SECTION 4

EXISTING CONDITION: YEAR 2021 NOISE EXPOSURE

4.1 INTRODUCTION

The evaluation of the airport noise environment at the Key West International Airport (EYW) was completed using the methodologies and standards developed by the Federal Aviation Administration (FAA) and published in Title 14 CFR part 150 (Part 150). The regulation requires that the cumulative noise energy exposure of individuals to noise resulting from aviation activities be established in terms of yearly day/night average sound level (DNL) as the FAA's primary metric. All detailed noise analyses must be performed using the most current version of the FAA's Aviation Environmental Design Tool (AEDT). For this NEM, the FAA's AEDT Version 3d was used to model aircraft noise exposure. User- defined information required to run the AEDT model includes:

- A physical description of the airport layout, including location, length and orientation of all runways, and airport elevation;
- The aircraft fleet mix for the average day;
- The number of daytime flight and run-up operations (7:00 a.m. to 9:59 p.m.);
- The number of nighttime flight and run-up operations (10:00 p.m. to 6:59 a.m.);
- Aircraft departure stage lengths;
- Runway utilization rates;
- Primary departure and arrival flight tracks; and
- Flight track utilization rates.

The noise analysis described in the section was conducted to reflect the existing (i.e., current) condition. This analysis includes maps depicting land uses within the DNL contours.

The following information is provided for the existing conditions:

- The number of people living or residences within each noise contour above DNL 65 dB for the Existing Condition NEM.
- The location and number of noise sensitive uses (e.g., schools, places of worship, hospitals, parks, recreation areas) exposed to DNL 65 dB or greater for the Existing Condition NEM.
- Mitigation measures in effect or proposed and their relationship to the Existing Condition NEM.

4.2 METHOD FOR DEVELOPING FLEET MIX AND NUMBER OF OPERATIONS

4.2.1 Data Sources

Historical aircraft operations data were obtained from Flightradar24 (FR24), FAA's Operations Network (OPSNET), and FAA's Traffic Flow Management System (TFMS), and EYW Landing Reports for the period October 1, 2020, through September 30, 2021. The sources of the detailed fleet mix data used in this analysis were FR24, TFMS, and EYW Landing Reports, because OPSNET only provides total operations

by aircraft category. Documentation of the consultation with the FAA regarding the method for developing the fleet mix and number of operations is included in **Appendix C, Section C.4**.

4.2.1.1 FlightRadar24

The primary technology that FR24 uses to receive flight information is called automatic dependent surveillance-broadcast (ADS-B). The ground-based ADS-B receivers collect data from any aircraft in their local area that are equipped with an ADS-B transponder and feed this data to the internet in real time. The aircraft-based transponders use the GPS and other flight data input to transmit signals containing aircraft registration, position, altitude, velocity and other flight data. For security and privacy reasons information about some aircraft is limited or blocked. This includes most military aircraft and certain high-profile aircraft, like Air Force One. (J. Andersson, personal communication, December 7, 2020)

The FAA published Federal Regulation 14 CFR 91.225 and 14 CFR 91.227 in May 2010. The final rule dictates that effective January 1, 2020, aircraft operating in airspace defined in §91.225 are required to have an Automatic Dependent Surveillance – Broadcast (ADS-B) system that includes a certified position source capable of meeting requirements defined in §91.227. These regulations set a minimum performance standard for both the ADS-B transmitter and the position sources integrated with the ADS-B equipment.

4.2.1.2 OPSNET

The OPSNET is the official source of FAA National Airspace System air traffic operations data. The data is reported to OPSNET by the Airport Traffic Control Tower (ATCT) personnel and can be viewed on the FAA Operations & Performance Data website.

The OPSNET separates operations into Itinerant and Local. Itinerant operations are separated into four categories: Air Carrier, Air Taxi, General Aviation, and Military. Local operations are separated into two categories: Civil and Military. OPSNET only provides total operations by aircraft category. Definitions of these categories are as follows:

- Air Carrier. (AC) 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. This includes US and foreign-flagged carriers.
- Air Taxi. (AT) Aircraft designed to have a maximum seating capacity of 60 seats or a maximum payload capacity of 18,000 pounds, carrying passengers or cargo for hire or compensation.
- Civil. Operations by all classes of private and commercial takeoffs and landings at FAA and Federal Contract Tower (FCT) facilities.
- General Aviation. (GA) Takeoffs and landings of all civil aircraft, except for air carriers or air taxis.
- Itinerant. Operations performed by an aircraft, either Instrument Flight Rules (IFR) or Visual Flight Rules (VFR), that land at an airport arriving from outside the airport area or depart from an airport and leave the airport area.
- Local. Operations performed by an aircraft that remain in the local traffic pattern, execute simulated instrument approaches or low passes at the airport, and operations to or from the same airport within a designated practice area within a 20-miles radius of the tower.

- Military. (MIL) Operations by all classes of military takeoffs and landings at FAA and FCT facilities.

Following consultation with the ATCT manager at EYW, it has been confirmed that OPSNET "Airport Operations" are just the aircraft that land and takeoff from EYW and the OPSNET "Tower Operations" contain the military overflights that fly through EYW airspace.

4.2.1.3 TFMSC

Traffic Flow Management System Counts (TFMSC) include aircraft that fly under IFR and are captured by the FAA's enroute computers. TFMSC groups flights into three user groups: Commercial, General Aviation, and Military. These three groups were chosen because of the slightly different user classes used by TFMS and OPSNET. Most VFR and some non-enroute IFR traffic are excluded. TFMSC source data are created when pilots file flight plans and/or when flights are detected by the National Airspace System, usually via radar. The flight counts reported in TFMSC are derived from flight records assembled by the FAA National Airspace System Data Warehouse by threading the many TFMS messages together. These flight records may be incomplete records when one end is missing, or when only planned components are available. Due to limited radar coverage and incomplete messaging, TFMSC may exclude certain flights that do not enter the enroute airspace and other low-altitude flights.

4.2.1.4 EYW Landing Reports

EYW tracks aircraft landings for passenger and cargo airlines for the purpose of collecting landing fees and statistical data. The airlines submit monthly reports to the airport that detail the number of each aircraft type that landed at the airport during the month. Landing Fees are collected from: Delta Airlines (including Endeavor, Republic, Express Jet), American Airlines (including American Eagle, Republic, and Envoy), Allegiant Air, United Airlines (including United Express, Republic, and Express Jet), JetBlue Airways, Silver Airways, Ameriflight, Mountain Air Cargo, and Martinaire Aviation. (M. J. Morgan, personal communication, January 18, 2022)

4.2.2 Existing Condition Fleet Mix

Fleet mix for the Existing Condition were developed from the FR24 and EYW Landing Reports for the period October 1, 2020, through September 30, 2021. The fixed-wing fleet mix was divided into five categories: AC/AT JET, AC/AT PROP, GA JET, GA PROP, and MIL. In this categorization, the term "Jet" includes aircraft with turbojet or turbofan engines. The term "Prop" includes aircraft where the main source of thrust is a propeller. In addition to the fixed-wing fleet mix, helicopter operations were also included as a separate category, HELO. These categories were selected primarily for flight track development and utilization.

4.2.2.1 Air Carrier / Air Taxi Jet

Regularly scheduled air carrier / air taxi jet (AC/AT JET) passenger aircraft operations at EYW include Airbus A319, Embraer EMB-145, EMB-170, EMB-175 and EMB-190 aircraft. Current AC/AT JET operators include Delta Airlines, American Airlines, American Eagle, Allegiant Air, United Express, and JetBlue Airways.

The top destinations for AC/AT JET aircraft flights from EYW include Atlanta (ATL), Miami (MIA), Charlotte (CLT), Chicago (ORD), Newark (EWR), Washington DC (IAD), and Dallas (DFW).

During the Ad-Hoc Committee meeting on March 7, 2022, there was a discussion regarding Delta's use of a CRJ (instead of an A319), during Eastern Standard Time, for their last arrival of the day. Subsequently it was determined via consultation with Delta Airlines that this did not occur between October 1, 2020, and September 30, 2021.

4.2.2.2 Air Carrier / Air Taxi Prop

Air carrier / air taxi prop (AC/AT PROP) passenger and cargo aircraft operations at EYW include ATR42, ATR72, Beech King Air, Cessna 208, De Havilland Canada Dash 8, De Havilland Twin Otter, Fairchild Swearingen SA26-AT Merlin, Saab 340, and Shorts 330. Current AC/AT PROP operators include, but are not limited to, Silver Airways, Ameriflight, and Mountain Air Cargo.

The top destinations for AC/AT PROP aircraft flights from EYW include Tampa (TPA), Orlando (MCO and ORL), Ft. Lauderdale (FLL and FXE), Miami (MIA, OPF, and TMB), Boca Raton (BCT), Fort Myers (FMY), Naples (APF), Palm Beach (PBI), and Kissimmee (ISM).

4.2.2.3 General Aviation Jet

General aviation jet (GA JET) aircraft operations consist of private- and corporate-owned based and itinerant turbojet aircraft. Common GA JET aircraft operations at EYW include Bombardier Challenger, Cessna Citation, Dassault Falcon, Gulfstreams, and Learjets.

4.4.2.4 General Aviation Prop

General aviation prop (GA PROP) aircraft operations consist of private- and corporate-owned based and itinerant aircraft, including lightweight single- and multi-engine (piston), and turboprop aircraft. Common GA PROP aircraft operations at EYW include Beech, Cessna, Cirrus, Mooney, Partenavia, and Piper.

4.2.2.5 Military

Military (MIL) aircraft operations consist of fixed-wing aircraft and helicopters that are operated by any armed service or the federal government. Military aircraft can be either combat or non-combat. Common fixed-wing MIL aircraft operations at EYW include Beechcraft C-12 Huron, Boeing 737, Boeing P-8 Poseidon, EADS CASA HC-144 Ocean Sentry, Cessna Citation UH-35A, Lockheed-Martin C-130 Hercules, and Northrop T-38 Falcon. Common MIL helicopter operations at EYW include Bell TH-57 Sea Ranger, Eurocopter UH-72A Lakota, Hughes MH-6 Little Bird, Sikorsky UH-60 Blackhawk, Sikorsky SH-60 Seahawk, and Sikorsky CH-53 Sea Stallion.

4.2.2.6 Helicopters

Helicopter (HELO) aircraft operations consist of local government-, private- and corporate-owned based and itinerant rotorcraft, in which lift and thrust are supplied by horizontally spinning rotors, which allows the aircraft to take off and land vertically, to hover, and to fly forward, backward and laterally. Helicopters do not takeoff or land on the airport's runways, but rather from the nonmovement area of the Fixed Base Operator. Common HELO aircraft operations at EYW include Aérospatiale AS-366, Eurocopter/Airbus H-130, Bell 206, Hughes 500, Robinson R-44, and Sikorsky S-76.

4.2.3 Existing Condition Number of Operations

Since the OPSNET represents FAA's official count of air traffic operations data, it was determined that the number of operations by category should match the OPSNET for modeling purposes. Aircraft operational levels for the 2022 Existing Condition were based on the FAA's OPSNET for the period October 1, 2020, through September 30, 2021. FR24 and EYW Landing Reports for the same period were reviewed as supplementary sources. A summary of the three data sources is shown in **Table 4.1**.

TABLE 4.1
AIRCRAFT OPERATIONS BY CATEGORY

SOURCE	AIR CARRIER	AIR TAXI	GENERAL AVIATION	MILITARY	TOTAL
FAA OPSNET	21,563	6,593	35,533	439	64,128
FLIGHT RADAR 24	19,742	6,370	33,230	406	59,748
EYW LANDING REPORTS	19,456	3,142	NA	NA	NA

Sources: OPSNET, 2021, FlightRadar24, 2022, EYW Landing Reports, 2021.
Prepared by: Deborah Murphy Lagos & Associates

4.2.4 Existing Condition Fleet Mix and Number of Operations

Fleet mix defines the various types of aircraft and allows development of very specific input data, such as engine type, title 14 CFR part 36 Noise Stage Certification, gross weight, and departure stage length.

The Aviation Environmental Design Tool (AEDT) is a software system that is designed to model aviation related operations in space and time to compute noise, emissions, and fuel consumption. The AEDT is currently the FAA's standard tool for producing noise contours and analyzing noise levels at sensitive sites. The AEDT aircraft database contains actual noise and performance data for numerous types of aircraft. Although the AEDT aircraft database provides a large selection of aircraft to model, it does not contain every known aircraft. For this reason, the FAA has developed an official aircraft substitution list which allows the modeler to substitute similar aircraft when necessary for modeling purposes. These substitutions represent a very close estimate of the noise produced by the actual aircraft.

To develop the proposed number of operations for the fleet mix, the percentage of operations for each aircraft in each category was calculated from the FR24 data (Step 1). This percentage by aircraft type was then applied to the total number of operations by category from the OPSNET data (Step 2). **Table 4.2** is the resulting fleet mix and number of flight operations by AEDT Aircraft Type.

TABLE 4.2

FLEET MIX AND NUMBER OF ANNUAL FLIGHT OPERATIONS

AEDT AIRCRAFT TYPE	AC/AT JET	AC/AT PROP	GENERAL AVIATION			MILITARY		GRAND TOTAL
			GA JET	GA PROP	GA HELO	MIL	MIL HELO	
EMB175	9,656							9,656
A319-131	7,242							7,242
EMB170	3,401							3,401
EMB190	917							917
737700	238							238
EMB145	103							103
CRJ9-ER	7							7
DHC8		3,096						3,096
DHC6		1,817						1,817
CNA208		1,299						1,299
SD330		202						202
SF340		142						142
DHC830		37						37
LEAR35			1,424					1,424
CNA510			1,314					1,314
CNA500			948					948
CNA560XL			916					916
CNA680			877					877
CL600			736					736
CNA560U			583					583
CNA55B			503					503
FAL900EX			503					503
CNA750			433					433
CNA560E			416					416
GV			282					282
GIV			255					255
IA1125			198					198
MU3001			183					183
ECLIPSE500			165					165
C525C			129					129
CIT3			103					103
CNA525C			102					102
BD-700-1A10			77					77
GIIB			11					11
LEAR25			2					2

TABLE 4.2 (CONTINUED)

FLEET MIX AND NUMBER OF ANNUAL FLIGHT OPERATIONS

AEDT AIRCRAFT TYPE	AC/AT JET	AC/AT PROP	GENERAL AVIATION			MILITARY		GRAND TOTAL
			GA JET	GA PROP	GA HELO	MIL	MIL HELO	
GASEPV				7,986				7,986
CNA182				6,699				6,699
BEC58P				2,587				2,587
CNA208				1,247				1,247
PA30				1,247				1,247
DHC6				931				931
CNA441				312				312
DHC-2FLT				239				239
CNA206				133				133
PA42				112				112
GASEPF				135				135
DO328				27				27
DHC830				11				11
DC3				4				4
1900D				4				4
DHC8				1				1
S76					1,764			1,764
R44					1,468			1,468
SA355F					186			186
B206					142			142
EC130					114			114
MD600N					14			14
B212					3			3
A109					3			3
B429					2			2
C130E						115		115
T-38A						70		70
DHC6						40		40
SF340						34		34
F5E						27		27
C17						19		19
C560						13		13
B350						11		11
F15E20						7		7
GASEPV						4		4

TABLE 4.2 (CONTINUED)
FLEET MIX AND NUMBER OF ANNUAL FLIGHT OPERATIONS

AEDT AIRCRAFT TYPE	AC/AT JET	AC/AT PROP	GENERAL AVIATION			MILITARY		GRAND TOTAL
			GA JET	GA PROP	GA HELO	MIL	MIL HELO	
DHC8						2		2
F18AF						2		2
GV						2		2
KC135R						2		2
DC3						1		1
LEAR35						1		1
S70							55	55
S65							31	31
B212							1	1
Grand Total	21,563	6,593	10,161	21,674	3,698	351	87	64,128

Sources: OPSNET, 2021, FlightRadar24, 2022.
Prepared by: Deborah Murphy Lagos & Associates

4.2.5 Time of Day

The time of day that aircraft operations occur is a very important factor in the calculation of cumulative noise exposure. The DNL treats nighttime (10:00 p.m. to 6:59 a.m.) noise differently from daytime (7:00 a.m. to 9:59 p.m.) noise. In the calculation of DNL, each operation at night is multiplied by 10, which effectively adds 10 dB to the A-weighted levels of each nighttime operation. This weighting factor is applied to account for people's greater sensitivity to nighttime noise. In addition, events during the night are often more intrusive because the ambient sound levels during this time are usually lower than daytime ambient sound levels. FlightRadar24 data was used to ascertain time of day. The daytime vs. nighttime distribution for the Existing Condition is shown in **Table 4.3**.

TABLE 4.3
DAYTIME VS. NIGHTTIME DISTRIBUTION

AIRCRAFT CATEGORY	DEPARTURES		ARRIVALS	
	DAYTIME	NIGHTTIME	DAYTIME	ARRIVALS
AC/AT JET	96%	4%	89%	11%
AC/AT PROP	97%	3%	98%	2%
GA JET	96%	4%	97%	3%
GA PROP	95%	5%	97%	3%
GA HELO	68%	322022%	81%	19%
MIL	98%	2%	93%	7%
MIL HELO	88%	12%	57%	43%
OVERALL	95%	5%	93%	7%

Source: FlightRadar24, 2022.
Prepared by: Deborah Murphy Lagos & Associates

4.2.6 Departure Profiles and Stage Length

The AEDT database contains several departure profiles for each fixed-wing aircraft type representing the varying performance characteristics for that aircraft at a particular takeoff weight. Use of appropriate departure profiles is an important component of calculating DNL noise exposure contours. Historically, it has been easier to obtain trip length data than average weight data, so the AEDT uses "departure stage length" of a given flight to determine the departure weight and associated departure profile.

Departure stage length is the distance between the departure airport and the destination airport. As the departure stage length increases, the aircraft's required fuel load and takeoff weight also increase. The increase in takeoff weight equates to a decrease in aircraft takeoff and climb performance. A decrease in aircraft performance results in a longer takeoff departure roll and decreased climb rates. These performance characteristics produce increased noise exposure impacts. The aircraft's noise impacts are greater because the aircraft is producing noise closer to the ground longer. The departure stage lengths are defined in **Table 4.4**. FlightRadar24 data was used to establish stage length. Stage length distribution by aircraft category is shown in **Table 4.5**.

During the Ad Hoc Committee meeting on June 1, 2021, the EYW ATCT manager explained the interaction between EYW ATC and Naval Air Station Key West (NAS KW) ATC. He stated that a restriction is placed on aircraft departing on EYW Runway 09 regarding the aircraft's climb profile. A 2,000-ft hold down on the initial altitude for instrument departures was instituted by the previous ATC Officer at NAS KW. NAS KW ATC must separate all NAS KW air traffic from the route and altitude of the EYW departure as it quickly gets into NAS KW airspace immediately after taking off from EYW Runway 09. Once NAS KW ATC sees the aircraft departing EYW on their radar and establishes radio contact, NAS KW ATC will issue further climb instructions based on the traffic at that time. NAS KW ATC is authorized to give EYW ATC a higher initial altitude upon request if NAS KW has no conflicting traffic. **Appendix D, Section D.5** includes the minutes of the Ad Hoc Committee meeting on June 1, 2021.

A screening analysis was conducted to determine how often EYW departures on Runway 09 were held down, and whether this procedure should be modeled for the NEM Update. The Screening Analysis was documented in a letter to the FAA dated October 26, 2021, and is included in **Appendix C, Section C.4**. A video conference was held on November 18, 2021, to discuss the results of the screening analysis and included participants from the FAA and the Consultant. It was concluded that standard profiles should be used to model all aircraft operations for the NEM Update as the hold-down occurs over water. The Record of Conversation is included in **Appendix C, Section C.4.**

TABLE 4.4
STAGE LENGTH DEFINITIONS

STAGE LENGTH	DISTANCE (NM)
1	0-500
2	501-1,000
3	1,001-1,500
4	1,501-2,500
5	2,501-3,500
6	3,501-4,500
7	4,501-5,500
8	5,501-6,500
9	> 6,500

Source: AEDT User Manual, 2021.

TABLE 4.5
STAGE LENGTH DISTRIBUTION

AIRCRAFT CATEGORY	STAGE LENGTH 1	STAGE LENGTH 2	STAGE LENGTH 3	STAGE LENGTH 4	STAGE LENGTH 5
AC/AT JET	15.6%	59.2%	25.1%	0.0%	0.0%
AC/AT PROP	89.9%	9.2%	0.8%	0.0%	0.0%
GA	95.5%	4.4%	0.1%	0.0%	0.0%
GA JET	51.7%	33.2%	13.6%	1.5%	0.1%
MIL	66.7%	16.7%	16.7%	0.0%	0.0%

Source: FlightRadar24, 2021.
Prepared by: Deborah Murphy Lagos & Associates

4.2.7 Runway Utilization

Runway utilization refers to the frequency with which aircraft utilize each runway during a year as dictated or permitted by wind, weather, aircraft weight, and noise considerations. The more often a runway is used throughout the year, the more noise is created in areas located off each end of that runway.

Runway utilization for the Existing Condition was determined from the FR24 data for each aircraft category. The runway utilization for departures is shown in **Table 4.6** and for arrivals in **Table 4.7**.

TABLE 4.6
RUNWAY UTILIZATION - DEPARTURES

AIRCRAFT CATEGORY	RUNWAY 09		RUNWAY 27	
	DAYTIME	NIGHTTIME	DAYTIME	ARRIVALS
AC/AT JET	88.7%	81.8%	11.3%	18.2%
AC/AT PROP	87.2%	81.8%	12.8%	18.2%
GA PROP	88.1%	87.2%	11.9%	12.8%
GA JET	88.9%	94.1%	11.1%	5.9%
MIL	100.0%	0.0%	0.0%	100.0%
OVERALL	88.4%	84.8%	11.6%	15.2%

Source: FlightRadar24, 2021.
Prepared by: Deborah Murphy Lagos & Associates

TABLE 4.7
RUNWAY UTILIZATION - ARRIVALS

AIRCRAFT CATEGORY	RUNWAY 09		RUNWAY 27	
	DAYTIME	NIGHTTIME	DAYTIME	ARRIVALS
AC/AT JET	85.2%	84.9%	14.8%	15.1%
AC/AT PROP	87.1%	93.3%	12.9%	6.7%
GA PROP	87.0%	82.4%	13.0%	17.6%
GA JET	85.1%	82.4%	14.9%	17.6%
MIL	100.0%	100.0%	0.0%	0.0%
OVERALL	85.9%	84.8%	14.1%	15.2%

Source: FlightRadar24, 2021.
Prepared by: Deborah Murphy Lagos & Associates

4.2.8 Back Taxi Operations

EYW has one runway, Runway 09/27, which is 5,075 feet long and 100 feet wide that includes 274 feet of pavement reclassified as runway pavement at the Runway 09 end in 2017. Although the western 274 feet of pavement is available for aircraft departures, the runway's parallel taxiway (Taxiway B) does not serve the end of the available pavement. Aircraft using the full departure length of Runway 09 must back taxi 274 feet to the runway end on the runway itself.

FR24 data was analyzed to determine the percentage of aircraft, by aircraft category, departing on Runway 09 that back taxied to the Runway 09 end vs. the percentage that departed from the Taxiway B intersection. The back taxi distribution for departures on Runway 09 is shown in **Table 4.8** for aircraft categories with greater than five percent use of the full runway length.

TABLE 4.8
BACK TAXI DISTRIBUTION

AIRCRAFT CATEGORY	BACK TAXI TO USE FULL RUNWAY LENGTH	DEPART FROM TAXIWAY B INTERSECTION
AC/AT JET	32%	68%
AC/AT PROP	44%	56%
GA JET	8%	92%

Sources: FlightRadar24, 2021.
Prepared by: Deborah Murphy Lagos & Associates

4.2.9 Standing Takeoff Operations

Because of the length of the runway at EYW, many of the air carrier and air taxi aircraft perform a standing takeoff. A standing takeoff is defined as one in which the aircraft's pilot comes to a complete stop at the departure end of the runway, applies the brakes, spools up the engine to takeoff power, then releases the brakes.

Field observations were conducted from December 5th to 9th, 2021. A total of 81 departure operations on Runway 09 were logged for air carrier and air taxi aircraft. The noise modeling assumes a percentage of air carrier and air taxi aircraft will perform this operation prior to departure, as determined by the field observations. Each standing takeoff operation is being modeled in AEDT as a 15-second engine spool-up to takeoff power and brake release. **Table 4.9** shows the details of the standing takeoff operations at the airport modeled for the Existing Condition NEM. Approximately 26 average daily standing takeoff operations were modeled

TABLE 4.9
STANDING TAKEOFF OPERATIONS

AEDT AIRCRAFT	% OF TOTAL OPS	RUNWAY USE 09 / 27	HEADING	ENGINE POWER SETTING	DURATION (SECONDS)	ANNUAL OPS	AVERAGE DAILY OPS
737700	68%	88% / 12%	90°/270°	20,400 lbs.	15.0	81	0.22
A319-131	80%	88% / 12%	90°/270°	18,700 lbs.	15.0	2,897	7.94
CNA208	68%	88% / 12%	90°/270°	1,955 lbs.	15.0	442	0.01
CRJ	100%	88% / 12%	90°/270°	11,496 lbs.	15.0	4	1.69
DHC6	68%	88% / 12%	90°/270°	1,700 lbs.	15.0	618	1.70
DHC8	40%	88% / 12%	90°/270°	4,038 lbs.	15.0	619	1.21
EMB145	68%	88% / 12%	90°/270°	6,375 lbs.	15.0	35	0.10
EMB170	45%	88% / 12%	90°/270°	11,730 lbs.	15.0	765	2.10
EMB175	80%	88% / 12%	90°/270°	11,730 lbs.	15.0	3,862	10.58
EMB190	40%	88% / 12%	90°/270°	15,725 lbs.	15.0	183	0.50
					TOTAL	**7,383**	**26.05**

Sources: Field Observation, 2021, FlightRadar24, 2022; AEDT, 2022.
Prepared by: Deborah Murphy Lagos & Associates

4.2.10 Low Approach, Touch-and-Go, and Go-Around Operations

Some general aviation and military aircraft perform a maneuver known as a touch-and-go (T&G) at EYW, primarily for pilot training. During a touch-and-go, the pilot makes an approach to landing, configures the plane to land, and briefly touches down on the runway. Rather than coming to a stop and taxiing off the runway as a pilot would with a normal landing, once the wheels touch down, the pilot continues down the runway, reconfigures the plane for takeoff and executes an immediate takeoff without ever coming to a stop. **Table 4.10** shows the details of the T&G operations at the airport modeled for the Existing Condition NEM. Approximately 7 average daily T&G operations were modeled.

TABLE 4.10
TOUCH-AND-GO OPERATIONS

AEDT AIRCRAFT	ANNUAL OPS	AVERAGE DAILY OPS
BEC58P	806	2.21
CNA182	782	2.14
GASPEV	781	2.14
C130E	83	0.23
TOTAL	2,452	6.72

Source: FlightRadar24, 2021.
Prepared by: Deborah Murphy Lagos & Associates

Military aircraft occasionally conduct low approaches to the runway at EYW, without touching down at the airport. These are often training flights to practice landing approach to just above the runway. The military made the decision decades ago that it is safer to not perform touch and go landings in high performance jet aircraft, because every landing decreases the useful life of the tires, wheels and brakes, and actual touch and go landings introduce risks to the flight operation, including running off the end of the runway before getting airborne again. For this analysis, low approaches are being counted as a departure and an arrival (i.e., two operations).

Aircraft occasionally must perform a go-around or missed approach at EYW. Generally, if a pilot determines by the time the aircraft is at the decision height (for a precision approach) or missed approach point (for a non-precision approach), that the runway or its environment is not in sight, or that a safe landing cannot be accomplished for any reason, the landing approach must be discontinued (a "go-around") and the missed approach procedure must be immediately initiated. It is also common for pilots to practice a missed approach as part of initial or recurrent instrument training. For this analysis, go-arounds and missed approaches are being counted as a departure and an arrival (i.e., two operations).

4.2.11 Flight Tracks and Flight Track Utilization

The source of the historic flight positions data used in this analysis was FR24. FR24 receives the position of an aircraft directly from the aircraft's ADS-B or Mode-S transponder. The frequency of position updates recorded starts around every 5 seconds during periods of rapid change (i.e., take-off and landing) and increases to a maximum of 60 seconds during steady flight. It is important to recognize that the availability of aircraft positional data is strictly dependent on the level of transponder data being broadcast from a

particular aircraft. Aircraft that have their information restricted or blocked on Flightradar24.com will not have this information included in the historic data. The FR24 aircraft location data points were used to generate flight trajectories for each individual flight.

FR24 aircraft flight trajectories were separated into six categories: AC/AT JET, AC/AT PROP, GA JET, GA PROP, T&G, and HELO. They were then further separated into East Flow (Runway 09) and West Flow (Runway 27). Touch-and-go operations on Runway 09 are in a right-hand pattern, with the downwind leg generally 1 to 1.5 miles abeam of the runway at approximately 800 feet elevation. Helicopter operations utilize the same tracks regardless of flow.

AEDT modeled flight tracks were developed based on the FR24 aircraft flight trajectories in each category. Modeled flight tracks do not represent the precise paths flown by all aircraft utilizing EYW. Instead, they represent the primary flight corridors (i.e., the highest concentration of FR24 aircraft flight trajectories) for the aircraft using the airport. Flight track utilization was also developed from the concentration of FR24 aircraft flight trajectories.

Figures 4.1 through **4.10** illustrate the FR24 flight trajectories and AEDT modeled flight tracks when the airport is operating in east flow and west flow, respectively. Flight track utilization is depicted on each graphic.

Title 14 CFR part 150, Airport Noise Compatibility Planning, Amendment No. 150-4, Section A150.103(b)(1), requires “A map of the airport and its environs at an adequately detailed scale (not less than 1 inch to 2,000 feet) indicating runway length, alignments, landing thresholds, takeoff start-of-roll points, airport boundary, and flight tracks out to at least 30,000 feet from the end of each runway.” Therefore, flight track maps at a scale of 1 inch to 2,000 feet are provided in **Appendix G**.

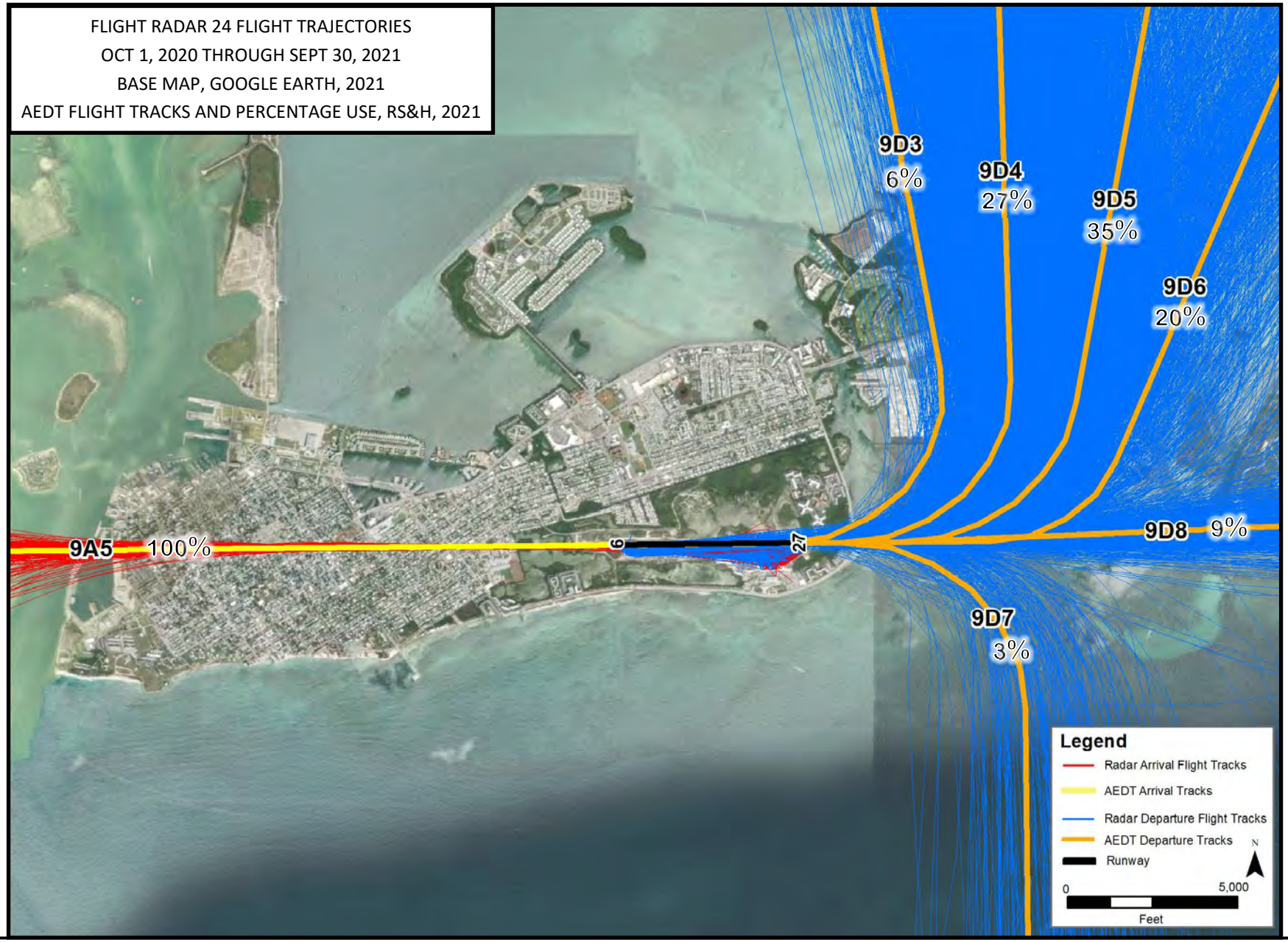

FIGURE 4.1

EAST FLOW AC/AT JET FR24 FLIGHT TRAJECTORIES WITH AEDT MODELED FLIGHT TRACKS AND UTILIZATION

KEY WEST INTERNATIONAL AIRPORT

NEM Update

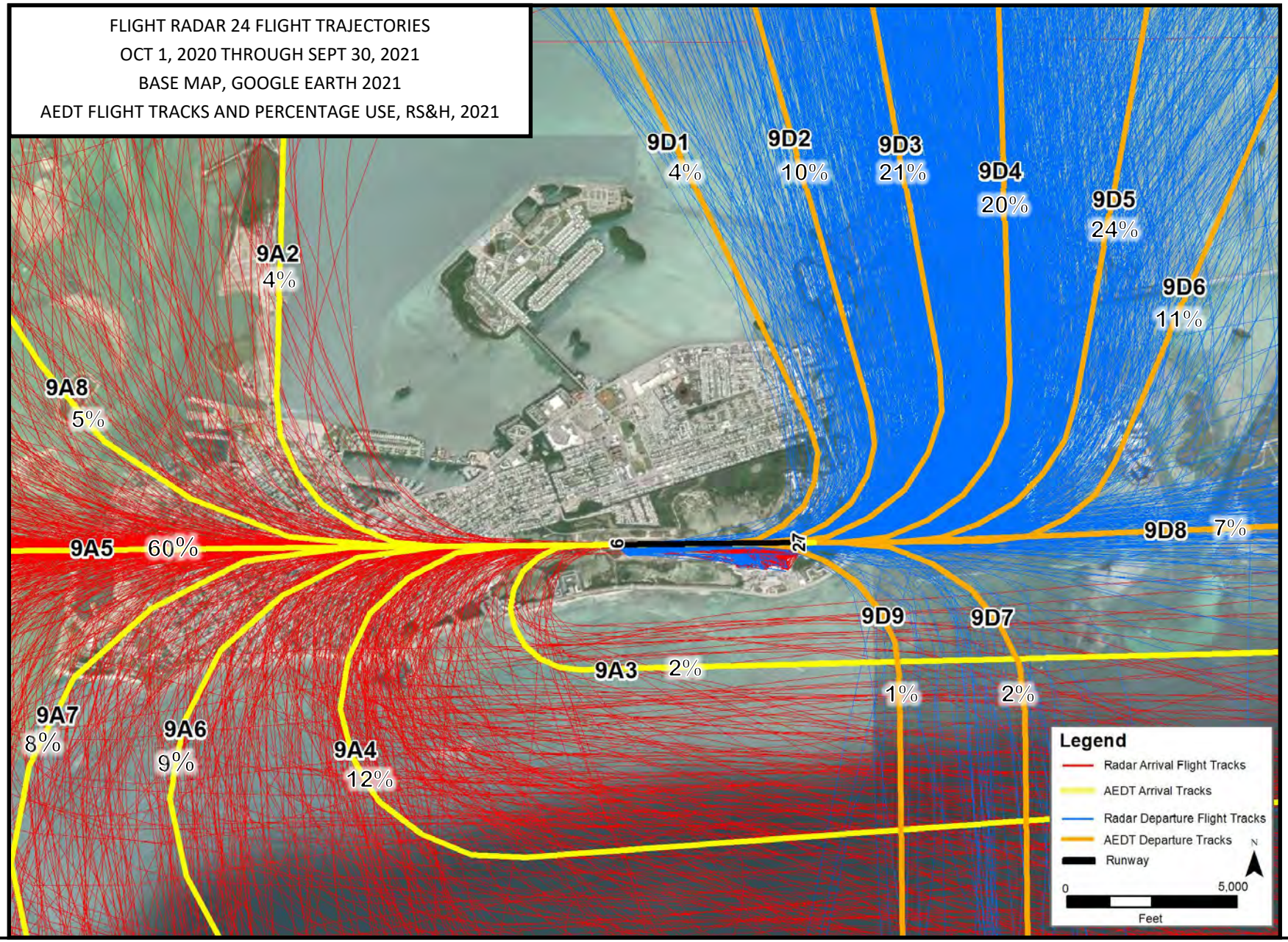

FIGURE 4.2

EAST FLOW AC/AT PROP FR24 FLIGHT TRAJECTORIES WITH AEDT MODELED FLIGHT TRACKS AND UTILIZATION

KEY WEST INTERNATIONAL AIRPORT

NEM Update

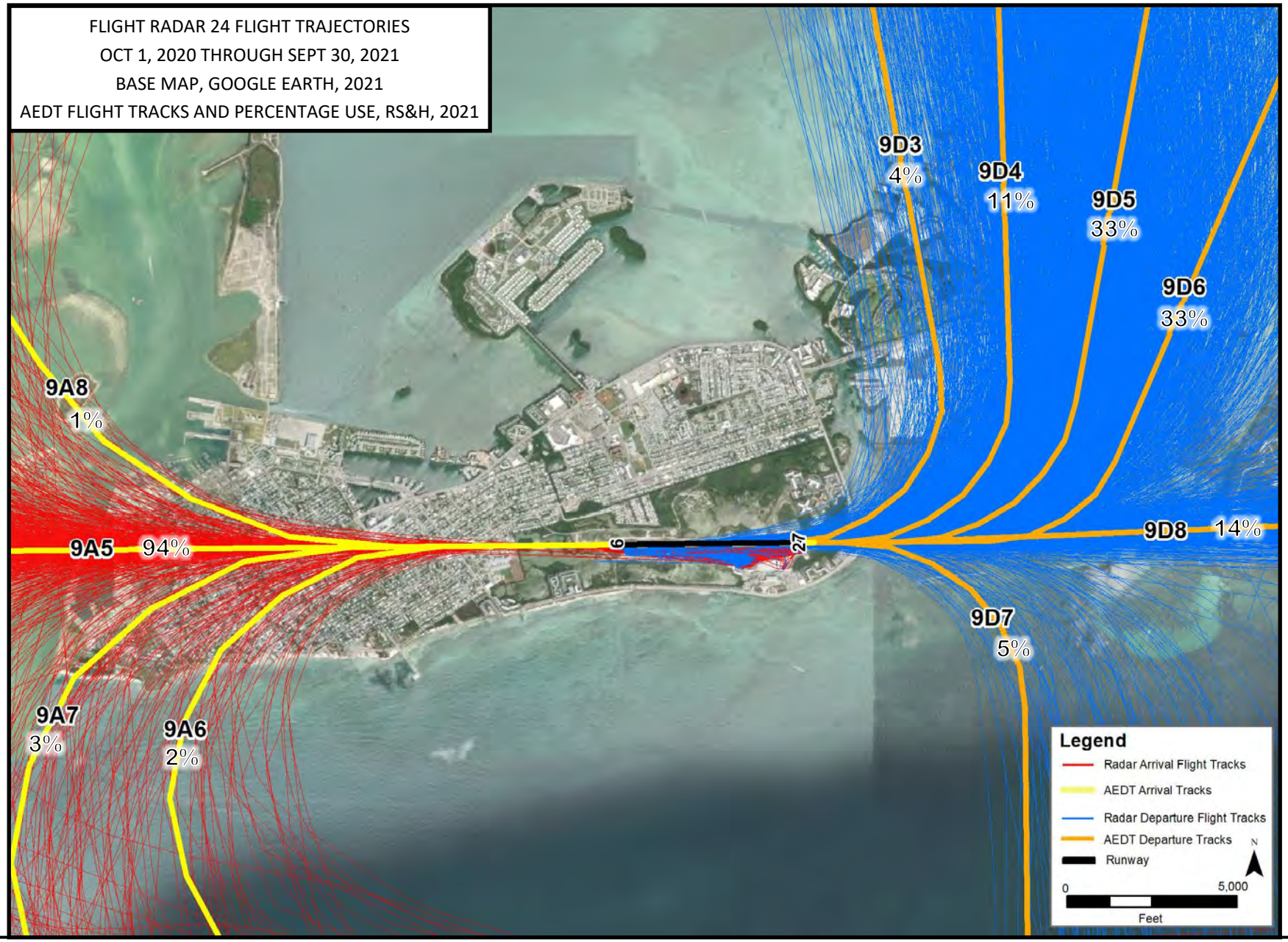

FIGURE 4.3

EAST FLOW GA JET FR24 FLIGHT TRAJECTORIES WITH AEDT MODELED FLIGHT TRACKS AND UTILIZATION

KEY WEST INTERNATIONAL AIRPORT

NEM Update

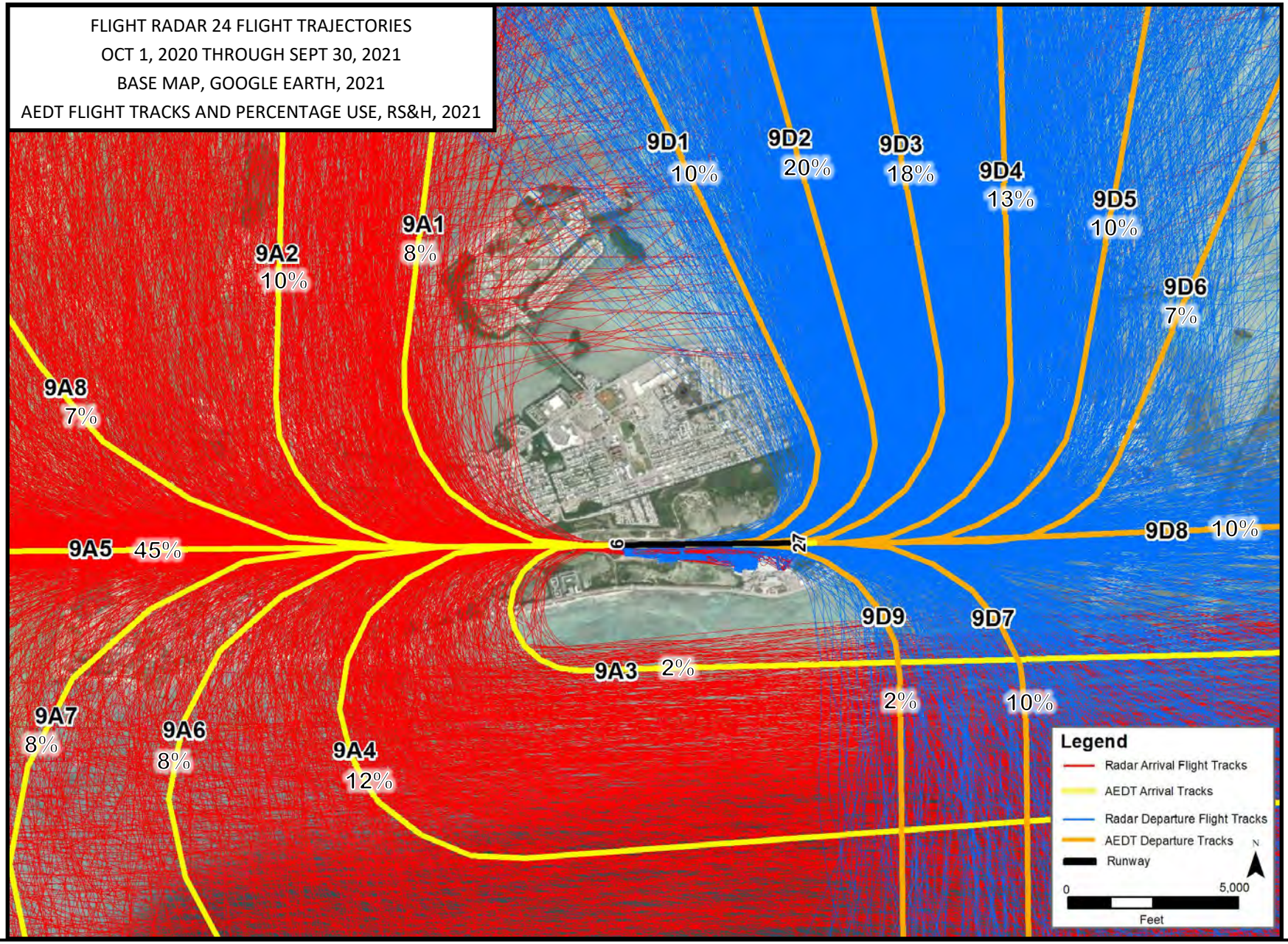

FIGURE 4.4

EAST FLOW GA PROP FR24 FLIGHT TRAJECTORIES WITH AEDT MODELED FLIGHT TRACKS AND UTILIZATION

KEY WEST INTERNATIONAL AIRPORT

NEM Update

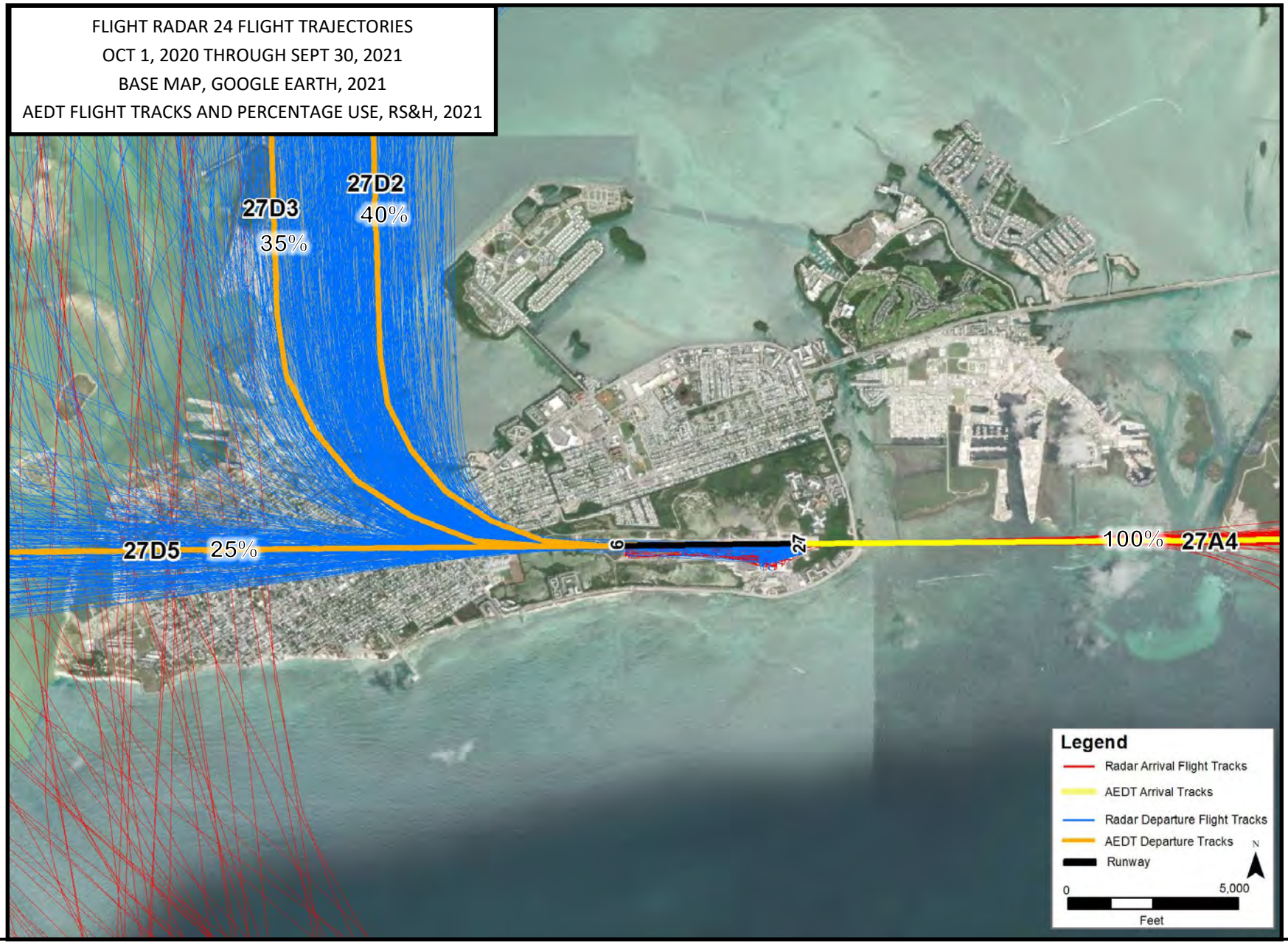

FIGURE 4.5

WEST FLOW AC/AT JET FR24 FLIGHT TRAJECTORIES WITH AEDT MODELED FLIGHT TRACKS AND UTILIZATION

KEY WEST INTERNATIONAL AIRPORT

NEM Update

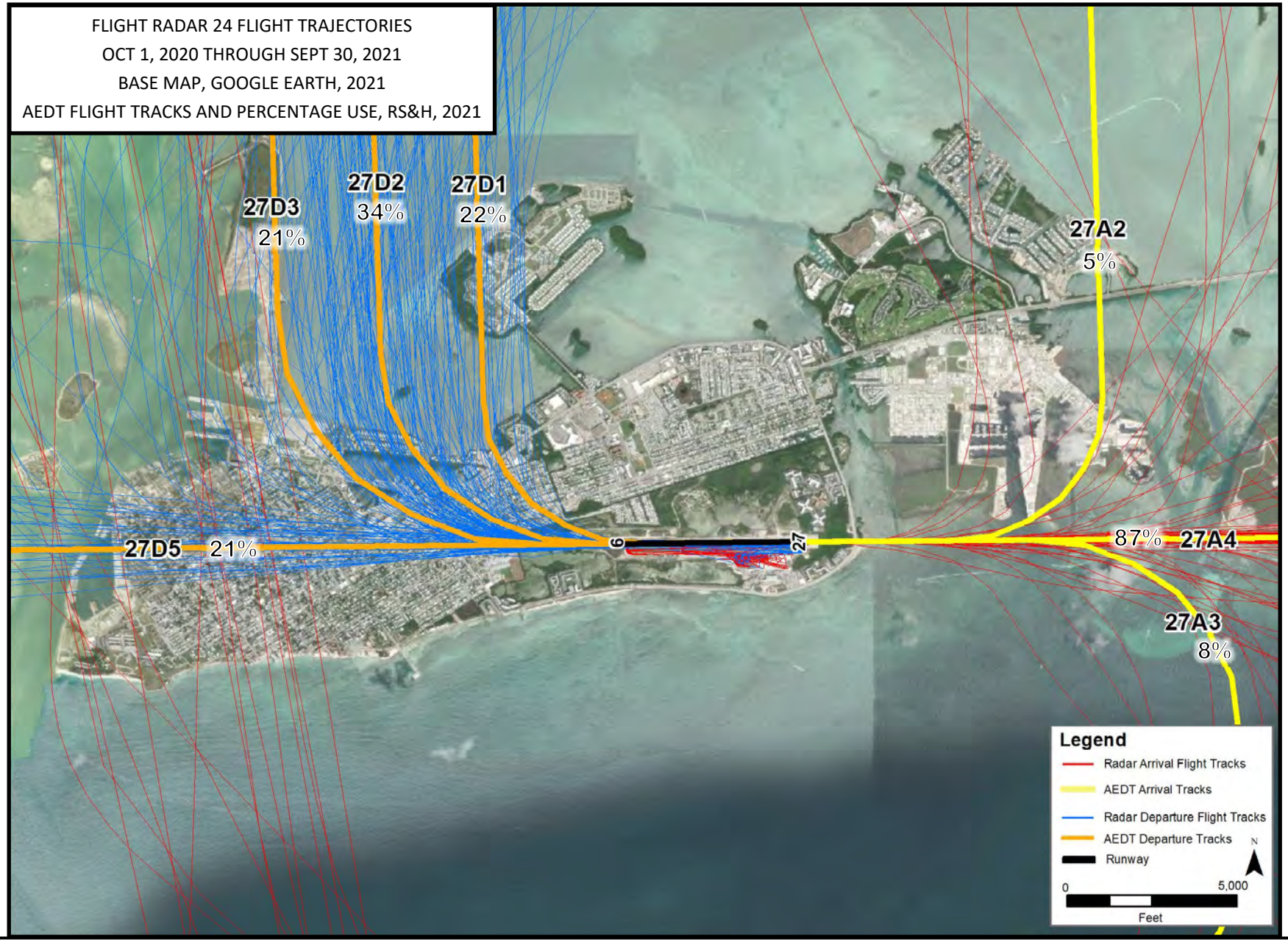

FIGURE 4.6

WEST FLOW AC/AT PROP FR24 FLIGHT TRAJECTORIES WITH AEDT MODELED FLIGHT TRACKS AND UTILIZATION

KEY WEST INTERNATIONAL AIRPORT

NEM Update

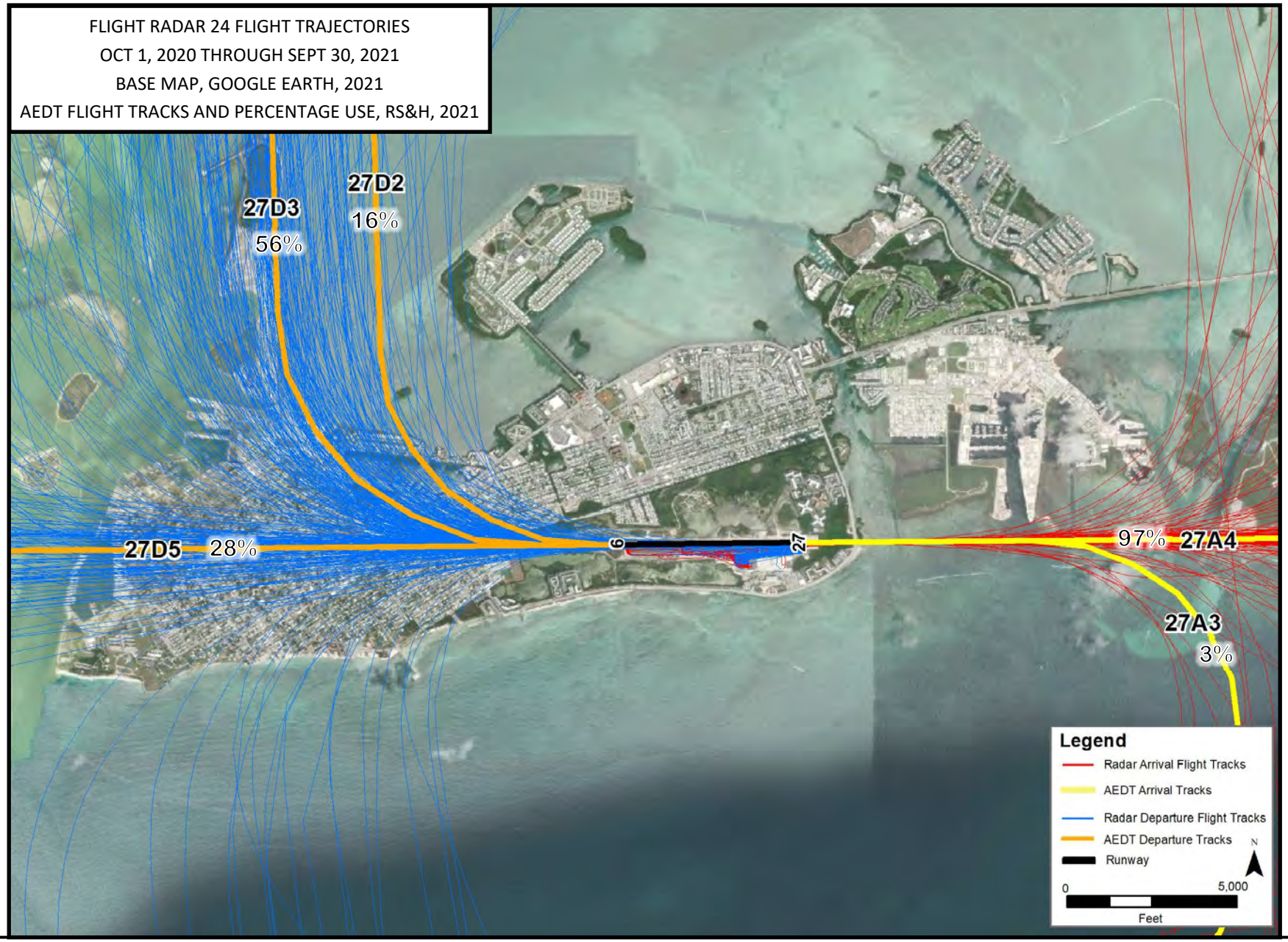

FIGURE 4.7

WEST FLOW GA JET FR24 FLIGHT TRAJECTORIES WITH AEDT MODELED FLIGHT TRACKS AND UTILIZATION

KEY WEST INTERNATIONAL AIRPORT

NEM Update

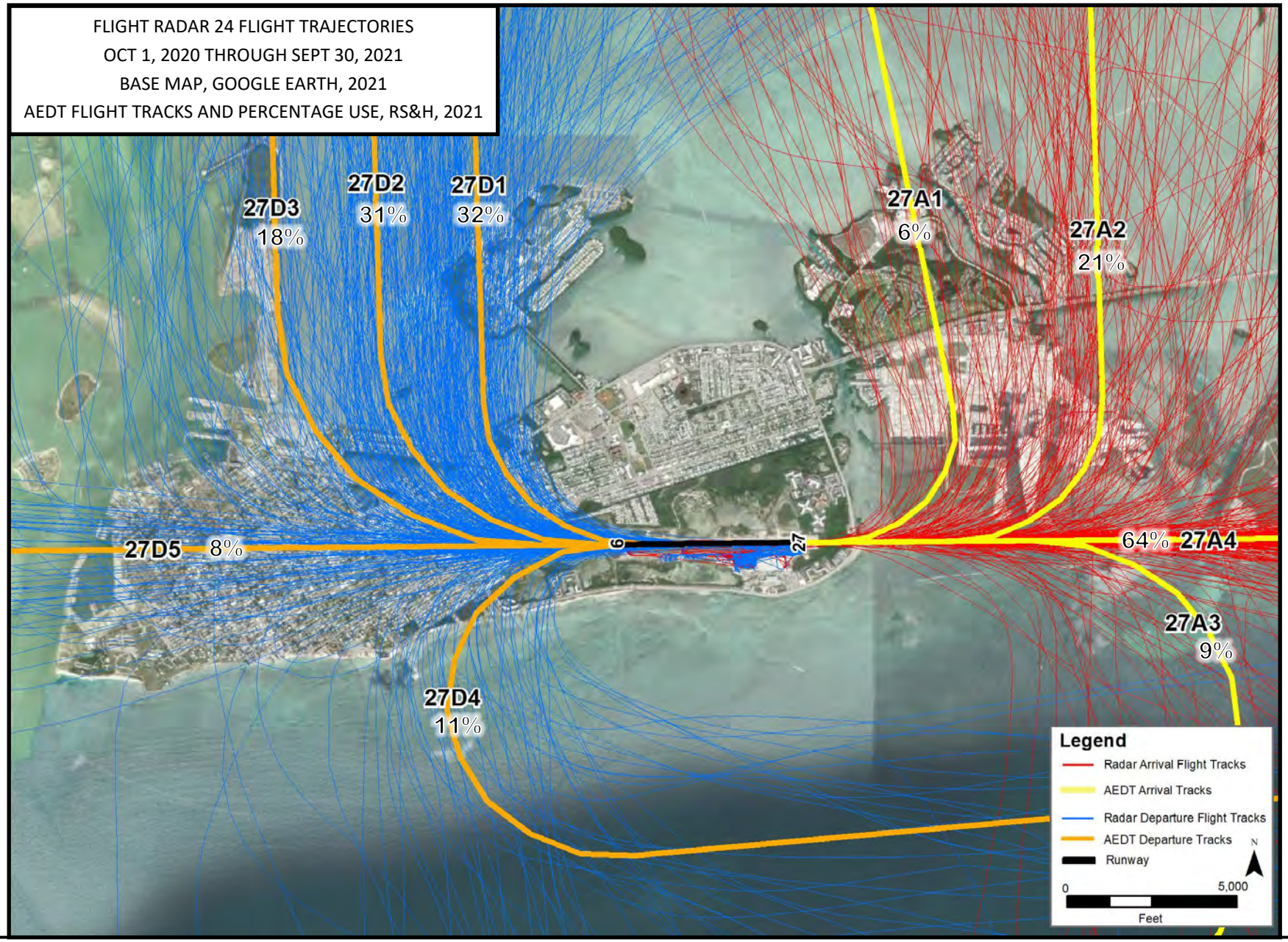

FIGURE 4.8

WEST FLOW GA PROP FR24 FLIGHT TRAJECTORIES WITH AEDT MODELED FLIGHT TRACKS AND UTILIZATION

KEY WEST INTERNATIONAL AIRPORT

NEM Update

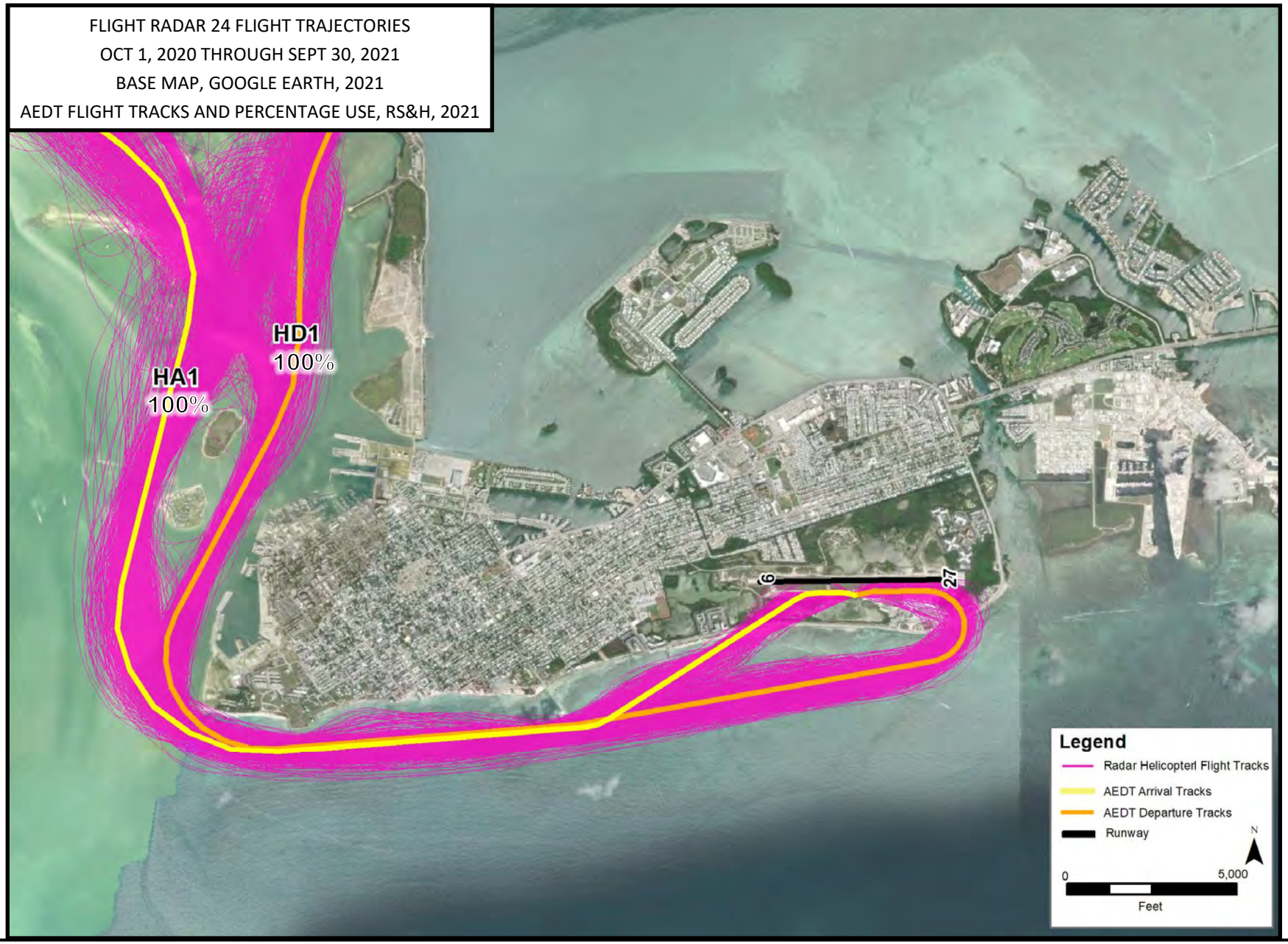

FIGURE 4.9

HELICOPTERS FR24 FLIGHT TRAJECTORIES WITH AEDT MODELED FLIGHT TRACKS AND UTILIZATION

KEY WEST INTERNATIONAL AIRPORT

NEM Update

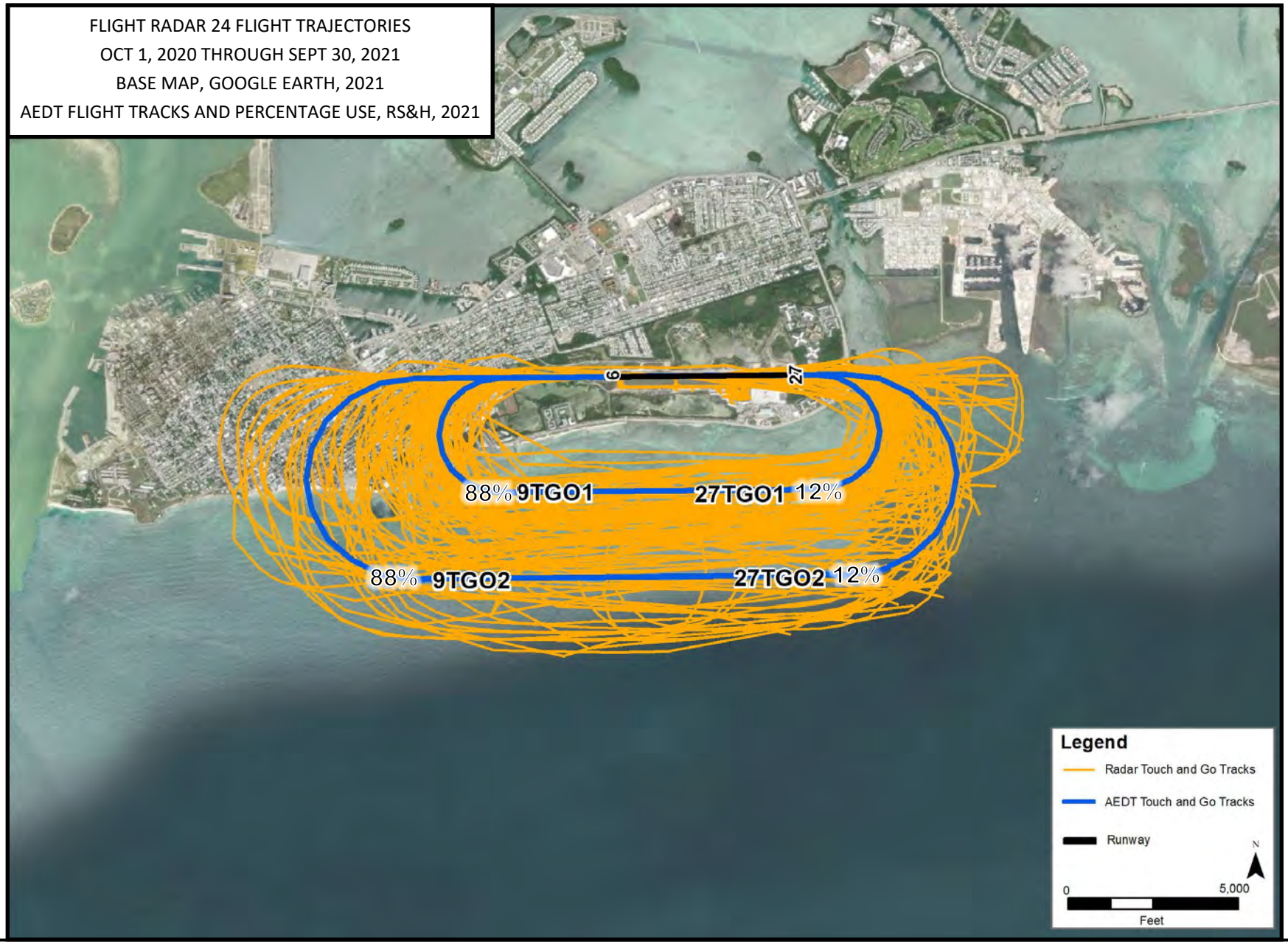

FIGURE 4.10

TOUCH & GO FR24 FLIGHT TRAJECTORIES WITH AEDT MODELED FLIGHT TRACKS AND UTILIZATION

KEY WEST INTERNATIONAL AIRPORT

NEM Update

4.2.12 Summary of Existing Condition NEM Modeled Operations

A total of 64,128 annual aircraft flight operations were modeled to develop the Existing Condition NEM. This equates to 176 average daily operations. **Table 4.11** provides a breakdown of these operations by aircraft category.

In addition to the 64,128 annual fixed-wing flight operations, 7,383 annual aircraft run-up operations (i.e., standing takeoff operations) were modeled to develop the Existing Condition NEM. This equates to 26 average daily run-up operations.

TABLE 4.11
SUMMARY OF 2021 FLIGHT OPERATIONS

CATEGORY	ANNUAL OPERATIONS	AVERAGE DAILY OPERATIONS
AC/AT JET	21,563	59.08
AC/AT PROP	6,593	18.06
GA PROP ITINERANT	19,305	52.89
GA PROP LOCAL	2,369	6.49
GA JET	10,161	27.84
GA HELO	3,698	10.13
MIL ITINERANT	268	0.73
MIL LOCAL	83	0.23
MIL HELO	88	0.24
TOTAL	**64,128**	**175.69**

Note: Numbers may not add due to rounding.
Sources: FAA OPSNET, 2021, FlightRadar24, 2022.
Prepared by: Deborah Murphy Lagos & Associates

While the noise contours represent an average annual day, the number of aircraft operations per day varies during the 365-day period. Historically, the number of aircraft operations have been the highest during March and lowest during September. In addition, certain holidays and local events attract out-of-town visitors that often utilize general aviation aircraft (e.g., Fantasy Fest, New Year's Eve). The noise exposure may be higher during times when there are more aircraft operations, and lower during times when there are less aircraft operations. The yearly day-night average sound level takes these variations into account by using the average annual day.

4.3 NOISE CONTOURS AND NONCOMPATIBLE LAND USES

The information presented thus far represents the key data necessary to develop the input for the AEDT. From these data, the AEDT generates lines of equal sound levels centered upon the runway. These lines of equal noise exposure are referred to as noise contours and are based on the DNL sound metric. The contours calculated for this study include the DNL 65-, 70-, and 75-dB contours. Aircraft noise, aircraft noise terminology, and effects of aircraft noise on people are described in greater detail in **Appendix B**.

Figure 4.11 presents the Existing Condition noise contours superimposed over the existing land use base map and is referred to as the Existing Condition NEM for Part 150 purposes. A large-scale version of the NEM is included in **Appendix G**. The base map provides community and airport geographic reference data such as runway configuration, roads, streets, and bodies of water. The surrounding land uses and the location of noise-sensitive facilities were identified from aerial photography, online database research, and field verification. This figure assists in understanding the geographic relationship of the airport to the community and to the noise contours generated by the airport's aircraft activity. **Figure 4.12** presents the 2022 Existing Condition noise contours with the 2013 Existing Condition noise contours (from the previous (NEM Update) superimposed; this figure is provided for comparison purposes.

Figure 4.11 illustrates current compatible and noncompatible land uses surrounding EYW that are found within the DNL 65-, 70-, and 75-dB noise contours. Noncompatible land uses include single-family, multi-family, and transient lodging residential uses, as well as places of worship and community facilities (institutional land uses) and are indicated by a crosshatch pattern. Portions of Key West by the Sea Condominiums, Ocean Walk Apartments, and Las Salinas Condominiums are within the DNL 65 dB and greater contour. Places of worship and community facilities (institutional land uses) within the DNL 65 dB contour include Grace Lutheran Church and School, and Catholic Charities St. Bede's Village. Transient lodging facilities within the DNL 65 dB contour include the Hyatt Residence Club Key West, Windward Pointe, and Hampton Inn Key West. Single- and multi-family land uses within the DNL 65 dB contour that are shown as compatible, which would normally be considered noncompatible, have been rendered compatible through participation in the Noise Insulation Program (NIP) (see **Appendix A, Section A.6**).

In addition to residential and institutional uses, **Figure 4.11** also indicates parks and recreational properties surrounding EYW that are found within the various noise contours within the Existing Condition NEM. These include Riggs Wildlife Refuge/Bridle Path, Little Hamaca City Park, 11th Street Public Boat Ramp, portions of Fran Ford White-crowned Pigeon Preserve, Smathers Beach, and Florida Keys Overseas Heritage Trail. There are no National Register properties located within the noise contours.

Table 4.12 summarizes the acreage, by land use category, located within the DNL 65-, 70-, and 75-dB contours. **Table 4.13** provides the number of housing units and population within the DNL 65-, 70-, and 75-dB contours. Single-family housing units that were split by a contour were counted in the higher-level contour. For multi-family residential and transient lodging facilities, the number of housing units was distributed amongst the various contours based on the proportion of the parcel's acreage that fell within each contour. The number of housing units was rounded to the nearest whole number.

To quantify the single-family and multi-family population within the existing condition DNL 65-, 70-, and 75-dB noise contours, U.S. Census Bureau, American Community Survey (ACS), 5-Year Estimates population

data were utilized. Condominiums and apartments were considered fully occupied as these are usually owner-occupied or long-term leases. The data for the City of Key West indicated an average household size of 2.25, which was multiplied by the number of housing units to calculate estimated population. Estimated population was rounded to the nearest whole number.

To calculate transient lodging population, Key West Hotel Occupancy Tourism Statistics were obtained from the Key West Travel Guide. The number of available transient lodging units was determined for the Hyatt Residence Club Key West, Windward Pointe, and Hampton Inn Key West. (A. Henriquez, personal communication, April 14, 2022) The average occupancy rate of 84.175% (for 2019) was then multiplied by the number of units to calculate estimated population. Estimated population was rounded to the nearest whole number.

Table 4.13 identifies the number of housing units that have participated in the NIP. These residences are now considered compatible land uses. The distribution of population between mitigated and unmitigated is based upon the number of mitigated and unmitigated housing units. Additional details regarding homes that have participated in the NIP are included in **Appendix A, Section A.6.**

TABLE 4.12

EXISTING CONDITION NOISE EXPOSURE ESTIMATES - ACREAGE

LAND USE TYPE (ACRES)	DNL 65 TO 70 dBA	DNL 70 TO 75 dBA	DNL 75+ dBA	TOTAL OVER DNL 65 dBA
Airport	61.8	72.5	87.3	221.6
Commercial/Office	0.5	0.0	0.0	0.5
Institutional	4.0	0.0	0.0	4.0
Open Space	3.0	0.6	0.0	3.6
Public/Semi-Public	80.7	18.2	4.1	103.0
Residential – Multi-Family	0.5	0.1	0.0	0.6
Key West by the Sea Condominiums	3.8	0.0	0.0	3.8
Ocean Walk Apartments	9.6	4.1	0.2	13.9
Las Salinas Condominiums	0.4	0.0	0.0	0.4
Residential – Single Family	18.6	7.3	0.3	26.2
Transient Lodging	11.9	0.6	0.1	12.6
Transportation/Utility/Right of Way	9.9	2.7	0.0	12.6
Vacant	0.5	0.0	0.0	0.5
Water	69.8	4.1	0.4	74.3
Total Acreage	**275.0**	**110.2**	**92.4**	**477.6**

Prepared by: Deborah Murphy Lagos & Associates and HD Mapping, 2022

TABLE 4.13

EXISTING CONDITION NOISE EXPOSURE ESTIMATES - HOUSING UNITS AND POPULATION

NUMBER OF HOUSING UNITS	DNL 65 TO 70 dBA	DNL 70 TO 75 dBA	DNL 75+ dBA	TOTAL OVER DNL 65 dBA
Unmitigated (i.e., Noncompatible)				
Residential – Multi-Family	5	0	0	5
Key West by the Sea Condominiums	12	0	0	12
Ocean Walk Apartments	160	68	3	231
Las Salinas Condominiums	18	0	0	18
Residential – Single Family	41	2	0	43
Transient Lodging (Occupancy Rate 84.175%)	146	8	0	154
Total Unmitigated Housing Units	**382**	**78**	**3**	**463**
Mitigated[1] (i.e., Compatible)				
Residential – Multi-Family	3	1	0	4
Key West by the Sea Condominiums	88	0	0	88
Residential – Single Family	87	60	7	154
Total Mitigated Housing Units	**178**	**61**	**7**	**246**
Total Housing Units	**560**	**139**	**10**	**709**
POPULATION	**DNL 65 TO 70 dBA**	**DNL 70 TO 75 dBA**	**DNL 75+ dBA**	**TOTAL OVER DNL 65 dBA**
Unmitigated (i.e., Noncompatible)				
Residential – Multi-Family	11	0	0	11
Key West by the Sea Condominiums	27	0	0	27
Ocean Walk Apartments	360	153	7	520
Las Salinas Condominiums	41	0	0	41
Residential – Single Family	92	5	0	97
Transient Lodging (Occupancy Rate 84.175%)	327	17	0	344
Total Unmitigated Population	**858**	**175**	**7**	**1,040**
Mitigated[1] (i.e., Compatible)				
Residential – Multi-Family	7	0	0	7
Key West by the Sea Condominiums	198	0	0	198
Residential – Single Family	195	135	16	346
Total Mitigated Population	**400**	**135**	**16**	**551**
Total Population	**1,258**	**310**	**23**	**1,591**

Notes: [1] Population and housing units are mitigated through participation in the NIP.

Sources: U.S. Department of Commerce. Census Bureau, QuickFacts, 2021.
https://www.hyattresidenceclub.com/resorts/hyatt-windward-pointe, 2022.
Alexis Averette Henriquez, Director of Sales, Hampton Inn Key West, 2022.
Key West Hotel Occupancy Tourism Statistics, Key West Travel Guide, 2022.

Prepared by: Deborah Murphy Lagos & Associates and HD Mapping, 2022

KEY WEST INTERNATIONAL AIRPORT
NEM Update

2022 EXISTING CONDITION NOISE EXPOSURE MAP - ENLARGED

Grace Lutheran Church and School
Catholic Charities St. Bede's Village
Las Salinas Condominium
Ocean Walk Apartments
Hampton Inn
Hyatt Residence Club
Key West by the Sea

LEGEND

Noise Contours
- 65 DNL
- 70 DNL
- 75 DNL

Non-Compatible Land Use
- Residential – Single Family
- Residential – Multi-Family
- Transient Lodging
- Institutional

Compatible Land Use
- Agricultural
- Industrial
- Institutional
- Mining, Petroleum, and Gas Land
- Open Space
- Public/Semi-Public
- Recreational Areas
- Residential – Single Family
- Residential – Mobile Homes
- Residential – Multi-Family
- Transient Lodging
- Unclassified
- Vacant
- Commercial/Office

Other Features
- Community Facility
- Healthcare Facility
- House of Worship
- Recreational Facility
- School/Day Care
- Florida Keys Overseas Paddling Trail (FKOPT)
- Florida Keys Overseas Heritage Trail (FKOHT)
- Airport Boundary
- City of Key West Boundary
- Monroe County Boundary

N W E S

0 1,000 Feet

Sources:
RS&H, February 2022 (2021 Existing Condition Noise Contour); Deborah Murphy Lagos & Associates, LLC, June 2021 (Land Use); Ricondo & Associates, Inc., June 2020 (Airfield); Deborah Murphy Lagos & Associates, LLC, August 2021 (Community Facilities, Health Facilities, Places of Worship, Recreational Facilities, Schools & Day Cares); Florida Department of Environmental Protection, March 2019 (Florida Keys Overseas Heritage Trail and Paddling Trail); Martinez Geospatial, Basemap Planimetrics, November 2016 (Airpor t Property Line); Monroe County, August 2017 (City of Key West Boundary); Monroe County, February 2020 (Monroe County Boundary); ESRI, November 2021 (World Imagery)

Path: C:\Users\dale_edgar.000\Dropbox\Deborah Murphy Lagos & Associates, LLC\Projects\Key West - NEM Update\maps\Figures\Figure 4-11 2021 Existing Condition NEM.mxd, Date Saved: 8/20/2022 11:48:50 PM

KEY WEST INTERNATIONAL AIRPORT
NEM Update

COMPARISON OF CURRENT EXISTING CONDITION AND PREVIOUS EXISTING CONDITION NOISE EXPOSURE MAPS

FIGURE 4.12
Page 71

Las Salinas Condominium

Ocean Walk Apartments

Hampton Inn

Hyatt Residence Club

Key West by the Sea

DRAFT DOCUMENT - SUBJECT TO REVISION

LEGEND

2022 Current Existing Condition 65 DNL Noise Contour

2012 Previous Existing Condition 65 DNL Noise Contour

Non-Compatible Land Use
- Residential – Single Family
- Residential – Multi-Family
- Transient Lodging
- Institutional

Compatible Land Use
- Agricultural
- Industrial
- Institutional
- Mining, Petroleum, and Gas Land
- Open Space
- Public/Semi-Public
- Recreational Areas
- Residential – Single Family
- Residential – Mobile Homes
- Residential – Multi-Family
- Transient Lodging
- Unclassified
- Vacant
- Commercial/Office

Other Features
- Community Facility
- Healthcare Facility
- House of Worship
- Recreational Facility
- School/Day Care
- Florida Keys Overseas Paddling Trail (FKOPT)
- Florida Keys Overseas Heritage Trail (FKOHT)
- Airport Boundary
- City of Key West Boundary
- Monroe County Boundary

N W E S

0 1,000 Feet

Sources:
RS&H, February 2022 (2021 Current Existing Condition Noise Contour); ; Ricondo & Associates, Inc., June 2020 (Airfield);
EWY Part 150 NEM, December 2013 (2012 Previous Existing Condition Noise Contour); Deborah Murphy Lagos & Associates, LLC, June 2021 (Land Use);
Deborah Murphy Lagos & Associates, LLC, August 2021 (Community Facilities, Health Facilities, Places of Worship,Recreational Facilities, Schools & Day Cares);
Florida Department of Environmental Protection, March 2019 (Florida Keys Overseas Heritage Trail and Paddling Trail);
Martinez Geospatial, Basemap Planimetrics, November 2016 (Airpor t Property Line); Monroe County, August 2017 (City of Key West Boundary);
Monroe County, February 2020 (Monroe County Boundary); ESRI, November 2021 (World Imagery)

Path: C:\Users\dale_edgar.000\Dropbox\Deborah Murphy Lagos & Associates, LLC\Projects\Key West - NEM Update\maps\Figures\Figure 4-12 Comparison of Current Existing and Previous Existing Condition Noise Contours.mxd. Date Saved: 9/5/2022 7:32:40 PM