted scale (dBA) are often used. This scale most closely approximates the relative loudness of sounds in the air as perceived by the human ear.

The FAA has determined that the major land uses listed in Table A.2-2 of Appendix A are normally compatible with aircraft noise less than DNL 65 dBA. Therefore, when evaluating land use compatibility, attention is focused on uses exposed to DNL 65 dBA and higher. As shown in Table A.2-2, the noise-sensitive land uses initially considered as incompatible can be compatible if noise attenuation is designed or retro-fitted into the building's structure to meet the noise level reductions (NLRs). These noise-sensitive land uses include residential, mobile home parks, transient lodging, schools, outdoor music venues, hospitals, nursing homes, places of worship,[10] auditoriums, and concert halls.

Commercial, manufacturing, and recreational land (parks, amusement parks, zoos, etc.) are generally less sensitive to noise and are considered compatible within noise levels up to DNL 70 dBA without noise attenuation and up to DNL 80 dBA with appropriate levels of noise attenuation.

Noise-sensitive areas within calculated levels of DNL 65 dBA and higher are not necessarily confirmed as being incompatible or eligible for mitigation; rather, these land use designations are initially considered incompatible and require further investigation. Factors that influence compatibility and/or eligibility for compatibility may include previous sound reduction treatments, current interior noise levels, structure condition, ambient and self-generated noise levels, whether a given use is considered temporary or permanent, and the timeframe within which a given structure was constructed.[11]

1.3.4 STATE LAND USE COMPATIBILITY GUIDELINES

DOT-A considers other noise compatibility and noise standards in addition to the FAA's aircraft and noise land use compatibility standards due to the outdoor lifestyle of the people and because most of Hawaii's residential structures are naturally ventilated. In accordance with 14 CFR Part 150 Section A150.101(d), the local aircraft noise land-use compatibly standards are based on local requirements and determinations associated with the local needs and values that dictate further delineation of compatibility. Application of local guidelines is also consistent with the 14 CFR Part 150 Table 1 – *Land Use Compatibility* With Yearly Day-Night Average Sound Levels* asterisk note which states:

> "The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses."

The outdoor-to-indoor sound reduction of these residential structures is moderately low (9 dBA), thus the exterior noise level of DNL 65 dBA does not eradicate all the risks of adverse noise impacts. The other noise compatibility standards are summarized as follows:

- US EPA 550/9-74-004 recommends that an exterior noise level of DNL 55 dBA is considered as "Unconditionally Acceptable or Near-Zero Risk."

[10] Places of worship represents facilities similar to "churches" as indicated in Table A.2-2 of Appendix A.

[11] On March 27, 1998, the FAA issued a policy on 14 CFR Part 150 airport noise compatibility programs that limits approval of remedial mitigation measures, e.g., soundproofing, property acquisitions, and relocation, to land uses that were in place as of October 1, 1998, unless an airport sponsor can demonstrate that DNL contours were not published prior to that date. New non-compatible uses resulting from airport expansion may be eligible for consideration.

- American National Standards Institute (ANSI) S3.23-1980 recommends "to incorporate the lower outdoor-to-indoor NLR characteristics of naturally ventilated structures and provide additional weight to extensive outdoor land uses."
- Federal Housing Authority / HUD and the US Department of Veterans Affairs acknowledge that noise levels between DNL 55 dBA and DNL 65 dBA have an adverse impact on communities. However, due to the cost and feasibility to enforce the DNL 55 dBA, the DNL 65 dBA has been selected as the regulatory standard.

As a result of reviewing all available noise compatibility standards, DOT-A established a compromise between the near-zero risk level of DNL 55 dBA and the significant risk level of DNL 65 dBA for naturally ventilated structures. DOT-A established stringent local land use compatibility guidelines and recommended that an aircraft noise limit of DNL 60 dBA should be used as a planning level for noise-sensitive land uses involving naturally ventilated structures, such as residential and public use (e.g., schools, libraries, places of worship, clinics, and meeting rooms). The State land use compatibility guidelines were taken from State of Hawaii statutes and the previous 14 CFR Part 150 NEM AND NCP reports published by DOT-A and are summarized in **Table A.2-3** of Appendix A.[12] [13,14]

The 1989 Lihue Airport 14 CFR Part 150 NEM and NCP Study noted that DOT-A consulted with the FAA to determine if the noise mitigation measures in areas subject to noise levels between DNL 60 dBA to DNL 65 dBA would be eligible for federal funding under the Part 150 NCP. According to the FAA's Honolulu District Office, the recommended noise mitigation measures are subject to specific case-by-case review for federal funding requests.

For the Part 150 NEM Update study, both the FAA guidelines and State recommended land use guidelines have been used to identify compatible and incompatible land uses.

Table 1.3-2 summarizes the general deviations of the State recommended land use guidelines from the FAA land use compatibility guidelines.

1.3.5 SUPPLEMENTAL INFORMATION

The DNL 55 dBA noise contour is presented as supplemental information for stakeholders, as they consider the noise environment around the Airport and support the DOT-A noise land use policy. The 1989 Lihue Airport 14 CFR Part 150 NEM and NCP Study recommended application of DNL 55 dBA and higher to notify buyers of potential aircraft noise impacts.[15] The pursuit of this requirement was approved by the FAA in review of the 1989 Lihue Airport 14 CFR Part 150 NEM and NCP Study.[16] However, there is no codified State or local law that specifies this requirement. Session Laws of Hawaii (SLH) 1987, Act 208 (mentioned in the 1989 Lihue Airport 14 CFR Part 150 NEM and NCP Study) refers only to real property and Hawaii Revised Statutes (HRS) 508D-15 refers to residential

[12] Hawaii Revised Statutes 205-2, *Districting and Classification of Lands*.

[13] State of Hawaii Department of Transportation – Airports Division, *Lihue Airport Noise Compatibility Program: Volume I -– Noise Exposure Map Report and Volume II -– Noise Compatibility Program Report*, 1989.

[14] State of Hawaii Department of Transportation – Airports Division, *Hilo International Airport FAR Part 150 Noise Exposure Map Update*, April 2013.

[15] State of Hawaii Department of Transportation – Airports Division, *Lihue Airport Noise Compatibility Program: Volume I – Noise Exposure Map Report*, May 1989, pp. 31, 258, and 264.

[16] US Department of Transportation, Federal Aviation Administration, Record of Approval Letter, February 1992.

real property.[17,18] As a result, the DNL 55 dBA noise contour and number of residential units located within the noise contour is provided for State of Hawaii informational purposes only.

TABLE 1.3-2 SUMMARY OF DEVIATIONS OF THE STATE OF HAWAII, DEPARTMENT OF TRANSPORTATION – AIRPORTS DIVISION RECOMMENDED LAND USE GUIDELINES FROM THE FAA LAND USE GUIDELINES

DOT-A RECOMMENDED GUIDELINES
Land Use Category Recommendations
Residential land use category is delineated into low density and high density.
Additional land use categories included under recreation: professional/resort sport facilities, locations of media events, extensive natural wildlife, and recreation areas.
Noise Level and Noise Level Reduction (NLR) Recommendations
Criteria of yearly DNL ranges in DOT-A recommended guidelines are below DNL 60 dBA to DNL 85 dBA in lieu of below DNL 65 dBA to over DNL 85 dBA in FAA guidelines.
NLR should achieve interior levels of DNL 45 dBA or less into building codes and be considered in individual approvals. Normal local construction can be expected to provide an average NLR of approximately 9 dBA.
NLR requirements should be evaluated and not be based solely upon the exterior DNL exposure level for schools, indoor auditoriums, concert halls, studios without outdoor sets, broadcasting, and production facilities.
No indication of dBA measurement to achieve required NLR for the design and construction of buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

NOTES:
DNL – Day-Night Average Sound Level
dBA – A-Weighted Decibels
NLR – Noise Level Reduction
SOURCES: Hawaii Revised Statutes 205-2, *Districting and Classification of Lands*; State of Hawaii Department of Transportation – Airports Division, *Hilo International Airport FAR Part 150 Noise Exposure Map Update*, April 2013; State of Hawaii Department of Transportation – Airports Division, *Lihue Airport Noise Compatibility Plan, Volume 1, Noise Exposure Map Report*, May 1989; Ricondo & Associates, October 2021.

[17] Hawaii State Legislature, https://www.capitol.hawaii.gov/slh/Years/SLH1987/Volume1/SLH1987_Act208.pdf (accessed November 29, 2021).

[18] Kawaoka, Lynette, Planner, State of Hawaii Department of Transportation – Airports Division, "State Disclosure for 60 and 55 DNL Contours," email to Ricondo & Associates, Inc. Staff, November 23, 2021.

2. DATA PREPARATION AND NOISE MODELING

The data required for the preparation of NEMs under 14 CFR Part 150 includes basemaps, land use, zoning, dwellings, population, and airport/aircraft operational and procedural data. The following subsections describe each data set used to model the aircraft noise and compute the impacts of aircraft operations at LIH.

2.1 BASEMAPPING

For existing zoning and land use, noise model tracks, and NEMs, a 2019 orthoimage[19] was used as the base. Additionally, primary roadways[20] and census county division boundaries[21] are added to provide geographic reference. The basemap also depicts the existing airport property boundary as well as the future airport property boundary and future airport easements for reference. Future airport property will avoid the Lihue Refuse Transfer Station, located directly north of existing Airport property, and future airport easements will include areas necessary for transportation access. The basemap extent is within the Puhi-Hanamaulu Census County Division Boundary and the Lihue Census County Division Boundary. The County of Kauai has jurisdiction over land uses around the Airport; however, the county boundary lines are not shown on the basemap because the county comprises the entire island. The subsequent section details existing and future airfield configurations.

2.2 AIRFIELD

The following subsections describe the configuration of the major airfield components at LIH.

2.2.1 EXISTING AIRFIELD

Exhibit 2.2-1 depicts the location of the existing runways, taxiways, and helipads.

2.2.1.1 RUNWAYS

LIH has two runways:

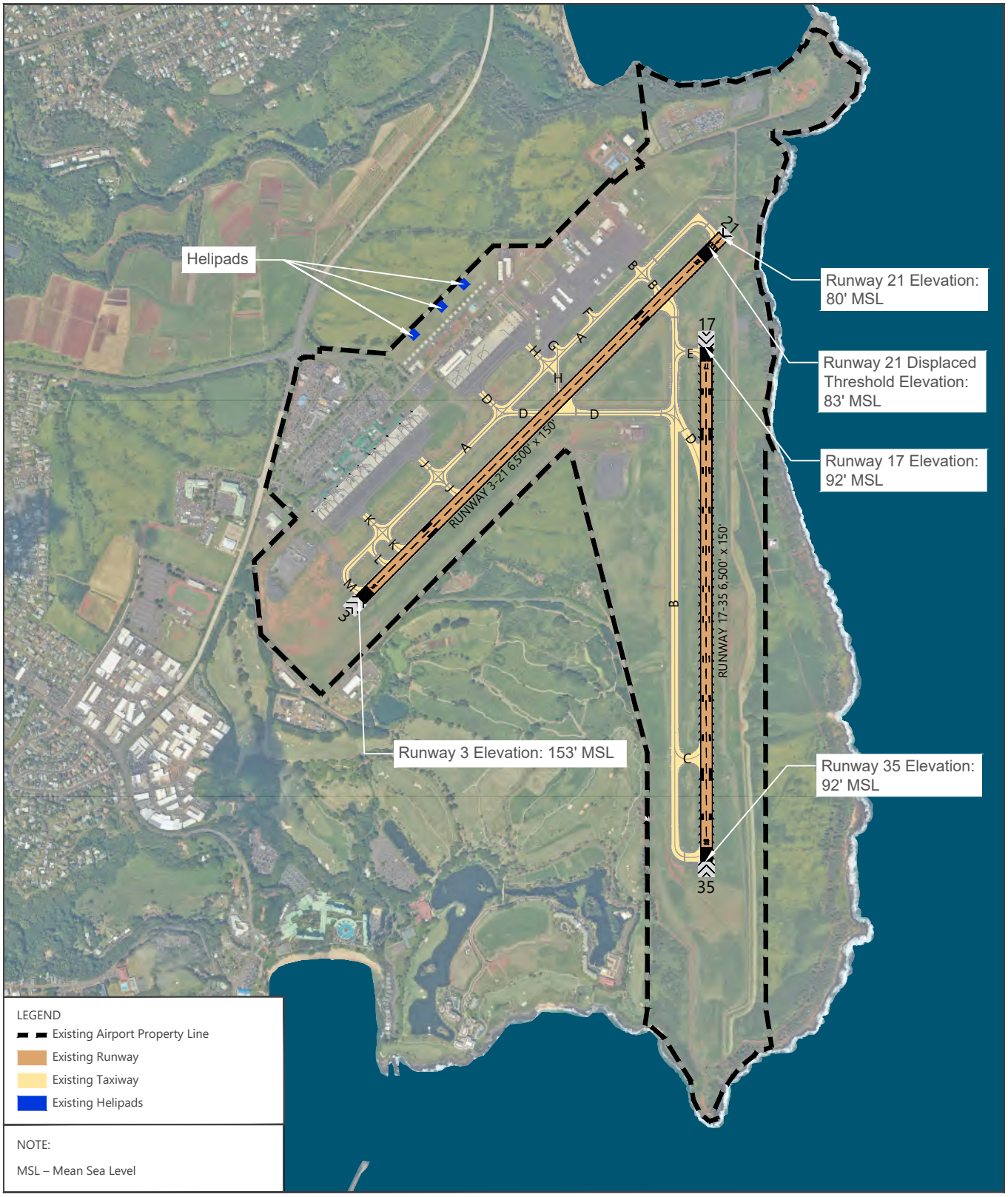
- Runway 3-21: oriented in a northeast–southwest direction
- Runway 17-35: oriented in a north–south direction

Table 2.2-1 presents additional information regarding the existing runways at LIH based on the FAA-approved ALP. Runway 3-21 is 6,500-feet long and 150-feet wide. There is a 205-foot displaced threshold at the Runway 21 end. The Runway 3 end elevation is approximately 153 feet above mean sea level (MSL), and the Runway 21 end elevation is approximately 80 feet above MSL. Runway 17-35 is 6,500-feet long and 150-feet wide. The Runway 17 end elevation is approximately 92 feet above MSL, and the Runway 35 end elevation is approximately 92 feet above MSL.

[19] Woolpert, August 2019.

[20] US Census Bureau, 2021, https://www.census.gov/cgi-bin/geo/shapefiles/index.php?year=2021&layergroup=Roads (accessed September 15, 2021).

[21] State of Hawaii, 2020, https://geoportal.hawaii.gov/datasets/HiStateGIS::2020-census-county-divisions-districts/about (accessed October 19, 2021).



SOURCES: State of Hawaii, Department of Transportation – Airports Division, *Conditonal Airport Layout Plan Approval*, October 2020; Woolpert, August 2019 (aerial imagery); Ricondo & Associates, Inc., October 2021.

EXHIBIT 2.2-1

NORTH 0 1,800 ft.

AIRFIELD CONFIGURATION - 2019 EXISTING CONDITION

Drawing: P:\project-chicago\Hawaii\LIH\07-master plan\2-NEM\2.4-NEM Documentation\Exhibits\CAD\Exhibit 2.2-1-2 Airfield Facilities.dwgLayout: Existing Plotted: Jan 20, 2023, 02:21PM

TABLE 2.2-1 RUNWAY CHARACTERISTICS – 2019 EXISTING CONDITION

DESCRIPTION	RUNWAY			
	3	21	17	35
Runway Length (feet)	6,500		6,500	
Runway Width (feet)	150		150	
Runway Surface Type	Asphalt		Asphalt	
Runway Surface Treatment	Grooved		Grooved	
Runway Pavement Strength by PCN	75/F/A/W/T		75/F/A/W/T	
Runway Pavement Strength				
Single-Wheel (pounds)	75,000		75,000	
Double-Wheel (pounds)	200,000		175,000	
Double Tandem (pounds)	350,000		250,000	
Dual Double Tandem (pounds)	730,000		630,000	
Runway Lighting	MIRL		HIRL	
Runway End Elevation (feet)	152.5	80.4	91.5	91.5
Effective Gradient	-1.11%	1.11%	0.00%	-0.00%
Displaced Threshold (feet)	None	205	None	None
Declared Distances (feet)				
Takeoff Run Available (TORA)	6,500	6,500	6,500	6,500
Takeoff Distance Available (TODA)	6,500	6,500	6,500	6,500
Accelerate-Stop Distance Available (ASDA)	6,500	6,500	6,500	6,500
Landing Distance Available (LDA)	6,500	6,295	6,500	6,500
Navigational Aids	Visual	RNAV (GPS), RNAV (RNP), VOR/DME, TACAN	RNAV (GPS)	LOC, GS, RNAV (GPS), RNAV (RNP), VOR, TACAN
Visual Aids	PAPI, REIL, LDIN	PAPI, REIL	PAPI, REIL	PAPI, MALSR
Runway Design Code (RDC)	C/IV/VIS	C/IV/5000	C/IV/5000	C/IV/2400
Approach Reference Code (APRC)	D/V/VIS D/IV/VIS	D/IV/5000 D/V/5000	D/IV/5000 D/V/5000	D/IV/2400 D/V/2400
Departure Reference Code (DPRC)	D/IV D/V	D/IV D/V	D/IV D/V	D/IV D/V

NOTES:
A refers to high strength subgrade for flexible pavement.
F refers to flexible pavement.
W refers to no tire pressure limit.
T refers to PCN value obtained by a technical evaluation.
GS – Glideslope
HIRL – High Intensity Runway Lights
LDIN – Lead-in Lights
LOC – Localizer
PAPI – Precision Approach Path Indicator
PCN – Pavement Classification Number
MALSR – Medium-Intensity Approach Lighting System with Runway Alignment Indicator Lights
MIRL – Medium Intensity Runway Lights
REIL – Runway End Identifier Lights
RNAV (GPS) – Area Navigation – Global Positioning System
RNAV (RNP) – Area Navigation – Required Navigation Performance
TACAN – Tactical Air Navigation System
VIS – Visual
VOR/DME – Very High Frequency Omnidirectional Range with Distance Measuring Equipment
SOURCES: State of Hawaii, Department of Transportation – Airports Division, *Conditional Airport Layout Plan Approval* October 2020; State of Hawaii, Department of Transportation – Airports Division, *Airport Layout Plan Narrative Report*, August 2019; Ricondo & Associates, Inc., December 2021.

2.2.1.2 TAXIWAYS

As shown on Exhibit 2.2-1, a series of taxiways connects the two runways to the passenger terminal complex, air cargo aprons, fixed base operator facilities, and general aviation areas. Full-length taxiways run parallel to the two runways. Taxiway A and Taxiway B move aircraft parallel to Runways 3-21 and 17-35, respectively, when departing aircraft position for takeoff, or when arriving aircraft taxi to their gates after arrival. Individual connector taxiways connect the parallel taxiways to the runways. Taxiway D connects Taxiway A with Taxiway B.

2.2.1.3 HELIPORT

The heliport at LIH is located adjacent to Ahukini Road, northeast of the passenger terminal complex. Helicopter tour companies use the heliport for conducting operations to and from the Airport. There are three helipads located along the western edge of the heliport, 20 concrete helicopter passenger loading/unloading apron pads (1,600 square feet each) in the ramp area, and a grassed-surface taxi lane. The area where helicopters operate encompasses approximately 335,550 square feet. One helipad in the middle of the three helipads was modeled in the AEDT due to the proximity of the three helipads to each other.

2.2.2 FUTURE AIRFIELD

Exhibit 2.2-2 depicts the future airfield configuration with the runway improvements described in the *Lihue Airport Runway 3-21 Runway Safety Area Improvements Final EA* (March 2018) and on the FAA-approved ALP. **Table 2.2-2** presents additional information regarding the future airfield configuration at LIH, as expected in 2027.

2.2.2.1 RUNWAYS

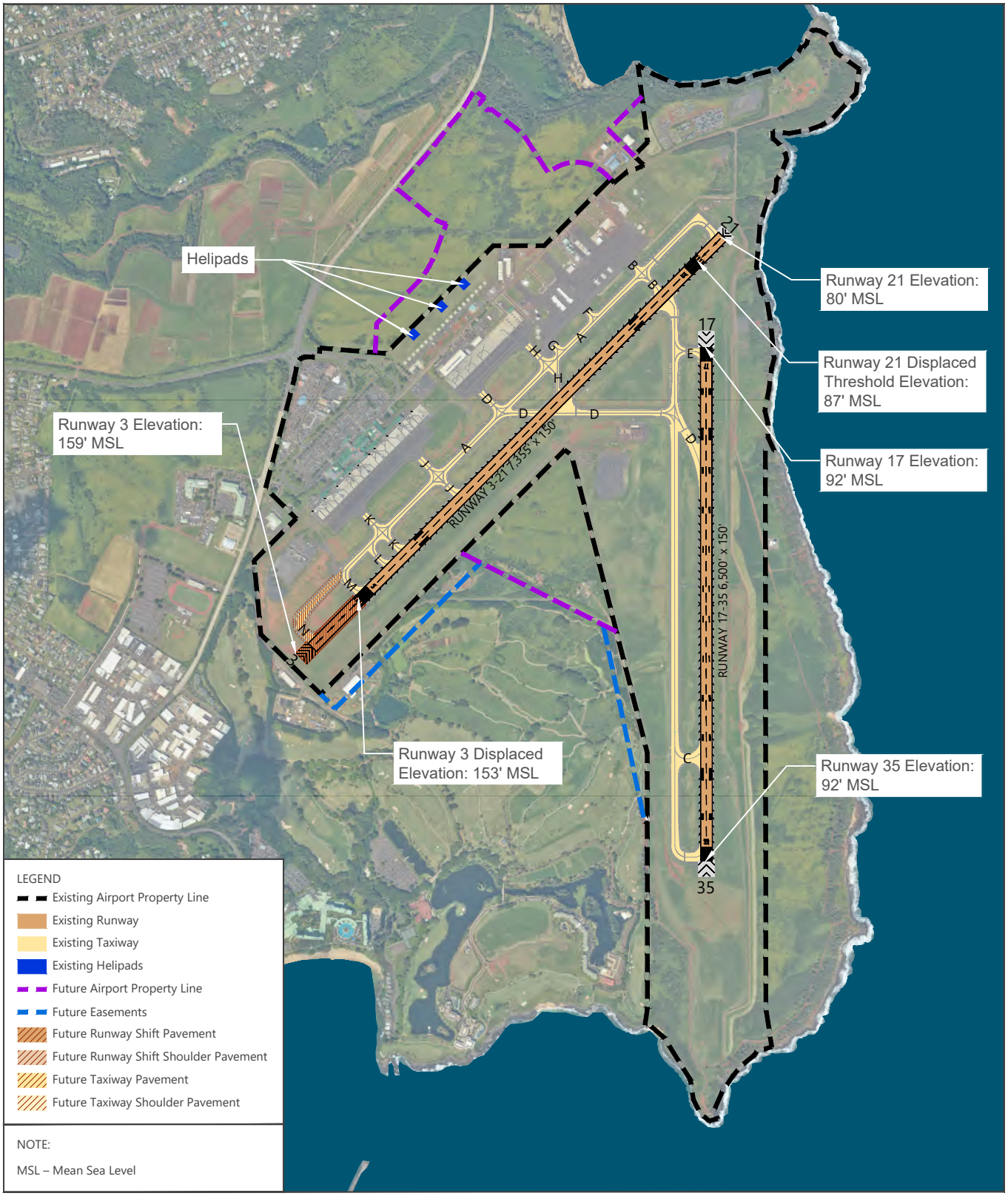
The RSA improvements to Runway 3-21 will increase the overall paved runway length by 855 feet, from 6,500 feet to 7,355 feet. The RSA improvements will not result in any changes to the runway capability or the types or percentages of aircraft that will use the runway. The primary components of the RSA improvements that affect operations and associated aircraft noise are summarized as follows:

- The departure end of Runway 3 shifts 855 feet to the southwest. The landing threshold will remain in the same location, resulting in an 855-foot displaced threshold for landings on Runway 3. This shift of the departure end of Runway 3 will allow aircraft to take off from the new runway end, 855 feet southwest of where aircraft take off under the existing condition.
- The existing Runway 21 landing displaced threshold will move 250 feet farther from the runway end, increasing the current displacement of 205 feet to 455 feet from the end of runway pavement (excludes blast pad pavement). This provides the 600 feet of the 1,000 feet standard for the RSA at the end of Runway 21.
- Construction, installation, relocation, and/or upgrade of various navigational and visual aids include, but are not limited to, runway end identifier lights (REILs), precision approach path indicators (PAPIs), runway threshold and edge lights, and taxiway edge lighting, signage, and associated utility lines. This equipment is necessary to ensure the safety of air navigation for aircraft operations at the Airport.

Based on review of the *Lihue Airport Runway 3-21 Runway Safety Area Improvements Final EA,* the RSA improvements to Runway 3-21 are not expected to cause a change in the type of aircraft and number of operations; therefore, the 2027 forecast conditions assumes the same type of operations with or without the RSA improvements. No changes are planned for Runway 17-35.

2.2.2.2 TAXIWAY

The Runway 3-21 RSA improvements will include a taxiway extension (Taxiway N) to the relocated departure end of Runway 3.



SOURCES: State of Hawaii, Department of Transportation – Airports Division, *Conditional Airport Layout Plan Approval*, October 2020; Woolpert, August 2019 (aerial imagery); Ricondo & Associates, Inc., October 2021.

EXHIBIT 2.2-2

AIRFIELD CONFIGURATION - 2027 FORECAST CONDITIONS

Drawing: P:\project-chicago\Hawaii\LIH\07-master plan\2-NEM\2.4-NEM Documentation\Exhibits\CAD\Exhibit 2.2-1-2 Airfield Facilities.dwgLayout: Future Plotted: Jan 20, 2023, 02:19PM

TABLE 2.2-2 RUNWAY CHARACTERISTICS – 2027 FORECAST CONDITIONS

DESCRIPTION	RUNWAY 3	RUNWAY 21	RUNWAY 17	RUNWAY 35
Runway Length (feet)	7,355		6,500	
Runway Width (feet)	150		150	
Runway Surface Type	Asphalt		Asphalt	
Runway Surface Treatment	TBD		Grooved	
Runway Pavement Strength by PCN	TBD		TBD	
Runway Pavement Strength				
Single-Wheel (pounds)	75,000		75,000	
Double-Wheel (pounds)	200,000		175,000	
Double Tandem (pounds)	350,000		250,000	
Dual Double Tandem (pounds)	730,000		630,000	
Runway Lighting	MIRL		HIRL	
Runway End Elevation (feet)	159.34	80.4	91.5	91.5
Effective Gradient	-1.07%	1.07%	TBD	TBD
Displaced Threshold (feet)	855	455	None	None
Declared Distances (feet)				
Takeoff Run Available (TORA)	7,355	6,500	6,500	6,500
Takeoff Distance Available (TODA)	7,355	6,500	6,500	6,500
Accelerate-Stop Distance Available (ASDA)	6,500	6,750	6,500	6,500
Landing Distance Available (LDA)	5,645	6,295	6,500	6,500
Navigational Aids	Visual	RNAV (GPS), RNAV (RNP), VOR/DME, TACAN	RNAV (GPS)	LOC, GS, RNAV (GPS), RNAV (RNP), VOR, TACAN
Visual Aids	PAPI, REIL, LDIN	PAPI, REIL	PAPI, REIL	PAPI, MALSR
Runway Design Code (RDC)	C/IV/VIS	C/IV/5000	C/IV/5000	C/IV/2400
Approach Reference Code (APRC)	D/V/VIS D/IV/VIS	D/IV/5000 D/V/5000	D/IV/5000 D/V/5000	D/IV/2400 D/V/2400
Departure Reference Code (DPRC)	D/IV D/V	D/IV D/V	D/IV D/V	D/IV D/V

NOTES:
GS – Glideslope
HIRL – High Intensity Runway Lights
LDIN – Lead-in Lights
LOC – Localizer
PAPI – Precision Approach Path Indicator
PCN – Pavement Classification Number
MALSR – Medium-Intensity Approach Lighting System with Runway Alignment Indicator Lights
MIRL – Medium Intensity Runway Lights
REIL – Runway End Identifier Lights
RNAV (GPS) – Area Navigation – Global Positioning System
RNAV (RNP) – Area Navigation – Required Navigation Performance
TACAN – Tactical Air Navigation System
TBD – To Be Determined
VIS – Visual
VOR/DME – Very High Frequency Omnidirectional Range with Distance Measuring Equipment
SOURCES: State of Hawaii, Department of Transportation – Airports Division, *Conditional Airport Layout Plan Approval*, October 2020; State of Hawaii, Department of Transportation – Airports Division, *Airport Layout Plan Narrative Report*, August 2019; Ricondo & Associates, Inc., December 2021.

2.3 TERRAIN DATA

Terrain data provide the elevation of the ground surrounding an airport and on-airport property. The AEDT uses the US Geological Survey (USGS) terrain data to adjust the ground level under the flight paths and thereby determine the vertical distance between the aircraft and a "receiver" on the ground. This distance affects the assumptions about how noise propagates over the ground. The digital elevation models were downloaded from the USGS and imported into the AEDT model.

2.4 WEATHER DATA

The AEDT accounts for temperature, relative humidity, air pressure, and headwind as part of its noise calculation process. Temperature, relative humidity, and air pressure affect noise attenuation as noise travels from the source to the receiver. AEDT also uses other weather components such as, the wind magnitude to account for the effects on aircraft performance. Airport-specific weather data derived from the NOAA Global Summary of the Day (GSOD) data in the AEDT program database was used for acoustic modeling to provide annual average weather conditions for LIH. For noise modeling, the 10-year average (2011 to 2020) weather data at the Airport were selected as shown in **Table 2.4-1**. The same 10-year average values were used for the 2027 forecast conditions as well.

TABLE 2.4-1 LIHUE WEATHER DETAILS

COMPONENT	10-YEAR AVERAGE (2011–2020)
Temperature (°F)	75.75
Sea Level Pressure (millibars)	1,016.94
Relative Humidity (%)	77.07
Dew Point (°F)	68.03
Wind Speed (Knots)	11.09

SOURCES: US Department of Transportation, Federal Aviation Administration, Aviation Environmental Design Tool (AEDT), Version 3d, March 29, 2021; Ricondo & Associates, Inc., November 2021.

2.5 LAND USE AND ZONING

Jurisdiction over land use planning and zoning in the County of Kauai belongs to the County of Kauai. The county boundary lines are not shown on the basemap due to being outside the map scale requirements and including the entire island; the census county division boundaries are shown to serve as geographic reference. The basemap extent is within the Puhi-Hanamaulu Census County Division Boundary and the Lihue Census County Division Boundary. Existing land use data and zoning information were readily available for the County of Kauai.[22]

2.5.1 EXISTING CONDITIONS

2.5.1.1 EXISTING LAND USE

Exhibit 2.5-1 shows the existing land uses surrounding the Airport. The Lihue Urban Center, an intensive area classified as general commercial and industrial uses, is located west of LIH. Land uses within the LIH property boundary include those owned primarily by the State of Hawaii and are related to LIH operations and land leased by DOT-A to Airport tenants. Residential communities nearest to LIH are located to the northwest. Much of the land adjacent to the Airport is developed for public uses, including the Lihue Refuse Transfer Station, the Ahukini Recreation Pier State Park, and Hanamaulu Bay to the north; the Lihue Wastewater Treatment Facility to the south; the Kauai Police Department, Kauai County Civil Defense Office, State of Hawaii Circuit Court, and Kauai Veterans Center to the west; and the County of Kauai's Vidinha Stadium sports complex to the southwest.

[22] SSFM International, *Kauai Kakou: Kauai County General Plan*, February 2018.

SOURCES: Woolpert, August 2019 (aerial photography – for visual reference only, may not be to scale); State of Hawaii, 2020 (points of interest, census county divisions); SSFM International, Inc., 2018 (Kauai General Plan Land Use Boundaries); State of Hawaii, Department of Transportation (DOT) – Airports Division, Lihue Airport Layout Plan, October 2020 (Airport property boundary, future Airport property boundary, and future Airport easements); County of Kauai, https://kauai.gov/Government/Departments-Agencies/Public-Works/Building-Division/Projects/Bike-Path-Project/Nawiliwili-Ahukini-Bike-Path (accessed May 19, 2021); Wilson Okamoto Corporation and State of Hawaii DOT – Airports Division, *Final Environmental Impact Statement: Lihue Airport Improvement – Appendix D*, November 2007 (historic properties); US Census Bureau, 2021 (roads).

NORTH 0 2,000 ft

EXHIBIT 2.5-1

EXISTING LAND USES – COUNTY OF KAUAI

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To the south and southwest of LIH are a golf course; natural areas; and a mix of high-density and low-density transient lodging, including resorts, hotels, condominium hotels, timeshares, and individual vacation units. The transient lodging south and southwest of LIH include Marriott's Kauai Lagoons Kalanipu'u, Kalapaki Circle, Kauai Marriott Resort / Beach Club, Banyan Harbor Resort, and Kauai Inn.

Southeast of LIH is Nawiliwili Harbor and numerous industrial facilities supporting harbor operations, which include harbor piers, storage facilities, and distribution centers. Kauai Petroleum, Honsador Lumber, the Kauai Food Bank, and Garden Isle Disposal operate out of this area. Located farther west on Rice Street are smaller commercial establishments, the Lihue Civic Center, and residential areas.

Farther west of the Airport is the city of Lihue, the island of Kauai's center of business, government, and transportation services. The major commercial and civic center of Lihue is designated as the Neighborhood Center, an area with mixed uses, such as retail and service, civic, and residential; the area supports an interconnected network of streets for multimodal transportation access. As home to Nawiliwili Harbor—the island's only deep-water commercial port—and to LIH, the Lihue region has emerged as the focal point for heavy and light industrial and commercial activities and services, such as warehousing, baseyard operations, automotive sales and maintenance, and retailing for equipment and materials suppliers.

2.5.1.2 EXISTING ZONING

Zoning is the traditional mechanism used by local governments to control land use. Zoning controls the location, type, and intensity of new urban land uses, and it can be an important tool in preventing incompatible land uses from locating around airports. The legal basis for zoning powers is the protection of public health, safety, and welfare of residents.

As shown on **Exhibit 2.5-2**, LIH is zoned by the County of Kauai as an Industrial and Special Treatment-Public Facilities Overlay District.[23] Special Treatment-Public Facilities Overlay Districts specify that additional performance is required when critical or valuable social or aesthetic characteristics of the environment or community exist in the same area as a parcel where particular functions or uses may be developed. Special Treatment-Public Facilities Overlay Districts are implemented as overlays to the traditional zoning.[24] Pursuant to Kauai County Code (KCC) Section 8-11.3, Generally Permitted Uses, Structures, and Development within the Special Treatment Districts, "all uses, structures, or development shall require a [zoning] Use Permit, except repairs or modifications of land and existing structures that do not substantially change the exterior form or appearance of the three (3) dimensional structures or land." Furthermore, KCC Section 8-11.3 also states that, "in addition, such repairs or modifications do not require a Zoning Permit."

[23] County of Kauai, *Lihue Community Plan*, Ordinance 935, June 2015.

[24] County of Kauai, Planning Department, Zoning and Land Use Permits, http://www.kauai.gov/Government/Departments/Planning-Department/Zoning-Land-Use-Permits (accessed August 16, 2016).

SOURCES: Woolpert, August 2019 (aerial photography – for visual reference only, may not be to scale); State of Hawaii, 2020 (census county divisions); SSFM International, Inc., 2018, Kauai County Zoning Ordinance, 2018 (zoning); State of Hawaii, Department of Transportation – Airports Division, Lihue Airport Layout Plan, October 2020 (Airport property boundary, future Airport property boundary, and future Airport easements); US Census Bureau, 2021 (roads); Ricondo & Associates, Inc., March 2021 (multi-family residential).

NORTH 0 2,000 ft

EXHIBIT 2.5-2

EXISTING ZONING – COUNTY OF KAUAI

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Land zoned by the County of Kauai for agriculture is located within and adjacent to existing Airport property to the north, east, and between Runway 3-21 and Runway 17-35. Although portions of Airport property are zoned for agriculture, Airport property is currently used for transportation and natural land uses, as shown on Exhibit 2.5-1. Conservation zones border Hanamaulu Bay to the north and along the coast east of Runway 17-35. The nearest commercial zones are located west and south of LIH. Single-family and multi-family residential zones surround the Airport from the northwest to the southwest. Two resort zones are southwest of the Runway 35 end.

The County of Kauai does not have an adopted set of aircraft noise compatibility guidelines in the current zoning ordinance.

2.5.2 FORECAST CONDITIONS

As shown on **Exhibit 2.5-3**, six future off-Airport development projects within the Airport environs were considered to evaluate potential changes to the existing land use and noise impacts.

According to the *Lihue Community Plan* (June 2015), five development projects are anticipated to be complete by 2035: Kohea Loa, Wailani Phase I, Wailani Phase II / Ahukini Mauka, Puakea, and Waiola. The Kohea Loa development, located along the Kuhio Highway is northwest of LIH and Hanamaulu Bay. The development is owned by DR Horton and is planned to provide 440 residential homes. The existing land use of the Kohea Loa project is already designated as Residential Community. Located northwest of LIH along the Kapule Highway, Wailani Phase I and Wailani Phase II / Ahukini Mauka are planned by Grove Farm (a subsidiary of Visionary LLC) and will be for mixed use that includes residential, retail, offices, and a town center. The existing land use of this mixed-use development is already designated as Urban Center. The Puakea and Waiola development projects, also owned by Grove Farm, will provide a total of 266 single-family homes. This entitled residential development will be located far south of the Airport and Nawiliwili Road. The existing land uses of the planned Puakea and Waiola developments are already designated as Residential Community.[25]

The sixth off-Airport development project to the south of LIH is identified in Timbers Resorts Kauai's Hokuala Phase I Master Plan. Specifically located between the ends of Runway 3 and Runway 35, the planned development is for residential, including timeshares, single family dwellings, condominiums, townhomes, and a boutique hotel.[26] The existing land use of the development is designated as golf course, although zoning indicates single-family residential near the area of the proposed development.[27]

2.6 POPULATION AND DWELLING UNITS

Demographic information related to population and housing unit data was incorporated into the geographic information system (GIS). US Decennial Census Data for 2020 by Census Tract was used to calculate a population factor for each census tract intersecting the 2019 existing or 2027 forecast conditions. Dwelling units were manually counted within the environs of the Airport using a combination of land use, aerial survey, and the County of Kauai's assessor's information.

[25] SSFM International, *Lihue Community Plan*, Chapter 4, "Future Land Use: Growth and Development," June 2015.

[26] Gary Siracusa, Director of Construction, Timbers Resorts Kauai, "Proposed Development Plans for LIH NEM Update," email to Ricondo & Associates, Inc. Staff, November 11, 2021.

[27] Timbers Resorts, Belles Graham, LLP, Wilson Okamoto Corporation, *Hokuala Resort – Subdivisions 1 and 1A Petition for County Zoning Amendment*, June 2021.

SOURCES: Woolpert, August 2019 (aerial photography – for visual reference only, may not be to scale); State of Hawaii, 2020 (points of interest, census county divisions); SSFM International, Inc., 2018 (Kauai General Plan Land Use Boundaries); State of Hawaii, Department of Transportation (DOT) – Airports Division, Lihue Airport Layout Plan, October 2020 (Airport property boundary, future Airport property boundary, and future Airport easements); County of Kauai, https://kauai.gov/Government/Departments-Agencies/Public-Works/Building-Division/Projects/Bike-Path-Project/Nawiliwili-Ahukini-Bike-Path (accessed May 19, 2021); Wilson Okamoto Corporation and State of Hawaii DOT – Airports Division, *Final Environmental Impact Statement: Lihue Airport Improvement – Appendix D*, November 2007 (historic properties); US Census Bureau, 2021 (roads).

NORTH 0 2,000 ft

EXHIBIT 2.5-3

OFF-AIRPORT FUTURE DEVELOPMENTS

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2.7 NOISE MODEL INPUT

As described in Section 1.3.1, operations, fleet mix, time-of-day distributions, runway use, noise model track locations and use, and aircraft performance characteristics are needed to calculate noise exposure patterns for the Airport. The following subsections summarize the noise model input to develop the 2019 Existing Condition and 2027 Forecast Conditions NEMs.

2.7.1 OPERATION LEVELS

The following subsections summarize the aircraft operational data used to develop the NEMs.

2.7.1.1 AIRCRAFT ACTIVITY LEVELS

Available operations data for the entire year of 2019 and an operations forecast for the year 2027 were used to develop aircraft activity levels for the development of the 2019 Existing Condition and 2027 Forecast Conditions NEMs. The annual aircraft activity forecasts for the NEMs were based on the forecast of aviation activity developed for the Master Plan Update, which was approved by the FAA on September 30, 2020 (see **Appendix B.2**). The FAA also approved the use of the Master Plan forecast for the Part 150 NEM Update study in the letter dated January 21, 2022 (see Appendix B.1). The Master Plan Forecast was analyzed to provide the additional inputs for planning, which also provide the required input for the AEDT. The following subsections summarize the operation levels modeled.

2.7.1.2 ACTUAL 2019 AND FORECAST 2027 ANNUAL AIRCRAFT OPERATIONS

The actual number of annual aircraft operations for 2019 and the number of operations forecast for 2027 were used for the NEM analysis; 126,833 total (itinerant and local[28]) annual aircraft operations were recorded in 2019 by the LIH ATCT, and 145,377 total (itinerant and local) annual aircraft operations were forecast for 2027 based on the Master Plan Forecast. **Tables 2.7-1** and **2.7-2** present the annual aircraft operations for the various user categories for itinerant and local operations, respectively.

TABLE 2.7-1 ANNUAL AIRCRAFT ITINERANT OPERATIONS BY USER CATEGORY

USER CATEGORY	DEFINITION[1]	2019 ACTUAL[2]	2027 FORECAST[3]
Air Carrier	An aircraft with seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds carrying passengers or cargo for hire or compensation.	27,246	33,919
Air Taxi	An aircraft designed to have a maximum seating capacity of 60 seats or less or a maximum payload capacity of 18,000 pounds or less carrying passengers or cargo for hire or compensation.	77,982	86,246
General Aviation	Takeoffs and landings of all civil aircraft, except those classified as air carriers or air taxis.	5,868	6,436
Military	All classes of military takeoffs and landings at FAA and FTC facilities.	1,677	1,797
Total		**112,773**	**128,398**

NOTES: FAA – Federal Aviation Administration FTC – Federal Contract Tower

1 Definitions obtained from the following webpage: https://aspm.faa.gov/aspmhelp/index/Glossary.html.

2 Represents historical annual operations for the calendar year reported by the FAA in the 2019 Distributed Operations Network report for the LIH Airport Traffic Control Tower.

3 Represents annual operations from the *Lihue Airport Master Plan and Noise Exposure Map Update – Aviation Activity Forecasts*.

SOURCES: US Department of Transportation, Federal Aviation Administration, Distributed Operations Network (OPSNET), https://aspm.faa.gov/opsnet/sys/Airport.asp (accessed March 10, 2021; Airport operations); US Department of Transportation, Federal Aviation Administration, *Aviation Forecast Approval – Lihue Master Plan*, September 30, 2020; Ricondo & Associates, Inc., March 2021 (analysis).

[28] Itinerant operations refer to aircraft that arrive from outside the airport area and depart the airport area. Local operations refer to aircraft that remain in the local traffic pattern and conduct simulated instrument approaches, touch-and-go operations, or designated practice generally within a 20-mile radius of the ATCT.

TABLE 2.7-2 ANNUAL AIRCRAFT LOCAL OPERATIONS BY USER CATEGORY

USER CATEGORY[1]	2019 ACTUAL[2]	2027 FORECAST[3]
General Aviation	13,572	16,558
Military	488	421
Total	**14,060**	**16,979**

NOTES:
1 No air carrier or air taxi local operations occurred at the Airport in 2019 and none are forecast for 2027.
2 Represents historical annual operations for the calendar year reported by the Federal Aviation Administration in the 2019 Distributed Operations Network report for the LIH Airport Traffic Control Tower.
3 Represents annual operations from the *Lihue Airport Master Plan and Noise Exposure Map Update – Aviation Activity Forecasts*.
SOURCES: US Department of Transportation, Federal Aviation Administration, Distributed Operations Network (OPSNET), https://aspm.faa.gov/opsnet/sys/Airport.asp (accessed March 10, 2021; Airport operations); US Department of Transportation, Federal Aviation Administration, *Aviation Forecast Approval – Lihue Master Plan*, September 30, 2020; Ricondo & Associates, Inc., March 2021 (analysis).

2.7.2 AIRCRAFT FLEET MIX AND TIME-OF-DAY DISTRIBUTION

The AAD[29] aircraft operations were split into the various aircraft type categories and then specific aircraft types for input to the AEDT. They were also split by time of day, with operations occurring between 7:00 a.m. and 9:59 p.m. defined as "day," and operations occurring between 10:00 p.m. and 6:59 a.m. defined as "night," as required for the calculation of DNL. Noise events occurring during the night hours are assigned a penalty of 10 decibels. In the calculation of DNL, one night operation with this penalty applied is equivalent to 10 daytime operations.

All air carrier operations are fixed-wing aircraft. Based on input from the LIH ATCT, 80 percent of air taxi and 70 percent of itinerant general aviation operations are helicopters. The remaining within each category are fixed-wing aircraft. For local general aviation operations, LIH ATCT indicated 40 percent are helicopters and the remaining 60 percent are fixed-wing aircraft.[30]

The air carrier and air taxi fixed-wing fleet mix proportion for 2019 was based on published airline flight schedules. There are some air cargo operations that are not scheduled; therefore, US DOT T-100[31] data were referenced to identify aircraft types that meet the air carrier definition and were used by cargo carriers. For 2027, the forecast design day flight schedules developed for the Master Plan Update were used. The forecast design day flight schedules include consideration of future aircraft orders, as well as expected airline retirements of older aircraft, in the development of the forecast fleet mix.

FAA TFMSC data for 2019 that provide aircraft-type operations for flights that filed an instrument flight rules (IFR) procedure were referenced to develop a generalized fleet mix for fixed-wing general aviation and military operations for both itinerant and local movements.

Helicopter operations for air taxi and general aviation were proportioned based on the types of helicopters based at LIH, which were confirmed based on the internet survey information. Military helicopter types were based on FAA TFMSC data for 2019. The type and proportion of helicopters for 2027 for air taxi, general aviation, and military were held constant from 2019 proportions.

Airline flight schedule data and FAA's Distributed OPSNET data for 2019 were applied to develop time-of-day distributions for 2019 scheduled operations for air carrier and air taxi fixed-wing operations. The FAA's Distributed

[29] AAD is calculated by dividing the annual operations by 365 days.

[30] Mark Heintzleman, Air Traffic Manager, Lihue Federal Contract Tower, "LIH Helicopters," email to Ricondo & Associates, Inc. Staff, November 6, 2020.

[31] US Department of Transportation, Air Carrier Statistics (T-100)

OPSNET data for 2019 were used to determine the proportion of general aviation and military fixed-wing operations by time of day. The time-of-day proportions for 2019 local operations for general aviation and military were based on a previous assessment conducted for the *Lihue Airport Runway3-21 Safety Area EA*. The time-of-day distributions for helicopter operations were based on previous 14 CFR Part 150 analysis and confirmed by Technical Advisory Committee (TAC) members associated with helicopter operations at LIH.[32] **Tables 2.7-3** and **2.7-4** present the AAD aircraft operations by aircraft type and time of day for 2019 for itinerant and local operations, respectively.

For scheduled air carrier and air taxi fixed-wing operations, the time-of-day distributions for 2027 were based on the forecast design day flight schedules developed for the Master Plan Update. The 2019 time-of-day distributions for itinerant general aviation fixed-wing and helicopter, air taxi helicopter, itinerant military fixed-wing and helicopter, local general aviation fixed-wing and helicopter, and local military fixed-wing and helicopter operations were maintained for 2027. **Tables 2.7-5** and **2.7-6** present the AAD aircraft operations by aircraft type and time of day for 2027 for itinerant and local operations, respectively. Note that all aircraft types are based on standard aircraft or an FAA-approved substitution available in the AEDT. There was no need to seek FAA Office of Environment and Energy (AEE) approval for custom aircraft substitutions.

2.7.3 RUNWAY USE

Two types of primary wind conditions occur at LIH: trade wind and Kona wind. During trade wind conditions, Runway 35 is the primary arrival runway, and Runway 3 is the primary departure runway. During Kona wind conditions, Runway 21 is the primary arrival runway, and Runway 17 is the primary departure runway. Because of a mountain range on the extended Runway 3 centerline, air carrier aircraft cannot depart from Runway 21 or land on Runway 3. Only smaller propeller and turboprop aircraft can conduct such operations. Also, although Runways 3-21 and 17-35 are the same length, they do not result in equal aircraft performance. Runway 3 departures benefit from a runway downslope, increasing departure performance. Runways 17 and 35 departures do not have such an advantage. These conditions will still be present with the Runway 3-21 RSA improvements implemented. LIH also has secondary runway operating configurations. **Table 2.7-7** summarizes the runway operating configurations, which are depicted on **Exhibit 2.7-1**.

Use of each runway end for arrivals and departures was based on a wind analysis using NOAA data from January 1, 2009, to December 31, 2018, at LIH, and the data were compared to previous 14 CFR Part 150 assessments and the noise analysis for the *Lihue Airport Runway 3-21 Runway Safety Area Improvements Final EA*. Consultation with DOT-A and LIH ATCT was conducted to confirm the runway-use assumptions reasonably represent 2019 conditions.[33] **Tables 2.7-8** through **2.7-10** present the itinerant arrival, itinerant departure, and local runway use percentages by aircraft category for daytime and nighttime operations for each runway end, respectively. It was assumed that the RSA improvements will not result in a change to the runway use percentages; therefore, the runway use modeled for 2019 would remain constant for the 2027 forecast conditions. This is consistent with the assumptions applied for the Proposed Action evaluated in the *Lihue Airport Runway 3-21 Runway Safety Area Improvements Final EA*.[34]

[32] See Appendix C for the meeting notes for the LIH NEM Update TAC Meeting #1 held on October 25, 2021.

[33] Mark Heintzleman, Air Traffic Manager, Lihue Federal Contract Tower, "Confirm Flight Track Data with LIH ATCT," email to Ricondo & Associates, Inc. Staff, November 12, 2020.

[34] State of Hawaii, Department of Transportation – Airports Division, *Lihue Airport Runway 3-21 Runway Safety Area Improvements Final Environmental Assessment – Appendices*, March 2018, p. C-25.

TABLE 2.7-3 ITINERANT AVERAGE ANNUAL DAY OPERATIONS BY AIRCRAFT TYPE AND TIME OF DAY – 2019 EXISTING CONDITION

REPRESENTATIVE AIRCRAFT	ARRIVAL			DEPARTURE			TOTAL
	DAY [4]	NIGHT [5]	TOTAL	DAY [4]	NIGHT [5]	TOTAL	
Heavy Jet [1]							
757PW	2.27	0.00	2.27	1.93	0.34	2.27	4.54
757RR	0.97	0.00	0.97	0.83	0.15	0.97	1.95
767-300	0.00	0.09	0.09	0.02	0.07	0.09	0.18
Heavy Jet Total [6]	**3.24**	**0.09**	**3.34**	**2.78**	**0.56**	**3.34**	**6.67**
Large Jets [2]							
717-200	18.98	3.89	22.86	19.04	3.83	22.86	45.73
737-300	1.77	0.61	2.39	1.91	0.48	2.39	4.77
737-800	6.18	2.14	8.31	6.65	1.66	8.31	16.63
737-800 Max	0.06	0.02	0.09	0.07	0.02	0.09	0.17
A321-200	3.26	0.60	3.86	3.26	0.60	3.86	7.72
Small Jets [3]							
CL601	1.00	0.37	1.37	0.90	0.47	1.37	2.74
GIV	2.60	0.97	3.57	2.34	1.23	3.57	7.14
GV	1.22	0.46	1.68	1.10	0.58	1.68	3.36
Large and Small Jets Total [6]	**35.07**	**9.06**	**44.14**	**35.27**	**8.87**	**44.14**	**88.27**
Piston and Turboprop							
DHC6	4.61	1.72	6.33	4.63	1.71	6.33	12.67
CNA208	7.53	2.81	10.35	7.56	2.79	10.35	20.70
AT72-212A	0.00	0.77	0.77	0.00	0.77	0.77	1.54
PA31	0.69	0.26	0.94	0.67	0.28	0.94	1.89
SD330	0.80	0.30	1.10	0.85	0.25	1.10	2.19
Piston and Turboprop Total [6]	**13.63**	**5.86**	**19.49**	**13.70**	**5.80**	**19.49**	**38.99**
Military [7]							
C130E	0.59	0.20	0.79	0.68	0.11	0.79	1.58
C17	0.25	0.08	0.33	0.28	0.05	0.33	0.66
F18	0.19	0.06	0.25	0.21	0.03	0.25	0.49
P3A	0.70	0.23	0.93	0.80	0.13	0.93	1.85
Military Total [6]	**1.72**	**0.57**	**2.29**	**1.97**	**0.32**	**2.29**	**4.59**
Helicopter							
EC130	27.99	0.87	28.86	27.99	0.87	28.86	57.72
H500D	12.44	0.38	12.83	12.44	0.38	12.83	25.65
R22	3.11	0.10	3.21	3.11	0.10	3.21	6.41
R44	6.22	0.19	6.41	6.22	0.19	6.41	12.83
S70	1.85	0.00	1.85	1.85	0.00	1.85	3.71
SA350D	31.11	0.96	32.06	31.11	0.96	32.06	64.12
Helicopter Total [6]	**82.73**	**2.50**	**85.22**	**82.73**	**2.50**	**85.22**	**170.45**
TOTAL ITINERANT OPERATIONS [6]	**136.39**	**18.09**	**154.48**	**136.44**	**18.04**	**154.48**	**308.97**

NOTES:

1 Heavy Jet – aircraft weighing more than 255,000 pounds

2 Large Jet – aircraft weighing more than 41,000 and up to 255,000 pounds

3 Small Jet – aircraft weighing less than 41,000 pounds

4 Day – 7:00 a.m. to 9:59 p.m.

5 Night – 10:00 p.m. to 6:59 a.m.

6 Totals may not add due to rounding.

7 Civilian-type aircraft operated by military and government agencies are included in the large jet, small jet, and prop/turboprop categories.

SOURCES: US Department of Transportation, Federal Aviation Administration, Distributed Operations Network (OPSNET), https://aspm.faa.gov/opsnet/sys/Airport.asp (accessed March 10, 2021; Airport operations); Ricondo & Associates, Inc., *Lihue Master Plan and Noise Exposure Map Update – Aviation Activity Forecasts*, March 2020; State of Hawaii Department of Transportation – Airports Division, *Lihue Airport Runway Safety Area Improvements – Final Environmental Assessment*, March 2018.

TABLE 2.7-4 LOCAL AVERAGE ANNUAL DAY OPERATIONS BY AIRCRAFT TYPE AND TIME OF DAY – 2019 EXISTING CONDITION

REPRESENTATIVE AIRCRAFT	ARRIVAL			DEPARTURE			TOTAL
	DAY [2]	NIGHT [3]	TOTAL	DAY [2]	NIGHT [3]	TOTAL	
General Aviation Jet[1]							
CL601	0.10	0.06	0.15	0.10	0.06	0.15	0.31
CNA500	0.28	0.16	0.44	0.28	0.16	0.44	0.88
CNA750	0.07	0.04	0.12	0.07	0.04	0.12	0.24
GIV	0.69	0.33	1.02	0.69	0.33	1.02	2.04
GV	0.32	0.17	0.49	0.32	0.17	0.49	0.99
General Aviation Jet Total [4]	**1.46**	**0.76**	**2.22**	**1.46**	**0.76**	**2.22**	**4.45**
Piston and Turboprop							
BEC58P	0.54	0.32	0.86	0.54	0.32	0.86	1.72
CNA206	2.16	1.25	3.42	2.16	1.25	3.42	6.83
CNA441	0.86	0.50	1.36	0.86	0.50	1.36	2.72
DHC6	0.33	0.00	0.33	0.33	0.00	0.33	0.66
GASEPV	0.87	0.51	1.37	0.87	0.51	1.37	2.75
Piston and Turboprop Total [4]	**4.76**	**2.58**	**7.34**	**4.76**	**2.58**	**7.34**	**14.68**
Military [5]							
C130E	0.50	0.00	0.50	0.50	0.00	0.50	1.00
Military Total [4]	**0.50**	**0.00**	**0.50**	**0.50**	**0.00**	**0.50**	**1.00**
Helicopter							
EC130	3.02	0.09	3.11	3.02	0.09	3.11	6.22
H500D	1.34	0.04	1.38	1.34	0.04	1.38	2.76
R22	0.34	0.01	0.35	0.34	0.01	0.35	0.69
R44	0.67	0.02	0.69	0.67	0.02	0.69	1.38
S70	0.20	0.00	0.20	0.20	0.00	0.20	0.40
SA350D	3.35	0.10	3.46	3.35	0.10	3.46	6.91
Helicopter Total [4]	**8.92**	**0.27**	**9.19**	**8.92**	**0.27**	**9.18**	**18.37**
TOTAL LOCAL OPERATIONS [4]	**15.64**	**3.61**	**19.25**	**15.64**	**3.61**	**19.25**	**38.50**

NOTES:

1 General Aviation Jet – non-commercial jet aircraft

2 Day – 7:00 a.m. to 9:59 p.m.

3 Night – 10:00 p.m. to 6:59 a.m.

4 Totals may not add due to rounding.

5 Civilian-type aircraft operated by military and government agencies are included in the large jet, small jet, and prop/turboprop categories.

SOURCES: US Department of Transportation, Federal Aviation Administration, Distributed Operations Network (OPSNET), https://aspm.faa.gov/opsnet/sys/Airport.asp (accessed March 10, 2021; Airport operations); Ricondo & Associates, Inc., *Lihue Master Plan and Noise Exposure Map Update – Aviation Activity Forecasts*, March 2020; State of Hawaii Department of Transportation – Airports Division, *Lihue Airport Runway Safety Area Improvements – Final Environmental Assessment*, March 2018.

TABLE 2.7-5 ITINERANT AVERAGE ANNUAL DAY OPERATIONS BY AIRCRAFT TYPE AND TIME OF DAY – 2027 FORECAST CONDITIONS

REPRESENTATIVE AIRCRAFT [1]	ARRIVAL			DEPARTURE			TOTAL
	DAY [4]	NIGHT [5]	TOTAL	DAY [4]	NIGHT [5]	TOTAL	
Heavy Jet [1]							
757PW	1.19	0.00	1.19	1.01	0.18	1.19	2.38
757RR	0.50	0.00	0.50	0.42	0.08	0.50	1.00
767-300	0.00	0.11	0.11	0.02	0.09	0.11	0.22
A330-200	0.13	0.02	0.15	0.13	0.02	0.15	0.30
787-8	0.04	0.01	0.05	0.04	0.01	0.05	0.10
Heavy Jet Total [6]	**1.86**	**0.14**	**2.00**	**1.63**	**0.37**	**2.00**	**4.00**
Large Jets [2]							
717-200	20.25	4.13	24.39	20.31	4.08	24.39	48.78
737-300	2.92	1.01	3.93	3.14	0.79	3.93	7.85
737-800	1.78	0.62	2.40	1.92	0.48	2.40	4.80
737-800 Max	6.20	2.14	8.34	6.68	1.66	8.34	16.69
A321-200	7.76	1.44	9.20	7.76	1.44	9.20	18.40
Small Jets [3]							
CL601	2.19	0.80	2.99	1.97	1.02	2.99	5.99
GIV	2.19	0.82	3.01	1.97	1.04	3.01	6.02
GV	1.02	0.38	1.40	0.92	0.48	1.40	2.79
Large and Small Jet Total [6]	**44.32**	**11.33**	**55.65**	**44.68**	**10.98**	**55.66**	**111.31**
Piston and Turboprop							
DHC6	6.14	2.30	8.44	6.16	2.28	8.44	16.88
CNA208	7.54	2.82	10.36	7.57	2.79	10.36	20.72
AT72-212A	0.00	1.55	1.55	0.00	1.55	1.55	3.09
PA31	0.75	0.28	1.03	0.73	0.30	1.03	2.06
SD330	0.90	0.34	1.24	0.95	0.28	1.24	2.47
Piston and Turboprop Total [6]	**15.34**	**7.27**	**22.61**	**15.41**	**7.20**	**22.61**	**45.22**
Military [7]							
C130E	0.62	0.21	0.83	0.71	0.12	0.83	1.65
C17	0.26	0.09	0.35	0.30	0.05	0.35	0.70
F18	0.21	0.07	0.29	0.25	0.04	0.29	0.57
P3A	0.75	0.25	1.00	0.86	0.14	1.00	2.00
Military Total [6]	**1.85**	**0.62**	**2.46**	**2.12**	**0.34**	**2.46**	**4.92**
Helicopter							
EC130	30.60	0.95	31.55	30.60	0.95	31.55	63.09
H500D	13.60	0.42	14.02	13.60	0.42	14.02	28.04
R22	3.40	0.11	3.51	3.40	0.11	3.51	7.01
R44	6.80	0.21	7.01	6.80	0.21	7.01	14.02
S70	2.03	0.00	2.03	2.03	0.00	2.03	4.05
SA350D	34.00	1.05	35.05	34.00	1.05	35.05	70.10
Helicopter Total [6]	**90.43**	**2.73**	**93.16**	**90.43**	**2.73**	**93.16**	**186.32**
TOTAL ITINERANT OPERATIONS [6]	**153.79**	**22.10**	**175.88**	**154.26**	**21.63**	**175.89**	**351.78**

NOTES:

1 Heavy Jet – aircraft weighing more than 255,000 pounds

2 Large Jet – aircraft weighing more than 41,000 and up to 255,000 pounds

3 Small Jet – aircraft weighing less than 41,000 pounds

4 Day – 7:00 a.m. to 9:59 p.m.

5 Night – 10:00 p.m. to 6:59 a.m.

6 Totals may not add due to rounding.

7 Civilian-type aircraft operated by military and government agencies are included in the large jet, small jet, and prop/turboprop categories.

SOURCES: US Department of Transportation, Federal Aviation Administration, Distributed Operations Network (OPSNET), https://aspm.faa.gov/opsnet/sys/Airport.asp (accessed March 10, 2021; Airport operations); Ricondo & Associates, Inc., *Lihue Master Plan and Noise Exposure Map Update – Aviation Activity Forecasts*, March 2020; State of Hawaii Department of Transportation – Airports Division, *Lihue Airport Runway Safety Area Improvements – Final Environmental Assessment*, March 2018.

TABLE 2.7-6 LOCAL AVERAGE ANNUAL DAY OPERATIONS BY AIRCRAFT TYPE AND TIME OF DAY – 2027 FORECAST CONDITIONS

REPRESENTATIVE AIRCRAFT	ARRIVAL			DEPARTURE			TOTAL
	DAY [2]	NIGHT [3]	TOTAL	DAY [2]	NIGHT [3]	TOTAL	
General Aviation Jet [1]							
CL601	0.12	0.07	0.18	0.12	0.07	0.18	0.37
CNA500	0.36	0.21	0.58	0.36	0.21	0.58	1.15
CNA750	0.09	0.05	0.14	0.09	0.05	0.14	0.28
GIV	0.86	0.41	1.28	0.86	0.41	1.28	2.55
GV	0.39	0.21	0.59	0.39	0.21	0.59	1.19
General Aviation Jet Total [4]	**1.82**	**0.96**	**2.77**	**1.82**	**0.96**	**2.77**	**5.54**
Piston and Turboprop							
BEC58P	0.65	0.38	1.03	0.65	0.38	1.03	2.06
CNA206	2.62	1.52	4.15	2.62	1.52	4.15	8.29
CNA441	1.03	0.60	1.63	1.03	0.60	1.63	3.27
DHC6	0.40	0.00	0.40	0.40	0.00	0.40	0.79
GASEPV	1.04	0.61	1.65	1.04	0.61	1.65	3.30
Piston and Turboprop Total [4]	**5.74**	**3.11**	**8.86**	**5.74**	**3.11**	**8.86**	**17.71**
Military [5]							
C130E	0.58	0.00	0.58	0.58	0.00	0.58	1.15
Military Total [4]	**0.58**	**0.00**	**0.58**	**0.58**	**0.00**	**0.58**	**1.15**
Helicopter							
EC130	3.63	0.11	3.74	3.63	0.11	3.74	7.49
H500D	1.61	0.05	1.66	1.61	0.05	1.66	3.33
R22	0.40	0.01	0.42	0.40	0.01	0.42	0.83
R44	0.81	0.02	0.83	0.81	0.02	0.83	1.66
S70	0.24	0.00	0.24	0.24	0.00	0.24	0.48
SA350D	4.03	0.12	4.16	4.03	0.12	4.16	8.32
Helicopter Total [4]	**10.73**	**0.32**	**11.06**	**10.73**	**0.32**	**11.06**	**22.11**
TOTAL LOCAL OPERATIONS [4]	**18.86**	**4.39**	**23.26**	**18.86**	**4.39**	**23.26**	**46.52**

NOTES:

1 General Aviation Jet – non-commercial jet aircraft

2 Day – 7:00 a.m. to 9:59 p.m.

3 Night – 10:00 p.m. to 6:59 a.m.

4 Totals may not add due to rounding.

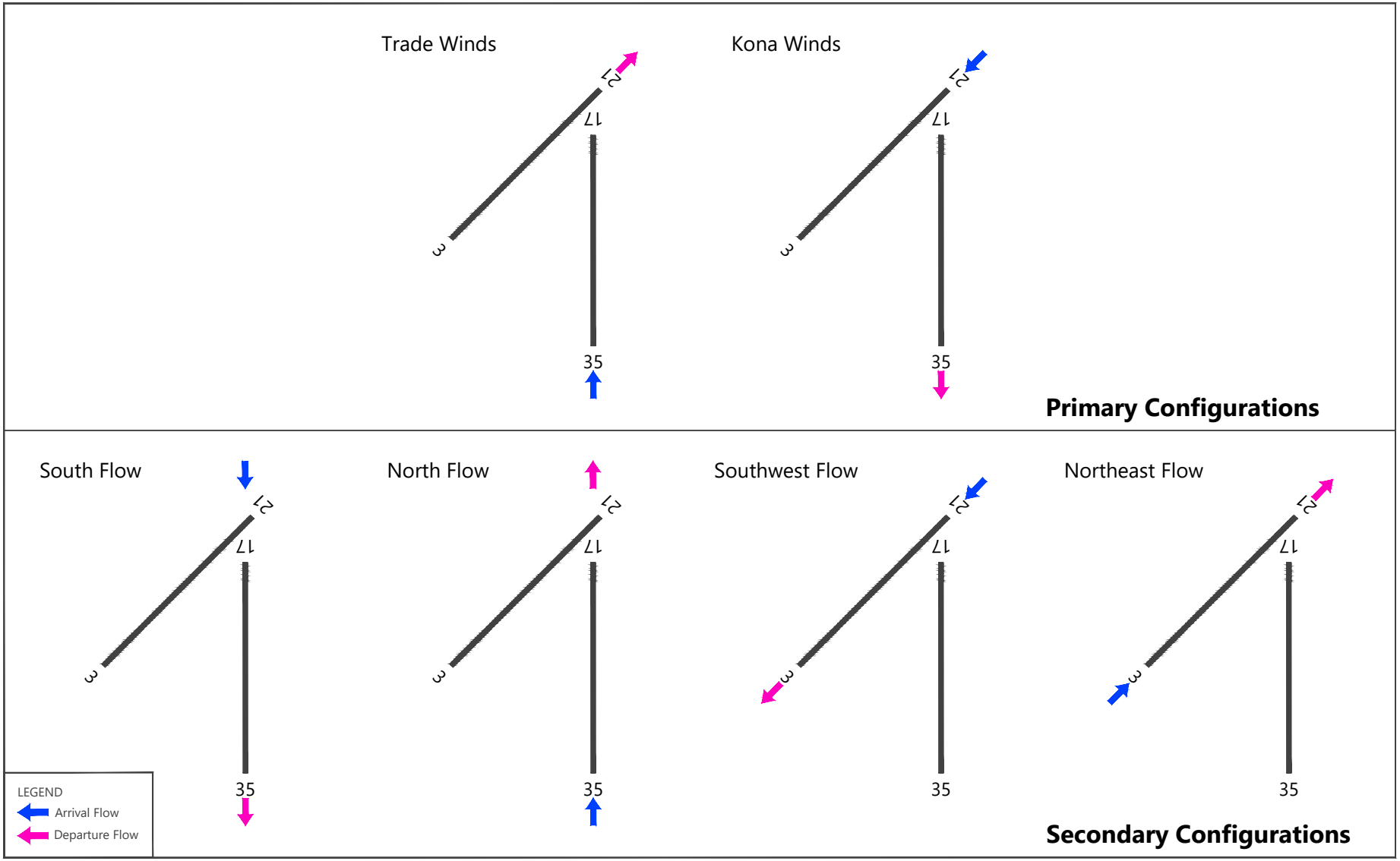
5 Civilian-type aircraft operated by military and government agencies are included in the large jet, small jet, and prop/turboprop categories.

SOURCES: US Department of Transportation, Federal Aviation Administration, Distributed Operations Network (OPSNET), https://aspm.faa.gov/opsnet/sys/Airport.asp (accessed March 10, 2021; Airport operations); Ricondo & Associates, Inc., *Lihue Master Plan and Noise Exposure Map Update – Aviation Activity Forecasts*, March 2020; State of Hawaii Department of Transportation – Airports Division, *Lihue Airport Runway Safety Area Improvements – Final Environmental Assessment*, March 2018.

TABLE 2.7-7 RUNWAY USE CONFIGURATIONS AND PERCENT WIND COVERAGE

CONFIGURATION	RUNWAYS USED	PERCENT OCCURRENCE
Trade Winds	Arrival: Runway 35; Departure: Runway 3	89.0%
Kona Winds	Arrival: Runway 21; Departure: Runway 17	7.4%
South Flow	Arrival: Runway 17; Departure: Runway 17	2.4%
North Flow	Arrival: Runway 35; Departure: Runway 35	1.0%
Southwest Flow	Arrival: Runway 21; Departure: Runway 21	0.1%
Northeast Flow	Arrival: Runway 3; Departure: Runway 3	0.1%

SOURCE: Ricondo & Associates, Inc., *Runway 3-21 Runway Safety Area Study*, February 2016.



SOURCES: Ricondo & Associates, Inc., May 2019 (based on National Oceanic and Atmospheric Administration, National Climatic Data Center, TD3505 Digital Data for Lihue Airport, Lihue, Hawaii, January 1, 2009 – December 31, 2018; 87,492 observations).

EXHIBIT 2.7-1

RUNWAY USE CONFIGURATION DIAGRAMS

Drawing: P:\project-chicago\Hawaii\LIH\07-master plan\2-NEM\2.4-NEM Documentation\Exhibits\CAD\Exhibit 2.7-1 Runway Use Configurations.dwgLayout: 2.7 Plotted: Jan 20, 2023, 02:13PM

TABLE 2.7-8 ITINERANT ARRIVAL RUNWAY USE PERCENTAGES – 2019 EXISTING AND 2027 FORECAST CONDITIONS

AIRCRAFT CATEGORY	RUNWAY 3	RUNWAY 21	RUNWAY 17	RUNWAY 35	TOTAL
Daytime[1] Itinerant Arrivals					
Heavy Jet	0.0%	8.0%	2.0%	90.0%	100.0%
Large Jet	0.0%	8.0%	2.0%	90.0%	100.0%
Small Jet	0.1%	7.5%	2.4%	90.0%	100.0%
Military Aircraft[2]	0.0%	13.0%	0.0%	87.0%	100.0%
Propeller/Turboprop	0.1%	7.5%	2.4%	90.0%	100.0%
Daytime Itinerant Arrivals All Aircraft	**0.03%**	**8.0%**	**2.1%**	**89.9%**	**100.0%**
Nighttime[3] Itinerant Arrivals					
Heavy Jet	0.0%	8.0%	2.0%	90.0%	100.0%
Large Jet	0.0%	8.0%	2.0%	90.0%	100.0%
Small Jet	0.1%	7.5%	2.4%	90.0%	100.0%
Military Aircraft[2]	0.0%	13.0%	0.0%	87.0%	100.0%
Propeller/Turboprop	0.1%	7.5%	2.4%	90.0%	100.0%
Nighttime Itinerant Arrivals All Aircraft	**0.05%**	**7.9%**	**2.1%**	**89.9%**	**100.0%**
All Itinerant Arrivals	**0.05%**	**8.0%**	**2.1%**	**89.9%**	**100.0%**

NOTES:

1 Daytime – 7:00 a.m. to 9:59 p.m.

2 Civilian-type aircraft operated by military and government agencies are included in large jet, small jet, prop/turboprop, and helicopter categories.

3 Nighttime – 10:00 p.m. to 6:59 a.m.

SOURCES: State of Hawaii Department of Transportation – Airports Division, *Runway 3-21 Safety Area Improvements at Lihue Airport, Safety Risk Management,* August 15, 2016; Ricondo & Associates, Inc., *Comments from Airline Committee of Hawaii to DOT-A's Preferred Alternative – LIH Runway 3-21 RSA*, December 2016; Ricondo & Associates, Inc., October 2021 (analysis).

TABLE 2.7-9 ITINERANT DEPARTURE RUNWAY USE PERCENTAGES – 2019 EXISTING AND 2027 FORECAST CONDITIONS

AIRCRAFT CATEGORY	RUNWAY 3	RUNWAY 21	RUNWAY 17	RUNWAY 35	TOTAL
Daytime[1] Itinerant Departures					
Heavy Jet	89.0%	0.0%	10.0%	1.0%	100.0%
Large Jet	89.0%	0.0%	10.0%	1.0%	100.0%
Small Jet	89.1%	0.1%	9.8%	1.0%	100.0%
Military Aircraft [2]	90.0%	0.0%	10.0%	0.0%	100.0%
Propeller/Turboprop	89.1%	0.1%	9.8%	1.0%	100.0%
Daytime Itinerant Departures All Aircraft	**89.1%**	**0.03%**	**9.9%**	**1.0%**	**100.0%**
Nighttime[3] Itinerant Departures					
Heavy Jet	89.0%	0.0%	10.0%	1.0%	100.0%
Large Jet	89.0%	0.0%	10.0%	1.0%	100.0%
Small Jet	89.1%	0.1%	9.8%	1.0%	100.0%
Military Aircraft[2]	90.0%	0.0%	10.0%	0.0%	100.0%
Propeller/Turboprop	89.1%	0.1%	9.8%	1.0%	100.0%
Nighttime Itinerant Departures All Aircraft	**89.1%**	**0.1%**	**9.9%**	**1.0%**	**100.0%**
All Itinerant Departures	**89.1%**	**0.1%**	**9.9%**	**1.0%**	**100.0%**

NOTES:

1 Daytime – 7:00 a.m. to 9:59 p.m.

2 Civilian-type aircraft operated by military and government agencies are included in large jet, small jet, prop/turboprop, and helicopter categories.

3 Nighttime – 10:00 p.m. to 6:59 a.m.

SOURCES: State of Hawaii Department of Transportation – Airports Division, *Runway 3-21 Safety Area Improvements at Lihue Airport, Safety Risk Management,* August 15, 2016; Ricondo & Associates, Inc., *Comments from Airline Committee of Hawaii to DOT-A's Preferred Alternative – LIH Runway 3-21 RSA*, December 2016; Ricondo & Associates, Inc., October 2021 (analysis).

TABLE 2.7-10 LOCAL RUNWAY USE PERCENTAGES – 2019 EXISTING AND 2027 FORECAST CONDITIONS

AIRCRAFT CATEGORY	RUNWAY 3	RUNWAY 21	RUNWAY 17	RUNWAY 35	TOTAL
Daytime[1] Local Operations					
Military Aircraft[2]	0.0%	0.0%	13.0%	87.0%	100.0%
General Aviation	87.0%	13.0%	0.0%	0.0%	100.0%
Daytime Local Operations All Aircraft	**1.0%**	**12.0%**	**80.5%**	**6.5%**	**100.0%**
Nighttime[3] Local Operations					
Military Aircraft[2]	0.0%	0.0%	0.0%	0.0%	N/A
General Aviation	87.0%	13.0%	0.0%	0.0%	100.0%
Nighttime Local Operations All Aircraft	**87.0%**	**13.0%**	0.0%	0.0%	**100.0%**
All Local Operations	**0.6%**	**12.4%**	**82.7%**	**4.3%**	**100.0%**

NOTES:
1 Daytime – 7:00 a.m. to 9:59 p.m.
2 Civilian-type aircraft operated by military and government agencies are included in large jet, small jet, prop/turboprop, and helicopter categories.
3 Nighttime – 10:00 p.m. to 6:59 a.m.
SOURCES: State of Hawaii Department of Transportation – Airports Division, *Runway 3-21 Safety Area Improvements at Lihue Airport, Safety Risk Management,* August 15, 2016; Ricondo & Associates, Inc., *Comments from Airline Committee of Hawaii to DOT-A's Preferred Alternative – LIH Runway 3-21 RSA*, December 2016; Ricondo & Associates, Inc., October 2021 (analysis).

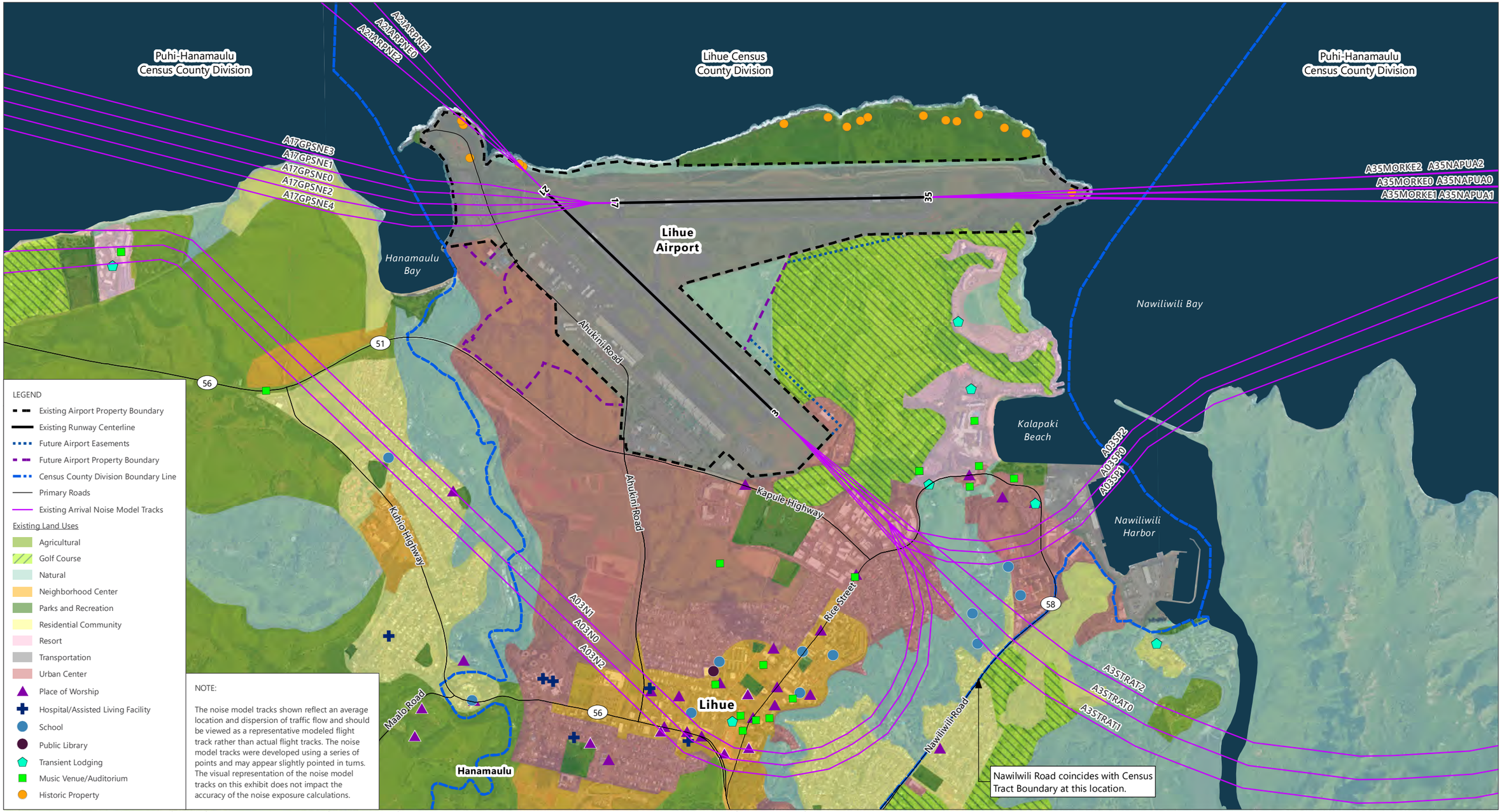
2.7.4 HELIPAD USE

As described in Section 2.2.1, three helipads are available for helicopter operations at LIH. Due to the proximity of the three helipads to each other, one was modeled in the AEDT. All helicopters were assigned to the central helipad for takeoff and landing in the AEDT. The direction to and from the helipad was based on the two primary runway operating configurations.

2.7.5 NOISE MODEL TRACK LOCATIONS AND USE

Generalized noise model tracks refer to the nominal flight paths aircraft follow when arriving to or departing from a runway or helipad at LIH and are required input to the AEDT. Because there are no radar data available, the noise model track development process began with the noise model tracks developed for the *Lihue Airport Runway 3-21 Runway Safety Area Improvements Final EA* noise modeling analysis. Supplementary sources of information, such as the LIH ATCT standard operating procedures, were considered to determine if any of the noise model tracks required adjustments. The proposed noise model tracks and their use were reviewed by the LIH ATCT to confirm the noise model tracks reasonably represent 2019 conditions at LIH.[35] **Exhibits 2.7-2** to **2.7-5** present the arrival and departure noise model tracks for 2019 existing and 2027 forecast conditions itinerant fixed-wing aircraft. **Exhibit 2.7-6** presents the noise model tracks for general aviation and military touch-and-go operations for the 2019 existing condition. **Exhibit 2.7-7** depicts 2027 forecast conditions noise model tracks for general aviation and military touch-and-go operations. Finally, **Exhibit 2.7-8** presents helicopter itinerant (arrival/departure) and local (touch-and-go) noise model tracks, which are the same for both the 2019 existing and 2027 forecast conditions. **Tables 2.7-11** to **2.7-14** summarizes the allocation of operations to the noise model tracks shown on Exhibits 2.7-2 through 2.7-8.

[35] Mark Heintzleman, Air Traffic Manager, Lihue Federal Contract Tower, "Confirm Flight Track Data with LIH ATCT," email to Ricondo & Associates, Inc. Staff, November 12, 2020.



SOURCES: Woolpert, August 2019 (aerial photography – for visual reference only, may not be to scale); State of Hawaii, 2020 (points of interest, census county divisions); SSFM International, Inc., 2018 (Kauai General Plan Land Use Boundaries); State of Hawaii, Department of Transportation (DOT) – Airports Division, Lihue Airport Layout Plan, October 2020 (Airport property boundary, future Airport property boundary, and future Airport easements); County of Kauai, https://kauai.gov/Government/Departments-Agencies/Public-Works/Building-Division/Projects/Bike-Path-Project/Nawiliwili-Ahukini-Bike-Path (accessed May 19, 2021); Wilson Okamoto Corporation and State of Hawaii DOT – Airports Division, *Final Environmental Impact Statement: Lihue Airport Improvements Appendix D*, November 2007 (historic properties); US Census Bureau, 2021 (roads); Ricondo & Associates, Inc., November 2021 (noise model tracks).

NORTH 0 2,000 ft

EXHIBIT 2.7-2

GENERALIZED FIXED-WING AIRCRAFT ARRIVAL NOISE MODEL TRACKS – 2019 EXISTING CONDITION

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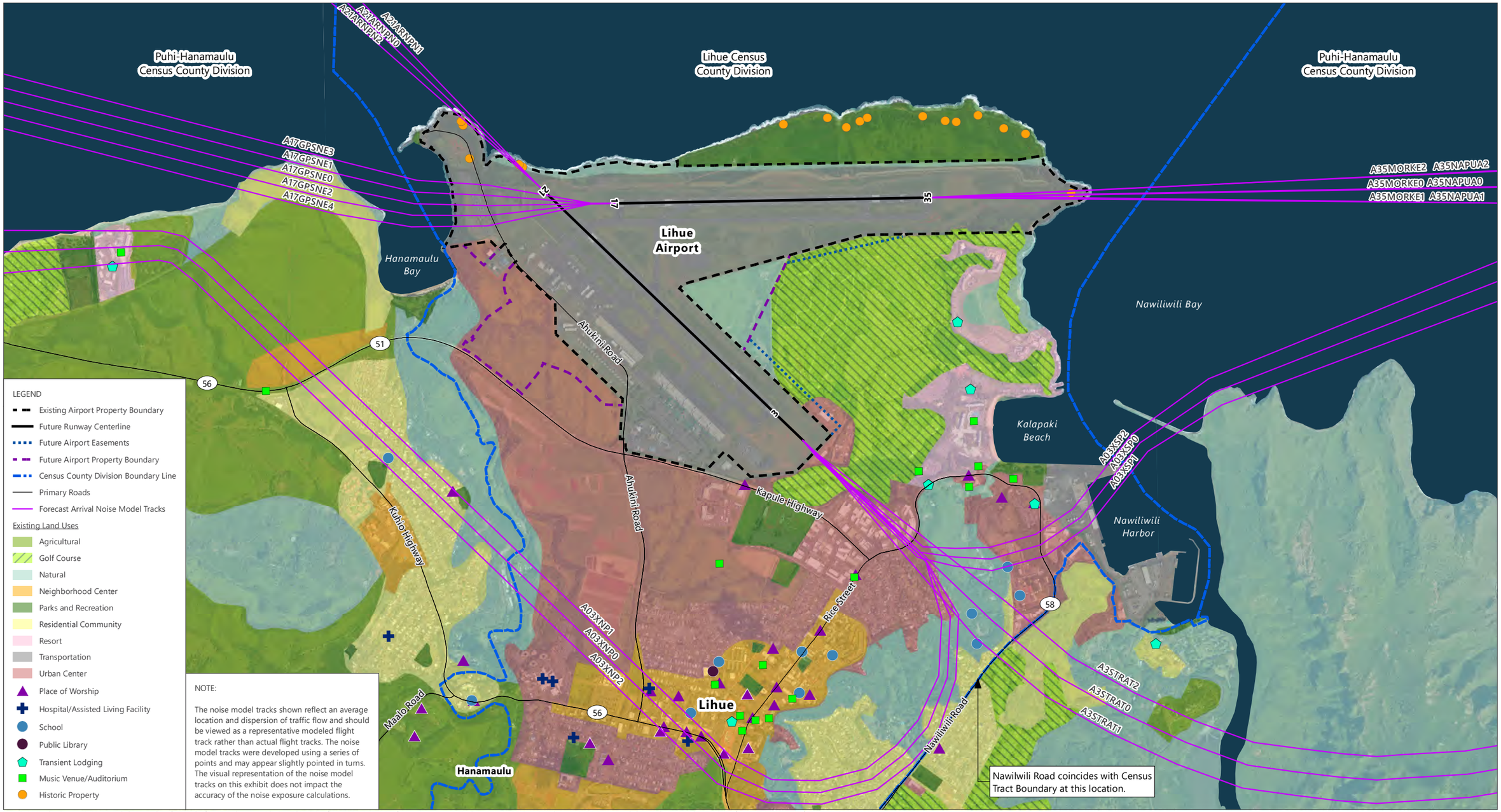
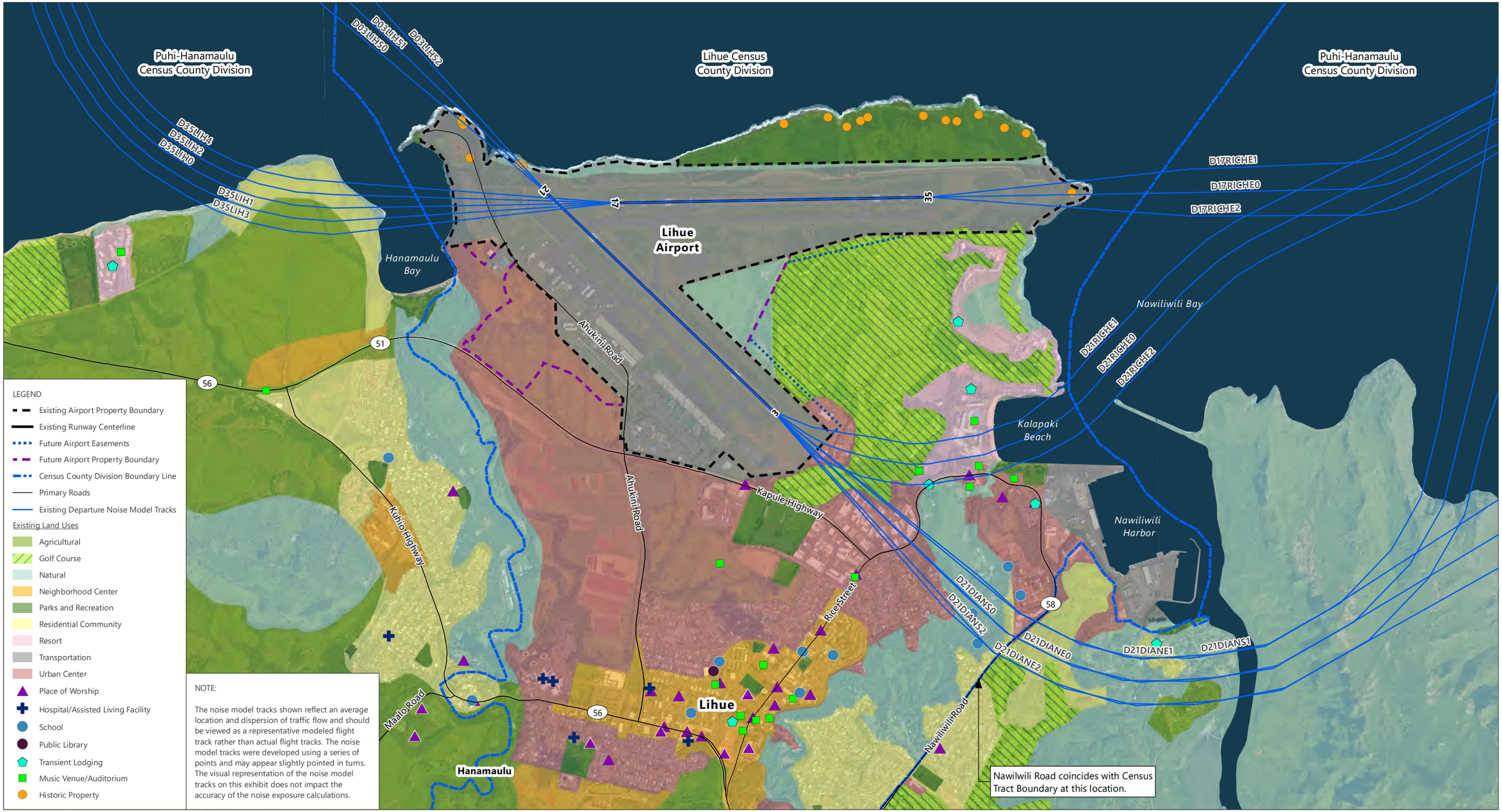


SOURCES: Woolpert, August 2019 (aerial photography – for visual reference only, may not be to scale); State of Hawaii, 2020 (points of interest, census county divisions); SSFM International, Inc., 2018 (Kauai General Plan Land Use Boundaries); State of Hawaii, Department of Transportation (DOT) – Airports Division, Lihue Airport Layout Plan, October 2020 (Airport property boundary, future Airport property boundary, and future Airport easements); County of Kauai, https://kauai.gov/Government/Departments-Agencies/Public-Works/Building-Division/Projects/Bike-Path-Project/Nawiliwili-Ahukini-Bike-Path (accessed May 19, 2021); Wilson Okamoto Corporation and State of Hawaii DOT – Airports Division, *Final Environmental Impact Statement: Lihue Airport Improvements Appendix D*, November 2007 (historic properties); US Census Bureau, 2021 (roads); Ricondo & Associates, Inc., November 2021 (noise model tracks).

EXHIBIT 2.7-3

GENERALIZED FIXED-WING AIRCRAFT ARRIVAL NOISE MODEL TRACKS – 2027 FORECAST CONDITONS

P:\GIS\Projects\LIH\MXD\LIH_NEM_Exh2-7_3_2027ForecastConditionsGeneralizedFixedWingAircraftArrivalNoiseModelTracks_20230120.mxd

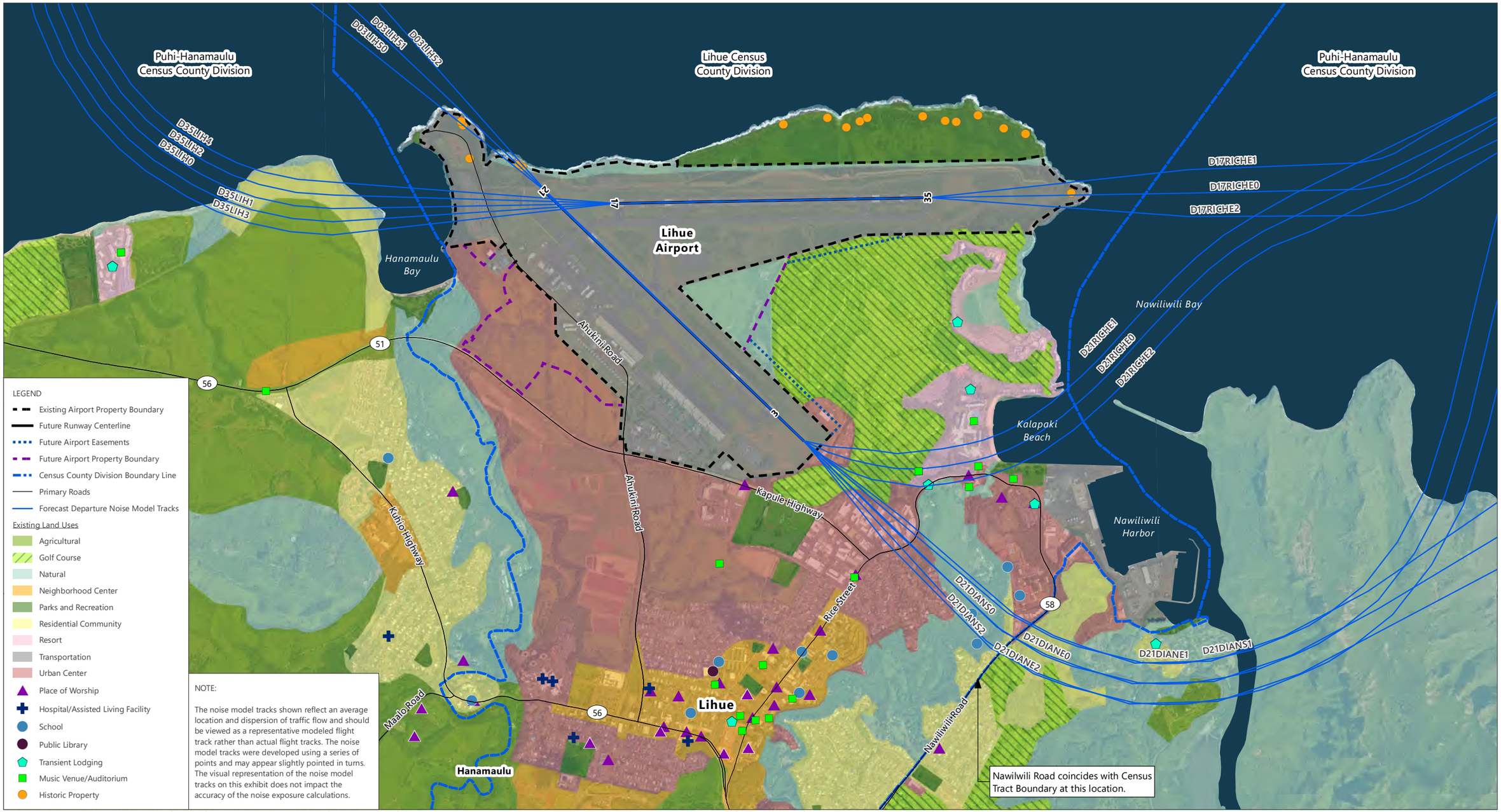


SOURCES: Woolpert, August 2019 (aerial photography – for visual reference only, may not be to scale); State of Hawaii, 2020 (points of interest, census county divisions); SSFM International, Inc., 2018 (Kauai General Plan Land Use Boundaries); State of Hawaii, Department of Transportation (DOT) – Airports Division, Lihue Airport Layout Plan, October 2020 (Airport property boundary, future Airport property boundary, and future Airport easements); County of Kauai, https://kauai.gov/Government/Departments-Agencies/Public-Works/Building-Division/Projects/Bike-Path-Project/Nawiliwili-Ahukini-Bike-Path (accessed May 19, 2021); Wilson Okamoto Corporation and State of Hawaii DOT – Airports Division, *Final Environmental Impact Statement: Lihue Airport Improvements Appendix D,* November 2007 (historic properties); US Census Bureau, 2021 (roads); Ricondo & Associates, Inc., November 2021 (noise model tracks).

EXHIBIT 2.7-4

GENERALIZED FIXED-WING AIRCRAFT DEPARTURE NOISE MODEL TRACKS – 2019 EXISTING CONDITION

P:\GIS\Projects\LIH\MXD\LIH_NEM_Exh2-7_4_2019ExistingConditionGeneralizedFixedWingAircraftDepartureNoiseModelTracks_20230120.mxd



SOURCES: Woolpert, August 2019 (aerial photography – for visual reference only, may not be to scale); State of Hawaii, 2020 (points of interest, census county divisions); SSFM International, Inc., 2018 (Kauai General Plan Land Use Boundaries); State of Hawaii, Department of Transportation (DOT) – Airports Division, Lihue Airport Layout Plan, October 2020 (Airport property boundary, future Airport property boundary, and future Airport easements); County of Kauai, https://kauai.gov/Government/Departments-Agencies/Public-Works/Building-Division/Projects/Bike-Path-Project/Nawiliwili-Ahukini-Bike-Path (accessed May 19, 2021); Wilson Okamoto Corporation and State of Hawaii DOT – Airports Division, *Final Environmental Impact Statement: Lihue Airport Improvements Appendix D*, November 2007 (historic properties); US Census Bureau, 2021 (roads); Ricondo & Associates, Inc., November 2021 (noise model tracks).

EXHIBIT 2.7-5

GENERALIZED FIXED-WING AIRCRAFT DEPARTURE NOISE MODEL TRACKS – 2027 FORECAST CONDITIONS

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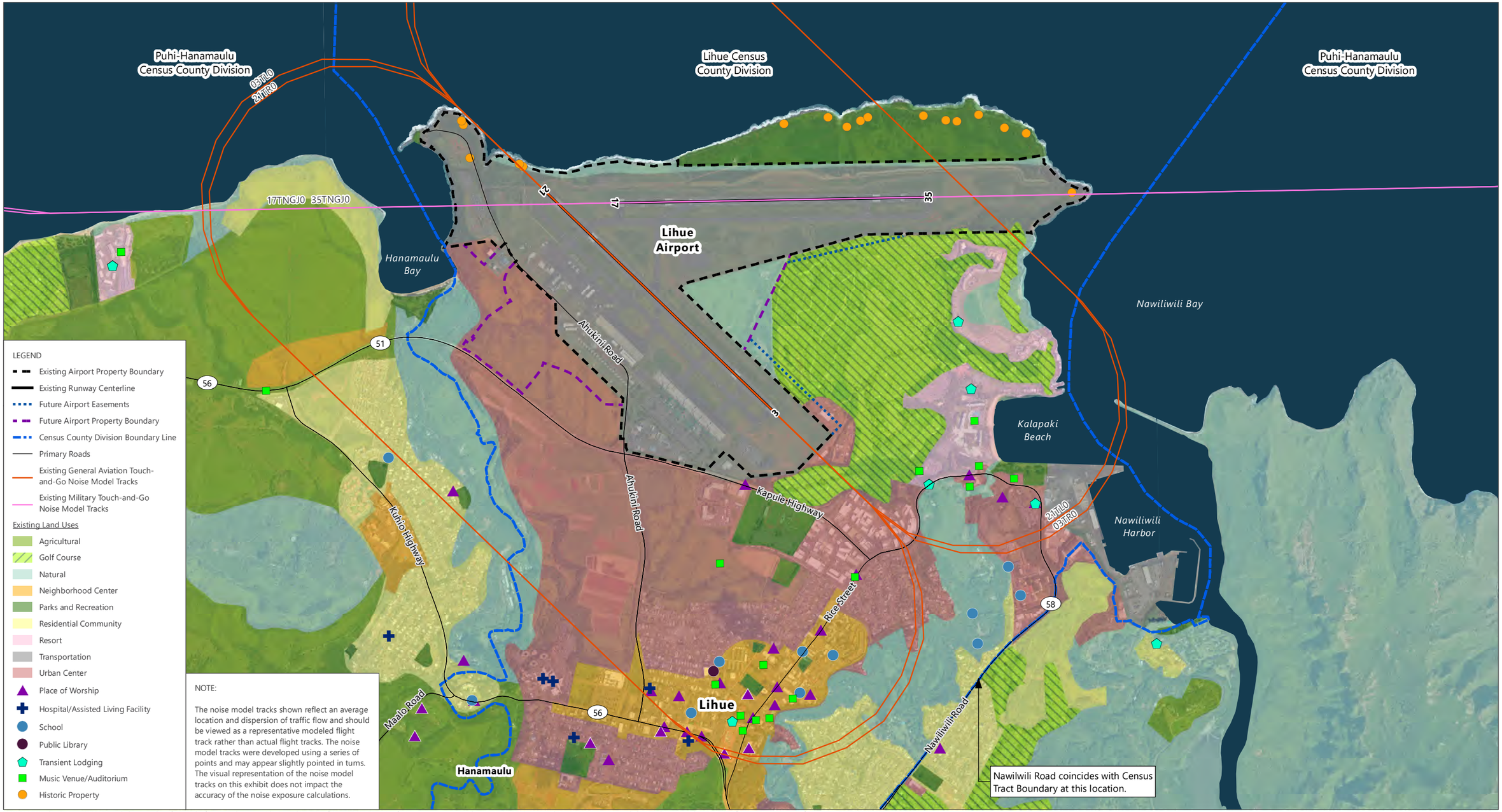
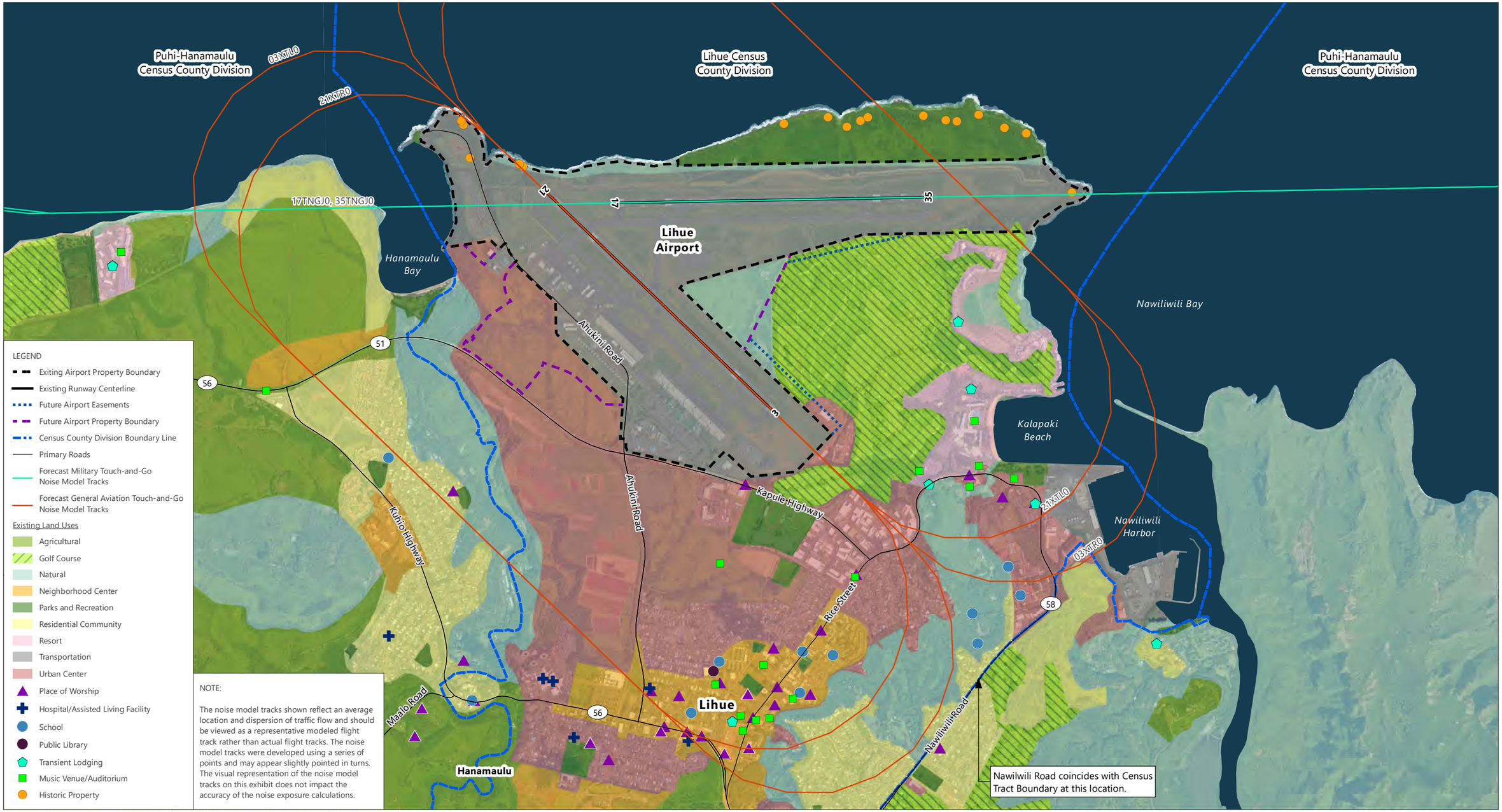


SOURCES: Woolpert, August 2019 (aerial photography – for visual reference only, may not be to scale); State of Hawaii, 2020 (points of interest, census county divisions); SSFM International, Inc., 2018 (Kauai General Plan Land Use Boundaries); State of Hawaii, Department of Transportation (DOT) – Airports Division, Lihue Airport Layout Plan, October 2020 (Airport property boundary, future Airport property boundary, and future Airport easements); County of Kauai, https://kauai.gov/Government/Departments-Agencies/Public-Works/Building-Division/Projects/Bike-Path-Project/Nawiliwili-Ahukini-Bike-Path (accessed May 19, 2021); Wilson Okamoto Corporation and State of Hawaii DOT – Airports Division, *Final Environmental Impact Statement: Lihue Airport Improvements Appendix D*, November 2007 (historic properties); US Census Bureau, 2021 (roads); Ricondo & Associates, Inc., November 2021 (noise model tracks).

EXHIBIT 2.7-6

GENERALIZED GENERAL AVIATION AND MILITARY TOUCH-AND-GO NOISE MODEL TRACKS – 2019 EXISTING CONDITION

P:\GIS\Projects\LIH\MXD\LIH_NEM_Exh2-7_6_2019ExistingConditionGeneralizedFixedWingMilitaryTouch-And-GoNoiseModelTracks_20230120.mxd

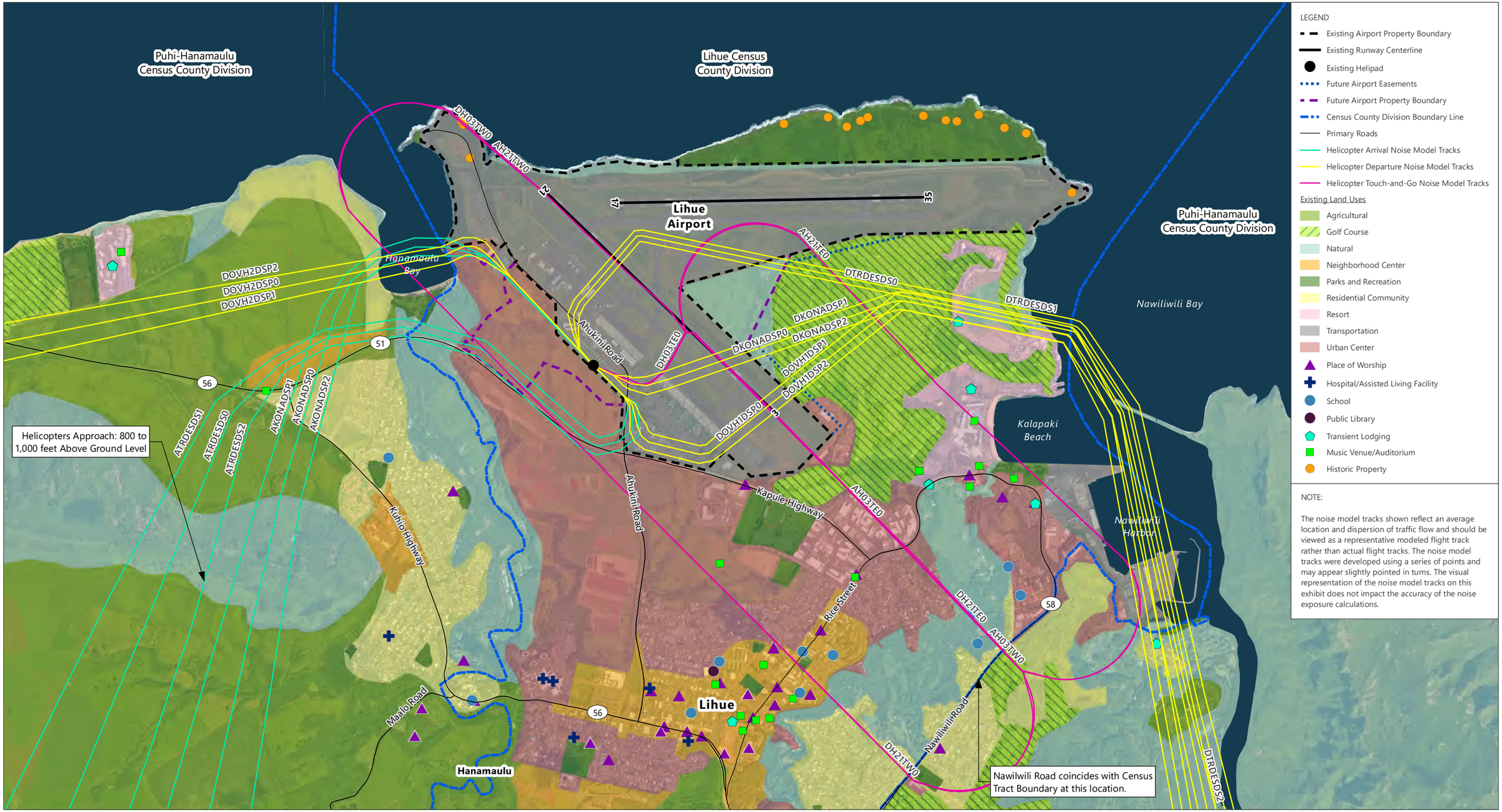


SOURCES: Woolpert, August 2019 (aerial photography – for visual reference only, may not be to scale); State of Hawaii, 2020 (points of interest, census county divisions); SSFM International, Inc., 2018 (Kauai General Plan Land Use Boundaries); State of Hawaii, Department of Transportation (DOT) – Airports Division, Lihue Airport Layout Plan, October 2020 (Airport property boundary, future Airport property boundary, and future Airport easements); County of Kauai, https://kauai.gov/Government/Departments-Agencies/Public-Works/Building-Division/Projects/Bike-Path-Project/Nawiliwili-Ahukini-Bike-Path (accessed May 19, 2021); Wilson Okamoto Corporation and State of Hawaii DOT – Airports Division, *Final Environmental Impact Statement: Lihue Airport Improvements Appendix D*, November 2007 (historic properties); US Census Bureau, 2021 (roads); Ricondo & Associates, Inc., November 2021 (noise model tracks).

EXHIBIT 2.7-7

GENERALIZED GENERAL AVIATION AND MILITARY TOUCH-AND-GO NOISE MODEL TRACKS – 2027 FORECAST CONDITIONS

P:\GIS\Projects\LIH\MXD\LIH_NEM_Exh2-7_7_2027ForecastGAAndMilitaryTouch-And-GoNoiseModelTracks_20230120.mxd



LEGEND

- Existing Airport Property Boundary
- Existing Runway Centerline
- Existing Helipad
- Future Airport Easements
- Future Airport Property Boundary
- Census County Division Boundary Line
- Primary Roads
- Helicopter Arrival Noise Model Tracks
- Helicopter Departure Noise Model Tracks
- Helicopter Touch-and-Go Noise Model Tracks

Existing Land Uses

- Agricultural
- Golf Course
- Natural
- Neighborhood Center
- Parks and Recreation
- Residential Community
- Resort
- Transportation
- Urban Center
- Place of Worship
- Hospital/Assisted Living Facility
- School
- Public Library
- Transient Lodging
- Music Venue/Auditorium
- Historic Property

NOTE:

The noise model tracks shown reflect an average location and dispersion of traffic flow and should be viewed as a representative modeled flight track rather than actual flight tracks. The noise model tracks were developed using a series of points and may appear slightly pointed in turns. The visual representation of the noise model tracks on this exhibit does not impact the accuracy of the noise exposure calculations.

SOURCES: Woolpert, August 2019 (aerial photography – for visual reference only, may not be to scale); State of Hawaii, 2020 (points of interest, census county divisions); SSFM International, Inc., 2018 (Kauai General Plan Land Use Boundaries); State of Hawaii, Department of Transportation (DOT) – Airports Division, Lihue Airport Layout Plan, October 2020 (Airport property boundary, future Airport property boundary, and future Airport easements); County of Kauai, https://kauai.gov/Government/Departments-Agencies/Public-Works/Building-Division/Projects/Bike-Path-Project/Nawiliwili-Ahukini-Bike-Path (accessed May 19, 2021); Wilson Okamoto Corporation and State of Hawaii DOT – Airports Division, *Final Environmental Impact Statement: Lihue Airport Improvements Appendix D*, November 2007 (historic properties); US Census Bureau, 2021 (roads); Ricondo & Associates, Inc., November 2021 (noise model tracks).

NORTH 0 2,000 ft

EXHIBIT 2.7-8

GENERALIZED HELICOPTER ARRIVAL, DEPARTURE, AND TOUCH-AND-GO NOISE MODEL TRACKS – 2019 EXISTING AND 2027 FORECAST CONDITIONS

P:\GIS\Projects\LIH\MXD\LIH_NEM_Exh2-7_8_GeneralizedHelicopterArrivalDepartureTGONoiseModelTracks_20230120.mxd

TABLE 2.7-11 GENERALIZED FIXED-WING NOISE MODEL TRACK USE – 2019 EXISTING CONDITION

ARRIVALS				DEPARTURES			
RUNWAY	TRACK ID	DAY	NIGHT	RUNWAY	TRACK ID	DAY	NIGHT
17	A17GPSNE0	38.60%	38.60%	17	D17RICHE0	68.26%	68.26%
	A17GPSNE1	24.40%	24.40%		D17RICHE1	15.87%	15.87%
	A17GPSNE2	24.40%	24.40%		D17RICHE2	15.87%	15.87%
	A17GPSNE3	6.30%	6.30%		**TOTAL**	**100.00%**	**100.00%**
	A17GPSNE4	6.30%	6.30%	35	D35LIH0	38.60%	38.60%
	TOTAL	**100.00%**	**100.00%**		D35LIH1	24.40%	24.40%
35	A35MORKE0	34.13%	34.13%		D35LIH2	24.40%	24.40%
	A35MORKE1	7.93%	7.93%		D35LIH3	6.30%	6.30%
	A35MORKE2	7.93%	7.93%		D35LIH4	6.30%	6.30%
	A35NAPUA0	34.13%	34.13%		**TOTAL**	**100.00%**	**100.00%**
	A35NAPUA1	7.93%	7.93%	3	D03LIH50	68.26%	68.26%
	A35NAPUA2	7.93%	7.93%		D03LIH51	15.87%	15.87%
	TOTAL	**100.00%**	**100.00%**		D03LIH52	15.87%	15.87%
3	A03N0	25.21%	26.10%		**TOTAL**	**100.00%**	**100.00%**
	A03N1	5.86%	6.07%	21	D21DIANE0	21.17%	21.88%
	A03N2	5.86%	6.07%		D21DIANE1	4.92%	5.09%
	A03SP0	25.21%	26.10%		D21DIANE2	4.92%	5.09%
	A03SP1	5.86%	6.07%		D21DIANS0	8.22%	9.63%
	A03SP2	5.86%	6.07%		D21DIANS1	1.91%	2.24%
	A3STRAT0	17.84%	16.05%		D21DIANS2	1.91%	2.24%
	A3STRAT1	4.15%	3.73%		D21RICHE0	38.86%	36.75%
	A3STRAT2	4.15%	3.73%		D21RICHE1	9.03%	8.54%
	TOTAL	**100.00%**	**100.00%**		D21RICHE2	9.03%	8.54%
21	A21ARPNE0	68.26%	68.26%		**TOTAL**	**100.00%**	**100.00%**
	A21ARPNE1	15.87%	15.87%				
	A21ARPNE2	15.87%	15.87%				
	TOTAL	**100.00%**	**100.00%**				

NOTES:
Noise model tracks shown on Exhibits 2.7-2 and 2.7-4.
Totals may not add due to rounding.
SOURCES: US Department of Transportation, Federal Aviation Administration, Aviation Environmental Tool (AEDT) Version 3d; Ricondo & Associates, Inc., October 2021.

TABLE 2.7-12 GENERALIZED FIXED-WING NOISE MODEL TRACK USE – 2027 FORECAST CONDITIONS

ARRIVALS				DEPARTURES			
RUNWAY	TRACK ID	DAY	NIGHT	RUNWAY	TRACK ID	DAY	NIGHT
17	A17GPSNE0	38.60%	38.60%	17	D17RICHE0	68.26%	68.26%
	A17GPSNE1	24.40%	24.40%		D17RICHE1	15.87%	15.87%
	A17GPSNE2	24.40%	24.40%		D17RICHE2	15.87%	15.87%
	A17GPSNE3	6.30%	6.30%		**TOTAL**	**100.00%**	**100.00%**
	A17GPSNE4	6.30%	6.30%	35	D35LIH0	38.60%	38.60%
	TOTAL	**100.00%**	**100.00%**		D35LIH1	24.40%	24.40%
35	A35MORKE0	34.13%	34.13%		D35LIH2	24.40%	24.40%
	A35MORKE1	7.93%	7.93%		D35LIH3	6.30%	6.30%
	A35MORKE2	7.93%	7.93%		D35LIH4	6.30%	6.30%
	A35NAPUA0	34.13%	34.13%		**TOTAL**	**100.00%**	**100.00%**
	A35NAPUA1	7.93%	7.93%	3	D3DLIH50	68.26%	68.26%
	A35NAPUA2	7.93%	7.93%		D3DLIH51	15.87%	15.87%
	TOTAL	**100.00%**	**100.00%**		D3DLIH52	15.87%	15.87%
3	A03XNP0	25.24%	26.77%		**TOTAL**	**100.00%**	**100.00%**
	A03XNP1	5.87%	6.22%	21	D21DIANE0	21.16%	21.50%
	A03XNP2	5.87%	6.22%		D21DIANE1	4.92%	5.00%
	A03XSP0	25.24%	26.77%		D21DIANE2	4.92%	5.00%
	A03XSP1	5.87%	6.22%		D21DIANS0	8.19%	8.89%
	A03XSP2	5.87%	6.22%		D21DIANS1	1.90%	2.07%
	A3STRAT0	17.77%	14.72%		D21DIANS2	1.90%	2.07%
	A3STRAT1	4.13%	3.42%		D21RICHE0	38.92%	37.87%
	A3STRAT2	4.13%	3.42%		D21RICHE1	9.05%	8.80%
	TOTAL	**100.00%**	**100.00%**		D21RICHE2	9.05%	8.80%
21	A21ARNPN0	68.26%	68.26%		**TOTAL**	**100.00%**	**100.00%**
	A21ARNPN1	15.87%	15.87%				
	A21ARNPN2	15.87%	15.87%				
	TOTAL	**100.00%**	**100.00%**				

NOTES:
Noise model tracks shown on Exhibits 2.7-3 and 2.7-5.
Totals may not add due to rounding.
SOURCES: US Department of Transportation, Federal Aviation Administration, Aviation Environmental Tool (AEDT) Version 3d; Ricondo & Associates, Inc., October 2021.

TABLE 2.7-13 GENERAL AVIATION AND MILITARY TOUCH-AND-GO NOISE MODEL TRACK USE – 2019 EXISTING AND 2027 FORECAST CONDITIONS

EXISTING (2019)				FORECAST (2027)			
RUNWAY	TRACK ID	DAY	NIGHT	RUNWAY	TRACK ID	DAY	NIGHT
17	17TNGJ0	100.00%	0.00%	17	17TNGJ0	100.00%	0.00%
	TOTAL	**100.00%**	**0.00%**		**TOTAL**	**100.00%**	**0.00%**
35	35TNGJ0	100.00%	0.00%	35	35TNGJ0	100.00%	0.00%
	TOTAL	**100.00%**	**0.00%**		**TOTAL**	**100.00%**	**0.00%**
3	03TL0	50.00%	50.00%	3	03XTL0	50.00%	50.00%
	03TR0	50.00%	50.00%		03XTR0	50.00%	50.00%
	TOTAL	**100.00%**	**100.00%**		**TOTAL**	**100.00%**	**100.00%**
21	21TL0	50.00%	50.00%	21	21XTL0	50.00%	50.00%
	21TR0	50.00%	50.00%		21XTR0	50.00%	50.00%
	TOTAL	**100.00%**	**100.00%**		**TOTAL**	**100.00%**	**100.00%**

NOTE: Noise model tracks shown on Exhibits 2.7-6 and 2.7-7.

SOURCES: US Department of Transportation, Federal Aviation Administration, Aviation Environmental Tool (AEDT) Version 3d; Ricondo & Associates, Inc., October 2021.

TABLE 2.7-14 GENERALIZED HELICOPTER NOISE MODEL TRACK USE – 2019 EXISTING AND 2027 FORECAST CONDITIONS

ARRIVALS			DEPARTURES			TOUCH-AND-GO		
TRACK ID	DAY	NIGHT	TRACK ID	DAY	NIGHT	TRACK ID	DAY	NIGHT
AKONADSP0	4.34%	4.34%	DKONADSP0	3.34%	0.00%	AH03TE0	21.75%	21.75%
AKONADSP1	4.33%	4.33%	DKONADSP1	3.33%	0.00%	AH03TW0	21.75%	21.75%
AKONADSP2	4.33%	4.33%	DKONADSP2	3.33%	0.00%	AH21TE0	3.25%	3.25%
ATRDESDS0	29.06%	29.06%	DOVH1DSP0	1.10%	0.00%	AH21TW0	3.25%	3.25%
ATRDESDS1	28.97%	28.97%	DOVH1DSP1	1.10%	0.00%	DH03TE0	21.75%	21.75%
ATRDESDS2	28.97%	28.97%	DOVH1DSP2	1.10%	0.00%	DH03TW0	21.75%	21.75%
TOTAL	**100.00%**	**100.00%**	DOVH2DSP0	0.33%	0.00%	DH21TE0	3.25%	3.25%
			DOVH2DSP1	0.33%	0.00%	DH21TW0	3.25%	3.25%
			DOVH2DSP2	0.33%	0.00%	**TOTAL**	**100.00%**	**100.00%**
			DTRDESDS0	28.62%	33.40%			
			DTRDESDS1	28.54%	33.30%			
			DTRDESDS2	28.54%	33.30%			
			TOTAL	**100.00%**	**100.00%**			

NOTES:

Noise model tracks shown on Exhibit 2.7-8.

Totals may not add due to rounding.

SOURCES: US Department of Transportation, Federal Aviation Administration, Aviation Environmental Tool (AEDT) Version 3d; Ricondo & Associates, Inc., October 2021.

2.7.6 PERFORMANCE CHARACTERISTICS

Aircraft weight during departure is a factor in the level of noise experienced on the ground because it impacts the rate at which an aircraft can climb. Generally, the heavier the aircraft, the slower the rate of climb, and the distribution of noise along its route of flight tends to be larger. The AEDT uses the distance flown to the destination as a surrogate for the weight, by assuming fuel load necessary to reach that first destination has a direct relationship to the takeoff weight. The AEDT groups trip lengths into nine stage length categories and assigns various aircraft weights associated with up to all nine categories. **Table 2.7-15** summarizes the stage length categories.

TABLE 2.7-15 STAGE LENGTH CATEGORIES

CATEGORY	STAGE LENGTH (NAUTICAL MILES)
1	0 – 500
2	500 – 1,000
3	1,000 – 1,500
4	1,500 – 2,500
5	2,500 – 3,500
6	3,500 – 4,500
7	4,500 – 5,500
8	5,500 – 6,500
9	6,500 +

SOURCE: US Department of Transportation, Federal Aviation Administration, *Aviation Environmental Design Tool (AEDT): Version 3d Technical Manual*, March 2021.

Departure stage length assignments were based on the distance to a flight's nonstop designation. Most general aviation and military aircraft do not have multiple stage lengths available in the model; therefore, the available stage length of "1" in the AEDT was used. **Table 2.7-16** summarizes the proportion of the aircraft operations with multiple stage lengths available in the AEDT that are assumed to fall within each of the stage length categories used for the 2019 existing and 2027 forecast conditions. For 2019, the destinations served for an AAD were based on flights provided in representative published flight schedules for commercial operations, as well as 2019 US DOT T-100 data for unscheduled operations (cargo operations). A representative destination city was correlated to a specific aircraft type for 2019. The forecast flight schedules developed for the Master Plan Update were used to determine destinations by aircraft type for scheduled commercial operations in 2027. The proportions of designations served by unscheduled cargo operations were maintained from 2019 proportions.

TABLE 2.7-16 DEPARTURE STAGE LENGTH DISTRIBUTION

	STAGE LENGTH					
YEAR	1	2	3	4	5	TOTAL
2019	63.32%	0.00%	0.00%	33.53%	3.15%	100.00%
2027	59.25%	0.00%	0.00%	37.42%	3.33%	100.00%

NOTE: The stage length is the nonstop distance flown by an aircraft departing the Airport. The greater the stage length, the greater the fuel load and the heavier the aircraft. The heavier aircraft weights result in slower climb performance, which tends to result in greater noise levels on the ground.

SOURCES: Diio Mi, October 2021 (Innovata scheduled carrier flight data for CY 2019); US Department of Transportation, (T-100 Database for 2019 and 2027); Ricondo & Associates, Inc., *Lihue Airport Master Plan and Noise Exposure Map Update – Aviation Activity Forecasts*, March 2020; US Department of Transportation, Federal Aviation Administration, *Aviation Forecast Approval-Lihue Master Plan,* September 30, 2020; Ricondo and Associates Inc. October 2021.

Note that standard fixed-wing aircraft performance profile data for arrivals and departures were used in the AEDT calculations. There were no user-defined performance profiles used in the AEDT model; therefore, the FAA AEE approval was not required.

The AEDT aircraft database provides standard arrival and departure profiles for helicopters. All helicopter altitude profiles include a level segment at 1,000 feet above field elevation (AFE) after climb or prior to descent. This level segment continues for the entire track after climb or at the start of an arrival track up to the point where it descends. Noise calculations were limited to an area where DNL 55 dBA and higher exposure levels are expected; therefore, terrain was not a factor that would require modifying the helicopter altitude profile.

3. NOISE EXPOSURE MAPS

As previously described, the compiled data were used as input to the FAA's AEDT Version 3d. Aircraft noise contours are presented at levels of DNL 55, 60, 65, 70, and 75 dBA. DNL 65 dBA and higher is identified in 14 CFR Part 150 to be significant noise for noise-sensitive land uses, such as residential, transient lodging, schools, places of worship, libraries, hospitals, nursing homes, auditoriums, outdoor amphitheaters, concert halls, and historic properties.[36, 37]

The noise contours represent the daily energy average of all 365 days of operation for the 2019 existing and 2027 forecast conditions. The noise contour pattern extends from each runway end and reflects the flight tracks used by all aircraft. The relative distance of the noise contours from the Airport along each route is a function of the frequency of each runway use for total arrivals and departures, use at night, and aircraft type.

GIS software, along with information on land use, population, dwelling units, and the NEM contours, was used to conduct a spatial analysis to identify incompatible land uses exposed to various levels of aircraft noise and the number of people, dwelling units, and noise-sensitive sites that are incompatible with the aircraft noise exposure levels they experience.

3.1 2019 EXISTING CONDITION NOISE EXPOSURE MAP

Exhibit 3.1-1 depicts the AAD noise exposure pattern for the 2019 existing condition, as well as the current land uses around the Airport in relation to the noise exposure pattern. Consistent with 14 CFR Part 150, the DNL 65, 70, and 75 dBA noise contours are depicted on the exhibit. Residential and other noise-sensitive land uses are identified in 14 CFR Part 150 as incompatible with aircraft noise of DNL 65 dBA and higher. Exhibit 3.1-1 also depicts the DNL 60 dBA noise contour and the DNL 55 dBA noise contour for State informational purposes only. Residential and other noise-sensitive land uses within the DNL 60 dBA noise contour are considered incompatible by the State of Hawaii recommended guidelines. The DNL 55 dBA noise contour is shown for informational purposes as described in Section 1.3.5. **Table 3.1-1** summarizes the land area (in acres) within each noise contour level.

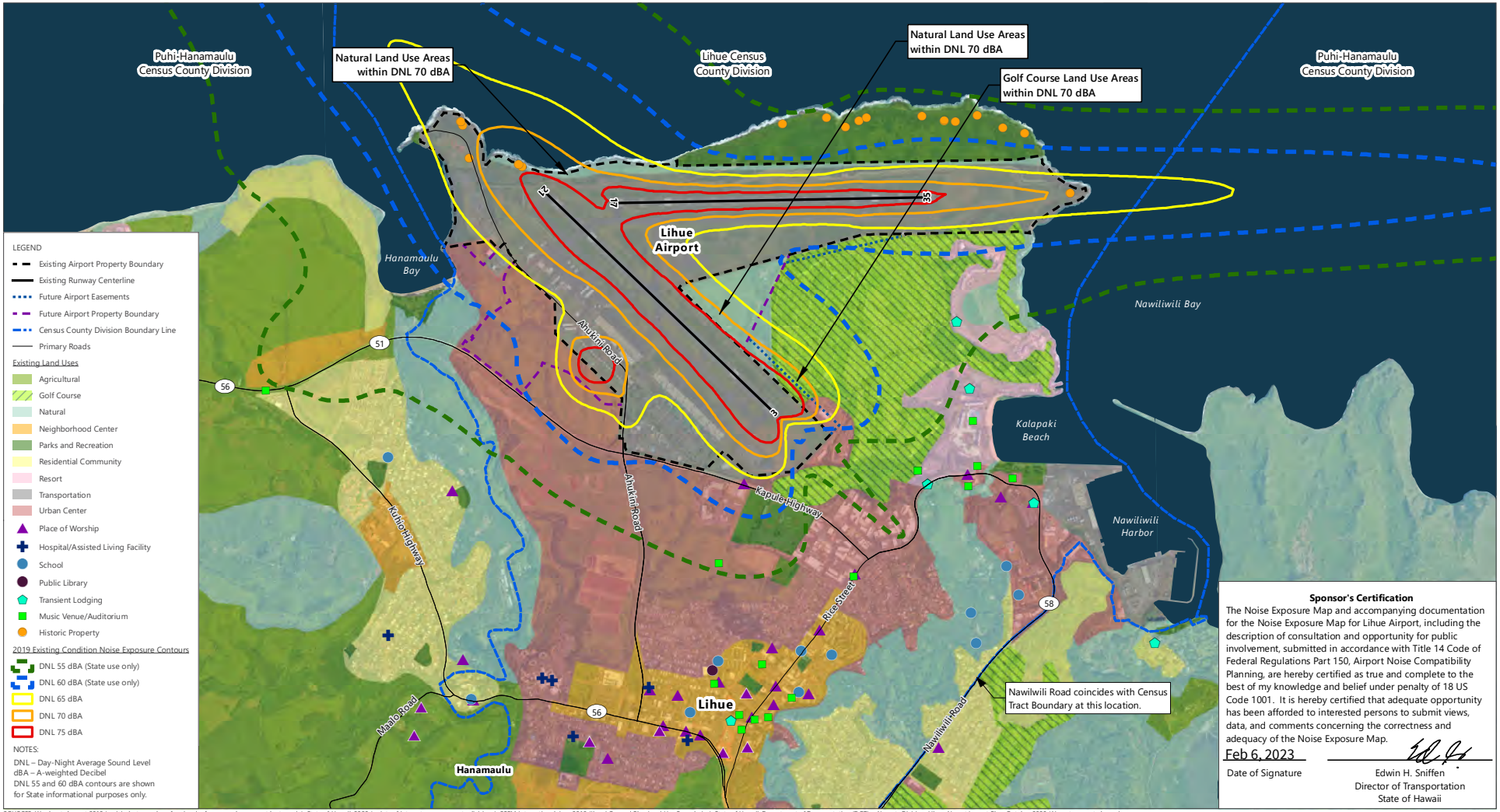
TABLE 3.1-1 LAND AREA – 2019 EXISTING CONDITION

DAY-NIGHT AVERAGE SOUND LEVEL (DNL) IN A-WEIGHTED DECIBELS (DBA)	LAND AREA (ACRES)
DNL 55–60	994.14
DNL 60–65	502.55
DNL 65–70	376.34
DNL 70–75	220.58
DNL 75+	237.29
TOTAL DNL 60+	**1,336.76**
TOTAL DNL 65+	**834.20**

NOTE: Totals may not add due to rounding.
SOURCE: Ricondo & Associates, Inc., November 2021 (based on the Federal Aviation Administration's Aviation Environmental Design Tool [AEDT], Version 3d).

[36] Historic properties are those that are listed in or eligible for listing in the National Register of Historic Places.

[37] Per 14 CFR 150.101(e)(6), noise exposure maps must also contain and identify the location of noise sensitive public buildings (such as schools, hospitals, and health care facilities), and properties on or eligible for inclusion in the National Register of Historic Places.



Sponsor's Certification

The Noise Exposure Map and accompanying documentation for the Noise Exposure Map for Lihue Airport, including the description of consultation and opportunity for public involvement, submitted in accordance with Title 14 Code of Federal Regulations Part 150, Airport Noise Compatibility Planning, are hereby certified as true and complete to the best of my knowledge and belief under penalty of 18 US Code 1001. It is hereby certified that adequate opportunity has been afforded to interested persons to submit views, data, and comments concerning the correctness and adequacy of the Noise Exposure Map.

Feb 6, 2023
Date of Signature

Edwin H. Sniffen
Director of Transportation
State of Hawaii

SOURCES: Woolpert, August 2019 (aerial photography – for visual reference only, may not be to scale); State of Hawaii, 2020 (points of interest, census county divisions); SSFM International, Inc., 2018 (Kauai General Plan Land Use Boundaries); State of Hawaii, Department of Transportation (DOT) – Airports Division, Lihue Airport Layout Plan, October 2020 (Airport property boundary, future Airport property boundary, and future Airport easements); County of Kauai, https://kauai.gov/Government/Departments-Agencies/Public-Works/Building-Division/Projects/Bike-Path-Project/Nawiliwili-Ahukini-Bike-Path (accessed May 19, 2021); Wilson Okamoto Corporation and State of Hawaii DOT – Airports Division, *Final Environmental Impact Statement: Lihue Airport Improvements Appendix D*, November 2007 (historic properties); US Census Bureau, 2021 (roads); Ricondo & Associates, Inc., based on Federal Aviation Administration (FAA) Aviation Environmental Design Tool (AEDT), Version 3d, November 2021 (noise contours).

EXHIBIT 3.1-1

2019 EXISTING CONDITION
NOISE EXPOSURE MAP

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The overall shape of the noise contours is primarily a function of the combination of runway use, flight tracks, and time-of-day operations at LIH. The shape of the noise contours north and south of the Airport reflects the predominant use of the primary runways – Runway 3 for departures and Runway 35 for arrivals. Helicopter arrivals from the northwest influence the shape of the DNL 55 dBA noise contour to the northwest, and helicopter operations influence the shape of the DNL 60 dBA and DNL 65 dBA noise contours west of the Airport.

Table 3.1-2 summarizes the residential dwelling units, population, and noise-sensitive public facilities exposed to aircraft noise levels of DNL 65 dBA and higher and DNL 60 dBA and higher for the 2019 existing condition. US Decennial Census data for 2020 by Census Tract was used to calculate a population factor for each census tract intersecting the 2019 Existing Condition or 2027 Forecast Conditions NEM contours exposed to DNL 55 dBA and higher. Two census tracts intersect the two NEM contours, Census Tracts 404.01 and 405, with a population factor of four and three, respectively. Dwelling units were manually counted within noise contours using a combination of land use, aerial survey, and the County of Kauai's assessor's information.

As shown in Table 3.1-2, there are no dwelling units or population within the DNL 65 dBA or DNL 60 dBA noise contours.

For informational purposes only, Exhibit 3.1-1 shows the DNL 55 dBA noise contour, extending to the south, west, and north of the airfield. There is one residential dwelling unit, with an estimated population of four between the DNL 55 and 60 dBA noise contours. All uses between the DNL 55 and 60 dBA are considered compatible by FAA guidelines and the State of Hawaii recommended guidelines.

Golf courses are included in the land use category "golf courses, riding stables, and water recreation" in FAA guidelines and "public golf courses, riding stables, cemeteries, gardens, etc." in the State of Hawaii recommended guidelines. Approximately 10 acres of a golf course are within the DNL 70 dBA and higher noise contour, which is considered incompatible by FAA guidelines. Approximately 132 acres of golf course are within the DNL 60 dBA and higher noise contour, which is considered incompatible by the State of Hawaii recommended guidelines.

Resort land uses are most closely related to "transient lodgings" in FAA guidelines and "low density residential, resorts, and hotels (outdoor facility)" and "transient lodgings with limited outdoor use" in the State of Hawaii recommended guidelines. No resort land use is within the DNL 65 dBA noise contour. Approximately 4 acres of resort land use are within the DNL 60 dBA noise contour, which is considered incompatible by the State of Hawaii recommended guidelines. Resort land use within the DNL 60 dBA noise contour includes structures associated with Kauai Lagoons Marina at Marriott's Kauai Lagoons Kalanipu'u.

As indicated in the 2018 Kauai General Plan, land use designated as "natural" includes State Land Use Conservation District land and County Open Zoning District land as well as the ridges, waterfalls, river valleys, and coastline of the island that comprise its open spaces and scenic views. Natural land uses are most closely related to "nature exhibits and zoos" in FAA guidelines and "nature exhibits and zoos, neighborhood parks" and "extensive natural wildlife and recreation areas" in the State of Hawaii recommended guidelines. Approximately 24 acres of natural land are within the DNL 70 dBA and higher noise contour, which is considered incompatible by FAA guidelines. Approximately 94 acres of natural land are within the DNL 60 dBA and higher noise contour (of which, approximately 52 acres are within the DNL 65 dBA and higher noise contour), which is considered incompatible by the State of Hawaii recommended guidelines.[38]

[38] Per the State of Hawaii recommended guidelines, "Extensive natural wildlife and recreation areas" are considered incompatible at and above DNL 60 dBA; "Nature exhibits and zoos, neighborhood parks" are considered incompatible at and above DNL 65 dBA.

TABLE 3.1-2 RESIDENTIAL UNITS, POPULATION, AND NOISE-SENSITIVE FACILITIES – 2019 EXISTING CONDITION

LAND USE		ANNUAL DAY-NIGHT AVERAGE SOUND LEVEL (DNL) IN A-WEIGHED DECIBELS (DBA)					
		60-65	65-70	70-75	**60+**	**65+**	**70+**
Residential	Population [1]	0	0	0	**0**	**0**	**0**
	Dwelling Units	0	0	0	**0**	**0**	**0**
Noise-Sensitive Facilities	Music Venues/Auditoriums	0	0	0	**0**	**0**	**0**
	Place of Worship [2]	1	0	0	**1**	**0**	**0**
	Hospitals	0	0	0	**0**	**0**	**0**
	Public Libraries	0	0	0	**0**	**0**	**0**
	Hospitals/Assisted Living Facilities	0	0	0	**0**	**0**	**0**
	Transient Lodging [3]	0	0	0	**0**	**0**	**0**
Other	Historic Properties [4]	0	4	2	**6**	**6**	**2**

NOTES:
1 Population counts do not include transient lodging.
2 Place of Worship is consistent with 14 CFR Part 150 "churches".
3 Transient Lodging includes resorts, hotels, and timeshares.
4 Historic properties are those that are listed in or eligible for listing in the National Register of Historic Places.

SOURCES: US Census Bureau, 2020 (census tract data); State of Hawaii, 2020 (points of interest); County of Kauai, Kauai Real Property Assessment, https://qpublic.schneidercorp.com/Application.aspx?AppID=986&LayerID=20101&PageTypeID=1&PageID=8741&KeyValue=380180010000 (accessed November 2021); Wilson Okamoto Corporation and State of Hawaii DOT Airports Division, *Final Environmental Impact Statement: Lihue Airport Improvements Appendix D*, November 2007 (historic properties); Ricondo & Associates, Inc., November 2021 (based on Federal Aviation Administration Aviation Environmental Design Tool [AEDT], Version 3d).

No places of worship are within the DNL 65 dBA and higher noise contour. One place of worship, New Hope Lihue, located at 3215 Kapule Highway, is within the DNL 60 dBA and higher noise contour, which is considered incompatible by the State of Hawaii recommended guidelines.

Six historic properties are within the DNL 60 dBA and higher noise contour. Four of the six historic properties are located in the DNL 65 dBA and higher noise contour in transportation land use areas, which is considered compatible by both FAA guidelines and the State of Hawaii recommended guidelines. The remaining two historic properties are located in the DNL 70 dBA and higher noise contour in natural land use areas, which is considered incompatible by both FAA guidelines and the State of Hawaii recommended guidelines. **Table 3.1-3** provides information regarding the six historic properties. Although a historic property may be located in an area that is considered incompatible by FAA guidelines and/or the State of Hawaii recommended guidelines, this does not necessarily mean the historic property would be impacted or that it affects its eligibility for listing in the National Register of Historic Places.

TABLE 3.1-3 HISTORIC PROPERTIES LOCATED WITHIN THE DNL 60 DBA AND HIGHER NOISE CONTOURS

STATE INVENTORY OF HISTORICS PLACES NUMBER	SITE TYPE	FUNCTION	DESCRIPTION	LOCATED WITHIN NOISE EXPOSURE CONTOUR	LAND USE DESIGNATION	LAND USE COMPATIBILITY PER FAA GUIDELINES	LAND USE COMPATIBILITY PER STATE OF HAWAII GUIDELINES
50-30-11-2087	Nawiliwili Harbor Light, Wall Remnants, and Building Foundations	Lighthouse and Associated Remnants of Caretaker's Quarters	Series of features interpreted as being associated with Nawiliwili Harbor Light	DNL 65 dBA	Transportation	Compatible	Compatible
50-30-11-2096	Ditch	Drainage	Concrete drainage ditch	DNL 65 dBA	Transportation	Compatible	Compatible
50-30-11-2097	Ditch	Drainage	Concrete drainage ditch	DNL 65 dBA	Transportation	Compatible	Compatible
50-30-11-2103	Structural Foundations	Industrial Complex	Remnants of five foundations associated with a historic industrial complex present near Ahukini Landing	DNL 65 dBA	Transportation	Compatible	Compatible
50-30-08-3958	Enclosures and Related Structures	Animal Husbandry	Piggery dating from the plantation era	DNL 70 dBA	Natural	Incompatible [1]	Incompatible [2]
	Enclosures and Related Structures	Animal Husbandry	Piggery dating from the plantation era	DNL 70 dBA	Natural	Incompatible [1]	Incompatible [2]

NOTES:

Historic properties are those that are listed in or eligible for listing in the National Register of Historic Places.

1 Although a historic property may be located in an area that is considered incompatible by FAA guidelines, this does not necessarily mean the historic property would be impacted or that it affects its eligibility for listing in the National Register of Historic Places. Natural land uses are most closely related to "Nature exhibits and zoos" in Title 14 Code of Federal Regulations Part 150 land use compatibility guidelines (see Table A.2-2 in Appendix A). Per FAA guidelines, these uses are considered incompatible at DNL 70 dBA and higher.

2 Although a historic property may be located in an area that is considered incompatible by the State of Hawaii recommended guidelines, this does not necessarily mean the historic property would be impacted or that it affects its eligibility for listing in the National Register of Historic Places. Natural land uses are most closely related to "Nature exhibits and zoos, neighborhood parks" and "Extensive natural wildlife and recreation areas" in State of Hawaii land use compatibility guidelines (see Table A.2-3 in Appendix A). Per State of Hawaii guidelines, these uses are considered incompatible at DNL 70 dBA and higher.

dBA – A-Weighted Decibels

DNL – Day-Night Average Sound Level

FAA – Federal Aviation Administration

SOURCES: Monahan, Chris, Ph.D., and Hallett H. Hammatt, Ph.D., *Archaeological Literature Review and Field Inspection Report for the Nawiliwili-Ahukini Bike Path Project, Nawiliwili, Kalapaki and Hanama'ulu Ahupua'a, Lihu'e District, Kaua'I Island*, July 2008; Wilson Okamoto Corporation and State of Hawaii Department of Transportation – Airports Division, *Final Environmental Impact Statement, Lihue Airport Improvements*, November 2007; Appendix A of this document.

3.2 2027 FORECAST CONDITIONS NOISE EXPOSURE MAP

Exhibit 3.2-1 depicts the expected AAD noise exposure pattern for the 2027 forecast conditions. This noise contour pattern is reflective of typical operating conditions at LIH, combined with the future changes to Runway 3-21 and associated noise model tracks, operational levels, and fleet mix as described in Chapter 2. Consistent with 14 CFR Part 150, the DNL 65, 70, and 75 dBA noise contours are depicted on the exhibit. Residential and other noise-sensitive land uses are identified in 14 CFR Part 150 as incompatible with aircraft noise of DNL 65 dBA and higher. Exhibit 3.2-1 also depicts the DNL 60 dBA noise contour and the DNL 55 dBA noise contour for State informational purposes only. Residential and other noise-sensitive land uses within the DNL 60 dBA noise contour are considered incompatible by the State of Hawaii recommended guidelines. The DNL 55 dBA noise contour is shown for informational purposes as described in Section 1.3.5.

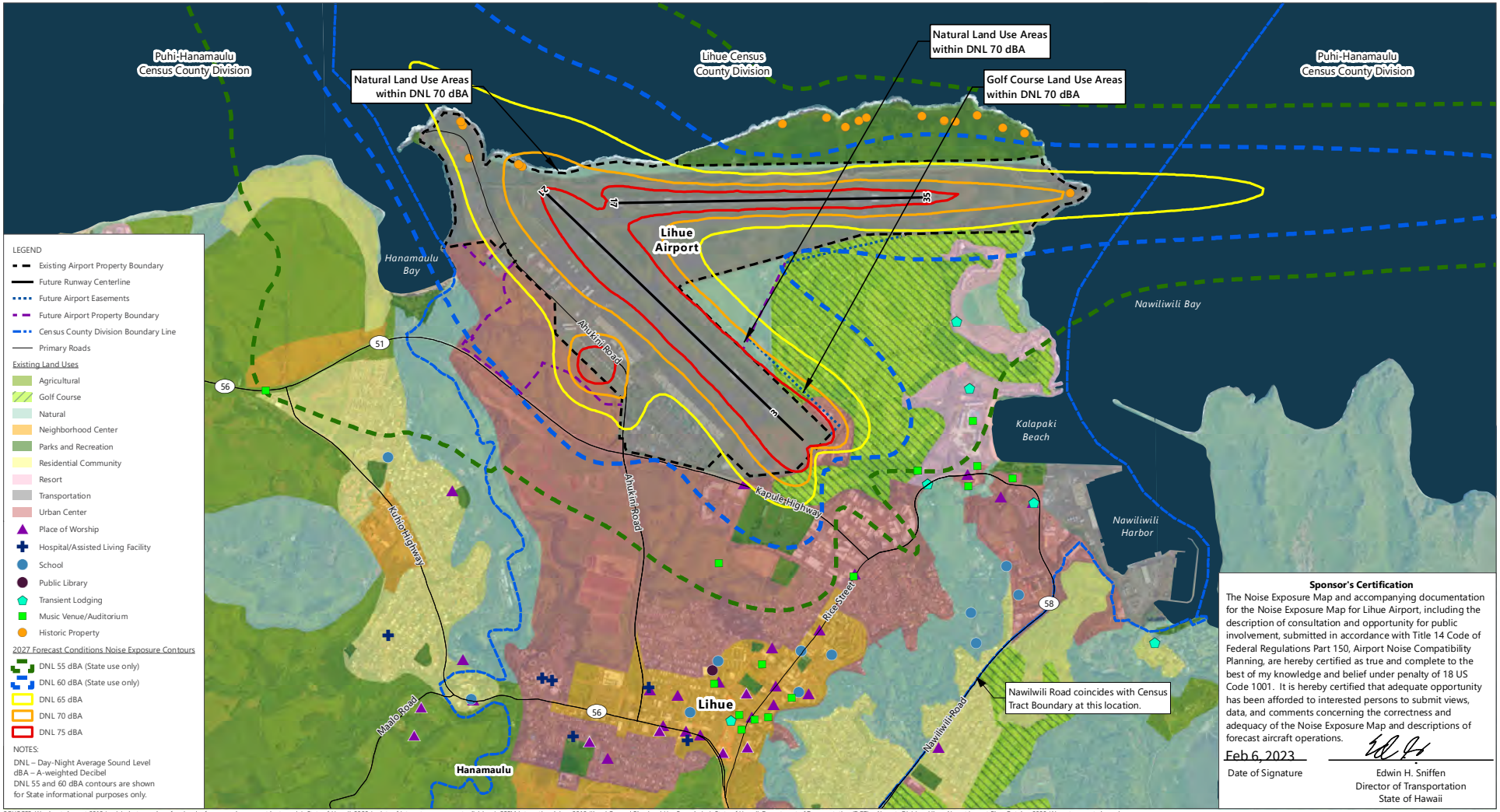
Table 3.2-1 compares the land area within each aircraft noise contour level for the existing and future conditions.

TABLE 3.2-1 LAND AREA COMPARISON – 2019 EXISTING AND 2027 FORECAST CONDITIONS

ANNUAL DAY-NIGHT AVERAGE SOUND LEVEL (DNL) IN A-WEIGHTD DECIBELS (DBA)	LAND AREA (ACRES)		
	EXISTING – 2019	FORECAST – 2027	DIFFERENCE
DNL 55–60	994.14	1,141.14	147.01
DNL 60–65	502.55	580.62	78.06
DNL 65–70	376.34	399.34	23.01
DNL 70–75	220.58	249.84	29.26
DNL 75+	237.29	259.77	22.48
TOTAL DNL 60+	**1,336.76**	**1,489.57**	**152.81**
TOTAL DNL 65+	**834.20**	**908.95**	**74.75**

NOTE: Totals may not add due to rounding.
SOURCE: Ricondo & Associates, Inc., November 2021 (based on the Federal Aviation Administration's Aviation Environmental Design Tool [AEDT], Version 3d).

The overall shape of the noise contours is generally similar to that of the 2019 existing condition noise contours. As evidenced in the comparison of noise contour areas reported in Table 3.2-1, the areas within the 2027 forecast conditions noise contours are slightly larger than those of the 2019 existing condition and departure noise from Runway 3 is shifted to the southwest due to the southwestern shift of the Runway 3 departure end. These changes are to be expected due to the forecast increase in operations by 2027 as compared to 2019 and the approved RSA improvements for Runway 3-21.



Sponsor's Certification

The Noise Exposure Map and accompanying documentation for the Noise Exposure Map for Lihue Airport, including the description of consultation and opportunity for public involvement, submitted in accordance with Title 14 Code of Federal Regulations Part 150, Airport Noise Compatibility Planning, are hereby certified as true and complete to the best of my knowledge and belief under penalty of 18 US Code 1001. It is hereby certified that adequate opportunity has been afforded to interested persons to submit views, data, and comments concerning the correctness and adequacy of the Noise Exposure Map and descriptions of forecast aircraft operations.

Feb 6, 2023
Date of Signature

Edwin H. Sniffen
Director of Transportation
State of Hawaii

SOURCES: Woolpert, August 2019 (aerial photography – for visual reference only, may not be to scale); State of Hawaii, 2020 (points of interest, census county divisions); SSFM International, Inc., 2018 (Kauai General Plan Land Use Boundaries); State of Hawaii, Department of Transportation (DOT) – Airports Division, Lihue Airport Layout Plan, October 2020 (Airport property boundary, future Airport property boundary, and future Airport easements); County of Kauai, https://kauai.gov/Government/Departments-Agencies/Public-Works/Building-Division/Projects/Bike-Path-Project/Nawiliwili-Ahukini-Bike-Path (accessed May 19, 2021); Wilson Okamoto Corporation and State of Hawaii DOT – Airports Division, *Final Environmental Impact Statement: Lihue Airport Improvements Appendix D*, November 2007 (historic properties); US Census Bureau, 2021 (roads); Ricondo & Associates, Inc., based on Federal Aviation Administration (FAA) Aviation Environmental Design Tool (AEDT), Version 3d, November 2021 (noise contours).

EXHIBIT 3.2-1

2027 FORECAST CONDITIONS
NOISE EXPOSURE MAP

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Table 3.2-2 summarizes the residential dwelling units, population, and noise-sensitive public facilities affected by the aircraft noise levels of DNL 65 dBA and higher and DNL 60 dBA and higher for the 2027 forecast conditions. Comparing the noise pattern to the land use map shows that there are no residential units within the DNL 65 dBA noise contour for 2027 forecast conditions. There would be 6 residential units with 18 residents exposed to aircraft noise between DNL 60 and 65 dBA, which is considered incompatible by the State of Hawaii recommended guidelines. The six residential units are in the southwest area of the DNL 60 dBA noise contour at Kamamalu Condominiums, located at 3920 Haoa Street. The Kamamalu Condominiums comprise 31 residential units total within 3 structures; the noise contour partially intersects 1 structure with an estimated 12 residential units.

For informational purposes only, Exhibit 3.2-1 shows the DNL 55 dBA noise contour and the estimated residential impact is recorded. Some areas of residential communities would be between the DNL 55 and 60 dBA noise contours, including 451 dwelling units with an estimated population of 1,563. The estimated dwelling units between the DNL 55 and 60 dBA consist of 88 existing residential dwelling units to the southeast and east, and 363 residential dwelling units in future developments, including the Kohea Loa development to the northwest, and the proposed Timbers Resorts Kauai's Hokuala Phase I Master Plan Development south of the airfield. All uses between the DNL 55 and 60 dBA noise contours are considered compatible by FAA guidelines and the State of Hawaii recommended guidelines.

TABLE 3.2-2 RESIDENTIAL UNITS, POPULATION, AND NOISE-SENSITIVE FACILITIES – 2027 FORECAST CONDITIONS

LAND USE		ANNUAL DAY-NIGHT AVERAGE SOUND LEVEL (DNL) IN A-WEIGHED DECIBELS (DBA)					
		60-65	65-70	70-75	**60+**	**65+**	**70+**
Residential	Population [1]	18	0	0	**18**	**0**	**0**
	Dwelling Units	6	0	0	**6**	**0**	**0**
Noise-Sensitive Facilities	Music Venues / Auditoriums	0	0	0	**0**	**0**	**0**
	Place of Worship [2]	1	0	0	**1**	**0**	**0**
	Hospitals	0	0	0	**0**	**0**	**0**
	Libraries	0	0	0	**0**	**0**	**0**
	Nursing Homes	0	0	0	**0**	**0**	**0**
	Transient Lodging [3]	0	0	0	**0**	**0**	**0**
Other	Historic Properties [4]	0	4	2	**6**	**6**	**2**

NOTES:

1 Population counts do not include transient lodging.

2 Place of Worship is consistent with 14 CFR Part 150 "churches".

3 Transient Lodging includes resorts, hotels, and timeshares.

4 Historic properties are those that are listed in or eligible for listing in the National Register of Historic Places.

SOURCES: US Census Bureau, 2020 (census tract data); State of Hawaii, 2020 (points of interest); County of Kauai, Kauai Real Property Assessment, (https://qpublic.schneidercorp.com/Application.aspx?AppID=986&LayerID=20101&PageTypeID=1&PageID=8741&KeyValue=380180010000, accessed: November 2021); Wilson Okamoto Corporation and State of Hawaii DOT Airports Division, Final Environmental Impact Statement: Lihue Airport Improvements Appendix D, November 2007 (historic properties); Gary Siracusa, Director of Construction, Timbers Resorts Kauai, "Proposed Development Plans for LIH NEM Update", email to Ricondo & Associates, Inc. Staff, November 11, 2021; Ricondo & Associates, Inc., November 2021 (based on Federal Aviation Administration Aviation Environmental Design Tool [AEDT], Version 3d).

Approximately 12 acres of golf course would be within the DNL 70 dBA and higher noise contour, which is considered incompatible by FAA guidelines. Approximately 184 acres of golf course would be within the DNL 60 dBA and higher noise contour, which is considered incompatible by the State of Hawaii recommended guidelines.

No resort land use would be within the DNL 65 dBA and higher noise contour. Approximately 8 acres of resort land use would be within the DNL 60 dBA and higher noise contour, which is considered incompatible by the State of Hawaii recommended guidelines. Resort land use located within the DNL 60 dBA and higher noise contour includes structures associated with Kauai Lagoons Marina at Marriott's Kauai Lagoons Kalanipu'u.

Approximately 23 acres of natural land would be within the DNL 70 dBA and higher noise contour, which is considered incompatible by FAA guidelines. Approximately 103 acres of natural land would be within the DNL 60 dBA and higher noise contour (of which, approximately 54 acres would be within the DNL 65 dBA and higher noise contour), which is considered incompatible by the State of Hawaii recommended guidelines.[39]

Consistent with the 2019 existing condition NEM discussed in Section 3.1, no places of worship would be within the DNL 65 dBA and higher noise contour. One place of worship, New Hope Lihue, would be within the DNL 60 dBA and higher noise contour, which is considered incompatible by the State of Hawaii recommended guidelines.

Consistent with the 2019 existing condition NEM discussed in Section 3.1, six historic properties would be within the DNL 60 dBA and higher noise contour. Four of the six historic properties would be located in the DNL 65 dBA and higher noise contour in transportation land use areas, which is considered compatible by both FAA guidelines and the State of Hawaii recommended guidelines. The remaining two historic properties would be located in the DNL 70 dBA and higher noise contour in natural land use areas, which is considered incompatible by both FAA guidelines and the State of Hawaii recommended guidelines. Table 3.1-3 provides information regarding the six historic properties. Although a historic property may be located in an area that is considered incompatible by FAA guidelines and/or the State of Hawaii recommended guidelines, this does not necessarily mean the historic property would be impacted or that it affects its eligibility for listing in the National Register of Historic Places.

[39] Per the State of Hawaii recommended guidelines, "Extensive natural wildlife and recreation areas" are considered incompatible at and above DNL 60 dBA. "Nature exhibits and zoos, neighborhood parks" are considered incompatible at and above DNL 65 dBA.

4. CONSULTATION AND PUBLIC REVIEW

The Part 150 NEM Update study included consultation with municipalities and stakeholders (those required by 14 CFR 150.21[b] and A150.105[a]) through a Technical Advisory Committee (TAC). The Study also provided an opportunity for interested persons to comment during public information meetings. Per 14 CFR 150.21(b) and A150.105(a) (Appendix A to Part 150), the NEMs and documentation should be submitted

> in consultation with states, public agencies, and planning agencies whose area, or any portion of whose area, of jurisdiction is within the DNL 65 dBA contour depicted on the map, FAA regional officials, and other Federal officials having local responsibility for land uses depicted on the map. This consultation must include regular aeronautical users of the airport. The airport operator shall certify that it has afforded interested persons adequate opportunity to submit their views, data, and comments concerning the correctness and adequacy of the draft noise exposure map and descriptions of forecast aircraft operations.

For the Study, stakeholder representatives include the County of Kauai; the FAA; State and federal congressional representatives; the US Department of Agriculture; the Department of Land and Natural Resources; the Kauai Chamber of Commerce; and the Kauai Visitors Bureau. 14 CFR 150.21(b) also indicates that the NEMs and documentation allow the opportunity for the public review and comment. Documents supporting the consultation process and opportunities for the public to comment are provided in **Appendix C**.

Public comments were considered when the Study was finalized. One written public comment was received (see **Appendix D**).

4.1 TECHNICAL ADVISORY COMMITTEE

Members of the NEM TAC are the same members as the Master Plan Update TAC, apart from federal congressional representation. **Table 4.1-1** lists the TAC members. The first NEM TAC meeting was conducted on October 25, 2021, and the second TAC meeting was conducted on May 4, 2022. Information presented to the TAC is provided in Appendix C. No written comments on the Draft 14 CFR Part 150 NEM Update study were received from TAC members.

4.2 PUBLIC REVIEW

The first NEM public information meeting was conducted on October 26, 2021, to discuss the noise analysis assumptions and methodology. This meeting provided the community an opportunity to comment on the Airport noise concerns. A copy of the legal notice newspaper affidavit and presentation for the first public information meeting is included in Appendix D. There were no public comments received during the workshop. A second NEM public meeting was conducted on May 5, 2022, to discuss the noise analysis results and provide the public an opportunity to comment on the Draft 14 CFR Part 150 NEM Update study. A copy of the legal notice newspaper affidavit and presentation is included in Appendix D. The public was provided an opportunity to review and comment in writing or an online form on the Draft 14 CFR Part 150 NEM Update study from April 17, 2022, to May 16, 2022. One public comment was received (see Appendix D).

TABLE 4.1-1 TECHNICAL ADVISORY COMMITTEE MEMBERS FOR THE NOISE EXPOSURE MAP UPDATE

NAME	TITLE	REPRESENTING [1]
Brian Schatz	US Senator	US Senate
Mazie Hirono	US Senator	US Senate
Kai Kahele	District 2 US Representative	US Congress
Harold Taira	Port Director	US Department of Agriculture
Dee Morikawa	District 16 State Representative	State of Hawaii
James Tokioka	District 15 State Representative	State of Hawaii
Nadine K. Nakamura	District 14 State Representative	State of Hawaii
Ronald D. Kouchi	President, Hawaii State Senate	State of Hawaii
Roth Puahala	Assistant to Senator Ronald D. Kouchi	State of Hawaii
Wesley T. Matsunaga	District Land Agent	Department of Land and Natural Resources
Arryl Kaneshiro	Council Chair	County of Kauai
Don Kakuda	Unknown	County of Kauai, Wastewater Division
Jason Kagimoto	Unknown	County of Kauai, Public Works Department
Kaaina Hull	Director	County of Kauai, Planning Department
Lea Kaiaokamalie	Senior Planner and Geographic Information System Analyst	County of Kauai, Planning Department
Mark Perriello	President/CEO	Kauai Chamber of Commerce
Gordon Wong	Program Manager	Federal Aviation Administration
Kimberly Evans	Community Planner	Federal Aviation Administration
Rod Kitchel	Air Traffic Manager	Lihue Federal Contract Tower, Hawaii
Amy St. Pierre	Manager	Lihue Federal Contract Tower, Hawaii
Sue Kanoho	Executive Director	Kauai Visitors Bureau
Bonita A. Saffold	Real Estate Agent	FedEx Express
Dale Nelson	Unknown	FedEx Feeder Ops – Corporate Air
Tony Ind	Unknown	FedEx
James Mertens	Duty Manager	Airlines Committee of Hawaii/AvAirPros
Dee Miranda	Unknown	Airborne Aviation Hawaii
Kiku Kobo	Unknown	Airborne Aviation Hawaii
Ingrid Wehner	Operations Manager	Aloha Helicopters
Linda Bukoski	Unknown	Island Helicopters
Casey Riemer	Manager	Jack Harter Helicopters
Chantelle Carverio	Unknown	Mauna Loa Helicopters
Kyle Jacobson	Unknown	Safari Helicopters
Dennis Fujimoto	General Public	The Garden Island
Jan TenBruggencate	General Public	Island Strategy

NOTES:

1 Title 14 Code of Federal Regulations Part 150 requires consultation with states, and public agencies and planning agencies whose area, or any portion of whose area, of jurisdiction is within the day-night average sound level (DNL) 65 A-weighted decibels (dBA) contour depicted on the Noise Exposure Map (NEM), Federal Aviation Administration (FAA) regional officials, and other federal officials having local responsibility for land uses depicted on the map. The airport proprietor shall identify each public agency and planning agency whose jurisdiction or responsibility is either wholly or partially within the DNL 65 dBA boundary and supporting documentation shall identify their geographic areas of jurisdiction. The planning agencies highlighted in gray in this table have jurisdiction, and their boundaries are depicted on the NEMs.

SOURCE: Ricondo & Associates, Inc., November 2021.