Federal Aviation Administration

Final Environmental Assessment for Wing Aviation, LLC Proposed Drone Package Delivery Operations in Central Florida

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Washington, D.C.

Notice of Availability of the Final Environmental Assessment for Wing Aviation, LLC, Proposed Package Delivery Operations in Central Florida

The Federal Aviation Administration (FAA) provides notice that a Final Environmental Assessment (EA), prepared pursuant to the National Environmental Policy Act (NEPA) (42 United States Code [U.S.C.] Sections 4321–4355), to assess Wing Aviation, LLC, proposed commercial drone delivery service in Central Florida is available.

Wing Aviation, LLC, is seeking to amend its air carrier Operations Specifications (OpSpecs) and other FAA approvals necessary to expand commercial drone package delivery operations in Florida. The FAA's approval of the amended OpSpecs is considered a major federal action under NEPA and requires a NEPA review. This Final EA has been prepared pursuant to NEPA, FAA Order 1050.1F, Environmental Impacts: Policies and Procedures, Section 4(f) of the Department of Transportation Act (49 U.S.C. Section 303), and Section 106 of the National Historic Preservation Act (16 U.S.C. Section 470).

The Final EA is available for online review at
https://www.faa.gov/uas/advanced_operations/nepa_and_drones

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Acronyms and Abbreviations

AGL	above ground level
APE	Area of Potential Effects
BVLOS	beyond visual line of sight
CFR	Code of Federal Regulations
dB	decibel
dBA	A-weighted decibel
DNL	Day-Night Average Sound Level
EA	Environmental Assessment
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
IPaC	Information for Planning and Consultation
MBTA	Migratory Bird Treaty Act
metro	metropolitan
mph	miles per hour
NWR	National Wildlife Refuge
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NRHP	National Register of Historic Places
OpSpecs	Operations Specifications
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Officer
THPOs	Tribal Historic Preservation Officers
U.S.C.	United States Code
UA	unmanned aircraft
USFWS	U.S. Fish and Wildlife Service
Wing	Wing Aviation, LLC

Chapter 1
Purpose and Need

1.1 Introduction

Wing Aviation, LLC (Wing), a subsidiary of Alphabet Inc., holds a Federal Aviation Administration (FAA) standard air carrier certificate under 14 Code of Federal Regulations (CFR) Part 135 (Part 135),[1] which allows holders to conduct on-demand or scheduled (commuter) operations, and a 49 United States Code (U.S.C.) Section 44807 exemption,[2] which allows Wing to carry the property of another for compensation or hire beyond visual line of sight (BVLOS) using its Hummingbird Unmanned Aircraft System. Wing's Part 135 certificate contains a stipulation that operations must be conducted in accordance with the provisions and limitations specified in its Operations Specifications (OpSpecs).[3,4] Wing is seeking to amend its OpSpecs and other FAA approvals necessary to conduct unmanned aircraft (UA; also referred to as a drone) commercial package delivery operations in the Central Florida metropolitan (metro) and surrounding areas (see Figure 2.2-1).

Wing is proposing to conduct UA retail package delivery operations from up to 150 "nests"[5] in the Central Florida metros and surrounding areas using Wing's Hummingbird 7000W-B and 8000-A. Wing's intent is to offer service throughout the Central Florida metro and surrounding areas from a network of nests, where each would serve a specific area, thereby avoiding an over-concentration of flights surrounding any given nest. Each nest houses up to 24 aircraft and each has a delivery range of approximately 6 miles. Wing proposes a maximum of 150 nest locations within the Central Florida metro and surrounding areas. Site locations of seven initial nests are provided in Table 1. Wing's nests would be located in commercially zoned areas, such as shopping centers, large individual retailers, and shopping malls. Wing projects operating a maximum of 400 delivery flights per operating day from each nest, with operations initially occurring between 7:00 a.m. and 7:00 p.m. and then extending to 7:00 a.m. to 10:00 p.m. In addition, operations would include low altitude (<8ft) in-nest hover checks (referred to as FitBITs) between 6:00 a.m. and 7:00 a.m. in preparation for the normal operational day which would begin no earlier than 7:00 a.m. Additional, higher hover flights (approximately 60 feet) may be performed up to 7 times per nest, per week, where the UA makes a separate hover flight to update the reference map of the nest; these flights are termed

[1] https://www.faa.gov/uas/advanced_operations/package_delivery_drone.

[2] 49 United States Code (U.S.C.) Section 44807 provides the Secretary of Transportation with authority to determine whether a certificate of waiver, certificate of authorization, or a certificate under 49 U.S.C. Section 44703 or 44704 is required for the operation of certain unmanned aircraft systems.

[3] An Operations Specifications is a document that defines the scope of aircraft operations that the Federal Aviation Administration (FAA) has authorized.

[4] This is different than a concept of operations, or ConOps, which is generally a description of how a set of capabilities may be employed to achieve desired objectives.

[5] A ground-based service area where unmanned aircraft (UA) are assigned and where flights originate and return.

geography built-in tests (GeoBITs) because of their similarity to the FitBIT stationary hover flight over the nest.

The FAA's approval of the amended OpSpecs is considered a major federal action under the National Environmental Policy Act (NEPA)[6] and requires NEPA review. Wing prepared this Final EA under the supervision of the FAA[7] to evaluate the potential environmental impacts that might result from the FAA's proposed action. Under NEPA, federal agencies are required to consider the environmental effects of proposed federal actions and to disclose to decision-makers and the interested public a clear and accurate description of the potential environmental impacts of proposed major federal actions. Additionally, under NEPA, federal agencies are required to consider the environmental effects of a proposed action, the reasonable alternatives to the proposed action, and a no action alternative (assessing the potential environmental effects of not implementing the proposed action). The FAA has established a process to ensure compliance with the provisions of NEPA through FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* (FAA 2015)[8].

1.2 FAA Role for Proposed Action

In general, Congress has charged the FAA with the safety of air commerce in the United States. The FAA provides multiple approvals associated with package delivery proposals, such as a waiver of 14 CFR Section 91.113(b) to enable BVLOS operations, and a Certificate of Waiver or Authorization; however, the FAA's issuance of an OpSpecs (or an amended OpSpecs) to include package delivery flights in a specified operating area is the approval that ultimately enables UA operations. In addition, the FAA has specific statutory and regulatory obligations related to its issuance of a Part 135 certificate and the related OpSpecs. The FAA is required to issue an operating certificate[9] to an air carrier when it "finds, after investigation, that the person properly and adequately is equipped and able to operate safely under this part and regulations and standards prescribed under this part."[10] An operating certificate also specifies "terms necessary to ensure safety in air transportation; and … the places to and from which, and the airways of the United States over which, a person may operate as an air carrier."[11] Also included in air carrier certificates is a stipulation that the air carrier's operations must be conducted in accordance with the provisions

[6] 42 U.S.C. Section 4321 et seq.

[7] See 40 CFR Section 1506.5(a).

[8] On January 20, 2025, President Trump issued Executive Order (EO) No. 14154, *Unleashing American Energy*, which revoked EO 11991, *Relating to Protection and Enhancement of Environmental Quality* (May 24, 1977), and instructed the Chair of the CEQ to rescind its NEPA-implementing regulations. On February 25, 2025, the CEQ issued an interim final rule to remove the existing implementing regulations for NEPA (90 *Fed. Reg.* 10610 (Feb. 25, 2025)). The Draft EA was prepared in accordance with CEQ's National Environmental Policy Act Implementing Regulations Revision Phase 2, 89 Fed. Reg. 35442(May 1, 2024) (Phase 2 final rule), now pending rescission.

[9] An operating certificate is issues to an applicant with will conduct intrastate transportation, which is transportation that is conducted wholly within the same state of the United States.

[10] 49 U.S.C. Section 44705.

[11] Id.

and limitations specified in the OpSpecs.[12] In addition, the regulations specify that a Part 135 certificate holder may not operate in a geographical area unless its OpSpecs specifically authorizes the certificate holder to operate in that area.[13] The regulations implementing 49 U.S.C. Section 44705 specify that an air carrier's approved OpSpecs must include, among other things, "authorization and limitations for routes and areas of operations."[14] An air carrier's OpSpecs may be amended at the request of an operator if the FAA "determines that safety in air commerce and the public interest allows the amendment."[15] After making this determination, the FAA must take an action on the OpSpecs amendment.[16]

1.3 Purpose and Need

Wing is proposing to establish UA commercial delivery service throughout the Central Florida area, which Wing, in its business judgment, has determined is appropriate given market demand (see Section 2.2. *Proposed Action*). Wing's current operations in the Dallas-Fort Worth metro area have provided Wing with an opportunity to assess community response to commercial delivery operations. Wing's findings from these operations were used as a basis for the business case to increase operations further throughout Central Florida. The purpose of the proposed action is related to the FAA's role and responsibility to review applications for safe flight and certification under Part 135. The proposed action is needed to meet consumer demand for package deliveries in Central Florida as identified by Wing and to implement BVLOS for those drone package delivery operations.

1.4 Public Involvement

The FAA created a Notice of Availability (NOA) with information about the Draft EA and provided it to local, state, and federal officials, interest groups, and federally recognized tribes. The NOA was provided in English and Spanish. The FAA also announced availability of the Draft EA for public review via the FAA's social media and an advertisement in the *Orlando Sentinel* and the *Tampa Bay Times* newspapers. The NOA provided information about the proposed action and requested public review and comments on the Draft EA, which was published on the FAA's website[17] for a 30 -day comment period from December 20, 2024, to January 20, 2025. Interested parties were invited to submit comments on any environmental concerns related to the proposed action. The FAA received six substantive comments. Public comments and FAA responses are provided in Appendix L, *Public Comments and FAA Responses*.

[12] 14 CFR Section 119.5 (g), (l).

[13] 14 CFR Section 119.5(j).

[14] 14 CFR Section 119.49(a)(6).

[15] 14 CFR Section 119.51(a); see also 49 U.S.C. Section 44709.

[16] 14 CFR Section 119.51(c).

[17] See: https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

Chapter 2
Proposed Action and Alternatives

FAA Order 1050.1F, Paragraph 6-2.1(d) states that, "[a]n EA may limit the range of alternatives to the proposed action and no action alternative when there are no unresolved conflicts concerning alternative uses of available resources." The FAA has not identified any unresolved conflicts concerning alternative uses of available resources associated with Wing's proposal. Therefore, this EA only considers the proposed action and the no action alternative.

2.1 No Action Alternative

FAA Order 1050.1F, Paragraph 6-2.1(d) requires the FAA to consider a no action alternative in their NEPA reviews to compare the environmental effects of not taking action with the effects of the action alternative(s). Thus, the no action alternative serves as a baseline to compare the impacts of the proposed action. Under the no action alternative, the FAA would not approve an OpSpecs under Part 135 to implement Wing package delivery operations in the Central Florida metro area. Wing would continue to conduct UA package delivery operations under Part 135 in locations currently authorized by its OpSpecs and at other locations under 14 CFR Part 107,[18] which limits operations to UA weighing less than 55 pounds and within visual line of sight. Consumers in the areas not served by UAs would be expected to continue to use personal ground transportation to retrieve small goods using their automobiles or in some cases with public transportation, if available. This alternative does not support the stated purpose and need.

2.2 Proposed Action

The proposed action is the introduction of Wing's UA commercial delivery service to the Central Florida metro and surrounding areas. Under the proposed action, Wing would establish up to 150 nests within the operating area. Operating hours would occur from 6:00 a.m. to 10:00 p.m. with flights only leaving the nest area between 7:00 a.m. and 10:00 p.m. while maintaining the current operational limit of 400 deliveries per nest per operating day. The exact timing and pace of nest installation is dependent on market conditions. If, in the future, Wing wanted to exceed 150 nests in the operating area, additional NEPA reviews would be required. Operations, including nest placement and all UA delivery flights, would be confined to the operating areas depicted in Figure 2.2-1 and Figure 2.2-2.[19] Operations would not occur within the boundaries of any National Wildlife Refuge (NWR) or restricted air space such as the Kennedy Space Center or Cape Canaveral Space Force Station within the larger operating area.

[18] The *Operation of Small Unmanned Aircraft Systems Over People* rule (codified in 14 CFR Part 107) permits routine operation of small Unmanned Aircraft Systems (UAs weighing less than 55 pounds) within visual line of sight at night and over people without a waiver or exemption under certain conditions.

[19] Modification of Wing's operations plan requires approval in accordance with 14 CFR Part 135.

Nests would be distributed throughout the Central Florida metro and surrounding areas following a measured rollout plan to be developed with Wing's partners and continuing best practices from Wing's established community outreach program, and in compliance with state and local statutory and regulatory requirements. Wing's nests would be located in established parking lots of commercially zoned areas whose use is consistent with local zoning and land use requirements, such as shopping centers, large individual retailers, and shopping malls. Installation activities are brief and would only involve the placement of fencing around the nest and the delivery of a shipping container for UA storage. Remote pickup infrastructure consisting of an autoloader (Figure 2.2.7) would be installed within proposed nests or at offsite locations, utilized during limited remote pickup and delivery operations, and would also be located within commercially zoned areas. Individual autoloader locations (either within a nest or offsite) would typically include up to three autoloaders within or in the vicinity of most nest sites, with a handful more distributed locations having up to 10 autoloaders, depending on market demand, for a total installation of 200–600 autoloaders distributed throughout the operating area. The autoloaders would consist of "Y"-shaped passive stands designed for automated pick up of packages without landing. Autoloaders would not require ground disturbance for installation and would be anchored through existing pavement, to existing poles, or ballasted for temporary use. The autoloaders would be controlled and operated by Wing and its partners, would be approximately 10 feet tall, 7 feet wide at the mouth, and 6 feet long, and would include a clear zone of approximately 2 parking spaces. Remote pickups are described further in Section 2.2.2.6, *Offsite Package Autoload*.

To avoid the potential for significant noise impacts, Wing would site its nests and autoloaders at least 120 feet away from a noise-sensitive area[20] when the nest is located within the controlled surface area of Class B, Class C, and Class D airspace[21] (refer to Figure 3.6-1) and at least 65 feet away from a noise-sensitive area in all other areas within the study area, which is defined as Wing's proposed nest locations and service area (see Figure 2.2-1 and Figure 2.2-2). Offsite package autoload and pickup flight paths would not occur within 80 feet of noise-sensitive areas when the autoloader is located within the controlled surface area of Class B, Class C, and Class D airspace and 45 feet away from noise-sensitive areas in all other areas within the study area.

Each nest would serve an area within a 6-mile radius for package delivery. Offsite Package Autoloads would serve an area within a 1-mile radius of the Offsite Package Autoload location due to flight energy constraints. Initially, Wing expects to fly considerably less than 400 deliveries per day from

[20] A *noise-sensitive area* is an area where noise interferes with normal activities associated with its use. Normally, noise-sensitive areas include residential, educational, health, and religious structures and sites, and parks, recreational areas, areas with wilderness characteristics, wildlife and waterfowl refuges, and cultural and historical sites. (FAA Order 1050.1F, Paragraph 11-5.b(10).)

[21] Class B airspace is generally airspace from the surface to 10,000 feet mean sea level surrounding the nation's busiest airports in terms of airport operations or passenger enplanements. Class C airspace is generally airspace from the surface to 4,000 feet above the mean sea level surrounding those airports that have an operational control tower, are serviced by a radar approach control, and have a certain number of operations or passenger enplanements. Class D airspace is generally airspace from the surface to 2,500 feet above the airport elevation (charted in mean sea level) surrounding those airports that have an operational control tower. For more information. See: https://www.faa.gov/regulationspolicies/handbooksmanuals/aviation/phak/chapter-15-airspace.

each nest and then gradually increase to 400 deliveries per day as consumer demand rises. Even in the locations where the service areas of nests overlap, Wing would not exceed 400 deliveries or overflights in a given location. Proposed delivery and GeoBit operations would occur from approximately 7:00 a.m. to 10:00 p.m., 7 days of the week, including holidays. Operating hours would also include FitBITs between 6:00 a.m. and 7:00 a.m.

Table 2.2-1. Proposed Initial Site Locations

Area Served	Site	Address	Latitude	Longitude
Tampa	Walmart Supercenter	990 Missouri Ave N Largo, FL 33770	27.92596	-82.78583
	Walmart Supercenter	11110 Causeway Blvd Brandon, FL 33511	27.92546	-82.32554
	Walmart Supercenter	2601 James L Redman Pkwy Plant City, FL 33566	27.98672	-82.12193
Orlando	Walmart Supercenter	8990 Turkey Lake Rd Orlando, FL 32819	28.44028	-81.47652
	Walmart Supercenter	1450 Johns Lake Rd Clermont, FL 34711	28.52943	-81.73150
	Walmart Supercenter	11250 E Colonial Dr Orlando, FL 32817	28.56584	-81.21781
	Walmart Supercenter	2855 N Old Lake Wilson Rd Kissimmee, FL 34747	28.33001	-81.58799

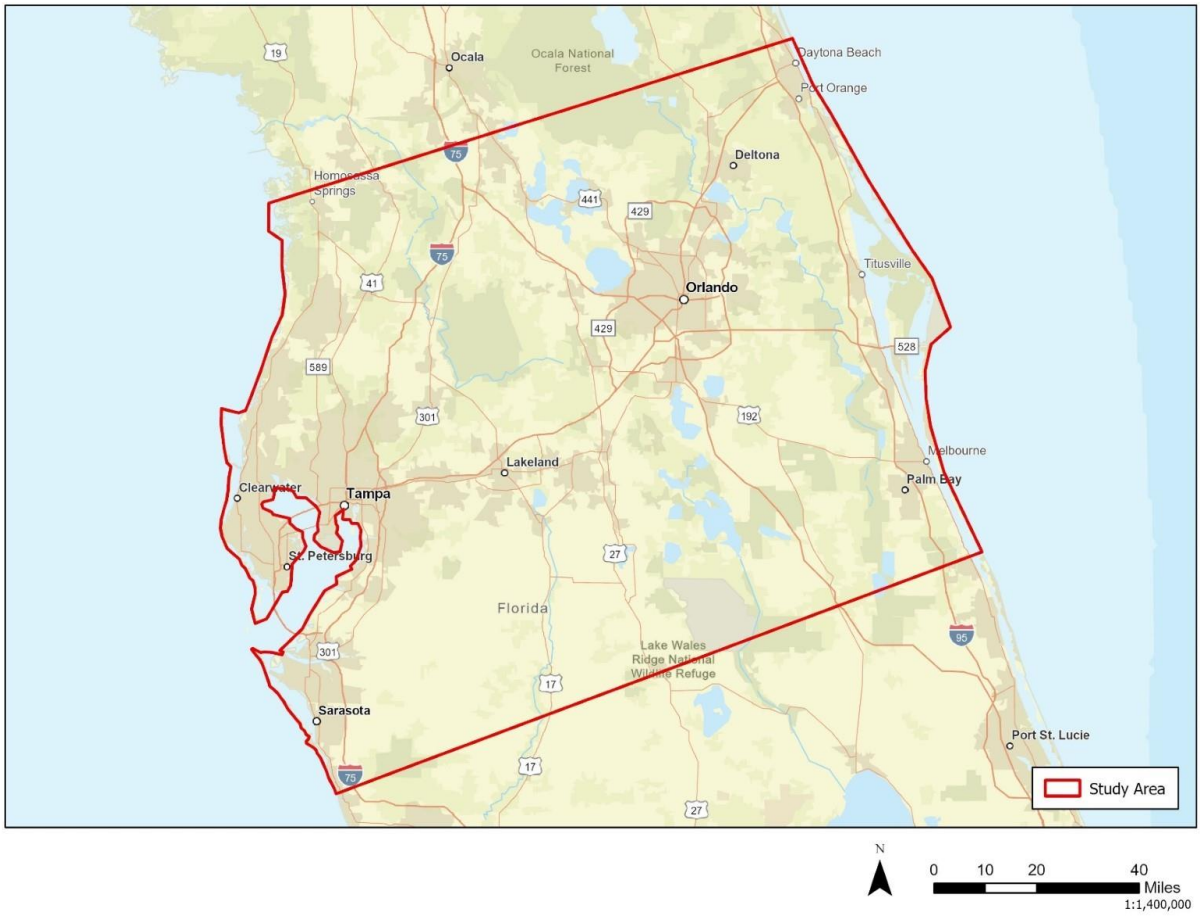

Figure 2.2-1. Wing's Proposed Central Florida Metro and Surrounding Area Operating Area

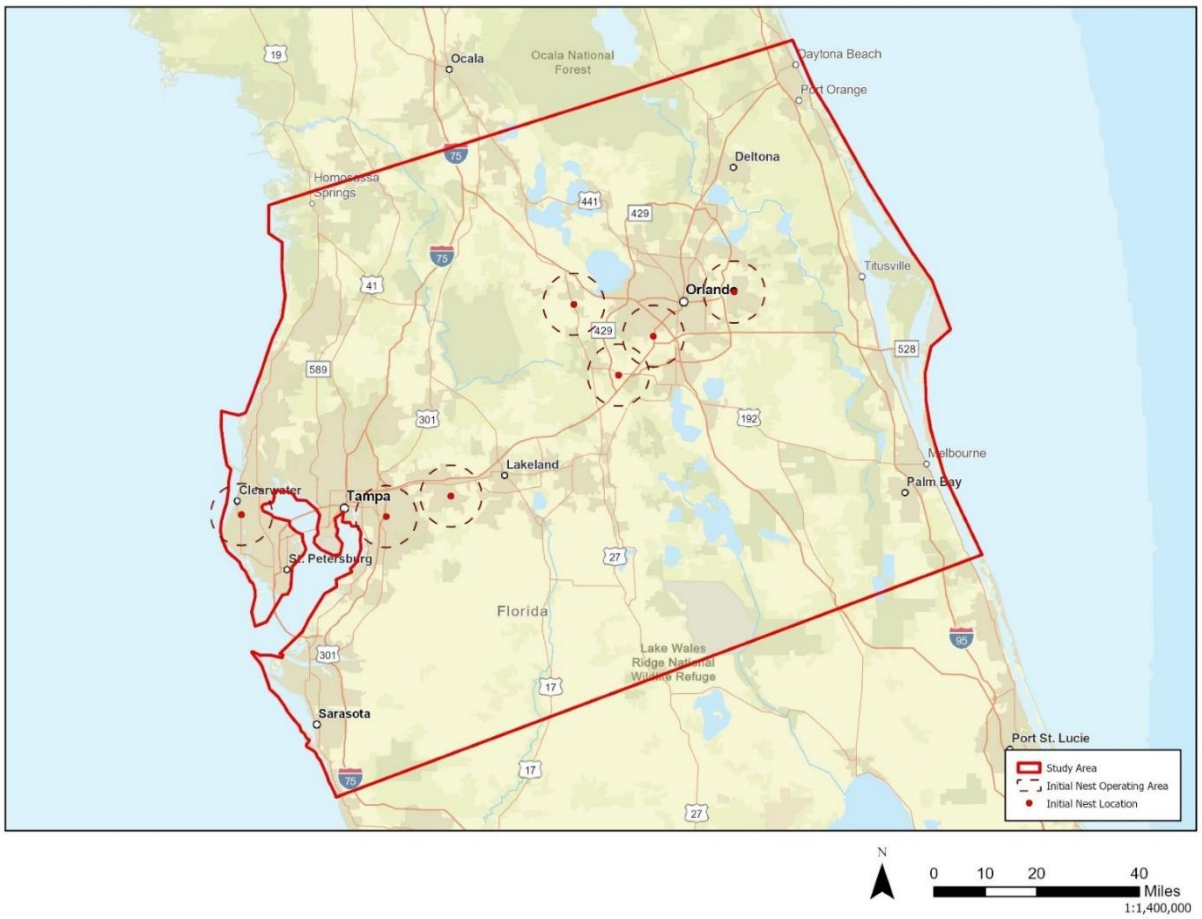

Figure 2.2-2. Wing's Proposed Central Florida Metro and Surrounding Area Initial Site Locations

Each nest would contain up to two dozen (24) aircraft on launch pads, and one or more merchants may be partnering with Wing at each nest for drone deliveries. The estimated total distance flown for deliveries would vary depending upon the pickup and drop-off locations in the operating area. The majority of delivery flights would consist of transport of a package from the nest to a customer delivery address before returning to the nest. There would be variability in the number of flights per day based on customer demand and weather conditions.

Wing would also conduct offsite operations of limited remote pickup and delivery flights in which the drone would transit from the nest to an offsite location, pick up a package, then deliver the package to the customer before returning back to the nest. Autoloaders would be installed at remote pickup locations, typically within 1,000 feet of a nest and within the same commercial area and would enable drone package delivery for Wing's commercial partners that are not located in the immediate vicinity of a nest. Remote pickup is expected to be complementary to typical package delivery operations and is anticipated to make up less than 50 percent of total operations. However, based on demand, some dedicated remote pickup nests would also be established in the vicinity of four (4) to 10 partner sites located in areas adequately isolated from sensitive noise receptors.

The UA would be transporting consumer goods in partnership with merchants in the communities they already serve and would provide an alternative to in-store pickup. Deliveries would be

conducted at the time of the customer's choosing and directly to the customer's home in the operating area.

Wing's flight planning software can automatically avoid identified medical facilities, schools (elementary, middle, and high school), preschools, or daycares with outdoor facilities based on the type of resource, time of day, and other factors.[22] Wing has confirmed to the FAA that it will generally not conduct operations over these "*fly less*"[23] areas during the scope of operations covered by this proposed action, including remote pickups, unless there is a specific purpose for Wing to enter one of these areas in coordination with the respective resource authority. Remote pickups would be further limited to continuous commercially zoned areas and corridors without sensitive noise receptors. In addition, Wing's flight planning software is designed to increase variability in flight paths to minimize overflights of any given location; with the diversification of flight paths, the frequency of overflights would inversely scale as the distance from a nest increases.

2.2.1 Unmanned Aircraft Specifications

Two UAs would be primarily used for deliveries: Wing's Hummingbird 7000W-B and 8000-A.

- Hummingbird 7000W-B
    - Multi-rotor design with 16 propellers (Figure 2.2-3).
    - Weight under 15 pounds when combined with its maximum payload weight of 2.7 pounds.
    - Has a wingspan of approximately 4.9 feet, a height of approximately 1 foot, and a length of 4 feet.
- 8000-A
    - Multi-rotor design with 12 propellers (Figure 2.2-4).
    - Weight under 25 pounds when combined with its maximum payload weight of 5 pounds.
    - Has a wingspan of approximately 6 feet, a height of approximately 1 foot, and a length of approximately 6.2 feet.

All Wing aircraft use electric power from rechargeable lithium-ion batteries.

Wing anticipates the Central Florida metro and surrounding areas fleet makeup would be comprised of 70 to 80 percent 7000W-B aircraft and 20 to 30 percent 8000-A aircraft. The fleet mix of individual nests would be variable based on payload, route, and demand characteristics; nests with a wider range of offerings are anticipated to carry higher proportions of 7000W-B Aircraft.

[22] Wing's flight planning software is updated monthly. Wing distributes flight routes to avoid concentrating flights over any one location.

[23] Fly less areas are properties that Wing identifies in its flight planning system, which can be automatically avoided based on the type of resource, time of day, and other factors. Wing has committed in its operational proposal to the FAA that it will generally avoid overflights of these fly less resources in the Central Florida operating area.

Figure 2.2-3. Wing Hummingbird 7000W-B UA

Figure 2.2-4. Wing Hummingbird 8000-A UA

2.2.2 Flight Operations

The UA[24] would generally be operated at an altitude of 150–300 feet above ground level (AGL) and always below an altitude of 400 feet AGL while en route to and from delivery locations. At a delivery location, the UA would descend vertically to a stationary hover at 23 feet AGL and lower a package to the ground by a retractable line for delivery. Once a package has been lowered to the ground, the UA would then retract the line, ascend vertically to a cruise altitude, and depart the delivery area en route back to a nest.

The UA would fly a predefined flight path that is set prior to takeoff. Flight missions are automatically planned by Wing's flight planning software. A mission originates from a nest location, and Wing's software automatically assigns, deconflicts, and routes each flight to the delivery location and back to a nest. Each nest site would include a controlled area wherein UA flights are launched and recovered.

A typical flight profile can be broken into the following general flight phases: takeoff, en route outbound, delivery, en route inbound, and landing (Figure 2.2-6). Remote pickup procedures are described in Section 2.2.2.6, *Offsite Package Autoload.*

Note: Each aircraft must complete a daily set of preflight checks before being assigned a delivery mission. These include a brief low height hover flight where the UA exercises various systems. These are termed FitBIT or Fitness Built-In Test and are at a height of approximately 6 feet for approximately 1 minute. Additional, higher hover flights (approximately 60 feet) may be occasionally performed, up to 7 times per nest, per week, where the UA makes a separate hover flight to update the reference map of the nest; these flights are termed GeoBITs because of their similarity to the FitBIT stationary hover flight over the nest.

2.2.2.1 Takeoff

Once the UA receives a mission and is cleared for takeoff from a launch pad, the UA takes off from the ground vertically to an altitude of 23 feet AGL and hovers for 30 seconds while the package is loaded. The UA then climbs to the en route altitude (150–300 feet AGL).

2.2.2.2 En Route Outbound

The en route outbound phase is the part of flight in which the fully loaded UA transits from the nest to a delivery point on a predefined flight path. During this flight phase, the UA would typically operate at an altitude of 150–300 feet AGL and a typical airspeed of 59 miles per hour (mph). The UA has a single set cruise airspeed, which would not be exceeded.

2.2.2.3 Delivery

The delivery phase consists of descent from the en route altitude to a delivery point, such as a residential yard, driveway, parking lot, or common area. The UA descends vertically to 23 feet AGL while maintaining position over the delivery point. The UA hovers at 23 feet AGL for approximately

[24]The flight profiles of the 7000W-B and the 8000W-A would be the same.

30 seconds while lowering its package and then proceeds to climb vertically back to en route altitude. The minimum distance a human should be from the UA during delivery is a 6-foot radius from underneath the center of the UA.

2.2.2.4 En Route Inbound

The UA continues to fly at an altitude of 150–300 feet AGL and a speed of 59 mph toward the nest.

2.2.2.5 Landing

Upon reaching the nest, the UA slowly descends over its assigned landing pad and lands on the pad (Figure 2.2-5).

Figure 2.2-5. Wing Hummingbird UA Nest Landing

2.2.2.6 Offsite Package Autoload

Offsite package autoload from each nest would be supported at up to 12 partner establishments depending upon demand and nest capacity. Pickup operations would follow general flight phases and parameters identical to typical delivery operations and would include the addition of a pickup phase. The pickup phase is similar to the delivery phase. The UA descends from its close transit altitude (safe altitude above local terrain and obstacles) to 22 feet AGL and lowers the package hook. The UA then passes approximately 10 feet laterally over the autoloader. The autoloader's Y-shaped poles passively guide the package hook to a narrow slot that ensures secure attachment of the package. The package is then retracted to the UA before it proceeds to climb to the en route

altitude. Offsite package autoload from descent to finish are expected to take no longer than 1 minute and 30 seconds (90 seconds). Delivery, en route return, and landing operations would then occur as described in Sections 2.2.2.3 through 2.2.2.5. The flight profile of offsite package autoload is illustrated in Figure 2.2-6 and the autoloader is illustrated in Figure 2.2-7.

Note: Manual remote pickups loading may also be performed by a person and without a physical autoloader. The profile would be similar to the autoloader pickup profile outlined above but would omit the lateral transition for autoloader engagement.

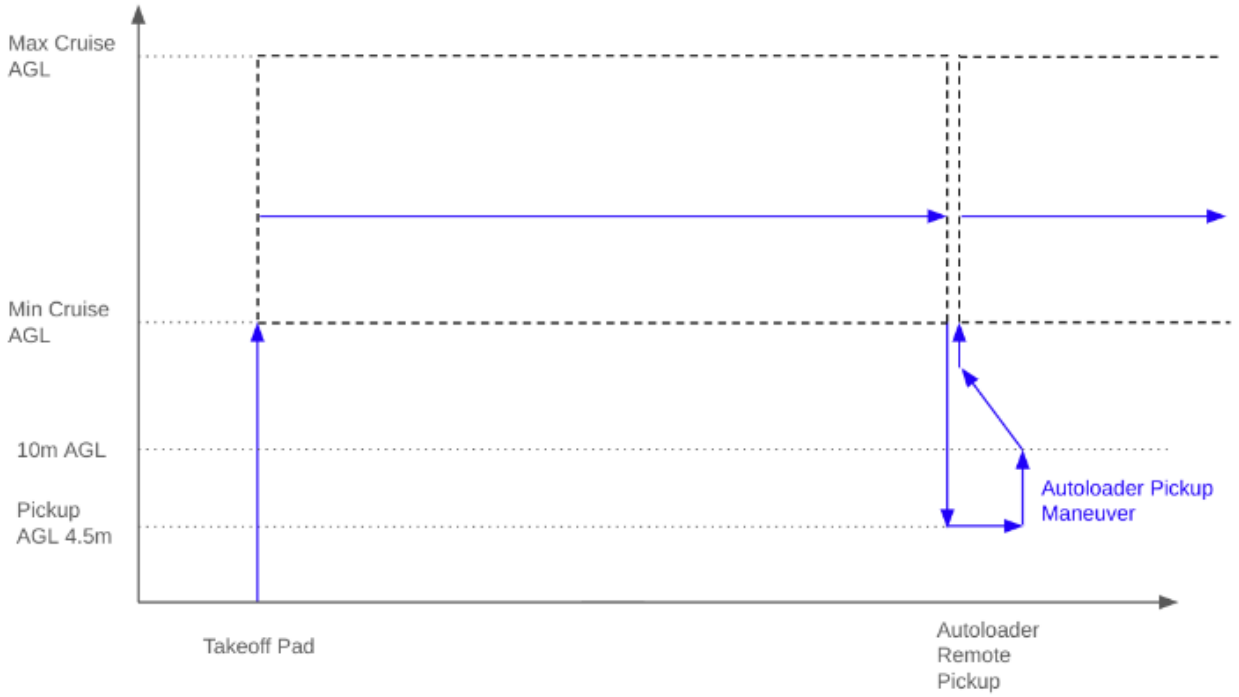

Figure 2.2-6. Wing Hummingbird Remote Pickup Flight Profile

Figure 2.2-7. Wing Hummingbird and Autoloader

Chapter 3
Affected Environment and Environmental Consequences

3.1 Introduction

This chapter provides a description of the affected environment and potential environmental consequences for the environmental impact categories that have the potential to be affected by the no action alternative and proposed action, as required FAA Order 1050.1F. As required by FAA Order 1050.1F, this EA presents an evaluation of impacts for the environmental impact categories listed below.

- Air quality
- Biological resources (including fish, wildlife, and plants)
- Climate
- Coastal resources
- Department of Transportation Act, Section 4(f)
- Farmlands
- Hazardous materials, solid waste, and pollution prevention
- Historical, architectural, archaeological, and cultural resources
- Land use
- Noise and noise-compatible land use
- Socioeconomics and children's environmental health and safety risks
- Visual effects (visual resources and visual character)
- Water resources (including wetlands, floodplains, surface waters, groundwater, and wild and scenic rivers)

The study area evaluated for potential impacts is defined as Wing's proposed operating area shown in Figure 2.2-1. The level of detail provided in this chapter is commensurate with the importance of the potential impacts (FAA Order 1050.1F, Paragraph 6-2.2(e)). EAs are intended to be concise documents that focus on aspects of the human environment that may be affected by the proposed action.

3.2 Environmental Impact Categories Not Analyzed in Detail

This EA did not analyze potential impacts on the following environmental impact categories in detail because the proposed action would not affect the resources included in the category (see FAA Order 1050.1F, Paragraph 4-2.c).

- **Air Quality** and **Climate:** The UA is battery powered and does not generate emissions that could result in air quality impacts or climate impacts. Electricity consumed for battery charging at the nests would be minimal. Electricity consumed for the proposed action would come from the power grid with backup generators on site in the event of an emergency. These emissions would be minimal and are not expected to contribute to any exceedance of National Ambient Air Quality Standards. Based on a 2020 study of drone delivery operations, by year 5 of operations drones were projected to replace between 11.2 percent and 18.7 percent of total delivery miles previously made by automobiles, or between 11.3 million miles and 96 million miles, within a given operating area (Lyon-Hill et al. 2020). The proposed action is expected to decrease emissions from delivery services that contribute to carbon dioxide (CO_2) emissions. The decreased emissions would have positive effects on climate as the proposed action would replace vehicle miles traveled by CO_2-emitting vehicles. UA operations are not expected to be impacted by climate (e.g., rising sea levels, increasing temperatures). Therefore, the proposed action would not affect nor be affected by the impacts of climate.

- **Coastal Resources:** The Florida Coastal Management Program (FCMP) was approved by National Oceanic and Atmospheric Administration in 1981 and is codified at Chapter 380, Part II, F.S. The state of Florida's coastal zone includes the area encompassed by the state's 67 counties and its territorial seas. The FCMP consists of a network of 24 Florida Statutes administered by eight state agencies and five water management districts. Federal consistency reviews are integrated into other review processes conducted by the state. Written notice of the submission of an application for an FAA license was sent to the Florida State Clearinghouse on December 17, 2024. Wing's proposed action is considered an unlisted activity in the FCMP. The Clearinghouse review determined the proposed action as described is consistent with the FCMP on February 5, 2025. Wing is responsible for complying with state and local permit requirements during the implementation process.

- **Farmlands:** The proposed action would not involve the development or disturbance of any land regardless of use, nor would it have the potential to convert any farmland to non-agricultural uses. The proposed action would not affect designated prime or unique farmlands.

- **Hazardous Materials, Solid Waste, and Pollution Prevention:** The proposed action would not result in any construction or development or any physical disturbances of the ground. Therefore, the potential for impact in relation to hazardous materials, pollution prevention, and solid waste is not anticipated. Additionally, each Wing UA is primarily made from recyclable materials and the only hazardous materials used in its manufacture and operation are lithium-ion batteries. Each Wing UA will be properly managed at the end of its operating life in accordance with 14 CFR Part 43. Any hazardous materials would be disposed of in accordance

with all federal, tribal, state, and local laws, including 40 CFR Part 273, *Standards for Universal Waste Management*.

- **Land Use:** The proposed action does not involve any changes to existing, planned, or future land uses within the area of operations. Wing would use current infrastructure, such as parking lots, to conduct its operations. Land use and zoning are typically governed by local and state laws. Wing is responsible for complying with any such applicable laws relevant to establishing its operations (e.g., siting drone nests and related infrastructure), and partners are responsible for complying with any applicable laws for remote pick-up nests and related infrastructure. All nest locations would be sited in accordance with all local land use ordinances and zoning requirements. Local jurisdictions in the Central Florida metropolitan and surrounding areas may vary in the scope of their review and approval of commercial operations. Further, Section 2.2, *Proposed Action,* identifies the standoff distances from noise-sensitive areas.

- **Natural Resources and Energy Supply:** The proposed action would not require the need for unusual natural resources and materials, or those in scarce supply. Wing's aircraft would be battery powered and would not consume fossil fuel (e.g., gasoline or aviation fuel) resources. Wing would use a charging pad (approximately 1 square meter in size) to charge the batteries of the UA. In addition, Wing's electrically powered aircraft is most often used to replace individual personal automobile trips to retrieve small goods and would therefore be expected to reduce consumption of fuel resources; a 2020 study found that by year 5 of drone operations in a single U.S. metro area, drone delivery could avoid up to 294 million miles per year in road use (Lyon-Hill et al. 2020).

- **Socioeconomics** and **Children's Environmental Health and Safety Risks:** The proposed action would not involve acquisition of real estate, relocation of residents or community businesses, disruption of local traffic patterns, loss in community tax base, or changes to the fabric of the community. Executive Order (EO) 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, requires federal agencies to ensure that children do not suffer disproportionately from environmental or safety risks. The proposed action would not affect products or substances a child would be likely to come into contact with, ingest, use, or be exposed to, and would not result in environmental health and safety risks that could disproportionately affect children. It is not anticipated that the proposed action would pose a greater health and safety risk to children than package delivery by other means (truck, mail, personal automobile trips, etc.). Additionally, Wing's proposal includes avoiding fly less areas during operational hours, which could help avoid or reduce any potential environmental health or safety impacts on children. Wing's electrically powered aircraft is most often used to replace individual personal automobile trips to retrieve small goods and would therefore reduce noxious emissions and improve road safety, which are both appreciable concerns for children.

- **Visual Effects (Light Emissions Only):** The proposed action would not result in significant light emission impacts because the majority of flights are expected to be conducted during the daytime. Light emissions would not noticeably affect the visual character or ambient light conditions of the study area. The small proportion of flights that do occur at night would likely be infrequent and of short duration, although flight cadence would vary depending on the location and partners served by an individual nest. Because of the overall small number of

operations likely to be conducted between twilight and 10:00 p.m., the proposed action would not result in significant light emission impacts due to nighttime operations. Night is defined by 14 CFR Section 1.1 as the time between the end of evening civil twilight[25] and the beginning of morning civil twilight, as published in the *Air Almanac*, converted to local time (U.S. Department of the Navy 2022).

- **Water Resources (Wetlands, Floodplains, Surface Water, Groundwater, and Wild and Scenic Rivers):** The proposed action would not result in the construction of facilities and would therefore not encroach upon areas designated as navigable waters, wetlands, or floodplains. The proposed action would not affect any waters of the U.S. The proposed action would not result in any changes to existing discharges to water bodies, create a new discharge that would result in impacts on surface waters, or modify a water body. The proposed action would not degrade water quality or contaminate public drinking water supplies. The proposed action does not involve activities that would withdraw groundwater from underground aquifers or reduce infiltration or recharge to groundwater resources through the introduction of new impervious surfaces. The Wekiva River and Black Water Creek are the sole designated wild and scenic river segments within the project area (NPS 2024). These segments are respectively located in Rock Springs Rung State Preserve and Seminole State Forest, just north of Apopka Forest. Wing would avoid all designated wild and scenic river segments other than at existing roadway crossings. Furthermore, limited to no deliveries are expected to occur in this area, and nests would be established sufficiently far from these resources to ensure that their wild and scenic character was not affected by nest noise or light emissions. Therefore, nest establishment and operations would not affect a wild and scenic river or river on the Nationwide Rivers Inventory. The proposed action does not have the potential to disrupt the free-flowing character of any designated wild and scenic river. Therefore, the proposed action would not affect wetlands, floodplains, surface water, groundwater, or wild and scenic rivers.

3.3 Biological Resources (Including Fish, Wildlife, and Plants)

3.3.1 Definition of Resource and Regulatory Setting

Biological resources include plant and animal species and their habitats, including special-status species (federally listed or state-listed threatened or endangered species, species proposed for listing, species that are candidates for federal listing, marine mammals, and migratory birds) and environmentally sensitive or critical habitat. Biological resources provide aesthetic, recreational, and economic benefits to society.

[25] According to the National Oceanic and Atmospheric Administration National Weather Service, civil twilight begins in the morning, or ends in the evening, when the geometric center of the sun is 6 degrees below the horizon. Therefore, morning civil twilight begins when the geometric center of the sun is 6 degrees below the horizon, and ends at sunrise. Evening civil twilight begins at sunset, and ends when the geometric center of the sun is 6 degrees below the horizon (National Oceanic and Atmospheric Administration National Weather Service n.d.).

3.3.1.1 Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973 (16 U.S.C. Section 1531 et seq.) requires all federal agencies to seek to conserve threatened and endangered species. Section 7(a)(2) of the ESA requires that each federal agency—in consultation with the U.S. Fish and Wildlife Service (USFWS) or National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS)—ensures that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. The FAA is required to consult the USFWS or NMFS if an action may affect a federally listed species or critical habitat. If the FAA determines the action would have *no effect* on listed species or critical habitat, consultation is not required.

3.3.1.2 Migratory Birds

The Migratory Bird Treaty Act (MBTA; 16 U.S.C. Sections 703–712) protects migratory birds by prohibiting the taking, killing, or possessing of migratory birds (including their eggs, nests, and feathers). The MBTA applies to migratory birds identified in 50 CFR Section 10.13 (defined hereafter as "migratory birds"). The USFWS is the federal agency responsible for the management of migratory birds when they occupy habitat in the United States. Wing is responsible for compliance with the MBTA. The MBTA applies to migratory birds identified in 50 CFR Section 10.13 (defined hereafter as "migratory birds").

The Bald and Golden Eagle Protection Act prohibits anyone from "*taking*" a bald or golden eagle, including their parts, nests, or eggs, without a permit issued by the USFWS. Implementing regulations (50 CFR Part 22), and USFWS guidelines as published in the *National Bald Eagle Management Guidelines*, provide for additional protections against "*disturbances*." Similar to take, "*disturb*" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, injury to an eagle or causes either a decrease in its productivity or nest abandonment due to a substantial interference with breeding, feeding, or sheltering. A permitting process provides limited exceptions to the Bald and Golden Eagle Protection Act's prohibitions. Permits are only needed when avoidance of incidental take is not possible. According to the National Bald Eagle Management Guidelines, if conservation measures can be implemented such that no aircraft are flown within 1,000 feet of an eagle nest, incidental take of Bald Eagles is unlikely to occur, and no permit is needed. Wing is responsible for compliance with the Bald and Golden Eagle Protection Act.

3.3.2 Affected Environment

According to the U.S. Environmental Protection Agency and Florida Department of Environmental Protection Agency, the action area is entirely within the Southern Coastal Plain level III ecoregion and overlaps four level IV ecoregions: Gulf Coast Flatwoods (northwestern portion of the action area), Southwestern Florida Flatwoods (western portion of the action area), Central Florida Ridges and Uplands (central portion of the action area), and Eastern Florida Flatwoods (eastern portion of the action area) (Griffith et al. 1999). The following is a general description of each of these ecoregions in Texas; however, note that much of the land surface in the action area is developed or disturbed, as it contains the cities of Clearwater, St. Petersburg, Sarasota, Tampa, Spring Hill, Kissimmee, Orlando, Sanford, Daytona Beach, and Melbourne. Outside these cities, much of the land

has been converted to suburban development and agricultural fields. There are forest patches interspersed throughout the action area, particularly along drainages and near waterbodies.

- The Gulf Coast Flatwoods region in Florida is a low, predominantly flat, forested region just inland from the coast. Soils are primarily acidic and low in nutrients and are underlain by a mix of sand, shell fragments, silt and clay, and peat. The climate of the region is subtropical, with high rainfall and humidity year-round. Vegetation of the region originally consisted of woodland and open savanna. Common native vegetation includes slash pine (*Pinus elliottii*), long leaf pine (*Pinus palustris*), saw palmetto (*Serenoa repens*) canopies with wiregrass (Aristida stricta) herbaceous layers (Griffith et al. 1999).
- The Southwestern Florida Flatwoods are among the most extensive terrestrial ecoregions in Florida. Soils are acidic, sandy, and low in organic and clay content. Flooding is common during summer months due to relatively poor drainage. Vegetation of the region originally consisted of woodland and open savanna. Common native vegetation includes slash pine (*Pinus elliottii*), long leaf pine (*Pinus palustris*), saw palmetto (*Serenoa repens*) canopies with wiregrass (Aristida stricta) herbaceous layers (Griffith et al. 1999).
- The Central Florida Ridges and Uplands extends 275 miles from east to west and from the northern edge of the panhandle into the central area of the peninsula. The area is characterized by low rolling sandhills and separates the coastal plains on either edge. Most of the typical native vegetation communities consist of sandhill, scrub, and xeric hammock communities which ware dependent on frequent fire (Griffith et al. 1999).
- The Eastern Florida Flatwoods is a low, predominantly flat, forested region inland from the Atlantic coast. It contains similar soil composition, climate, and vegetation communities as the Gulf Coast and Southwestern Flatwoods.

The majority of the land surface within the study area is urban, suburban, and agricultural. Therefore, wildlife habitats within the study area predominantly include parks and open spaces, lakes and waterways, and vacant lands. Additionally, urban flora and fauna thrive in such environments and typically are well established and populated.

The Central Florida and Interstate 4 corridor are rapidly developing from increasing migration into the area (Berdychowski 2021). Existing vacant lands in and near the area are being developed from this expansion at a fast rate. The habitat in the study area includes agricultural areas; commercial areas (i.e., business parks, airports, landfills); communities; downtown areas; recreational areas (i.e., public parks, golf courses); residential areas; thoroughfare (i.e., highways, railroads, public roads); undeveloped areas (i.e., open fields, vacant lots, wooded areas); and waterbodies, wetlands, and floodplains. These areas provide habitat for the smaller and more common bird and mammal species of the southern United States, including mammals such as white-tailed deer, raccoons, opossums, and squirrels.

3.3.2.1 Special-Status Species

Federally Listed Species

The potential for impacts on federally listed species was assessed using the USFWS Information for Planning and Consultation (IPaC) online system (August 15, 2024). The IPaC report for the study area is included within Appendix E. Table 3.3-1 lists the federally threatened and endangered species that could be present in the study area. The study area contains designated critical habitat for the aboriginal prickly-apple (*Harrisia aboriginum*), Florida bonneted bat (*Eumops floridanus*), Florida bristle fern (*Trichomanes punctatum ssp. Floridanum*), green sea turtle (*Chelonia mydas*), loggerhead sea turtle (*Caretta caretta*), piping plover (*Charadrius melodus*), red knot (*Calidris melodus*), and West Indian manatee (*Trichechus manatus*).

Table 3.3-1. IPaC Results of Federally Threatened and Endangered Species

Common Name	Scientific Name	ESA Status
Mammals		
Florida bonneted bat	*Eumops floridanus*	Endangered
Tricolored bat	*Perimyotis subflavus*	Proposed Endangered
Florida Panther	*Puma concolor coryi*	Endangered
Puma	*Puma concolor*	Similarity of Appearance (Threatened)
Southeastern beach mouse	*Peromyscus polionotus niveventris*	Threatened
West Indian manatee	*Trichechus manatus*	Threatened
Birds		
Crested caracara	*Caracara plancus audubonii*	Threatened
Eastern black rail	*Laterallus jamaicensis ssp. jamaicensis*	Threatened
Everglade snail kite	*Rostrhamus sociabilis plumbeus*	Endangered
Florida scub-jay	*Aphelocoma coerulecens*	Threatened
Piping plover	*Charadrius melodus*	Threatened
Red-cockaded woodpecker	*Picoides borealis*	Endangered
Red knot	*Calidris canutus rufa*	Threatened
Whooping crane	*Grus americana*	Endangered
Wood stork	*Mycteria americana*	Threatened
Reptiles		
American alligator	*Alligator mississippiensis*	Similarity of Appearance (Threatened)
American crocodile	*Crocodylus acutus*	Threatened
Atlantic salt marsh snake	*Nerodia clarkia taeniata*	Threatened
Blue-tailed mole skink	*Eumeces egregious lividus*	Threatened
Eastern indigo snake	*Drymarchon couperi*	Threatened
Green sea turtle	*Chelonia mydas*	Threatened
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered

Common Name	Scientific Name	ESA Status
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened
Sand skink	*Neoseps reynoldsi*	Threatened
Fishes		
Gulf sturgeon	*Acipenser oxyrinchus*	Threatened
Insects		
Miami blue butterfly	*Cyclargus thomasi bethunebakeri*	Endangered
Monarch butterfly	*Danaus plexippus*	Candidate
Flowering Plants		
Aboriginal prickly-apple	*Harrisia aboriginum*	Endangered
Avon park harebells	*Crolatalria avonensis*	Endangered
Beautiful pawpaw	*Deeringothamnus pulchellus*	Endangered
Britton's bear-grass	*Nolina brittoniana*	Endangered
Brooksville bellflower	*Campanula robinsiae*	Endangered
Carter's mustard	*Warea carteri*	Endangered
Cooley's water-willow	*Justicia cooleyi*	Endangered
Florida Bonamia	*Bonamia grandiflora*	Threatened
Florida ziziphus	*Zizipush celata*	Endangered
Fragrant prickly-apple	*Cereus eriophorus var. fragrans*	Endangered
Garrett's mint	*Dicerandra christmanii*	Endangered
Highlands scrub hypericum	*Hypericum cumulicola*	Endangered
Lakela's mint	*Dicerandra immaculata*	Endangered
Lewton's polygala	*Polygala lewtonii*	Endangered
Longspurred mint	*Dicerandra conutissima*	Endangered
Okeechobee gourd	*Cucurbita okeechobeensis ssp. okeechobeensis*	Endangered
Papery whitlow-wort	*Paronchia chartacea*	Threatened
Pigeon wings	*Clitoria fragrans*	Threatened
Pygmy fringe-tree	*Chionthus pygmaeus*	Endangered
Rugel's pawpaw	*Deeringothamnus rugelii*	Endangered
Sandlace	*Polygonella myriophylla*	Endangered
Scrub blazingstar	*Liatris ohlingerae*	Endangered
Scrub buckwheat	*Eriogonum lonifolium var. gnaphalifolium*	Threatened
Scrub lupine	*Lupinus aridorum*	Endangered
Scrub mint	*Dicerandra frutescens*	Endangered
Scrub plum	*Prunus geniculata*	Endangered
Short-leaved rosemary	*Conradina brevifolia*	Endangered
Snakeroot	*Eryngium cuneifolium*	Endangered
Wide-leaf warea	*Awarea amplexifolia*	Endangered

Common Name	Scientific Name	ESA Status
Wireweed	*Polygonella basiramia*	Endangered
Ferns and Allies		
Florida bristle fern	*Trichomanes punctatum ssp. floridanum*	Endangered
Lichens		
Florida perforate cladonia	*Cladonia perforata*	Endangered

Given that the action does not include any ground construction or habitat modification and the UA would not touch the ground except at the nests, there are no possible mechanism of effect to ESA-listed fishes, flowering plants, ferns and allies, and lichens. Therefore, these species are not discussed further in this document. Similarly, this analysis summarizes effects to those species most likely to be affected by the proposed action; see Appendix J for analysis of potential effects to all species potentially present within the action area.

Based on the IPaC report, there are nine ESA-listed bird species, one ESA-listed bat species, and one proposed bat species that could be present in the study area: crested caracara (*Caracara plancus audobonii*), a threatened species; Eastern black rail (*Laterallus jamicensis ssp. jamaicensis*), a threatened species; Everglade snail kite (*Rostrhamus sociabilis plumbeus*), an endangered species; Florida scrub-jay (*Aphelocoma coerulecens*), a threatened species; piping plover (*Charadrius melodus*), a threatened species; red-cockaded woodpecker (*PIcoides borealis*), an endangered species; red knot (*Calidris canutus rufa*), a threatened species; whooping crane (*Grus americana*), an endangered species; wood stork (*Mycteria americana*), a threatened species; Florida bonneted bat (*Eumops floridanus*), and endangered species; and tricolored bat (*Perimyotis subflavus*), a proposed endangered species.

Please refer to Appendix J for a detailed description of all ESA-listed species which could potentially affected by the proposed action.

State Species of Greatest Conservation Need

In Florida, native animals or plants designated as a Species of Greatest Conservation Need (SGCN) are generally those that are declining or rare and in need of attention to recover, or to prevent the need to list under federal regulation (FWC 2019). The counties identified in the study area that have been evaluated for SGCN include: Brevard, Citrus, DeSoto, Hardee, Hernando, Highlands, Hillsborough, Indian River, Lake, Manatee, Marion, Okeechobee, Orange, Osceola, Pasco, Pinellas, Polk, Sarasota, Seminole, Sumter and Volusia. NatureServe's database of Rare, Threatened, and Endangered Species lists 364 species of amphibians, birds, fish, mammals, reptiles, insects, crustaceans, mollusks, and plants in these counties considered as SGCN as defined in the 2019 Florida Wildlife Action Plan (NatureServe 2023). Table E-1 in Appendix E provides information on the SGCN in these counties.

Migratory Birds

Migratory bird species found within the study area vary throughout the year. The study area is a part of the Atlantic Migratory Flyway where millions of birds, including songbirds, grassland birds,

waterfowl, shorebirds, and raptors migrate north and south during spring and fall migration (USFWS n.d.-a).

Drones fly at lower speeds and elevations and are smaller than conventional aircraft. Furthermore, the Wing UA would be hovering in fixed positions at both the nest and delivery locations leaving them temporarily exposed to a mobbing and attacking bird defending its breeding territory.

Bird behavior, in particular mobbing and territorial defense behaviors, on flying and hovering UA is the most important risk consideration for analysis, as these behaviors are the most pertinent to the proposed action. Mobbing behavior includes birds emitting alarm calls, flying at the predator, diverting its attention, and harassing it. Mobbing and aerial attack behaviors typically occur when a raptor, crow, or other aerial predator enters the airspace of a breeding habitat bird or territorial male (The Royal Society for the Protection of Birds 2023). Certain species of birds are known to harass, mob, and attack aerial predators that fly into or near their territory, especially during the breeding season when birds are actively nesting. The defending birds will chase, dive bomb, attack the backside, and vocalize to harass the aerial predator until the offender is far enough from the territory that the defending birds cease attacking and return to their nests and foraging activities (Kalb and Randler 2019). Not all bird species exhibit mobbing and territorial defensive behaviors. Some bird species are more aggressive, defensive, and cued on aerial predators, while other species may show no aggression or interest toward an overflying hawk in its territory. Species of birds that exhibit mobbing and territorial defense behaviors that are known to occur in the Central Florida area are shown in Table 3.3-2.

According to the IPaC report, the Bald Eagle (*Haliaeetus leucocephalus*) is not a Bird of Conservation Concern in the study area but warrants attention under the Eagle Act. Bald Eagles may be year-round throughout Florida as spring and fall migrants, breeders, or winter residents (Cornell Lab n.d.). Bald Eagles typically nest in forested areas adjacent to large bodies of water (Cornell Lab n.d.) and nests have been previously documented throughout the study area area (iNaturalist 2024). Bald Eagles and other raptors may exhibit territorial behavior when nesting (USFWS n.d.-b).

Table 3.3-2. Central Florida Metro Bird Species with Mobbing and Territorial Behaviors

Common Name (*Scientific Name*)	Habitat Preferences	Notes
Northern Mockingbird (*Mimus polyglottos*)	Habitat generalist occurring in nearly all types of urban development settings.	The most aggressive territorial bird species in North America, the Mockingbird is a potential mobbing species during hovering at the nest and delivery location. Mockingbirds are known to nest in parking lot landscaping and areas with high density development. Birds will attack any moving object in territory, including humans and pets.
Red-winged Blackbird (*Agelaius phoeniceus*) and Common Grackle (*Cyanocitta cristata*)	Both species have a strong affinity for wetland habitats and lake shorelines for breeding and nesting.	Relatively aggressive territorial defender known to mob a wide variety of animals who fly over or perch within a male Blackbird or Grackle's harem territory. Both males and females exhibit mob behaviors during the breeding season but do not mob during the non-breeding season during the fall and winter months when Blackbirds and Grackles tend to form in flocks.
American Crow (*Corvus brachyrhynchos*)	The American Crow is less of a nest defending bird and is more prone to territorial defense and inquisitive behaviors as the bird species with the highest intelligence in the Central Florida metro area.	Little to no concern over mobbing UA vehicles; greater concern over territorial defense and curiosity behaviors. Crows can also attack larger prey items cooperatively.
Blue Jay (*Cyanocitta cristata*)	Known for nest defensive mobbing but can also discern predator from non-predator more easily than other species.	Hovering will be the greatest risk point for Blue Jay mobbing attack. Blue Jays require mature tree cover and some degree of pervious surfaces in urban areas, making them a less likely risk than Mockingbirds.
Least tern (*Sternula antillarum*)	Typically present in shoreline areas. Nests in colonies on sandy, shelly beaches. Exhibits nest defensive mobbing and attack behaviors.	Both males and females exhibit nest defensive behaviors. However, nesting typically occurs away from recreation and development and limited to no deliveries are expected to occur in least tern nesting habitat.
American Oystercatcher	Occurs in intertidal areas and adjacent beaches. Typically nests on sandy, shelly beaches but also in salt march areas. Exhibits nest defensive mobbing and attack behaviors.	Both males and females exhibit nest defensive behaviors. However, nesting typically occurs away from recreation and development and no deliveries are expected to occur in American Oystercatcher nesting habitat.

Source: Cornell Lab n.d.

Multiple factors result in the Northern Mockingbird being considered the most aggressive bird in North America (Mass Audubon 2023). During the breeding season, Mockingbirds are known to attack any moving object that enters their territory, including pedestrians, bicycles, and the occasional passing vehicle. Mockingbirds occupy a wide range of urban habitats, including industrial and highly commercialized areas such as parking lots with landscaping trees. Mockingbirds are abundant throughout Florida (Cornell Lab n.d.).

While also abundant, the Red-winged Blackbird and Common Grackle show strong affinity to open herbaceous wetland habitats during the breeding season. The probability of a mobbing attack by these two species is likely lower than the Northern Mockingbird.

3.3.3 Environmental Consequences

Potential impacts on biological resources associated with the proposed action were considered in the area where drones may operate (launch, fly, and drop packages). Wing's nests would be located in retail store parking lots; therefore, there would be no ground disturbance or habitat modification associated with the proposed action. Wing's deliveries would initiate from the nest, approach at an en route altitude less than 400 feet AGL and would generally occur between 150 and 300 feet AGL. The UA would descend to around 23 feet AGL and hover for a brief time to make a delivery. Then, the UA would ascend and transition back to en route flight mode for a return to the nest. At a potential maximum of 60,000 flights per day across the entire study area, the distribution and altitude of the flights are not expected to significantly affect wildlife in the study area.

A significant impact on federally listed threatened and endangered species would occur when the USFWS or NMFS determines the proposed action would be likely to jeopardize the continued existence of a federally listed threatened or endangered species or would be likely to result in the destruction or adverse modification of federally designated critical habitat. An action need not involve a threat of extinction to federally listed species to meet the NEPA standard of significance. Lesser impacts, including impacts on non-listed or special-status species, could also constitute a significant impact.

3.3.3.1 No Action Alternative

Under the no action alternative, Wing would not implement commercial UA package delivery operations in the Central Florida metropolitan and surrounding areas and would continue to conduct UA package delivery operations under Part 135 in locations currently authorized by its OpSpecs and at other locations under 14 CFR Part 107,[26] which limits operations to UA weighing less than 55 pounds and within visual line of sight. The no action alternative is not expected to result in significant impacts on biological resources.

3.3.3.2 Proposed Action

There would be no ground construction or habitat modification associated with the proposed action, as the nests would be located in lots that are already developed with commercial uses. Wing's aircraft would not touch the ground in any other place than the nest (except during emergency landings) because it remains aerial while conducting deliveries. Wing's deliveries would initiate from the nest, approach an en route altitude less than 400 feet AGL, and would generally occur between 150 and 250 feet AGL. The UA would lower to around 23 feet AGL and hover for

[26] The *Operation of Small Unmanned Aircraft Systems Over People* rule (codified in 14 CFR Part 107) permits routine operation of small Unmanned Aircraft Systems (UAs weighing less than 55 pounds) within visual line of sight at night and over people without a waiver or exemption under certain conditions.

a brief time to make a delivery. Then, the UA would transition back to an en route flight mode for a return to the nest.

Because operations would occur mostly in an urban environment, typically well above the tree line and away from sensitive habitats and given the short duration of increased ambient sound levels, flights are not expected to significantly influence wildlife in the area. Wing has also established a direct line of communication with the Florida Wildlife Commission to discuss any potential concerns regarding impacts on wildlife or high-quality habitat in the project area. Wing will also specifically coordinate with the managing entities of state parks and natural areas within the study area on the thoughtful placement and use of delivery sites within these areas as necessary.

Special-Status Species

Federally Listed, Proposed, and Candidate Species

The proposed action could affect ESA-listed species through the emission of light, noise, and risk of collision. This analysis broadly summarizes potential affects to taxa groups most affected by these factors. Refer to Appendix J for species-specific effect analysis.

ESA-listed bird species could potentially be affected by noise, light, and collision risk associated with the proposed action. However, the action does not involve ground disturbance or vegetation removal and therefore would not physically impact any suitable habitat for ESA-listed birds. If present in the action area, ESA-listed birds could experience UA noise during the en route and delivery flight phases. Birds resting or foraging at or near the tree line at the time a UA flies by would experience the greatest sound levels. Birds near the ground at the time a UA flies by would experience lower sound levels. Given the estimated sound levels of the UA, the UA's linear flight profile to and from nests and delivery locations, the low probability of encountering an individual warbler in the action area based on the counties they nest in, and the short period of time the UA would be in any particular location, UA noise is not expected to adversely affect ESA-listed birds. Further, the chances of any one individual experiencing multiple overflights of a UA are low given the mobility of the birds. One study found that, in most instances, drones within 4 meters of birds did not cause a behavioral response (Vas et al. 2015). In another study, drones barely elicited behavioral responses in terrestrial mammals (Mulero-Pázmány et al. 2017).

Suitable habitat for both ESA-listed bat species roosting and feeding in the action area includes wooded areas, open water habitat, and manmade structures. Based on current data from the North American Bat Monitoring Program (USGS 2023), there is a low probability of either species occurring in the action area, particularly in the predominantly urban and suburban environment where nests would be located, and deliveries would occur. Nests would be located in commercial areas and therefore not within high-quality roosting or foraging habitats. Bats at roost or in flight could experience UA noise during the en route and delivery flight phases. Bats foraging at or near the tree line at the time a UA flies by would experience the greatest sound levels. Roosting bats or bats foraging near the ground at the time a UA flies by would experience lower sound levels. Bats may exhibit disturbance behaviors and change their flight paths to avoid drones in the event that flights overlap with bat activity areas (Ednie et al. 2021). Research suggests that drones have "minimal impact on bat behavior" (Fu et al. 2018) primarily from noise emissions. However, drone

disturbance is temporary, and bats are expected to return to normal foraging and flight activities shortly after the exposure to drone noise ends (Kuhlmann et al. 2022; Ednie et al. 2021). Given the estimated sound levels of the UA, the UA's linear flight profile to and from nests and delivery locations, the short period of time the UA would be in any particular location, and the low probability of encountering an individual tricolored bat in the action area, UA noise is not expected to adversely affect ESA-listed bats. Any increase in ambient sound levels caused by the UA's flight would only last a few seconds during the en route phase and approximately 30 seconds during a delivery.

ESA-listed sea turtles could potentially be affected by noise and light emissions from delivery operations. Turtles are particularly sensitive to disturbance during the nesting period and could potentially experience noise and light emissions from drones. However, drone disturbance has not been previously documented to substantially disrupt nesting behavior (Bevan et al. 2018). Similarly, limited to no deliveries are expected to occur in sea turtle nesting habitat and sea turtles would likely only be exposed to extremely brief periods of noise by transiting UAs. Sea turtle hatchlings are also susceptible to disorientation from artificial light sources during emergence from nests (FWC 2024). However, light emissions from drones are not expected to substantially contribute to the artificial light environment. Furthermore, given that limited deliveries are expected in the vicinity of nesting beaches, it is highly unlikely that effects to hatchlings attributable to drone lighting would raise beyond the level of discountable.

ESA-listed and candidate insects are not expected to be adversely affected by the proposed action. The primary threats to these species are habitat loss and degradation from ongoing urban, suburban, and agricultural development. The proposed action would not physically affect any insect habitat or host plants. Although these species could be struck by drones en route to and from delivery; however, strikes are not likely given the species' mobility. Information regarding drone impacts on insects is limited, there have been no widespread negative impacts identified in the scientific literature, and it is highly unlikely that any effects attributable to drone activity would raise beyond the level of discountable.

On December 17, 2024, the FAA submitted a biological evaluation and informal consultation to the U.S. Fish and Wildlife Service (USFWS), in accordance with Section 7 of the ESA, and requested concurrence with the FAA's effect determination for the proposed project. Operations would occur mostly in an urban environment, typically well above the tree line and away from sensitive habitats, and would result in only a short duration of increased ambient sound levels. Given these factors, FAA determined that the Proposed Action ***may affect, but is not likely to adversely affect*** the Florida bonneted bat, tricolored bat, Florida panther, SEBM, West Indian Manatee, crested caracara, eastern black rail, Everglade snail kite, Florida scrub-jay, piping plover, red-cockaded woodpecker, red knot, wood stork, American crocodile, Atlantic salt marsh snake, blue-tailed mole skink, eastern indigo snake, green sea turtle, hawksbill sea turtle, leatherback sea turtle, loggerhead sea turtle, and sand skink). USFWS did not provide concurrence or non-concurrence with FAA's determination even though over 120 days elapsed since the FAA's submission to USFWS. The scope of the Proposed Action and the effects on biological resources and listed species resemble other actions that have received USFWS concurrence. In light of the limited effects to listed species from the Proposed

Action, as described in the EA, and the lapsed time during informal consultation, FAA considers the ***may affect, not likely to adversely affect*** determination appropriate.

Species of Greatest Conservation Need

As with ESA-listed species, the proposed action poses the largest potential to affect flying SGCN species at risk for collision during delivery operations. While other species would also be affected by noise and light emissions, these temporary disturbances are not expected to measurably effect the reproduction or survival of any given individuals and would not result in population level changes to any particular species. SGCN most at risk in include birds, bats, and insects. However, the risk of collision is very low and species most likely would be able to avoid UAs due to the same disturbance factors listed previously. As such, the proposed action is not expected to significantly adversely affect any SGCN species within the study area.

SGCN Insects, such as the bumblebee, could be struck by drones en route to or during delivery. Information regarding drone impacts on insects is limited and there have been no widespread negative impacts identified in the scientific literature. Therefore, based on the information available, the action is not expected to have significant impacts on insect populations.

Migratory Birds

While there is a well-established repository of literature on bird mobbing and attack behaviors, and on bird strikes with large aircraft, information on drone interactions with birds is not as well documented. Without a baseline of data or pre-existing research on drone interactions with birds, creation of an effective and sensible predictive model is not possible. Therefore, this analysis focused on bird behavior and identified the Northern Mockingbird, red-winged blackbird, common grackle, least tern, and American oystercatcher as potential species that could mob or attack a drone while defending territory, especially during the early spring to mid-summer breeding period.

With larger scale operations in Australia since 2017, Wing has incurred relatively few conflicts with birds, which involved a handful of mobbing and brief attack behaviors in Canberra, Australia (2021) from Australian Ravens in delivery flight. In each instance, the Raven attacked the drone from behind causing damage to foam on the vertical tail and then disengaged from the attack. Additionally, two other instances of birds making contact with drones were recorded in the United States by hobbyists (Connecticut Audubon Society n.d.). These were similar to the Australian instance where Ravens made a brief touch to the backside of the drone in flight as a curiosity behavior before flying away from the moving object.

To avoid impacts on nesting Bald Eagles, Wing will implement a monitoring plan for Bald Eagle nests that integrates multiple strategies and resources. This includes periodically checking online tools such as iNaturalist[27] to identify eagle nests that may occur in the operating area, as well as communication with the bird watching community to identify nests. Wing personnel will also be educated in the visual identification of Bald Eagle nests, which are typically very conspicuous. If Wing identifies a Bald Eagle nest or is notified of the presence of a nest, Wing will establish an avoidance area such that there is a 1,000 feet vertical and horizontal separation distance between

[27] https://www.inaturalist.org/.

the vehicle's flight path and the nest. Wing will maintain this avoidance area until the end of the breeding season or until a qualified biologist indicates the nest has been vacated. Wing will regularly report monitoring and avoidance measures to FWC and the USFWS Regional Migratory Bird Permit Office. In response to FWC comments and to further minimize impacts to migratory birds, Wing has also agreed to establish 330 foot avoidance buffers for imperiled wading bird colonies, breeding sites, critical brood rearing sites, and roosting sites as documented in ShoreMapper and the FWC Imperiled Wading Bird Colony viewer.

Based on the information available regarding the interaction between drones and birds, the FAA concludes that mobbing and attacking behaviors would be the most relevant interaction to occur. As detailed in Table 3.3-2, some bird species are more likely to exhibit this type of behavior, and these are the species that would be expected to interact with the drones, if any. The proposed action would not be expected to result in significant impacts on migratory birds because it would not result in long-term or permanent loss of wildlife species, would not result in substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or populations, and would not have adverse impacts on reproductive success rates, natural mortality rates, non-natural mortality, or ability to sustain the minimum population levels.

3.4 Department of Transportation Act, Section 4(f) Resources

3.4.1 Definition of Resource and Regulatory Setting

Section 4(f) of the U.S. Department of Transportation Act (codified at 49 U.S.C. Section 303) protects significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites. Section 4(f) states that, subject to exceptions for de minimis impacts[28] "[t]he Secretary may approve a transportation program or project requiring the use of [4(f) resources]…only if—(1) there is no prudent and feasible alternative to using that land; and (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use."

The term "use" includes both direct or physical and indirect or "constructive" impacts on Section 4(f) resources. *Direct use* is the physical occupation or alteration of a Section 4(f) property or any portion of a Section 4(f) property. *Constructive use* does not require direct physical impacts or occupation of a Section 4(f) resource. A constructive use would occur when a proposed action would result in substantial impairment of a resource to the degree that the protected activities, features, or

[28] The FAA may make a de minimis impact determination with respect to a physical use of Section 4(f) property if, after taking into account any measures to minimize harm, the result is either: (1) a determination that the project would not adversely affect the activities, features, or attributes qualifying a park, recreation area, or wildlife or waterfowl refuge for protection under Section 4(f); or (2) a Section 106 finding of no adverse effect or no historic properties affected. See 1050.1F Desk Reference, Paragraph 5.3.3.

attributes of the resource that contribute to its significance or enjoyment are substantially diminished.[29]

Another type of physical use*,* known as *temporary occupancy,* results when a transportation project results in activities that require a temporary easement, right-of-entry, project construction, or another short-term arrangement involving a Section 4(f) property. A temporary occupancy is considered a Section 4(f) use unless all the conditions listed in Appendix B, Paragraph 2.2.1 of FAA Order 1050.1F and the Section 4(f) regulations at 23 CFR 773.13(d) are satisfied.

A physical *use* may be considered de minimis if, after considering avoidance, minimization, mitigation, and enhancement measures, the result is either (1) a determination that the project would not adversely affect the activities, features, or attributes qualifying a park, recreation area, or wildlife or waterfowl refuge for protection under Section 4(f); or (2) a Section 106 *finding of no adverse effect* or *no historic properties affected*. Before the FAA may finalize a determination that a physical use is de minimis, the official(s) with jurisdiction must concur in writing that the project will not adversely affect the activities, features, or attributes that make the property eligible for Section 4(f) protection.

The concept of *constructive use* is that a project that involves no actual physical use of a Section 4(f) property via permanent incorporation or *temporary occupancy*, but may still, by means of noise, air pollution, water pollution, or other proximity-related impacts, substantially impair important features, activities, or attributes associated with the Section 4(f) property. Substantial impairment occurs only when the protected activities, features, or attributes of the Section 4(f) property that contribute to its purpose and significance are substantially diminished. This means that the value of the Section 4(f) property, in terms of its prior purpose and significance, is substantially reduced or lost.

Procedural requirements for complying with Section 4(f) are set forth in the U.S. Department of Transportation Order 5610.1C, *Procedures for Considering Environmental Impacts*. The FAA also uses Federal Highway Administration regulations (23 CFR Part 774) and guidance (e.g., Section 4(f) Policy Paper) when assessing potential impacts on Section 4(f) properties. These requirements are not binding on the FAA; however, the FAA may use them as guidance to the extent relevant to FAA projects. More information about the U.S. Department of Transportation Act, Section 4(f) can be found in Chapter 5 of the FAA Order 1050.1F Desk Reference (FAA 2023).

3.4.2 Affected Environment

The FAA used data from federal, state, and other public-access sources to identify potential Section 4(f) resources within the study area (Appendix B). The FAA identified many properties that meet the definition of a Section 4(f) resource, including public parks administered by state, city, and county authorities, and historic properties identified on the Florida State Historic Preservation Officer (SHPO) website. By count, most of the Section 4(f) resources are local public parks, trails, and ballfields. Appendix B provides an inventory list of Section 4(f) resources in the study area (FWC

[29] Federal Highway Administration (FHWA) Section 4(f) Policy Paper. (Note: FHWA regulations are not binding on the FAA; however, the FAA may use them as guidance to the extent relevant to aviation projects.) Available: https://www.environment.fhwa.dot.gov/legislation/section4f/4fpolicy.pdf.

2024). There are 10 wildlife refuges within the study area, however Wing has committed to avoid overflights and deliveries within NWRs (see Section 2.2). The majority of Section 4(f) resources are not currently included in Wing's fly less restrictions, which include schools (elementary, middle, high school), preschools and daycares with outdoor facilities, and churches.

There may be instances where the delivery would be to a customer located within a Section 4(f) resource. Wing validation activities with the FAA often include deliveries to sites in parks. For example, public delivery zones have been set up for events and community engagement in collaboration with the city parks and recreation department in Frisco, Texas, and Christiansburg, Virginia. Wing was also invited to provide deliveries to a historic site in Christiansburg, Virginia, as part of their youth programs.[30]

As discussed in Section 3.5, *Historical, Architectural, Archaeological, and Cultural Resources*, there are numerous historic properties within the study area as listed on the Florida SHPO website, although most of these are considered for architectural or other purposes that would not typically be affected by UA operations. The FAA will also be consulting with the Florida SHPO in to determine whether historic and traditional cultural properties would be affected by the proposed action (see Section 3.5.2, *Affected Environment*).

3.4.3 Environmental Consequences

3.4.3.1 No Action Alternative

Under the no action alternative, Wing would not implement commercial UA package delivery operations in the Central Florida metropolitan and surrounding areas and would continue to conduct UA package delivery operations under Part 135 in locations currently authorized by its OpSpecs and at other locations under 14 CFR Part 107,[31] which limits operations to UA weighing less than 55 pounds and within visual line of sight. Market demand would not be met, and consumers would continue to use personal ground transportation to retrieve small goods. This alternative does not support the stated purpose and need.

3.4.3.2 Proposed Action

Under the proposed action, there would be no physical use of Section 4(f) resources because occasional flyovers in the study area would not result in substantial impairment of Section 4(f) properties. As discussed in Section 3.6, *Noise and Noise-Compatible Land Use*, and Appendix D, the proposed action would not result in significant noise levels at any location within the study area. As further described in Section 3.8, *Visual Effects*, the short duration of en route flights (approximately 15 seconds) would minimize any potential for significant visual impacts. In addition, Wing's flight planning software is designed to increase variability in flight paths to minimize overflights of any given location; with the diversification of flight paths, the frequency of overflights would inversely scale as the distance from a nest increases. Wing has established a direct line of communication

[30] https://www.christiansburginstitute.com/.

[31] The *Operation of Small Unmanned Aircraft Systems Over People* rule (codified in 14 CFR Part 107) permits routine operation of small Unmanned Aircraft System (UAs weighing less than 55 pounds) within visual line of sight at night and over people without a waiver or exemption under certain conditions.

with FWC to discuss any concerns regarding parkland noise and will carefully coordinate any parkland delivery operations with managing entities as necessary. Furthermore, Wing will not conduct operations in NWR areas and would not noticeably contribute to increased noise levels or disrupt quiet settings. Therefore, the FAA has determined that UA overflights as described in the proposed action would not cause substantial impairment to any of the Section 4(f) resources in the study area and are therefore not considered a constructive use of any Section 4(f) resource.

3.5 Historical, Architectural, Archaeological, and Cultural Resources

3.5.1 Definition of Resource and Regulatory Setting

Cultural resources encompass a range of sites, properties, and physical resources relating to human activities, society, and cultural institutions. Such resources include past and present expressions of human culture and history in the physical environment, such as prehistoric and historic archaeological sites, structures, objects, and districts that are considered important to a culture or community. Cultural resources also include aspects of the physical environment, namely natural features and biota that are a part of traditional ways of life and practices and are associated with community values and institutions.

The major law that protects cultural resources is the National Historic Preservation Act (NHPA). Section 106 of the NHPA of 1966 [54 U.S.C. Section 306108] requires federal agencies to consider the effects of their undertakings on properties listed or eligible for listing in the National Register of Historic Places (NRHP). This includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization that meets the NRHP criteria. Regulations related to this process are contained in 36 CFR Part 800, Protection of Historic Properties. Compliance with Section 106 requires consultation with the SHPO and applicable other parties, including Indian tribes.

Major steps in the Section 106 process include identifying the Area of Potential Effects (APE), identifying historic and cultural resources within the APE, consulting with the SHPO and Tribal Historic Preservation Officers (THPOs) for tribes that are identified as potentially having traditional cultural interests in the area, and determining the potential effects on historic properties as a result of the action.

The FAA has not established a significance threshold for this impact category; however, the FAA has identified a factor to consider when evaluating the context and intensity of potential environmental impacts for historical, architectural, archaeological, and cultural resources. A factor to consider in assessing a significant impact is when an action would result in a finding of adverse effect through the Section 106 process. However, an adverse effect finding does not automatically trigger the preparation of an Environmental Impact Statement (i.e., a significant impact). If an adverse effect is determined, the Section 106 process will be resolved through a Memorandum of Agreement (MOU) or Programmatic Agreement (PA) to record resolution measures to mitigate or minimize adverse effects.

3.5.2 Affected Environment

The APE for the proposed action is the entire study area where Wing is planning to conduct UA package deliveries, as shown in Figure 2.2-1. According to the National Park Service's online database of the NRHP, a total of 629 historic properties and 157 historic districts occur within the APE (National Park Service 2024). These historic properties and districts are listed in the attached Tribal and SHPO letters (Appendices F and G, respectively).

3.5.3 Environmental Consequences

3.5.3.1 No Action Alternative

Under the no action alternative, Wing would not implement commercial UA package delivery options in the Central Florida metro and surrounding areas. Wing would continue to conduct UA package delivery operations under Part 135 in locations currently authorized by its OpSpecs and at other locations under 14 CFR Park 107. The no action alternative is not expected to result in significant impacts related to historical, architectural, archaeological, and cultural resources.

3.5.3.2 Proposed Action

Nests would be located in commercially zoned areas within parking lots of shopping centers and large retailers. Infrastructure for this project would consist almost entirely of pre-existing hardstand and would involve no ground disturbance. Therefore, the nature of UA effects on historic properties would be limited to non-physical, reversible impacts (i.e., the introduction of audible and/or visual elements). The only aboveground structures would consist of autoloaders no more than 10 feet in height and seven feet wide, which could incur a minor visual effect on historic properties if those properties are within the viewshed of the autoloaders. However, required standoff distances of 45–80 feet, depending on airspace classification as described in Appendix G, would minimize these impacts.

Wing projects up to 400 delivery flights per operating day per nest, meaning any historic or cultural resource would experience few overflights per day, if any. All takeoff and loading operations would occur at least 300 feet away from any historic properties, adhering to standoff requirements for noise-sensitive areas. Deliveries at or near historic properties would involve the UA hovering at 23 feet AGL for about 30 seconds. In flight, the UA would appear as a small object moving at twice the speed of bird flight. These rapid and intermittent flight operations would result in minimal visual effects. Additionally, Wing's flight planning software minimizes overflights of any specific location by varying flight paths (Section 2.2, Proposed Action).

Noise levels for takeoff and delivery would remain below 84 dB SEL for 30 seconds, similar to a freight train 100 feet away. In-flight noise for the 7000W-B model at 165 feet AGL is 56.5 dBA SEL, comparable to the sound inside an urban residence, while the 8000-A model produces 62.0 dBA, akin to a conversation at a 3-foot distance. The FAA's noise exposure analysis (Section 3.6, Noise and Noise-Compatible Land Use, and Appendix G) confirms that noise levels would be below significance thresholds, even in areas of highest exposure. The small size of the UA ensures no vibrations that could affect historic structures or contents within the APE.

In conclusion, Wing UA operations would only incur intermittent and minor visual and audible effects on historic properties. While delivery noise and potential visual impacts were considered for properties where a quiet setting or an unobstructed sky contributes to significance, any effects would be negligible and temporary. In accordance with 36 CFR Section 800.4(a)(1), the FAA transmitted a letter on December 18, 2024, to the Florida SHPO and local government stakeholders that there would be *no adverse effect* on historic properties by the proposed action based on the minimal infrastructure required for the project, consideration of historic properties in the OpSpecs as noise-sensitive areas, and the temporary nature of potential audible and visual effects (Appendix G).

The FAA also consulted with four THPOs for tribes that may potentially attach religious or cultural significance to resources in the APE. The four tribes are: (1) Coushatta Tribe of Louisiana; (2) Miccosukee Tribe of Indians; (3) Muscogee (Creek) Nation; and (4) Seminole Tribe of Florida. The FAA sent consultation letters to the first three tribes on July 11, 2024, and to the Seminole Tribe of Florida on September 19, 2024, regarding the entire APE and did not receive any responses or objections.

The FAA received concurrence from the Florida SHPO on January 17, 2025, of its determination of *no adverse effect* by the proposed action. As currently analyzed, the proposed action would not result in significant impacts on historical, architectural, archaeological, or cultural resources. The FAA's historic and tribal outreach letters are included as Appendices F and G, respectively.

3.6 Noise and Noise-Compatible Land Use

3.6.1 Definition of Resource and Regulatory Setting

Noise is considered any unwanted sound that interferes with normal activities (such as sleep, conversation, student learning) and can cause annoyance. Aircraft noise is often the most noticeable environmental effect associated with any aviation project. Several federal laws, including the Aviation Safety and Noise Abatement Act of 1979, as amended (49 U.S.C. Sections 47501–47507) regulate aircraft noise and noise-compatible land use. Through 14 CFR Part 36, the FAA regulates noise from aircraft. FAA Order 1050.1F, Appendix B, Paragraph B-1.3 requires the FAA to identify the location and number of noise-sensitive areas that could be significantly impacted by noise. As defined in Paragraph 11-5b of Order 1050.1F, page 11-3, a noise-sensitive area is "an area where noise interferes with normal activities associated with its use. Normally, noise-sensitive areas include residential, educational, health, and religious structures and sites, and parks, recreational areas, areas with wilderness characteristics, wildlife refuges, and cultural and historical sites."

Sound is measured in terms of the decibel (dB), which is the ratio between the sound pressure of the sound source and 20 micropascals, which is nominally the threshold of human hearing. Various weighting schemes have been developed to collapse a frequency spectrum into a single dB value. The A-weighted decibel, or dBA, corresponds to human hearing accounting for the higher sensitivity in the mid-range frequencies. To comply with NEPA requirements, the FAA has issued requirements for assessing aircraft noise in FAA Order 1050.1F, Appendix B. The FAA's required noise metric for aviation noise analysis is the yearly day-night average sound level (DNL) metric. The DNL metric is a single value representing the logarithmically averaged aircraft sound level at a location over

a 24--hour period, with a 10 dB adjustment added to those noise events occurring from 10:00 p.m. to 7:00 a.m. the following morning. A significant noise impact is defined in Order 1050.1F as an increase in noise of DNL 1.5 dB or more at or above DNL 65 dB noise exposure or a noise exposure at or above the DNL 65 dB due to a DNL 1.5 dB or greater increase.

3.6.2 Affected Environment

The approximate land area within the study area is 14,200 square miles, the approximate water area is 237 square miles, and the estimated population within the counties included in the study area is 9,587,041 per 2022 estimates.

The ambient (or background) sound level in the operations area varies and depends on the uses in the immediate vicinity. For example, the ambient sound level along a major highway is higher than the ambient sound level within a residential neighborhood. Existing sound sources in the operating area are primarily those from anthropogenic sources associated with commercial, industrial, transportation (e.g., highways, rail, and air travel), and residential land uses in an urban and city environment (e.g., vehicles, construction equipment, aircraft). Except for areas proximate to airports (see Figure 3.6-1), existing aviation noise levels in the Central Florida study area are expected to be well below the FAA's threshold for significant noise exposure to residential land use (DNL 65 dB).

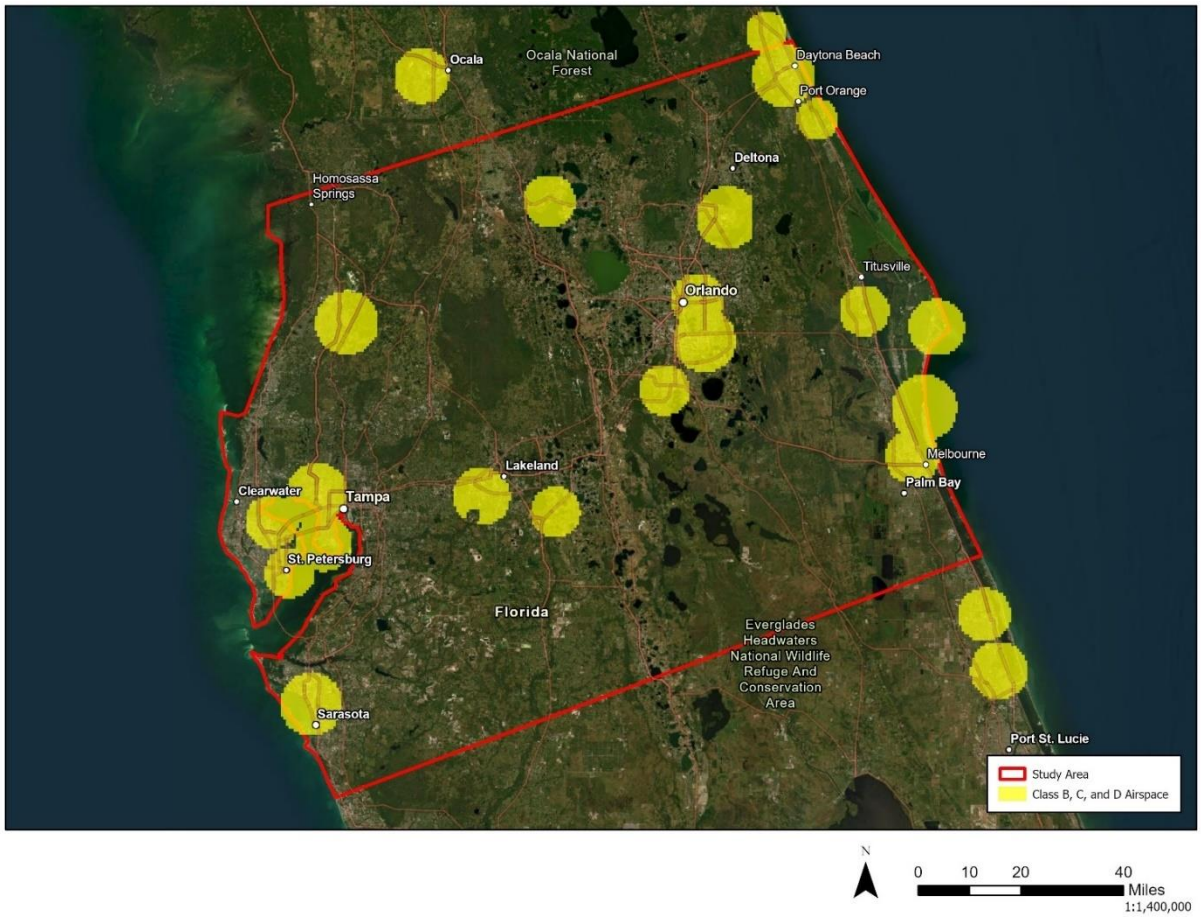

Figure 3.6-1. Controlled Surface Area of Class B, Class C, and Class D Airspace

3.6.3 Environmental Consequences

3.6.3.1 No Action Alternative

Under the no action alternative, Wing would not implement commercial UA package delivery operations in the Central Florida metro and surrounding areas. Wing would continue to conduct UA package delivery operations under Part 135 in locations currently authorized by its OpSpecs and at other locations under 14 CFR Part 107. The no action alternative is not expected to cause a significant impact on any noise-sensitive resources within the study area.

3.6.3.2 Proposed Action

Operations would include up to 400 deliveries from each nest and would occur up to 365 days per year. The FAA developed a methodology to evaluate the potential noise exposure in the proposed study area that could result from implementation of the proposed action (Appendix D). The noise assessment evaluated noise emissions data for the Hummingbird 7000W-B and 8000-A.

Due to the unknown fleet mix and operational profile(s) that would be used (i.e., manual load, nearfield autoload, or offsite autoload), this analysis assumes the most conservative scenario with the farthest setback distances presented in Tables 9 to 16 of Appendix D. This analysis was used to define the potential significant impacts due to the proposed action. Noise assessments were performed for each of the flight phases as discussed in detail in the following sections.

Noise Exposure for Nest Operations

Based on a daily maximum of 400 deliveries per nest, 24 FitBIT operations before 7 a.m., 1 GeoBIT operation, and 365 operating days per year, Table 3.6-1 provides the most conservative extent of daily noise exposure for nest operations.

Table 3.6-1. Estimated Extent of Noise Exposure from Nest

Annual Average Daily DNL Equivalent Deliveries	DNL Equivalent FitBIT Operations	DNL Equivalent GeoBIT Operations	DNL 65 dB	DNL 60 dB	DNL 55 dB	DNL 50 dB
400	240	1	35 feet	65 feet	120 feet	235 feet

Source: ICF 2024.
Note: Distances are the worst-case noise scenario (longest set back distances) based on Tables 9 through 12 of Appendix D.
dB = decibel; DNL = day-night average sound level; FitBIT = fitness built-in test; GeoBIT = geography built-in test.

As described in Section 2.2, *Proposed Action*, nests would be placed at least 120 feet away from noise-sensitive areas within the controlled surface areas of Class B, Class C, and Class D airspace. In addition, nests would be placed at least 65 feet away from noise-sensitive areas when they are outside of the controlled surface areas of Class B, Class C, and Class D airspace. Based on the above distances, the increase of noise would not be expected to exceed DNL 1.5 dB within DNL 65 dB of existing aviation noise exposure or become DNL 65 dB with the increase of DNL 1.5 dB because DNL 60- and 65-dB of existing aviation noise exposure would not exceed the controlled surface areas of Class B, Class C, and Class D airspace. Therefore, there would be no significant impact due to the nest operations.

Noise Exposure for Offsite Package Autoload Operations

As stated in 2.2.3, offsite package autoload operations consist of UA descent from its close transit altitude (safe altitude above local terrain and obstacles) to 22 feet AGL and lowers the package hook. The UA then passes approximately 10 feet laterally over the autoloader. The DNL exposures assume an arrival and departure flight path restricted to a single trajectory over a receiver array with distances of 25 to 1,000 feet. A single offsite package autoload operation consists of arrival, package autoload, and departure phases. As shown in Table 3.6-2, offsite package autoload operations would not exceed 65 DNL at 25 feet from an offsite autoloading location at a rate of 400 deliveries per day.

Table 3.6-2. Estimated Extent of Noise Exposure from an Offsite Package Autoloading Location

Average Daily Deliveries per Autoloader	DNL 65 dB (ft)	DNL 60 dB (ft)	DNL 55 dB (ft)	DNL 50 dB (ft)	DNL 45 dB (ft)
1	<25	<25	<25	<25	<25
5	<25	<25	<25	<25	<25
10	<25	<25	<25	<25	40
15	<25	<25	<25	<25	50
20	<25	<25	<25	30	55
25	<25	<25	<25	35	65
50	<25	<25	<25	50	95
75	<25	<25	35	60	135
100	<25	<25	40	70	170
150	<25	<25	50	95	230
200	<25	30	55	115	275
300	<25	40	70	165	355
400	<25	45	80	205	430

Note: Distances are the worst-case noise scenario (longest set back distances) based on Tables 13 and 14 of Appendix D.
DNL = day-night average sound level.

Offsite package autoload and pickup flight paths would not occur within 80 feet of noise-sensitive areas when the autoloader is located within the controlled surface area of Class B, Class C, and Class D airspace and 45 feet away from noise-sensitive areas in all other areas within the study area. Based on the above distances, the increase of noise would not be expected to exceed DNL 1.5 dB within DNL 65 dB of existing aviation noise exposure or become DNL 65 dB with the increase of DNL 1.5 dB because DNL 60- and 65-dB of existing aviation noise exposure would not exceed the controlled surface areas of Class B, Class C, and Class D airspace. Therefore, there would be no significant impact due to autoload operations. See Appendix D for a detailed explanation of setback distances.

Noise Exposure for En Route Operations

Based on the information provided by Wing, it is expected that UA would generally cruise at or above an altitude of 165 feet AGL and travel at a ground speed of 59 mph (51 knots) during en route

flight. The en route noise exposure for a single point exposed to 400 delivery and return flights (800 flights total) would be DNL 40.7 dBA. Considering that en route UA noise would be significantly low under any delivery scenarios, this was not quantified further.

Noise Exposure for Delivery Operations

The noise exposure for delivery operations includes the noise exposure for the delivery point itself, based on maximum daily deliveries to any one location. The DNL delivery noise exposures assume an arrival and departure flight path restricted to a single trajectory over a receiver array with distances of 25 to 1,000 feet. The noise exposure for any one delivery point is provided in Tables 15 and 16 of Appendix D and summarized in Table 3.6-3 for various DNL levels. At the level of five daily DNL equivalent deliveries, significant noise effects would not be expected anywhere beyond the immediate point of delivery.

Table 3.6-3. Estimated Extent of Noise Exposure for Delivery Locations Based on Maximum Deliveries per Location

Average Daily DNL Equivalent Deliveries	DNL 65 dB (ft)	DNL 60 dB (ft)	DNL 55 dB (ft)	DNL 50 dB (ft)	DNL 45 dB (ft)
1	<25	<25	<25	<25	<25
5	<25	<25	<25	<25	<25

Source: ICF 2024.
Note: Distances are the worst-case noise scenario (longest set back distances) based on Tables 15 and 16 of Appendix D.
DNL = day-night average sound level.

Overall Noise Exposure Results

The maximum noise exposure levels are associated with nest operations, where DNL 65 dB occurs within 45 feet of a nest perimeter and DNL 60 dB occurs within 65 feet. As described in Section 2.2, *Proposed Action*, nests would be located at least 65 feet away from noise-sensitive areas. In addition, when nests are planned to be within the controlled surface areas of Class B, Class C, and Class D airspace, nests would be placed 120 feet away from noise-sensitive areas. Offsite package autoload and pickup flight paths would not occur within 80 feet of noise-sensitive areas when the autoloader is located within the controlled surface area of Class B, Class C, and Class D airspace and 45 feet away from noise-sensitive areas in all other areas within the study area

Based on the noise analysis, and the above operating parameters, *the proposed action would not have a significant noise impact.*

3.7 Visual Effects (Visual Resources and Visual Character)

3.7.1 Definition of Resource and Regulatory Setting

Visual effects deal broadly with the extent to which the project would either (1) produce light emissions that create annoyance or interfere with activities; or (2) contrast with, or detract from,

the visual resources and/or the visual character of the existing environment. Visual effects can be difficult to define and assess because they involve subjectivity. In this case, visual effects would be limited to the introduction of a visual intrusion—a UA in flight—which could be out of character with the suburban or natural landscapes.

The FAA has not developed a visual effects significance threshold. Factors the FAA considers in assessing significant impacts include the degree to which the action would have the potential to (1) affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources; (2) contrast with the visual resources and/or visual character in the study area; or (3) block or obstruct the views of visual resources, including whether these resources would still be viewable from other locations.

3.7.2 Affected Environment

The proposed action would take place over mostly suburban and commercially developed properties. As noted in Section 3.4, *Department of Transportation Act, Section 4(f) Resources*, there are some publicly owned resources that could be valued for aesthetic attributes within the study area. However, Wing's flight planning software is designed to increase variability in flight paths to minimize overflights of any given location; with the diversification of flight paths, the frequency of overflights would inversely scale as the distance from a nest increases. During takeoff, remote pickup, and delivery, the UA would depart from a nest and travel en route at an altitude less than 400 feet AGL (en route travel would generally occur between 150 and 250 feet AGL). Deliveries would mostly take place at residences, and, in some cases, there may be instances where the delivery would be to a customer located within a Section 4(f) resource (see Section 3.4.2 for more information on 4(f) properties). A 6-foot-radius clear space is required for delivery, such as a driveway, parking lot, field, common area, patio, or clear spaces surrounding multi-family dwellings, as determined during the delivery request process.[32] The duration of delivery from the time the customer approves the delivery to the transition back to en route flight mode is expected to last approximately 15 seconds. The FAA estimates at typical operating altitude and speeds the UA en route would be observable for approximately 6 seconds by an observer on the ground.

3.7.3 Environmental Consequences

3.7.3.1 No Action Alternative

Under the no action alternative, Wing would not implement commercial UA package delivery operations in the Central Florida metro and surrounding areas and would continue to conduct UA package delivery operations under Part 135 in locations currently authorized by its OpSpecs and at other locations under 14 CFR Part 107, which limits operations to UA weighing less than 55 pounds and within visual line of sight. Market demand would not be met, and consumers would continue to use personal ground transportation to retrieve small goods. This alternative does not support the

[32] In the event that the clear space contains obstructions such as trees or cars, the UA would abort the delivery and return to the nest.

stated purpose and need. Therefore, the no action alternative is not expected to result in significant visual effects.

3.7.3.2 Proposed Action

The proposed action would make no changes to any landforms or land uses; thus, there would be no effect on the visual character of the area, as the nests would be located in established commercial areas as further described in Section 2.2, *Proposed Action*. The proposed action involves airspace operations that could result in visual impacts on sensitive areas such as Section 4(f) properties where the visual setting is an important resource of the property. The short duration when each UA flight could be seen from any resource in the study area and the low number of overflights within any given location would minimize any potential for significant visual impacts.

Based on the above analysis, the proposed action would not result in the following impacts:

- Create annoyance or interfere with normal activities from light emissions;
- Affect the visual character of the area due to the light emissions, including the importance, uniqueness, and aesthetic value of the affected visual resources;
- Affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources;
- Contrast with the visual resources and/or visual character in the study area; and
- Block or obstruct the views of visual resources, including whether these resources would still be viewable from other locations.

Therefore, the proposed action is not expected to cause significant impacts to visual resources.

Chapter 4
Reasonably Foreseeable Effects in Context of Past, Present, and Future Actions[33]

Reasonably foreseeable effects may include those that interact with baseline conditions caused by other past and present activity as well as reasonably foreseeable environmental trends and planned activity in the affected environment. As most of the impacts discussed in Chapter 3, *Affected Environment and Environmental Consequences,* were found to be minimal and given that the drone flight is limited in its ability to interact with other outside actions due to its short duration, the proposed action's contribution to additional environmental impacts in conjunction with past, present, and future actions within the study area would largely be from noise. Additionally, Wing is developing an automated deconfliction network for UA avoidance across participating operators in the Dallas-Fort Worth area that is expected to be enacted in early 2024. Similar efforts could be undertaken as other operators move into the Central Florida operating area. Thus, this section will focus on the proposed action's potential impact on the noise environment in conjunction with other reasonably foreseeable noise sources.

Because UA operations would occur in areas subject to other aviation noise sources, it is necessary to evaluate the total noise exposure that would result from the other aviation noise sources present. Examples of such scenarios are Wing operations occurring in the vicinity of an airport where Wing flight activity may overlap with traditional aircraft. Aviation noise sources are most likely to be the dominant contribution to noise impacts near airports. By comparison, other sources of noise would not appreciably contribute to overall noise levels at these locations.

There are 319 airports within the study area (see Appendix H). The potential for noise and noise-compatible land use reasonably foreseeable effects would result from UA and manned aircraft operating within DNL 60 dB noise exposure areas of existing airports. As such, the potential for additional effects would be minimized because Wing has elected to require that all nests would be placed at least 120 feet away from noise-sensitive areas within the controlled surface areas of Class B, Class C, and Class D airspace. In addition, nests would be placed at least 65 feet away from noise-sensitive areas when they are outside of the controlled surface areas of Class B, Class C, and Class D airspace. No other Part 135 UA operations currently occur in the Central Florida area. The proposed

[33] Chapter 4 of the FAA's Draft EA refers to the impacts discussed in this section as "Cumulative Impacts" which is a term used in CEQ's NEPA-implementing regulations. 40 CFR 1508(i)(3) (2024). However, since the publication of the Draft EA, CEQ issued an interim final rule to remove these regulations in accordance with E.O. 14154, Unleashing American Energy. See n. 1. As explained by CEQ in its February 19, 2025, memorandum, Implementation of the National Environmental Policy Act, NEPA, as amended, does not employ the term "cumulative effects" or "cumulative impacts." CEQ instead directs agencies to consider "'reasonably foreseeable' effects, regardless of whether or not those effects might be characterized as 'cumulative,'" consistent with NEPA. 42 U.S.C. 4332(2)(C)(i). In accordance with this direction, the FAA has removed the term "cumulative effects" and "cumulative impacts" wherever previously used, but retains with edits the underlying analysis in Chapter 4 of the Draft EA.

automated deconfliction network for UA avoidance would help reduce any additional or additive effects by limiting drone flight path overlap. Wing's flight planning software is designed to increase variability in flight paths to minimize overflights of any given location, thereby reducing the potential for total effects when combined with other operations in the study area. Additionally, Part 135 operators would be required to complete an environmental review before beginning operations, ensuring that any potential additional effects are properly analyzed and disclosed.

Nest sites would be in areas zoned for commercial activities and away from noise-sensitive areas. Nests would be powered using available electric outlets for recharging batteries. No effects are expected on the power grid or from energy sources.

Wing acknowledges that future operators may propose locating operations within this proposed action's study area. Should that occur, Wing understands the potential for impacts may increase due to a future operator's project and would work with that operator and the FAA to mitigate potential impacts. Wing also understands that any future operators would be required to perform their own NEPA analysis to identify the potential for any noise impacts due to their operations. The degree to which all of the different operators would operate within areas of shared airspace is dependent on the operators, their specific business use cases, and their ability to deconflict with one another in those overlapping areas. Each operator is responsible for coordinating with other operators in the same geographic area to avoid significant impacts from joint operational use. Wing will communicate and coordinate with other operators to limit operations occurring concurrently in the same area to avoid any significant impacts.

As discussed in Chapter 3, the proposed action is not expected to significantly impact the environmental impact categories (see Section 3.2). Areas of existing aviation noise sources within the study area would be avoided; thus, the proposed action would not contribute to significant noise impacts. No other past, present, or reasonably foreseeable future actions are anticipated to interact with the proposed action to result in significant effects; therefore, the proposed action is not expected to result in significant reasonably foreseeable effects.

Appendix A
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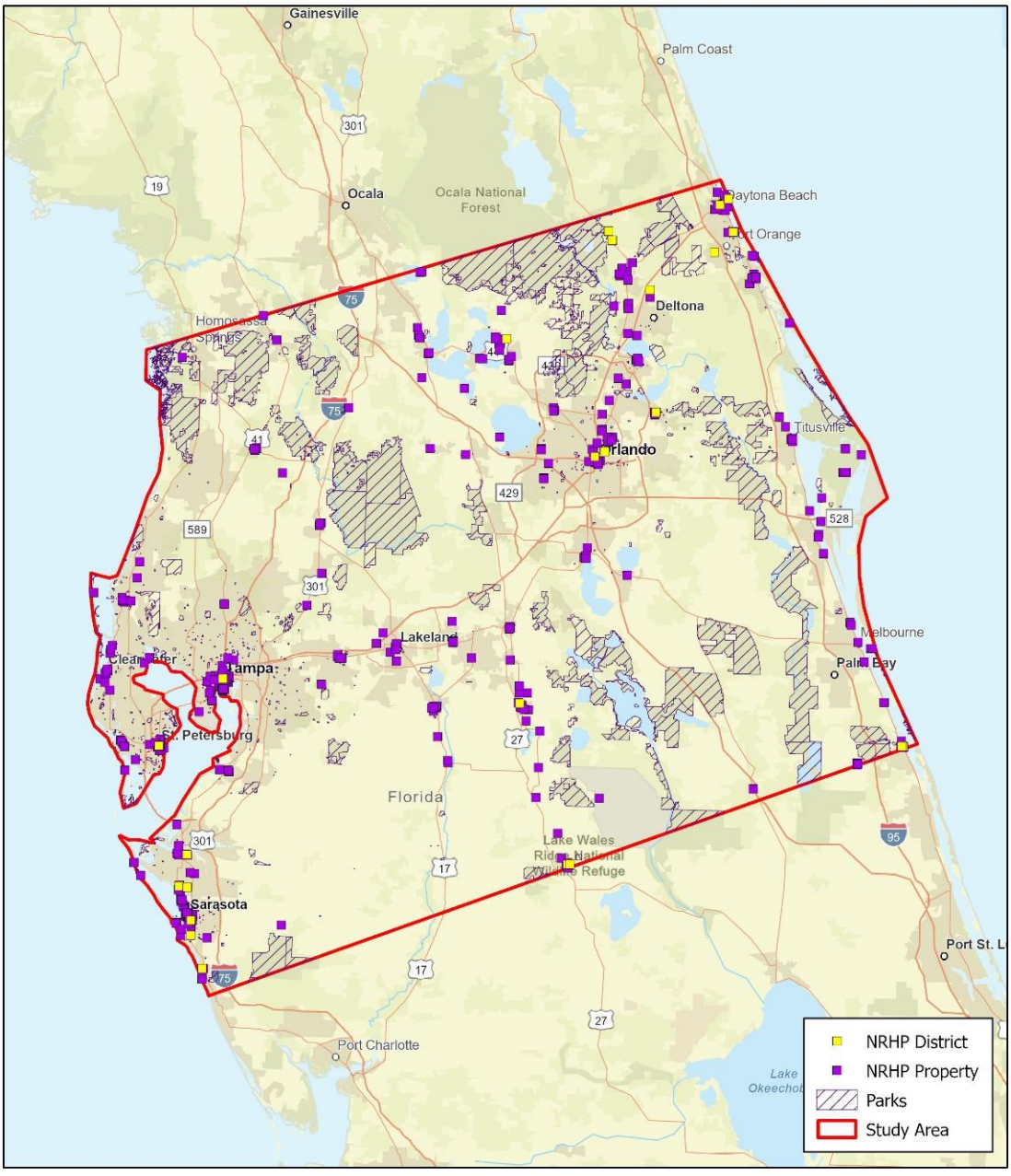

Section 4(f) Properties
Wing Central Florida

Section 4(f) Property Name	Section 4(f) Property Type	County
1890 Windermere School	Historic Buildings	Orange
Abbey, The	Historic Buildings	Volusia
Aladdin Theater	Historic Buildings	Brevard
Alexander Hotel	Historic Buildings	Pinellas
All Saints Episcopal Church	Historic Buildings	Orange
All Saint's Episcopal Church	Historic Buildings	Volusia
American National Bank Building	Historic Buildings	Sarasota
Anderson, Charles B., House	Historic Buildings	Pasco
Anderson-Frank House	Historic Buildings	Hillsborough
Andrews Memorial Chapel	Historic Buildings	Pinellas
Apopka Seaboard Air Line Railway Depot	Historic Buildings	Orange
Appleby Building	Historic Buildings	Sarasota
Arcade Hotel	Historic Buildings	Pinellas
Archbold Biological Station at Red Hill	Historic Buildings	Polk
Arfaras, N. G., Sponge Packing House	Historic Buildings	Pinellas
Armistead, William Martin, House	Historic Buildings	Sarasota
Atha, S. Howard, House	Historic Buildings	Orange
Atlantic Coast Line Passenger Depot	Historic Buildings	Sarasota
Atlantic Coast Line Railroad Depot	Historic Buildings	Polk
Auburndale Citrus Growers Association Packing House	Historic Buildings	Polk
Auburndale City Hall	Historic Buildings	Polk
Austin House	Historic Buildings	Manatee
Babson Park Woman's Club	Historic Buildings	Polk
Bacon and Tomlin, Inc.	Historic Buildings	Sarasota
Baker, Samuel, House	Historic Buildings	Pasco
Barbour, Robert Bruce, House	Historic Buildings	Orange
Bay Haven School	Historic Buildings	Sarasota
Bay Isle Commercial Building	Historic Buildings	Hillsborough
Baynard, Ephriam M., House	Historic Buildings	Polk
Beasley, John M., House	Historic Buildings	Manatee
Bee Ridge Woman's Club	Historic Buildings	Sarasota
Belleview-Biltmore Hotel	Historic Buildings	Pinellas
Bethune, Mary McLeod, Home	Historic Buildings	Volusia
Bing Rooming House	Historic Buildings	Hillsborough
Binz, Frank and Matilda, House	Historic Buildings	Sarasota
Blatchley, Willis S., House	Historic Buildings	Pinellas
Blodgett, Delos A., House	Historic Buildings	Volusia
Boone House	Historic Buildings	Pinellas
Bradenton Carnegie Library	Historic Buildings	Manatee
Bradlee-McIntyre House	Historic Buildings	Seminole
Brewer, Edward Hill, House	Historic Buildings	Orange

Bridges, J.J., House	Historic Buildings	Orange
Brown, Lawrence, House	Historic Buildings	Polk
Browne--King House	Historic Buildings	Seminole
Bryson--Crane House	Historic Buildings	Sarasota
Bullard, B. K., House	Historic Buildings	Polk
Burns Realty Company--Karl Bickel House	Historic Buildings	Sarasota
Burns, William J., House	Historic Buildings	Sarasota
Campbell House	Historic Buildings	Lake
Carroll Building	Historic Buildings	Orange
Casa Coe da Sol	Historic Buildings	Pinellas
Casa De Josefina	Historic Buildings	Polk
Casa De Muchas Flores	Historic Buildings	Pinellas
Casa Del Mar	Historic Buildings	Sarasota
Central Avenue School	Historic Buildings	Polk
Central Grammar School, Old	Historic Buildings	Polk
Central High School	Historic Buildings	Pinellas
Central Instrumentation Facility	Historic Buildings	Brevard
Central Station	Historic Buildings	Highlands
Centro Asturiano	Historic Buildings	Hillsborough
Chidsey Library	Historic Buildings	Sarasota
Chief Master at Arms House	Historic Buildings	Volusia
Christ Church	Historic Buildings	Polk
Church of the Good Shepherd	Historic Buildings	Orange
Church of the Holy Spirit	Historic Buildings	Polk
Circulo Cubano de Tampa	Historic Buildings	Hillsborough
Citrus County Courthouse, Old	Historic Buildings	Citrus
City Point Community Church	Historic Buildings	Brevard
City Waterworks	Historic Buildings	Sarasota
Clermont Woman's Club	Historic Buildings	Lake
Cleveland Court School	Historic Buildings	Polk
Cleveland Street Post Office	Historic Buildings	Pinellas
Clifford House	Historic Buildings	Lake
Colonial Estate	Historic Buildings	Osceola
Community Chapel of Melbourne Beach	Historic Buildings	Brevard
Comstock-Harris House	Historic Buildings	Orange
Corrigan House	Historic Buildings	Sarasota
Cox, John F., Grammar School	Historic Buildings	Polk
Crisp Building	Historic Buildings	Sarasota
Curtis, William E., House	Historic Buildings	Hillsborough
Cypress Street Elementary School	Historic Buildings	Volusia
Dade City Atlantic Coast Line Railroad Depot	Historic Buildings	Pasco
Dade City Woman's Club	Historic Buildings	Pasco

DeBary Hall	Historic Buildings	Volusia
DeCanizares, F.A., House	Historic Buildings	Sarasota
DeLand Hall	Historic Buildings	Volusia
DeLand Memorial Hospital, Old	Historic Buildings	Volusia
DeLeon Springs Colored School	Historic Buildings	Volusia
DeMarcay Hotel	Historic Buildings	Sarasota
Dennis Hotel	Historic Buildings	Pinellas
Desert Inn	Historic Buildings	Osceola
Dickinson Memorial Library and Park	Historic Buildings	Volusia
Dickman, A.P., House	Historic Buildings	Hillsborough
Dixie Walesbilt Hotel	Historic Buildings	Polk
Domestic Science and Manual Training School	Historic Buildings	Pinellas
Don Ce Sar Hotel	Historic Buildings	Pinellas
Donnelly House	Historic Buildings	Lake
Donnelly, Bartholomew J., House	Historic Buildings	Volusia
Douglas, J. O., House	Historic Buildings	Pinellas
Duncan, Harry C., House	Historic Buildings	Lake
Dundee ACL Railroad Depot, Old	Historic Buildings	Polk
Earle House	Historic Buildings	Sarasota
Edge House	Historic Buildings	Sumter
Edwards Theatre	Historic Buildings	Sarasota
El Centro Espanol de Tampa	Historic Buildings	Hillsborough
El Centro Espanol of West Tampa	Historic Buildings	Hillsborough
El Pasaje	Historic Buildings	Hillsborough
El Patio Apartments	Historic Buildings	Sarasota
El Real Retiro	Historic Buildings	Volusia
El Retiro	Historic Buildings	Polk
El Vernona Apartments-Broadway Apartments	Historic Buildings	Sarasota
El Vernona Hotel--John Ringling Hotel	Historic Buildings	Sarasota
Episcopal House of Prayer	Historic Buildings	Hillsborough
Federal Building, U.S. Courthouse, Downtown Postal Station	Historic Buildings	Hillsborough
Fell, Marian, Library	Historic Buildings	Indian River
Fellsmere Public School	Historic Buildings	Indian River
First Baptist Church	Historic Buildings	Polk
First Church of Christ Scientist	Historic Buildings	Orange
First Methodist Church of Oviedo	Historic Buildings	Seminole
First Methodist Church of St. Petersburg	Historic Buildings	Pinellas
First Methodist Episcopal Church	Historic Buildings	Indian River
First United Methodist Church	Historic Buildings	Osceola
Florida Power and Light Company Ice Plant	Historic Buildings	Brevard
Floridan Hotel	Historic Buildings	Hillsborough
Fort Foster	Historic Buildings	Hillsborough

Fort Homer W. Hesterly National Guard Armory	Historic Buildings	Hillsborough
Frances-Carlton Apartments	Historic Buildings	Sarasota
French, Seth, House	Historic Buildings	Volusia
Frostproof High School, Old	Historic Buildings	Polk
Fruitland Park Community Center	Historic Buildings	Lake
Gardner, Isaac Sr., House	Historic Buildings	Hillsborough
Gary--Morgan House	Historic Buildings	Orange
Gleason, William H., House	Historic Buildings	Brevard
Grace Episcopal Church and Guild Hall	Historic Buildings	Volusia
Grand Army of the Republic Memorial Hall	Historic Buildings	Osceola
Green Gables	Historic Buildings	Brevard
Green--Richman Arcade	Historic Buildings	Pinellas
Griffin Grammar School	Historic Buildings	Polk
Guida, George, Sr., House	Historic Buildings	Hillsborough
Gulfport Casino	Historic Buildings	Pinellas
Hacienda Hotel	Historic Buildings	Pasco
Haines City National Guard Armory, Old	Historic Buildings	Polk
Haines, Elizabeth, House	Historic Buildings	Highlands
Hainz, Edward, House	Historic Buildings	Highlands
Halton, Dr. Joseph, House	Historic Buildings	Sarasota
Harper House	Historic Buildings	Lake
Haynes, Alexander, House	Historic Buildings	Volusia
Headquarters Building	Historic Buildings	Brevard
Helm, Johnson, House	Historic Buildings	Manatee
Henley Field Ball Park	Historic Buildings	Polk
Henry, James, House	Historic Buildings	Pinellas
Hernando Elementary School, Old	Historic Buildings	Citrus
Highlands County Courthouse	Historic Buildings	Highlands
Hill Crest	Historic Buildings	Lake
Hill, Dr. George E., House	Historic Buildings	Brevard
Hillsboro State Bank Building	Historic Buildings	Hillsborough
Hillsborough County High School, Old	Historic Buildings	Hillsborough
Holland, Benjamin Franklin, House	Historic Buildings	Polk
Holly Hill Municipal Building	Historic Buildings	Volusia
Holy Trinity Episcopal Church	Historic Buildings	Lake
Homeland School	Historic Buildings	Polk
Hopper Academy	Historic Buildings	Seminole
Hotel Mims	Historic Buildings	Brevard
House at 100 West Davis Boulevard	Historic Buildings	Hillsborough
House at 116 West Davis Boulevard	Historic Buildings	Hillsborough
House at 124 Baltic Circle	Historic Buildings	Hillsborough
House at 125 Baltic Circle	Historic Buildings	Hillsborough

House at 131 West Davis Boulevard	Historic Buildings	Hillsborough
House at 132 Baltic Circle	Historic Buildings	Hillsborough
House at 161 Bosporous Avenue	Historic Buildings	Hillsborough
House at 190 Bosporous Avenue	Historic Buildings	Hillsborough
House at 200 Corsica Avenue	Historic Buildings	Hillsborough
House at 202 Blanca Avenue	Historic Buildings	Hillsborough
House at 220 Blanca Avenue	Historic Buildings	Hillsborough
House at 301 Caspian Street	Historic Buildings	Hillsborough
House at 36 Aegean Avenue	Historic Buildings	Hillsborough
House at 36 Columbia Drive	Historic Buildings	Hillsborough
House at 418 Blanca Avenue	Historic Buildings	Hillsborough
House at 507 Jackson Drive	Historic Buildings	Sarasota
House at 53 Aegean Avenue	Historic Buildings	Hillsborough
House at 59 Aegean Avenue	Historic Buildings	Hillsborough
House at 84 Adalia Avenue	Historic Buildings	Hillsborough
House at 97 Adriatic Avenue	Historic Buildings	Hillsborough
Howey House	Historic Buildings	Lake
Hutchinson House	Historic Buildings	Hillsborough
Ingleside	Historic Buildings	Pinellas
Jackson Rooming House	Historic Buildings	Hillsborough
Jackson, Capt. William Parker, House	Historic Buildings	Hillsborough
Jeffries, Capt. Harold B., House	Historic Buildings	Pasco
Jenks, Holland, House	Historic Buildings	Polk
Jennings, William Sherman, House	Historic Buildings	Hernando
Johnson, C. L., House	Historic Buildings	Polk
Johnson, Louis, Building	Historic Buildings	Pinellas
Johnson-Wolff House	Historic Buildings	Hillsborough
Jordan, Rufus P., House	Historic Buildings	Manatee
Jorgensen's General Store	Historic Buildings	Brevard
Josselyn, James Riley, House	Historic Buildings	Marion
Kenilworth Lodge	Historic Buildings	Highlands
Kennedy, Dr. Walter, House	Historic Buildings	Sarasota
Kerouac, Jack, House	Historic Buildings	Orange
Kilkoff House	Historic Buildings	Volusia
Kling, Amos, House	Historic Buildings	Volusia
Knowles Memorial Chapel	Historic Buildings	Orange
Kreissle Forge	Historic Buildings	Manatee
Kress, S.H., and Co. Building	Historic Buildings	Volusia
Kress, S.H., and Company Building	Historic Buildings	Pinellas
Kress, S.H., Building	Historic Buildings	Sarasota
La Grange Church and Cemetery	Historic Buildings	Brevard
Lake County Courthouse	Historic Buildings	Lake

Lake Mary Chamber of Commerce Building	Historic Buildings	Seminole
Lake of the Hills Community Club	Historic Buildings	Polk
Lake Wales City Hall	Historic Buildings	Polk
Lake Weir Yacht Club	Historic Buildings	Marion
Lakeland High School, Old	Historic Buildings	Polk
Lakeside Inn	Historic Buildings	Lake
Lamb, A.M., House	Historic Buildings	Hillsborough
Launch Control Center	Historic Buildings	Brevard
Lawson, Bamma Vickers, House	Historic Buildings	Indian River
LeClaire Apartments	Historic Buildings	Hillsborough
Lee School	Historic Buildings	Lake
Leech, Hilton, House and Amagansett Art School	Historic Buildings	Sarasota
Leiman House	Historic Buildings	Hillsborough
Lewis, W. Henry, House	Historic Buildings	Polk
Longwood Hotel	Historic Buildings	Seminole
Lutz Elementary School, Old	Historic Buildings	Hillsborough
Maitland Art Center	Historic Buildings	Orange
Manatee County Courthouse	Historic Buildings	Manatee
Manatee County Courthouse (Original)	Historic Buildings	Manatee
Mann Manor	Historic Buildings	Polk
Masonic Temple No. 25	Historic Buildings	Hillsborough
May--Stringer House	Historic Buildings	Hernando
McKeage, John & Florence, House	Historic Buildings	Pinellas
Meacham Elementary School	Historic Buildings	Hillsborough
Merchants Bank Building	Historic Buildings	Volusia
Meres, E. R., Sponge Packing House	Historic Buildings	Pinellas
Methodist Episcopal Church, South, at Umatilla	Historic Buildings	Lake
Meyer--Davis House--Hasty Cottage	Historic Buildings	Pinellas
Miakka School House	Historic Buildings	Sarasota
Miller, George McA., House	Historic Buildings	Hillsborough
Mitchill--Tibbetts House	Historic Buildings	Orange
Mote--Morris House	Historic Buildings	Lake
Moulton--Wells House	Historic Buildings	Volusia
Mount Dora A. C. L. Railroad Station, Old	Historic Buildings	Lake
Mount Olive African Methodist Episcopal Church	Historic Buildings	Pinellas
Mountain Lake Colony House	Historic Buildings	Polk
Municipal Auditorium--Recreation Club	Historic Buildings	Sarasota
Nielsen, Lucienne, House	Historic Buildings	Sarasota
Norton, Gould Hyde, House	Historic Buildings	Lake
Oates Building	Historic Buildings	Polk
Ocoee Christian Church	Historic Buildings	Orange
Old Belleair Town Hall	Historic Buildings	Pinellas

Old Fernald--Laughton Memorial Hospital	Historic Buildings	Seminole
Old Holy Redeemer Catholic Church	Historic Buildings	Osceola
Old Orlando Railroad Depot	Historic Buildings	Orange
Old People's Home	Historic Buildings	Hillsborough
Old School House	Historic Buildings	Hillsborough
Old Tampa Children's Home	Historic Buildings	Hillsborough
Olds Hall	Historic Buildings	Volusia
Operations and Checkout Building	Historic Buildings	Brevard
Orange City Colored School	Historic Buildings	Volusia
Orange City Town Hall	Historic Buildings	Volusia
Orlando Utilities Commission Administration Building	Historic Buildings	Orange
Osceola County Courthouse	Historic Buildings	Osceola
Osprey School	Historic Buildings	Sarasota
Out of Door School	Historic Buildings	Sarasota
Palace of Florence Apartments	Historic Buildings	Hillsborough
Palm Cottage Gardens	Historic Buildings	Orange
Palmer, Cal, Memorial Building	Historic Buildings	Orange
Palmerin Hotel	Historic Buildings	Hillsborough
Palmetto Armory	Historic Buildings	Manatee
Pasco County Courthouse	Historic Buildings	Pasco
Payne, Christy, Mansion	Historic Buildings	Sarasota
Pendleton, William Kimbrough, House	Historic Buildings	Lake
Phillips, Dr. P., House	Historic Buildings	Orange
Pierce, Thomas R., House	Historic Buildings	Sumter
Pinecrest Hotel, Old	Historic Buildings	Highlands
Pinellas County Courthouse, Old	Historic Buildings	Pinellas
Plant City High School	Historic Buildings	Hillsborough
Plant City Union Depot	Historic Buildings	Hillsborough
Polasek, Albin, House and Studio	Historic Buildings	Orange
Polk County Courthouse, Old	Historic Buildings	Polk
Polk Hotel	Historic Buildings	Polk
Polk Theatre and Office Building	Historic Buildings	Polk
Ponce De Leon Inlet Lightstation	Historic Buildings	Pinellas
Porcher House	Historic Buildings	Brevard
Port Orange Florida East Coast Railway Freight Depot	Historic Buildings	Volusia
Potter House	Historic Buildings	Pinellas
Pritchard House	Historic Buildings	Brevard
Purdy Villa	Historic Buildings	Lake
Purdy, Capt. W. F., House	Historic Buildings	Sarasota
Reagin, L.D., House	Historic Buildings	Sarasota
Reasoner, Egbert, House	Historic Buildings	Manatee
Reid, Leonard, House	Historic Buildings	Sarasota

Reid--Woods House	Historic Buildings	Manatee
Revere Quality Institute House	Historic Buildings	Sarasota
Richardson House	Historic Buildings	Manatee
Ritz Theater	Historic Buildings	Seminole
Robbins, Judge George, House	Historic Buildings	Brevard
Robles, Horace T., House	Historic Buildings	Hillsborough
Roebling, Donald, Estate	Historic Buildings	Pinellas
Rogers Building	Historic Buildings	Orange
Rogers House	Historic Buildings	Volusia
Roosevelt Elementary School	Historic Buildings	Hillsborough
Roosevelt School	Historic Buildings	Polk
Rossetter, James Wadsworth, House	Historic Buildings	Brevard
Roth Cigar Factory	Historic Buildings	Sarasota
Rothman, Maurice and Thelma, House	Historic Buildings	Pinellas
Rudolph, Paul, Sarasota High School Addition	Historic Buildings	Sarasota
Russell, Annie, Theatre	Historic Buildings	Orange
Russell, Judge Willis, House	Historic Buildings	Hernando
Ryan & Company Lumber Yard	Historic Buildings	Orange
Safford House	Historic Buildings	Pinellas
Sanford Grammar School	Historic Buildings	Seminole
Sanitary Public Market	Historic Buildings	Pinellas
Santa Rosa Hotel	Historic Buildings	Highlands
Sarasota County Courthouse	Historic Buildings	Sarasota
Sarasota Herald Building	Historic Buildings	Sarasota
Sarasota High School	Historic Buildings	Sarasota
Sarasota Times Building	Historic Buildings	Sarasota
Sarasota Woman's Club	Historic Buildings	Sarasota
Saxon, Frank, House	Historic Buildings	Hernando
Schueler, George, House	Historic Buildings	Sarasota
Scott Commercial Building	Historic Buildings	Sarasota
Sebastian Grammar and Junior High School	Historic Buildings	Indian River
Sebring, H. Orvel, House	Historic Buildings	Highlands
Seminole County Home	Historic Buildings	Seminole
Seybold Baking Company Factory	Historic Buildings	Volusia
Smith, Archie, Wholesale Fish Company	Historic Buildings	Indian River
Snell Arcade	Historic Buildings	Pinellas
Souder, Paul M., House	Historic Buildings	Manatee
South Florida Military College	Historic Buildings	Polk
South Ridgewood Elementary School	Historic Buildings	Volusia
South Side School	Historic Buildings	Sarasota
South Ward School	Historic Buildings	Pinellas
Southwick--Harmon House	Historic Buildings	Sarasota

Spanish Apartments	Historic Buildings	Hillsborough
Spell House	Historic Buildings	Brevard
Spring Lake Community Center	Historic Buildings	Hernando
St. Andrews Episcopal Church	Historic Buildings	Hillsborough
St. Gabriel's Episcopal Church	Historic Buildings	Brevard
St. James A. M. E. Church	Historic Buildings	Seminole
St. Joseph's Catholic Church	Historic Buildings	Brevard
St. Luke's Episcopal Church and Cemetery, Old	Historic Buildings	Brevard
St. Mark's Episcopal Church	Historic Buildings	Polk
St. Petersburg Public Library	Historic Buildings	Pinellas
St. Petersburg Woman's Club	Historic Buildings	Pinellas
St. Rita's Colored Catholic Mission	Historic Buildings	Volusia
Standard Oil Service Station	Historic Buildings	Hillsborough
Stetson, John B., House	Historic Buildings	Volusia
Stevens, Ann, House	Historic Buildings	Volusia
Stevens--Gilchrist House	Historic Buildings	Manatee
Stockton--Lindquist House	Historic Buildings	Volusia
Stovall House	Historic Buildings	Hillsborough
Studebaker Building	Historic Buildings	Pinellas
Sunset Hotel	Historic Buildings	Pinellas
Swearingen, John J., House	Historic Buildings	Polk
Taliaferro, T. C., House	Historic Buildings	Hillsborough
Tampa Bay Hotel	Historic Buildings	Hillsborough
Tampa City Hall	Historic Buildings	Hillsborough
Tampa Free Public Library, Old	Historic Buildings	Hillsborough
Tampa Theater and Office Building	Historic Buildings	Hillsborough
Tampania House	Historic Buildings	Hillsborough
Tarpon Springs City Hall, Old	Historic Buildings	Pinellas
Tarpon Springs High School, Old	Historic Buildings	Pinellas
Taylor, Moses J., House	Historic Buildings	Lake
Terra Ceia Village Improvement Association Hall	Historic Buildings	Manatee
The Masonic Temple of Citrus, Lodge #18, F. and A.M.	Historic Buildings	Citrus
Thompson and Company Cigar Factory	Historic Buildings	Polk
Thoms House	Historic Buildings	Sarasota
Thurman, Howard, House	Historic Buildings	Volusia
Thursby, Louis P., House	Historic Buildings	Volusia
Tillman, G. V., House	Historic Buildings	Polk
Tinker Building	Historic Buildings	Orange
Tourist Church	Historic Buildings	Volusia
Turkey Creek High School, Historic	Historic Buildings	Hillsborough
U.S. Post Office	Historic Buildings	Pinellas
U.S. Post Office-Federal Building	Historic Buildings	Sarasota

Union Depot Hotel, Old	Historic Buildings	Hillsborough
Union Railroad Station	Historic Buildings	Hillsborough
US Post Office	Historic Buildings	Volusia
Vehicle Assembly Building--High Bay and Low Bay	Historic Buildings	Brevard
Veillard House	Historic Buildings	Pinellas
Villa Serena Apartments	Historic Buildings	Manatee
Vinson, Paul L., House	Historic Buildings	Highlands
Wager House	Historic Buildings	Brevard
Waite--Davis House	Historic Buildings	Orange
Warlow, Thomas Picton, Sr., House	Historic Buildings	Orange
Waterhouse, William H., House	Historic Buildings	Orange
Well'sbuilt Hotel	Historic Buildings	Orange
Whaley, Marion S., Citrus Packing House	Historic Buildings	Brevard
Wheeler--Evans House	Historic Buildings	Seminole
White Hall	Historic Buildings	Volusia
Whitfield Estates--Broughton Street Historic District	Historic Buildings	Manatee
Whitfield, J. G., Estate	Historic Buildings	Sarasota
William, H.B., House	Historic Buildings	Sarasota
Williams, John C., House	Historic Buildings	Pinellas
Wilson, Dr. C. B., House	Historic Buildings	Sarasota
Windermere Town Hall	Historic Buildings	Orange
Winston School	Historic Buildings	Polk
Withers--Maguire House	Historic Buildings	Orange
Witherspoon Lodge No. 111 Free and Accepted Masons (F&AM)	Historic Buildings	Lake
Woman's Club of Eustis	Historic Buildings	Lake
Woman's Club of New Smyrna	Historic Buildings	Volusia
Woman's Club of Ocoee	Historic Buildings	Polk
Woman's Club of Palmetto	Historic Buildings	Manatee
Woman's Club of Winter Haven	Historic Buildings	Polk
Woman's Club of Winter Park	Historic Buildings	Orange
Worth's Block	Historic Buildings	Sarasota
Ybor Factory Building	Historic Buildings	Hillsborough
Young, S. Cornelia, Memorial Library	Historic Buildings	Volusia
Bacheller--Brewer Model Home Estate	Historic Districts	Sarasota
Bethune--Cookman College Historic District	Historic Districts	Volusia
Bispham--Wilson Historic District	Historic Districts	Sarasota
Burrows, Waters and Elsa, Historic District	Historic Districts	Sarasota
Curry Houses Historic District	Historic Districts	Manatee
Daytona Beach Bandshell and Oceanfront Park Complex	Historic Districts	Volusia
Dunlawton Avenue Historic District	Historic Districts	Volusia
Estes, R.W. Celery Company Precooler Historic District	Historic Districts	Seminole

Gamble Place Historic District	Historic Districts	Volusia
Huttig, John N., Estate	Historic Districts	Orange
Lake Helen Historic District	Historic Districts	Volusia
Laroe Family Homestead Historic District	Historic Districts	Lake
Midway Subdivision Historic District	Historic Districts	Manatee
Mizell--Leu House Historic District	Historic Districts	Orange
North Avenue Historic District	Historic Districts	Polk
North Franklin Street Historic District	Historic Districts	Hillsborough
Old Town Sebastian Historic District East	Historic Districts	Indian River
Old Town Sebastian Historic District, West	Historic Districts	Indian River
Seaboard Air Line Depot, Old--Sebring	Historic Districts	Highlands
Sebring Downtown Historic District	Historic Districts	Highlands
St. Petersburg Lawn Bowling Club	Historic Districts	Pinellas
Strawn Historic Agricultural District	Historic Districts	Volusia
Strawn Historic Citrus Packing House District	Historic Districts	Volusia
Strawn Historic Sawmill District	Historic Districts	Volusia
Whitfield Estates Lantana Avenue Historic District	Historic Districts	Manatee
Missile Crawler Transporter Facilities	Historic Objects	Brevard
Monument of States	Historic Objects	Osceola
Press Site--Clock and Flag Pole	Historic Objects	Brevard
City Island Ball Park	Historic Sites	Volusia
Dunlawton Plantation--Sugar Mill Ruins	Historic Sites	Volusia
Ferran Park and the Alice McClelland Memorial Bandshell	Historic Sites	Lake
Oak Hill Cemetery	Historic Sites	Polk
Old Fort Park Archeological Site	Historic Sites	Volusia
Regina Shipwreck Site	Historic Sites	Manatee
Rose Hill Cemetery	Historic Sites	Pinellas
Rosemary Cemetery	Historic Sites	Sarasota
Safety Harbor Site	Historic Sites	Pinellas
Tinker Field	Historic Sites	Orange
Anclote Key Lighthouse	Historic Structures	Pinellas
Blackburn Point Bridge	Historic Structures	Sarasota
DUCHESS (Sponge Hooking Boat)	Historic Structures	Pinellas
GEORGE N. CRETEKOS (Sponge Diving Boat)	Historic Structures	Pinellas
Melbourne Beach Pier	Historic Structures	Brevard
N.K. SYMI (Sponge Diving Boat)	Historic Structures	Pinellas
New Smyrna Sugar Mill Ruins	Historic Structures	Volusia
Perry Harvey Sr. Park Skateboard Bowl	Historic Structures	Hillsborough
SS AMERICAN VICTORY (Victory ship)	Historic Structures	Hillsborough
ST. NICHOLAS III (Sponge Diving Boat)	Historic Structures	Pinellas
ST. NICHOLAS VI (Sponge Diving Boat)	Historic Structures	Pinellas
Tarragona Tower	Historic Structures	Volusia

Yulee Sugar Mill Ruins	Historic Structures	Citrus
13th Ave Youth Center and Park	Park	Manatee
28th Street Park	Park	Manatee
Ab Smith Park	Park	Sarasota
Abercrombie Park	Park	Pinellas
Academy Manor Park	Park	Seminole
AL Anderson Park	Park	Pinellas
Al Lopez Park	Park	Hillsborough
Alafia River Park	Park	Hillsborough
Alafia River State Park	Park	Hillsborough
Aldermans Ford Park	Park	Hillsborough
Alexander Park	Park	Hillsborough
Alexander Springs Recreational Area	Park	Lake
Alfred McKethan Pine Island Park	Park	Hernando
Allen David Broussard Catfish Creek Preserve State Park	Park	Polk
Allendale Park	Park	Pinellas
Aloha Gardens Park	Park	Pasco
Anclote Gulf Park	Park	Pasco
Anclote Key Preserve State Park	Park	Pasco
Anclote River Park	Park	Pasco
Antioch Park	Park	Hillsborough
Apollo Beach County Park	Park	Hillsborough
Arbuckle Wildlife Management Area	Park	Highlands
Archie Carr National Wildlife Refuge	Park	Brevard
Arlington Park and Aquatic Center	Park	Sarasota
Arrowhead Park	Park	Pinellas
Arthur Engle Park	Park	Pasco
Austin Tyndell Regional Park	Park	Osceola
Avon Park	Park	Sarasota
Azalea Park	Park	Orange
Babe Ruth Complex-A League	Park	Sarasota
Baker Creek Park	Park	Hillsborough
Ball Field	Park	Hillsborough
Ball Fields Park	Park	Hillsborough
Ball Park	Park	Orange
Ballast Point Park	Park	Hillsborough
Balm Park	Park	Hillsborough
Barnett Family Park	Park	Polk
Barnett Park	Park	Orange
Barrett Park	Park	Hillsborough
Bartlett Park	Park	Pinellas
Bass Lake Park	Park	Pasco

Bay Ave Park	Park	Seminole
Bay Crest Park	Park	Hillsborough
Bay Front Park	Park	Pinellas
Bay Island Park	Park	Sarasota
Bay Vista Park	Park	Pinellas
Bayfront Park	Park	Manatee
Bayfront Park Recreation Center	Park	Manatee
Bayshore Boulevard Linear Park	Park	Hillsborough
Bayside Meadows Park	Park	Pinellas
Baywood Park	Park	Pinellas
Beach Boulevard Park	Park	Pinellas
Beacon Meadows Park	Park	Hillsborough
Beacon Square Park	Park	Pasco
Bealsville Park	Park	Hillsborough
Bear Creek Park	Park	Orange
Beaudette County Park	Park	Hillsborough
Bee Ridge County Park	Park	Sarasota
Bee Ridge Park	Park	Sarasota
Bel-Air 2 Rose Way Parks	Park	Seminole
Belcher Mines Park	Park	Pasco
Bell Creek Preserve	Park	Hillsborough
Belle Vista Triangle Park	Park	Pinellas
Belleair Beach Causeway Park	Park	Pinellas
Ben Lomond Park	Park	Hillsborough
Bertha and Tony Saladino County Park	Park	Hillsborough
Bethune Park	Park	Hillsborough
Bethune Point Park	Park	Volusia
Bicentennial Park	Park	Pinellas
Big Tree Park	Park	Seminole
Biltmore Park	Park	Hillsborough
Bishop Field	Park	Lake
Bithlo Community Park	Park	Orange
Black Bear Wilderness Area	Park	Volusia
Blackstone County Park	Park	Manatee
Blackwater Creek Preserve	Park	Hillsborough
Blake Park	Park	Volusia
Blanchard Park	Park	Orange
Blind Pass Park	Park	Pinellas
Bloomingdale East Park	Park	Hillsborough
Bloomingdale Hills Park	Park	Hillsborough
Bloomingdale West Park	Park	Hillsborough
Blue Water Springs	Park	Volusia

Bobby Hicks Park	Park	Hillsborough
Booker Creek Park	Park	Pinellas
Bookertown Park	Park	Seminole
Boston Hill Park	Park	Seminole
Boyd Hill Nature Park	Park	Pinellas
Boyette Springs Park	Park	Hillsborough
Brandon Park	Park	Hillsborough
Bray and Chelsea Park	Park	Hillsborough
Brinson Park	Park	Osceola
Brittany Park	Park	Pasco
Broadwaters Park	Park	Pinellas
Broderick Park	Park	Pinellas
Brooker Creek Preserve	Park	Hillsborough
Buck Lake Wildlife Management Area	Park	Volusia
Buckhorn Park	Park	Hillsborough
Bull Creek Wildlife Management Area	Park	Osceola
Bullard Park	Park	Hillsborough
Burchwood Park	Park	Hillsborough
Burnett Park	Park	Hillsborough
Busch Field	Park	Pinellas
Buschman Park	Park	Volusia
Bypass Canal Park	Park	Hillsborough
Cacciatore Park	Park	Hillsborough
Caladesi Island State Park	Park	Pinellas
Camp Wai Lani	Park	Pinellas
Campbell Park	Park	Pinellas
Canal Park	Park	Pinellas
Canaveral National Seashore	Park	Volusia
Candyland Park	Park	Seminole
Capaz Park	Park	Hillsborough
Capehart Park	Park	Orange
Cargill County Park	Park	Hillsborough
Carol Elizabeth Kennedy Field	Park	Hillsborough
Carpenter Field	Park	Pinellas
Carrollwood Meadows Park	Park	Hillsborough
Carrollwood Recreation Center	Park	Hillsborough
Catalina Park	Park	Orange
Causeway Park	Park	Sarasota
Centennial Park Sanford Fl	Park	Seminole
Central Florida Fairgrounds	Park	Orange
Central Park	Park	Orange
Central Winds Park	Park	Seminole

Chandler Park	Park	Hillsborough
Charles H Bronson State Forest	Park	Volusia
Chase Park	Park	Pinellas
Chassahowitzka National Wildlife Refuge	Park	Citrus
Chassahowitzka Wildlife Management Area	Park	Hernando
Cheney Park	Park	Hillsborough
Cherry Tree Park	Park	Orange
Childs Park	Park	Pinellas
Childs Park Sports Complex	Park	Pinellas
Chuck Lennon Park	Park	Volusia
Church Park	Park	Hillsborough
Circle B Bar Reserve	Park	Polk
Circle Park	Park	Pinellas
Citrus Park Little League	Park	Hillsborough
Citrus Wildlife Management Area	Park	Hernando
City Island Park	Park	Volusia
City Pier and Waterfront Park	Park	Manatee
City Recreational Facility	Park	Pinellas
Clam Bayou Nature Park	Park	Pinellas
Clam Bayou Park	Park	Pinellas
Clarcona Park	Park	Orange
Clayton Park	Park	Hillsborough
Clearwater Lake Recreation Area	Park	Lake
Cliff Stephens Park	Park	Pinellas
Coachman Park	Park	Pinellas
Coconut Park	Park	Pinellas
Cocoris Park	Park	Pinellas
Coffee Pot Park	Park	Pinellas
Cohen Park	Park	Sarasota
Colins Park	Park	Volusia
College Park Playground	Park	Orange
Colonial Oak Park	Park	Sarasota
Colt Creek State Park	Park	Polk
Columbus Statue Park	Park	Hillsborough
Common Ground Playground	Park	Polk
Commongood Park	Park	Hillsborough
Compton Park	Park	Hillsborough
Coolidge Park	Park	Sarasota
Coquina Bayside Park	Park	Manatee
Coquina Gulfside Park	Park	Manatee
Coquina Key Park	Park	Pinellas
Cotanchobee Fort Brooke Park	Park	Hillsborough

Country Club East Park	Park	Manatee
Country Place East Park	Park	Hillsborough
Country Place West Park	Park	Hillsborough
Country Run Park	Park	Hillsborough
Courier Park	Park	Hillsborough
Craig Park	Park	Pinellas
Crane Park	Park	Manatee
Crescent Lake Park	Park	Pinellas
Crest Lake Park	Park	Pinellas
Crisp Park	Park	Pinellas
Croom Wildlife Management Area	Park	Hernando
Crosby Island Marsh Preserve	Park	Orange
Crystal River Preserve State Park	Park	Citrus
Culbreath Park	Park	Hillsborough
Cuscaden Park	Park	Hillsborough
Cuyler Park	Park	Brevard
Cypress Creek Preserve (Hillsborough County) Preserve	Park	Hillsborough
Cypress Grove Park	Park	Orange
Cypress Lake Park	Park	Pasco
Cypress Park	Park	Volusia
Cyrus Green Playground	Park	Hillsborough
Dacey Park	Park	Orange
Dade Battlefield Historic State Park	Park	Sumter
Daisy Stocking Park	Park	Volusia
David E West Park	Park	Hillsborough
Davis Field	Park	Pinellas
Davis Island Playground	Park	Hillsborough
Davis Park	Park	Hillsborough
De Leon Springs State Park	Park	Volusia
Dead River Park	Park	Hillsborough
Debary Community Park	Park	Volusia
Delaney Park	Park	Orange
Delta Woods Park	Park	Hernando
Demens Landing Park	Park	Pinellas
Demetree Park	Park	Orange
Denn John Park	Park	Osceola
Denver Park	Park	Pinellas
Derby Park	Park	Seminole
Derbyshire Recreation Area	Park	Volusia
Desota Park Playground	Park	Hillsborough
Desoto National Memorial	Park	Manatee
Detweiler Park	Park	Volusia

Dewey Boster Park	Park	Volusia
Dick Greco Jr Softball Complex	Park	Hillsborough
Dickson Park	Park	Orange
Disney Wilderness Preserve	Park	Polk
Disston Lake Park	Park	Pinellas
Donnelly Park	Park	Lake
Dorsett Park	Park	Pinellas
Double Run Preserve	Park	Lake
Dover District Park	Park	Hillsborough
Dover Mott Park	Park	Hillsborough
Dover Park	Park	Hillsborough
Downey Park	Park	Orange
Dreggors Park	Park	Volusia
Dunedin Community Center Park	Park	Pinellas
Dupont Lake Park	Park	Volusia
Duran Park	Park	Hillsborough
E L Bing Park	Park	Hillsborough
Eagle Crest Park	Park	Pinellas
Earl Brown Park	Park	Volusia
Earl Simmons County Park	Park	Hillsborough
East Bay Little League	Park	Hillsborough
East Bradenton Recreation Center	Park	Manatee
East Tarpon Recreation Center	Park	Pinellas
Eastpoint Little League Fields	Park	Hillsborough
Eastwood Park	Park	Sarasota
Econ River Wilderness Area	Park	Seminole
Edgewater Park	Park	Pinellas
Edward Medard Park	Park	Hillsborough
Eg Simmons County Park	Park	Hillsborough
Egan Park	Park	Orange
Egypt Lake Park	Park	Hillsborough
El Dorado Park	Park	Orange
Elapp Forty Eight Park	Park	Hillsborough
Ellie Schiller Homosassa Springs Wildlife State Park	Park	Citrus
Elliot Ave Park	Park	Seminole
Ellis Park	Park	Hillsborough
Elysial Memorial Park	Park	Orange
Emerson Point Park	Park	Manatee
Englewood Park	Park	Orange
Epps Park	Park	Hillsborough
Euclid Park	Park	Pinellas
Evans Park	Park	Hillsborough

Fair Oaks Park	Park	Hillsborough
Fairview Park	Park	Orange
Fay Boulevard Park	Park	Brevard
Fern Prairie Preserve	Park	Lake
Ferran Park	Park	Lake
Fivay Recreation Complex	Park	Pasco
Flatwoods Wilderness County Park	Park	Hillsborough
Fletcher Park on Lake Bonny	Park	Polk
Flora Wylie Park	Park	Pinellas
Flutie Athletic Complex	Park	Brevard
Flying Eagle Wildlife Management Area	Park	Sumter
Forest Bluff Park	Park	Pinellas
Forest Run Park	Park	Pinellas
Fort Christmas Park	Park	Orange
Fort Cooper State Park	Park	Citrus
Fort de Soto Park	Park	Hillsborough
Fort Mellow Park	Park	Seminole
Fossil Park	Park	Pinellas
Foster Playground	Park	Hillsborough
Fox Lake Park	Park	Brevard
Frank Rendon Park	Park	Pinellas
Franklin Heights Park	Park	Pinellas
Fred Ball Park	Park	Hillsborough
Fred Howard Park	Park	Pinellas
Freedom Lake Park	Park	Pinellas
Freedom Park	Park	Hillsborough
Friendship Park	Park	Seminole
Fruitville Park	Park	Sarasota
Fruitville Road Park	Park	Sarasota
G T Bray Recreation Complex	Park	Manatee
Gadsden Park	Park	Hillsborough
Gaither Field	Park	Hillsborough
Gandy Park	Park	Hillsborough
Gardenville Recreation Center and Park	Park	Hillsborough
Gary Playground	Park	Hillsborough
George Barker Memorial Park	Park	Orange
George F Heine Jr Park	Park	Hardee
Gibson Park	Park	Hillsborough
Giddons Playground	Park	Hillsborough
Gilbert Park	Park	Lake
Gilchrist Park	Park	Hillsborough
Gillespie Park	Park	Sarasota

Gladden Park	Park	Pinellas
Glebe Park	Park	Sarasota
Godwin Park	Park	Osceola
Granada Terrace Parkway Park	Park	Pinellas
Grand Ave Elementary School Park	Park	Orange
Grandview Park	Park	Pinellas
Grant Field	Park	Pinellas
Grant Park	Park	Hillsborough
Green Key Park	Park	Pasco
Green Swamp West Unit Wildlife Management Area	Park	Sumter
Green Swamp Wildlife Management Area	Park	Sumter
Greenbrook Adventure Park	Park	Manatee
Greenwood Lakes Park	Park	Seminole
Greenwood Urban Wetlands	Park	Orange
Groveview Village Park	Park	Seminole
Guernsey Park	Park	Orange
Gulf Front Park	Park	Pinellas
Gulfport Beach Park	Park	Pinellas
Half Moon Wildlife Management Area	Park	Citrus
Halifax Harbor Park	Park	Volusia
Hamilton Park	Park	Hillsborough
Hampton Park	Park	Hillsborough
Hankins Park	Park	Orange
Hardee Park	Park	Hardee
Harding Park	Park	Pinellas
Harris Memorial Park	Park	Volusia
Harshaw Lake	Park	Pinellas
Hatbill Park	Park	Volusia
Hawk Park	Park	Hillsborough
Hawthorne Park	Park	Orange
Heather Lakes Park	Park	Hillsborough
Helen Howarth Park	Park	Pinellas
Hemdon Park	Park	Orange
Henry Lee Park	Park	Volusia
Heritage Park	Park	Pinellas
Hester Park	Park	Volusia
Hibiscus Park	Park	Pasco
Highland Pines Playground	Park	Hillsborough
Highland Playground	Park	Hillsborough
Highlander Park	Park	Pinellas
Highlands County Fair Grounds	Park	Highlands
Highlands Hammock State Park	Park	Highlands

Hillsborough County Park	Park	Hillsborough
Hillsborough River State Park	Park	Hillsborough
Hilochee Wildlife Management Area	Park	Lake
Holden Community Park	Park	Citrus
Holder Park	Park	Brevard
Holiday Recreation Complex	Park	Pasco
Hollyland Park	Park	Volusia
Holopaw State Forest	Park	Osceola
Homosassa Wildlife Management Area	Park	Citrus
Honeymoon Island State Park	Park	Pinellas
Honore Trail Park	Park	Sarasota
Hontoon Island State Park	Park	Volusia
Hourglass Park	Park	Hillsborough
Hovnanian Park	Park	Seminole
Howell Branch Park	Park	Orange
Hoyt Park	Park	Pinellas
Huerta Park	Park	Hillsborough
Huggins-Stengel Field	Park	Pinellas
Hunt Memorial Park	Park	Manatee
Hurley Park	Park	Pinellas
Hyde Park	Park	Hillsborough
Indian Mounds Park	Park	Hillsborough
Indian Springs Park	Park	Manatee
Interbay Park	Park	Hillsborough
Island Park	Park	Sarasota
Isle of Pine Preserve	Park	Orange
Ivanhoe Park	Park	Orange
J B Starkey Wilderness Park	Park	Pasco
J. C. Handley Athletic Complex	Park	Hillsborough
J. W. Cate Recreation Center	Park	Pinellas
Jack Puryear Park	Park	Pinellas
Jackson Heights Playground	Park	Hillsborough
Jackson Park	Park	Hillsborough
Jackson Springs Park	Park	Hillsborough
Jean Park	Park	Hillsborough
Jenkins Creek Park	Park	Hernando
John Bonner Nature Park	Park	Pinellas
John Chestnut Senior Park	Park	Pinellas
John F. Germany Legacy Park	Park	Hillsborough
Johnson Park	Park	Osceola
Jorgenson Lake Park	Park	Pinellas
Jumper Creek Wildlife Management Area	Park	Sumter

Jungle Park	Park	Pinellas
Jungle Prada and de Narvaez Park	Park	Pinellas
Kars Park	Park	Brevard
Keith Waller Park	Park	Hillsborough
Kelly County Park	Park	Orange
Kelly Park	Park	Brevard
Ken Thompson Park	Park	Sarasota
Kennedy Park	Park	Hernando
Kenny Dixon Sports Complex	Park	Sumter
Kenwood Park	Park	Pinellas
Key Vista Slash Gills Park	Park	Pasco
Keystone Park	Park	Hillsborough
Keysville Park and Community Center	Park	Hillsborough
Kicco Wildlife Management Area	Park	Highlands
Kings Forest Park	Park	Hillsborough
Kings Park	Park	Brevard
Kissimmee Chain of Lakes Area	Park	Polk
Kissimmee Prairie Preserve State Park	Park	Highlands
Kiwanis Park	Park	Pinellas
Knights Griffin Park	Park	Hillsborough
Kolb Park	Park	Pinellas
Kraft Azalea Park	Park	Orange
Lake Adair Park	Park	Orange
Lake Cane Marsha Park	Park	Orange
Lake Chautuaqua Park	Park	Pinellas
Lake Cherokee Park	Park	Orange
Lake Como Park	Park	Orange
Lake David Park	Park	Lake
Lake Davis Park	Park	Orange
Lake Eola Park	Park	Orange
Lake Eva Park	Park	Polk
Lake Gem Park	Park	Seminole
Lake George State Forest	Park	Volusia
Lake George Wildlife Management Area	Park	Volusia
Lake Griffin State Park	Park	Lake
Lake Harney Wilderness Area	Park	Seminole
Lake Highland Park	Park	Orange
Lake Jessup Park	Park	Seminole
Lake Jesup Wilderness Area	Park	Seminole
Lake Kissimmee State Park	Park	Polk
Lake Lawsona Park	Park	Orange
Lake Lotus Park	Park	Seminole

Lake Louisa State Park	Park	Lake
Lake Louise	Park	Pinellas
Lake Lucille Park	Park	Pinellas
Lake Manatee State Park	Park	Manatee
Lake Marion Creek Wildlife Management Area	Park	Polk
Lake Mills County Park	Park	Seminole
Lake Monroe Park	Park	Volusia
Lake Monroe Westside Park	Park	Seminole
Lake Monroe Wildlife Management Area	Park	Volusia
Lake Orienta Park	Park	Seminole
Lake Panasoffkee Wildlife Management Area	Park	Sumter
Lake Park	Park	Hillsborough
Lake Pasadena Park	Park	Pinellas
Lake Proctor Wilderness Area	Park	Seminole
Lake Rogers County Park	Park	Hillsborough
Lake Underhill Park	Park	Orange
Lake View Park	Park	Pinellas
Lake Vista Park	Park	Pinellas
Lake Wales Ridge National Wildlife Refuge	Park	Highlands
Lake Wales Ridge State Forest	Park	Highlands
Lake Weeks Park	Park	Hillsborough
Lake Woodruff National Wildlife Refuge	Park	Volusia
Lakefront Park	Park	Osceola
Lakeview Park	Park	Sarasota
Lakewood Country Park	Park	Hillsborough
Lakewood Ranch Community Park	Park	Manatee
Lakewood Village Park	Park	Hillsborough
Lamb Park	Park	Manatee
Land O Lakes Park	Park	Pasco
Land O Lakes Recreation Complex	Park	Pasco
Langford Park	Park	Orange
Larrick Park	Park	Hillsborough
Lassing Park	Park	Pinellas
Laurel Street Park	Park	Hillsborough
Lazarillo Park	Park	Pinellas
Lenox Park	Park	Volusia
Leslee Park	Park	Pinellas
Lettuce Lake Park	Park	Hillsborough
Leu Gardens	Park	Orange
Lewis Park	Park	Manatee
Lickton Park	Park	Pinellas
Lighthouse Point Park	Park	Pinellas

Limona Park	Park	Hillsborough
Lincoln Community Park	Park	Manatee
Linda Pederson Park at Jenkins Creek	Park	Hernando
Lindy McDaniel Field	Park	Hillsborough
Lions Park	Park	Polk
Lithia Clubhouse Park	Park	Hillsborough
Lithia Pinecrest Park	Park	Hillsborough
Lithia Springs County Park	Park	Hillsborough
Little Bayou Park	Park	Pinellas
Little Big Econ State Forest	Park	Volusia
Little Manatee River State Park	Park	Hillsborough
Live Oak Playground	Park	Volusia
Lizzie Rodgers Park	Park	Orange
Lloyd Copeland Park	Park	Hillsborough
Lockhaven Park	Park	Orange
Logan Gate Park	Park	Hillsborough
Logan Park	Park	Hillsborough
Long Lake Park	Park	Seminole
Longleaf Pine Preserve	Park	Volusia
Longwood Park	Park	Sarasota
Lori Wilson Park	Park	Brevard
Lorna Doone Park	Park	Orange
Lou Piniella Softball Field	Park	Hillsborough
Lower Wekiva River Preserve State Park	Park	Volusia
Lowry Park	Park	Hillsborough
Lukewood Park	Park	Sarasota
Lula M McElroy Park	Park	Pinellas
Lutz Little League Park	Park	Hillsborough
Lutz Memorial Park	Park	Hillsborough
Lydia Pettis Park	Park	Volusia
MacFarlane Park	Park	Hillsborough
Madeira Beach Access Park	Park	Pinellas
Madira Bickel Mound State Archaeological Site	Park	Manatee
Magnolia Ave Park	Park	Seminole
Magnolia Park	Park	Orange
Malibu Park	Park	Orange
Manard May Park	Park	Volusia
Manatee County Boys and Girls Clubs	Park	Manatee
Manatee Cove Park	Park	Brevard
Manatee Island Park	Park	Volusia
Mango Park	Park	Hillsborough
Manny Rodriguez Memorial Park	Park	Volusia

Maple Street Park	Park	Orange
Marina Park	Park	Osceola
Marjorie Park	Park	Hillsborough
Mark Durbin Community Park	Park	Osceola
Marsh Memorial Park	Park	Lake
Marshall Park	Park	Pinellas
Marti Park	Park	Hillsborough
Martin Luther King Neighborhood Center	Park	Pinellas
Martin Luther King Park	Park	Sarasota
Martin Luther King Recreation Complex	Park	Hillsborough
Martin Luther King, Jr. Park	Park	Orange
Mary Dewees Park	Park	Volusia
Mary Holland Park	Park	Polk
Mary McCleod Bethune Park	Park	Volusia
Marymont Park	Park	Pinellas
Masonic Park and Youth Camp	Park	Hillsborough
Mastry Park	Park	Pinellas
Maxfield Park	Park	Sarasota
Maximo Park	Park	Pinellas
McCray Sports Complex	Park	Manatee
McGough Nature Park	Park	Pinellas
McKethan Park	Park	Hernando
McKinney Park	Park	Lake
McMullen Park	Park	Pinellas
McQueen Park	Park	Orange
Mead Botanical Garden	Park	Orange
Meadowlawn Park	Park	Pinellas
Melodie Park	Park	Volusia
Memorial Park	Park	Seminole
Merrill Park	Park	Seminole
Midway Park	Park	Seminole
Mike E Sansone Community Park	Park	Hillsborough
Miss Sarasota Softball Complex	Park	Sarasota
Mobbly Bayou Wilderness Preserve	Park	Pinellas
Mobbly Beach Park	Park	Pinellas
Moccasin Lake Park	Park	Pinellas
Monterey Park	Park	Pinellas
Moon Lake Park	Park	Pasco
Moore Youth Baseball Complex	Park	Volusia
Morgan Street Park	Park	Hillsborough
Morgan Woods Playground Park	Park	Hillsborough
Morris Bridge Park	Park	Hillsborough

Mort Playground Park	Park	Hillsborough
Moss Park	Park	Orange
Mound Park	Park	Pinellas
Municipal Stadium-Ballfields	Park	Volusia
Myakka Head Park	Park	Manatee
Myakka River State Park	Park	Sarasota
Nancy Cummings Park	Park	Volusia
Nathanial Hunter Park	Park	Hillsborough
Neal Preserve	Park	Manatee
Nebraska Avenue Park	Park	Hillsborough
Ned Wagner Park	Park	Volusia
New Lakeside Park	Park	Hillsborough
Newton Eastern Park	Park	Sarasota
Nick Bollettieri Soccer Center	Park	Manatee
Nick Bollettieri Tennis Center	Park	Manatee
North Brandon Sports Complex	Park	Hillsborough
North City Park	Park	Pinellas
North Hubert Playground	Park	Hillsborough
North Metro Park	Park	Sarasota
North Point Park	Park	Hillsborough
North Sebastian Conservation Area	Park	Indian River
North Shore Park	Park	Pinellas
North Straub Park	Park	Pinellas
North Tampa Park	Park	Hillsborough
North Water Tower Park	Park	Sarasota
Northdale Recreation Center	Park	Hillsborough
Northdale Soccer Club Park	Park	Hillsborough
Northside Little League	Park	Hillsborough
Northwest Little League Park	Park	Hillsborough
Northwest Park	Park	Pinellas
Norton Park	Park	Pinellas
Nuccio Park	Park	Hillsborough
Nye Park	Park	Hillsborough
Oak Park	Park	Hillsborough
Oak Ridge Park	Park	Pasco
Oak Street Park	Park	Osceola
Oakland Nature Preserve	Park	Orange
Ocala National Forest	Park	Volusia
Ocala Wildlife Management Area	Park	Volusia
Odessa Park	Park	Pasco
Ola and Henry Playground Park	Park	Hillsborough
Old Hyde Park	Park	Hillsborough

Olds Park	Park	Pinellas
Omar K Lightfoot Recr Center	Park	Hillsborough
Orange Ave Park	Park	Seminole
Orange Avenue Park	Park	Sarasota
Orange Grove Drive Recr Area	Park	Hillsborough
Oren Brown Park	Park	Osceola
Orlando Sports Complex	Park	Orange
Orlando Tennis Centre	Park	Orange
Orlando Wetlands Park	Park	Orange
Oscar Cooler Park	Park	Hillsborough
Oscar Scherer State Park	Park	Sarasota
Osprey Unit - Hilochee Wildlife Management Area	Park	Polk
Otis M Andrews Sports Complex	Park	Hillsborough
Overbrook Park	Park	Pinellas
Overlook Park	Park	Manatee
Oviedo Riverside Park	Park	Seminole
Palatakaha Park	Park	Lake
Palma Ceia Lions Park	Park	Hillsborough
Palma Ceia Little League	Park	Hillsborough
Palma Ceia Park	Park	Hillsborough
Palma Sola Recreation Park	Park	Manatee
Paramount Park	Park	Hillsborough
Park Lake Park	Park	Orange
Park Riverside	Park	Pinellas
Parrish Park	Park	Brevard
Partin Triangle Park	Park	Osceola
Patterson Park	Park	Polk
Paul Sanders Park	Park	Hillsborough
Paw Park North	Park	Sarasota
Payne Park Field and Tennis Center	Park	Sarasota
Paynes Creek Historic State Park	Park	Hardee
Pelican Island National Wildlife Refuge	Park	Indian River
Perico Preserve	Park	Manatee
Phil Bourquarez Park	Park	Hillsborough
Philippe Park	Park	Pinellas
Philippi Estate Park	Park	Sarasota
Phillippi Shores Park	Park	Sarasota
Phillips Jones Park	Park	Pinellas
Picnic Island Park	Park	Hillsborough
Pine Craft Park	Park	Sarasota
Pine Island Conservation Area	Park	Brevard
Pinecrest Park	Park	Seminole

Pinecrest Sports Complex	Park	Hillsborough
Pinehill Recreation Complex	Park	Pasco
Pinehurst Park	Park	Seminole
Pinellas National Wildlife Refuge	Park	Pinellas
Pioneer Park	Park	Sarasota
Plant City Ball Fields	Park	Hillsborough
Plant Park	Park	Hillsborough
Pleasant Valley Park	Park	Orange
Plymouth Park	Park	Hillsborough
Plymouth Playground	Park	Hillsborough
Polanis Park	Park	Hillsborough
Ponce de Leon Playground	Park	Hillsborough
Pop Stanstell Park	Park	Pinellas
Poppy Park	Park	Orange
Port Tampa Community Center	Park	Hillsborough
Port Tampa Park	Park	Hillsborough
Port Tampa Playground	Park	Hillsborough
Potter Park	Park	Sarasota
Potts Wildlife Management Area	Park	Citrus
Poynter Park	Park	Pinellas
Prairie Lakes Unit - Three Lakes Wildlife Management Area	Park	Osceola
Progress Village Park	Park	Hillsborough
Providence Park and Community Center	Park	Hillsborough
R D Keene Park	Park	Orange
Ragan Park	Park	Hillsborough
Randell Chase Park	Park	Seminole
Rattlesnake Park	Park	Orange
Ravenall Park	Park	Orange
Recreation Center	Park	Hillsborough
Red Bug Lake Park	Park	Seminole
Red Bug Slough	Park	Sarasota
Red McEwen Field	Park	Hillsborough
Red Rock Park	Park	Sarasota
Reed Canal Park	Park	Volusia
Rey Park	Park	Hillsborough
Richard Ervin Park	Park	Pinellas
Richloam Wildlife Management Area	Park	Sumter
Ridge Park	Park	Lake
Ridgecrest Park	Park	Pinellas
Ridgedale Sports Complex	Park	Hillsborough
Rima Ridge Unit - Tiger Bay Wildlife Management Area	Park	Volusia
Rio Vista Park	Park	Pinellas

River Acres Park	Park	Hillsborough
River Boulevard Park	Park	Hillsborough
River Garden Park	Park	Hillsborough
Rivercove Park	Park	Hillsborough
Rivercrest Park	Park	Hillsborough
Riverfront Park	Park	Volusia
Riverfront Veterans Memorial Park	Park	Volusia
Riverhills Park	Park	Hillsborough
Riverside Park	Park	Volusia
Riverside Pavilion Park	Park	Volusia
Riverview Park	Park	Sarasota
Riverview Terrace Playground	Park	Hillsborough
Riviera Park	Park	Volusia
Roadside Park	Park	Volusia
Robards Sports Arena	Park	Sarasota
Robert Nicol Park	Park	Brevard
Roberts Community Center Park	Park	Pinellas
Robinson Preserve	Park	Manatee
Robles Park	Park	Hillsborough
Rocco Park	Park	Volusia
Rock Lake Park	Park	Orange
Rock Springs Run State Reserve	Park	Orange
Rock Springs Run Wildlife Management Area	Park	Orange
Rodney Colson County Park	Park	Hillsborough
Rogers Park	Park	Hillsborough
Rome And Sligh Park	Park	Hillsborough
Ron Frost Athletic Complex	Park	Hillsborough
Rose Park	Park	Manatee
Rose Place Park	Park	Orange
Roseland Park	Park	Hillsborough
Roseland Park Recreation Area	Park	Seminole
Rosell Park	Park	Pinellas
Roser Park	Park	Pinellas
Rossi Waterfront Park	Park	Manatee
Rotary Park	Park	Pinellas
Rotary Riverfront Park	Park	Hillsborough
Round Lake Park	Park	Seminole
Rowlett Park	Park	Hillsborough
Roy Haynes Park	Park	Hillsborough
Royal Park	Park	Sumter
Ruskin Center Park	Park	Hillsborough
Russell Park	Park	Hillsborough

Rye Preserve	Park	Manatee
Safety Harbor City Park	Park	Pinellas
Salt Lake Wildlife Management Area	Park	Brevard
Sam Horton Stadium	Park	Hillsborough
Sand Key County Park	Park	Pinellas
Sand Point Park	Park	Brevard
Sandra Perrone Park One	Park	Hillsborough
Sanford Community Park	Park	Seminole
Sanlando Park	Park	Seminole
Sargeant Wilderness Memorial Park	Park	Hillsborough
Savage/Christmas Creek Preserve	Park	Orange
Sawgrass Lake Park	Park	Pinellas
Scotsdale Park	Park	Pinellas
Scout Park	Park	Hillsborough
Sebastian Inlet State Park	Park	Brevard
Seffner Park	Park	Hillsborough
Selby Botanical Gardens	Park	Sarasota
Seminole City Park	Park	Pinellas
Seminole County Softball Complex	Park	Seminole
Seminole Forest Wildlife Management Area	Park	Lake
Seminole Park	Park	Pinellas
Seminole Ranch Wildlife Management Area	Park	Orange
Seminole State Forest	Park	Lake
Seminole Youth Center	Park	Pinellas
Senator Beth Johnson Park	Park	Orange
Shane Kelly Park	Park	Seminole
Sheffield Park	Park	Pinellas
Sherwood L. Stokes Preserve/Lake Marion Preserve	Park	Polk
Shimberg Park	Park	Hillsborough
Shore Acres Park	Park	Pinellas
Shoreland Park	Park	Sarasota
Simmons Bowers Park	Park	Hillsborough
Sissler Field	Park	Pinellas
Skycrest Park	Park	Pinellas
Skyview Playground	Park	Hillsborough
Skywalk Little League Park	Park	Hillsborough
Smyrna Dunes Park	Park	Volusia
Snell Isle Park	Park	Pinellas
Snowden Park	Park	Hillsborough
Soldiers Creek Park	Park	Seminole
Soreno Park	Park	Pinellas
South Lido Park and Nature Center	Park	Sarasota

Southgate Circle Park	Park	Sarasota
Southwest Community Center and Park	Park	Hillsborough
Southwest Little League Park	Park	Hillsborough
Southwest Recreation Complex	Park	Pinellas
Southwest Tampa Little League	Park	Hillsborough
Spanish Point	Park	Sarasota
Speer Grove Park	Park	Seminole
Sperling Sports Complex	Park	Volusia
Spessard Holland South Beach Park	Park	Brevard
Spivey Sports Complex	Park	Polk
Spring Hammock Preserve	Park	Seminole
Spring Lake Park	Park	Orange
Spring Valley Farms Recreational Park	Park	Seminole
Springhead Park	Park	Hillsborough
Springhill Park	Park	Hillsborough
Spruce Creek Park	Park	Volusia
St Petersburg Beach Park	Park	Pinellas
St Sebastian River Preserve State Park	Park	Indian River
St. Johns National Wildlife Refuge	Park	Brevard
Stearns Road Park	Park	Hillsborough
Stephen J Wortham Park	Park	Hillsborough
Sterling Heights County Park	Park	Hillsborough
Sterling Ranch Park	Park	Hillsborough
Suburbia Playground	Park	Volusia
Sulphur Springs Park	Park	Hillsborough
Summerall Park	Park	Lake
Sumner Acres Park	Park	Hillsborough
Sun City Heritage Park	Park	Hillsborough
Sun Splash Park	Park	Volusia
Sundance Park	Park	Hillsborough
Sunland Estates Park	Park	Seminole
Sunnyland Recreation Area	Park	Volusia
Sunrise Park	Park	Volusia
Sunset Beach Park	Park	Pinellas
Sunset Beach Pavilion and Park	Park	Pinellas
Sunset Park	Park	Pinellas
Sunshine Park	Park	Orange
Sutton Park	Park	Manatee
Swann Circle Park	Park	Hillsborough
Sweetwater Park	Park	Seminole
Sylvan Lake Park	Park	Seminole
T. Mabry Carlton, Jr. Memorial Reserve	Park	Sarasota

Takomah Trail Park	Park	Hillsborough
Tampa Park Plaza	Park	Hillsborough
Tangerine Park	Park	Pinellas
Taylor Park	Park	Pinellas
Taylor Reservoir Park	Park	Pinellas
Temple Crest Community Center	Park	Hillsborough
Temple Crest Park	Park	Hillsborough
Temple Terrace Playground Park	Park	Hillsborough
Temple Terrace Youth Sports Complex	Park	Hillsborough
Terra Ceia Park	Park	Manatee
The Curtis Hixon Waterfront Park	Park	Hillsborough
The Great Mirror Lake	Park	Pinellas
The Hammock Park	Park	Pinellas
The Pavillion Community Park	Park	Seminole
Thonotosassa Park	Park	Hillsborough
Three Lakes Wildlife Management Area	Park	Osceola
Tiger Bay State Forest	Park	Volusia
Tiger Bay Wildlife Management Area	Park	Volusia
Timber Ridge Park	Park	Volusia
Timberland Park N Recr Center	Park	Hillsborough
Timberlane Park	Park	Hillsborough
Tinker Field	Park	Orange
Tom Varn Park	Park	Hernando
Tomlinson Park	Park	Pinellas
Tony Jannus Park	Park	Hillsborough
Tosohatchee Wildlife Management Area	Park	Brevard
Town and Country Park	Park	Hillsborough
Town and Country Preserve	Park	Hillsborough
Treasure Island Community Center Park	Park	Pinellas
Trimble Park	Park	Orange
Triple N Ranch Wildlife Management Area	Park	Osceola
Trout Creek Wilderness County Park	Park	Hillsborough
Turkey Creek Playground	Park	Hillsborough
Turkey Lake Park	Park	Orange
Turtle Beach Park	Park	Sarasota
Turtle Lakes Park	Park	Pasco
Tuscawilla Park	Park	Volusia
Tuttle Avenue Park	Park	Sarasota
Twin Lakes Park	Park	Sarasota
Tyrone Park	Park	Pinellas
Ulmer Park	Park	Pinellas
University Community Park	Park	Hillsborough

Upham Beach Park	Park	Pinellas
Upper Hillsborough Wildlife Management Area	Park	Polk
Upper St John's River Marsh Wildlife Management Area	Park	Brevard
Upper Tampa Bay County Park	Park	Hillsborough
USF Park	Park	Hillsborough
Valentine Park	Park	Volusia
Valrico Park	Park	Hillsborough
Vance Vogel Park	Park	Hillsborough
Vann Park	Park	Volusia
Veterans Memorial Park	Park	Pasco
Veterans Memorial Regional Park	Park	Hillsborough
Vignetti Park	Park	Orange
Vina del Mar Park	Park	Pinellas
Vinoy Park	Park	Pinellas
Violet Cury Nature Preserve	Park	Hillsborough
W H Jack Mitchell Park	Park	Pasco
W W James Park	Park	Brevard
Wadeview Park	Park	Orange
Walk-in-the-Water Wildlife Management Area	Park	Polk
Walsingham County Park	Park	Pinellas
Walter Fuller Park	Park	Pinellas
War Veterans Memorial Park	Park	Pinellas
Ward Park	Park	Orange
Warren Park	Park	Orange
Washington Oaks Park	Park	Seminole
Washington Shore Park	Park	Orange
Weedon Island Preserve	Park	Pinellas
Weeki Wachee Springs State Park	Park	Hernando
Wekiwa Springs State Park	Park	Orange
Wellswood Baseball Complex	Park	Hillsborough
Werner-Boyce Salt Springs State Park	Park	Pasco
Wes Crile Park	Park	Volusia
West Park	Park	Hillsborough
West Pines Park	Park	Hillsborough
West Tampa Little League Park	Park	Hillsborough
Westchase Recreational Center	Park	Hillsborough
Westmonte Park	Park	Seminole
Westwind Park	Park	Hillsborough
Westwood Lakes Park	Park	Hillsborough
Whistle Stop Park	Park	Volusia
Whitaker Gateway Park	Park	Sarasota
Whitfield Park	Park	Manatee

Wickham Park	Park	Brevard
Wildwood Park	Park	Pinellas
William Owens Pass Park	Park	Hillsborough
Williams Park	Park	Hillsborough
Williams Park Pool and Playground	Park	Hillsborough
Williams Tanner Road Park	Park	Hillsborough
Willie Mays Park	Park	Orange
Wilmslow Park	Park	Pasco
Wimauma Park	Park	Hillsborough
Withlacoochee State Forest	Park	Hernando
Wood Park	Park	Pinellas
Wood Valley Park	Park	Pinellas
Woodgate Park	Park	Pinellas
Woodlawn Park	Park	Pinellas
Woodmont Park	Park	Hillsborough
Wright Park	Park	Pinellas
Wynnewood Park	Park	Seminole
Ybor City Museum State Park	Park	Hillsborough
Youth Athletic Complex	Park	Sarasota
Youth Park	Park	Pinellas
Yulee Sugar Mill Ruins Historic State Park	Park	Citrus
Zinnbeck Park	Park	Seminole

Source: FWC 2024

Appendix C
List of Agencies Consulted, Preparers, and Reviewers

Consulting Agency / Tribal Government	Representative
Coushatta Tribe of Louisana	Chairman Jonathan Cernek
Miccosukee Tribe of Indians	Chairman Talbert Cypress
Muscogee (Creek) Nation	Principal Chief David Hill
Seminole Tribe of Florida	Chairman Marcellus Osceola Jr.
Florida State Historic Preservation Office	Scott Edwards
U.S. Fish and Wildlife Service	Pending
Florida Department of Environmental Protection	State Environmental Clearinghouse

Name and Affiliation	Years of Industry Experience	EA Responsibility
FAA Evaluators		
Shelia Neumann Ph.D., P.E.; FAA AFS (Office of Safety Standards, Flight Standards Service) General Aviation Operations	30	Environmental Protection Specialist, NEPA Project Lead and Document Review
Christopher Hurst REM, CEA, CESCO; FAA AFS (Office of Safety Standards, Flight Standards Service) General Aviation Operations	20	Environmental Protection Specialist, Document Review
Christopher Couture, FAA AQS (Aviation Safety, Quality, Integration, and Executive Services)	17	Environmental Protection Specialist, Document Review
Adam Scholten, FAA AEE (Office of Environment and Energy, Noise Division [AEE-100])	13	Environmental Protection Specialist, Noise Analysis and Document Review
Susumu Shirayama, FAA AEE (Office of Environment and Energy, Noise Division [AEE-100])	22	Environmental Protection Specialist, Noise Analysis and Document Review
Preparers		
Rob Greene, ICF	12	NEPA SME, Research, and Document Preparation
Jimmy Zaccagnino, ICF	4	Research and Document Preparation
Elisabeth Mahoney, ICF	5	Research and Document Preparation
Robbie Baldwin, ICF	5	Biologist and Document Preparation
Megan O'Donnell, ICF	9	QA/QC

Appendix D
Noise

Appendix E
Biological Resources

Table E-1. State Species of Greatest Conservation Need in Brevard, Citrus, DeSoto, Hardee, Hernando, Highlands, Hillsborough, Indian River, Lake, Manatee, Marion, Okeechobee, Orange, Osceola, Pasco, Pinellas, Polk, Sarasota, Seminole, Sumter and Volusia Counties, Florida.

Taxon	Scientific Name	Common Name	ESA Status	State Status
Amphibians				
	Amphiuma pholeter	One-toed Amphiuma		
	Lithobates capito	Gopher frog		
	Notophthalmus perstriatus	Striped Newt		
Birds				
	Ammodramus savannarum floridanus	Florida Grasshopper Sparrow	E	
	Ammospiza maritima	Seaside Sparrow		
	Ammospiza maritima peninsulae	Scott's Seaside Sparrow		ST
	Antigone canadensis pratensis	Florida Sandhill Crane		ST
	Aphelocoma coerulescens	Florida Scrub-Jay	E	
	Aramus guarauna	Limpkin		
	Athene cunicularia	Burrowing Owl		
	Athene cunicularia floridana	Florida Burrowing Owl		ST
	Buteo brachyurus	Short-tailed Hawk		
	Caracara plancus	Crested Caracara	T	
	Charadrius melodus	Piping Plover	T	
	Charadrius nivosus	Snowy Plover		ST
	Cistothorus palustris	Marsh Wren		
	Cistothorus palustris marianae	Marian's Marsh Wren		ST
	Dryobates borealis	Red-cockaded Woodpecker	E	
	Dryobates villosus	Hairy Woodpecker		
	Egretta rufescens	Reddish Egret		ST
	Egretta thula	Snowy Egret		
	Elanoides forficatus	Swallow-tailed Kite		
	Elanus leucurus	White-tailed Kite		
	Falco peregrinus	Peregrine Falcon		
	Falco sparverius paulus	Southeastern American Kestrel		ST
	Fregata magnificens	Magnificent Frigatebird		
	Grus americana	Whooping Crane		
	Haematopus palliatus	American Oystercatcher		ST
	Haliaeetus leucocephalus	Bald Eagle		
	Sterna antillarum	Least Tern		ST
	Laterallus jamaicensis	Black Rail	T	

Taxon	Scientific Name	Common Name	ESA Status	State Status
	Mycteria americana	Wood Stork	T	
	Pandion haliaetus	Osprey		
	Peucaea aestivalis	Bachman's Sparrow		
	Platalea ajaja	Roseate Spoonbill		ST
	Rostrhamus sociabilis	Snail Kite	E	
	Rynchops niger	Black Skimmer		ST
	Setophaga discolor paludicola	Florida Prairie Warbler		
	Sterna dougallii	Roseate Tern	T	
	Sternula antillarum	Least Tern		ST
Fish				
	Acipenser oxyrinchus	Atlantic Sturgeon	E	
	Acipenser oxyrinchus desotoi	Gulf Sturgeon	T	
	Acipenser oxyrinchus oxyrinchus	Atlantic Sturgeon	E	
	Ctenogobius pseudofasciatus	Slashcheek Goby		
	Cyprinodon variegatus hubbsi	Lake Eustis Minnow		
	Enneacanthus chaetodon	Blackbanded Sunfish		
	Kryptolebias marmoratus	Mangrove Rivulus		
	Pteronotropis welaka	Bluenose Shiner		ST
Mammals				
	Corynorhinus rafinesquii	Rafinesque's Big-eared Bat		
	Eumops floridanus	Florida Bonneted Bat	E	
	Myotis austroriparius	Southeastern Myotis		
	Neofiber alleni	Round-tailed Muskrat		
	Neogale frenata peninsulae	Florida Long-tailed Weasel		
	Neogale vison lutilimnetes	Gulf Salt Marsh Mink		
	Peromyscus polionotus niveiventris	Southeast Beach Mouse	T	
	Puma concolor coryi	Florida Panther	E	
	Sciurus niger niger	Southeastern Fox Squirrel		
	Trichechus manatus	West Indian Manatee	T	
	Trichechus manatus latirostris	Florida Manatee	T	
Reptiles				
	Drymarchon couperi	Eastern Indigo Snake	T	
	Heterodon simus	Southern Hog-nosed Snake		
	Lampropeltis extenuata	Short-tailed Kingsnake		ST
	Lampropeltis floridana	Florida Kingsnake		
	Lampropeltis occipitolineata	South Florida Mole Kingsnake		
	Nerodia clarkii taeniata	Atlantic Saltmarsh Watersnake	T	
	Plestiodon egregius lividus	Blue-tailed Mole Skink	T	
	Plestiodon egregius pop. 1	Mole Skink, Egmont Key Population		ST

Taxon	Scientific Name	Common Name	ESA Status	State Status
	Plestiodon reynoldsi	Sand Skink	T	
	Sceloporus woodi	Florida Scrub Lizard		
Crustaceans				
	Crangonyx grandimanus	Florida Cave Amphipod		
	Crangonyx hobbsi	Hobbs's Cave Amphipod		
	Crangonyx sulphurium	Sulphurous Cave Amphipod		
	Procambarus acherontis	Orlando Cave Crayfish		
	Procambarus delicatus	Bigcheek Cave Crayfish		
	Procambarus franzi	Orange Lake Cave Crayfish		
	Procambarus leitheuseri	Coastal Lowland Cave Crayfish		
	Procambarus lucifugus	Light-fleeing Cave Crayfish		
	Troglocambarus maclanei	North Florida Spider Cave Crayfish		
	Troglocambarus sp. 1	Orlando Spider Cave Crayfish		
Insects				
	Aethecerinus hornii	Horn's Aethecerinus Longhorn Beetle		
	Anax amazili	Amazon Darner		
	Aneflomorpha delongi	Delong's Aneflomorpha Longhorn Beetle		
	Anomala exigua	Pygmy Anomala Scarab Beetle		
	Anomala eximia	Archbold Anomala Scarab Beetle		
	Anthanassa frisia	Cuban Crescent		
	Atrytone arogos	Arogos Skipper		
	Atrytonopsis loammi	Loammi Skipper		
	Bombus fraternus	Southern Plains Bumble Bee		
	Callophrys gryneus	Oliver Hairstreak		
	Caupolicana floridana	Giant Scrub Plasterer Bee		
	Cicindela highlandensis	Highlands Tiger Beetle		
	Colaspis thomasi	Scrub Oak Colaspis		
	Colletes francesae	Tough Buckthorn Bee		
	Colletes titusensis	a cellophane bee		
	Copris gopheri	Gopher Tortoise Copris Beetle		
	Dorymyrmex flavopectus	Bi-colored Scrub Cone Ant		
	Drapetis sp. 1	Tortoise Burrow Dance Fly		
	Euphyes berryi	Berry's Skipper		
	Eutrichota gopheri	Gopher Tortoise Burrow Dance Fly		
	Geomysaprinus floridae	Equal-clawed Gopher Tortoise Hister Beetle		
	Geopsammodius morrisi	Morris' Tiny Sand-loving Scarab		
	Geopsammodius relictillus	Relictual Tiny Sand-loving Scarab		

Taxon	Scientific Name	Common Name	ESA Status	State Status
	Geopsammodius withlacoochee	Withlacoochee Tiny Sand-loving Scarab		
	Gomphurus modestus	Gulf Coast Clubtail		
	Heterachthes sablensis	Mangrove Longhorn Beetle		
	Hydroptila berneri	Berner's Microcaddisfly		
	Hydroptila wakulla	Wakulla Springs Vari-colored Microcaddisfly		
	Keltonia robusta	Conradina Mirid Bug		
	Keltonia rubrofemorata	Scrub Wireweed Mirid Bug		
	Leiopsammodius deyrupi	Scrub Little Mole Scarab		
	Leptobasis lucifer	Lucifer Damsel		
	Lestes tenuatus	Blue-striped Spreadwing		
	Liopinus sp. 1	Scrub Hickory Longhorn Beetle		
	Melanoplus forcipatus	Broad Cercus Scrub Grasshopper		
	Melanoplus indicifer	East Coast Scrub Grasshopper		
	Melanoplus nanciae	Ocala Claw-Cercus Grasshopper		
	Ministrymon azia	Gray Ministreak		
	Nastra fusca	Neamathla Skipper		
	Nectopsyche tavara	Tavares White Miller Caddisfly		
	Neotrichia rasmusseni	Rasmussen's Neotrichia Caddisfly		
	Odontotaenius floridanus	Archbold Bess Beetle		
	Onthophagus aciculatulus	Sandyland Onthophagus Beetle		
	Onthophagus polyphemi	Onthophagus Tortoise Commensal Scarab Beetle		
	Onychomira floridensis	a comb-clawed beetle		
	Osmia calaminthae	Blue Calamintha Bee		
	Oxyethira florida	Florida Oxyethiran Micro Caddisfly		
	Peltotrupes youngi	Ocala Deepdigger Scarab Beetle		
	Perdita townesi	a miner bee		
	Philonthus gopheri	Gopher Tortoise Rove Beetle		
	Photomorphus archboldi	Nocturnal Scrub Velvet Ant		
	Phyllophaga elizoria	Elizoria June Beetle		
	Phyllophaga okeechobea	Diurnal Scrub June Beetle		
	Phyllophaga panorpa	Southern Lake Wales Ridge June Beetle		
	Phyllophaga skelleyi	Skelley's June Beetle		
	Pieza rhea	Scrub Pygmy Bee Fly		
	Pleotomodes needhami	Ant-loving Scrub Firefly		
	Plesioclytus relictus	Florida Relictual Longhorn Beetle		
	Polyphylla starkae	Auburndale Scrub Scarab Beetle		
	Progomphus alachuensis	Tawny Sanddragon		

Taxon	Scientific Name	Common Name	ESA Status	State Status
	Romulus globosus	Round-necked Romulus Longhorn Beetle		
	Satyrium liparops floridensis	Sparkleberry Hairstreak		
	Selonodon archboldi	Archbold Cebrionid Beetle		
	Serica frosti	Frost's Silky June Beetle		
	Stelis ater	Southwest Florida Stelis Bee		
	Telamona archboldi	Archbold's Treehopper		
	Triaenodes florida	Floridian Triaenode Caddisfly		
Mollusks				
	Aphaostracon asthenes	Blue Spring Hydrobe Snail		
	Aphaostracon monas	Wekiwa Hydrobe Snail		
	Aphaostracon theiocrenetum	Clifton Spring Hydrobe Snail		
	Elliptio monroensis	St. Johns Elephantear		
	Floridobia alexander	Alexander Siltsnail		
	Floridobia helicogyra	Crystal Siltsnail		
	Floridobia leptospira	Flatwood Siltsnail		
	Floridobia petrifons	Rock Springs Siltsnail		
	Floridobia wekiwae	Wekiwa Siltsnail		
Plants				
	Acrostichum aureum	Golden Leather Fern		ST
	Adiantum tenerum	Fan Maidenhair Fern		SE
	Aeschynomene pratensis var. pratensis	Meadow Joint-vetch		SE
	Agalinis flexicaulis	Hampton False Foxglove		
	Agrimonia incisa	Incised Groovebur		ST
	Andropogon arctatus	Florida Bluestem		ST
	Asimina manasota	Manasota Pawpaw		
	Asplenium auritum	Auricled Spleenwort		
	Asplenium heteroresiliens	Wagner's Spleenwort		
	Asplenium plenum	Ruffled Spleenwort		
	Asplenium pumilum	Dwarf Spleenwort		SE
	Asplenium trichomanes-dentatum	Toothed Spleenwort		
	Astragalus obcordatus	Florida Milkvetch		
	Baptisia perfoliata	Catbells		
	Bigelowia nuttallii	Nuttall's Rayless-goldenrod		SE
	Blechnum occidentale var. minor	Sinkhole fern		SE
	Bonamia grandiflora	Florida Lady's-nightcap		
	Calopogon multiflorus	Many-flower Grass-pink		ST
	Campanula robinsiae	Robins' Bellflower		SE
	Carex chapmanii	Chapman's Sedge		ST
	Centrosema arenicola	Sand Butterfly-pea		SE

Taxon	Scientific Name	Common Name	ESA Status	State Status
	Cheilanthes microphylla	Southern Lipfern		SE
	Cheiroglossa palmata	Hand Fern		
	Chionanthus pygmaeus	Pygmy Fringe-tree	E	
	Chrysopsis floridana	Florida Goldenaster	E	
	Chrysopsis highlandsensis	Highlands Goldenaster		SE
	Clinopodium ashei	Ashe's Savory		
	Clitoria fragrans	Sweet-scented Pigeonwings		
	Coelorachis tuberculosa	Florida Jointgrass	T	
	Conradina brevifolia	Shortleaf Rosemary	E	
	Conradina grandiflora	Large-flower False Rosemary		ST
	Crotalaria avonensis	Avon Park Rabbit-bells	E	
	Cucurbita okeechobeensis	Okeechobee Gourd	E	
	Deeringothamnus pulchellus	Beautiful Pawpaw	E	
	Deeringothamnus rugelii	Rugel's Pawpaw	E	
	Dennstaedtia bipinnata	Cuplet Hay-scented Fern		SE
	Dicerandra christmanii	Yellow Scrub Balm	E	
	Dicerandra cornutissima	Longspurred Mint	E	
	Dicerandra frutescens	Scrub Balm	E	
	Dicerandra modesta	Blushing Scrub Balm		
	Digitaria gracillima	Longleaf Crabgrass		
	Eragrostis pectinacea var. tracyi	Sanibel Island Lovegrass		SE
	Eriogonum longifolium var. gnaphalifolium	Scrub Buckwheat	T	
	Eryngium cuneifolium	Wedgeleaf Button-snakeroot	E	
	Euphorbia commutata	Tinted Woodland Spurge		SE
	Euphorbia cumulicola	Sand-dune Spurge		
	Euphorbia rosescens	Rosy-pink Spurge		SE
	Forestiera godfreyi	Godfrey's Swamp-privet		SE
	Glandularia maritima	Coastal Sanddune Vervain		
	Glandularia tampensis	Tampa Vervain		
	Gymnopogon chapmanianus	Chapman's Skeletongrass		
	Harrisia aboriginum	Aboriginal Prickly-apple		
	Harrisia fragrans	Fragrant Prickly-apple		
	Harrisia simpsonii	Simpson's Prickly-apple		
	Hartwrightia floridana	Florida Hartwrightia		ST
	Hasteola robertiorum	Hammockherb		SE
	Helianthus carnosus	Lakeside Sunflower		SE
	Helianthus debilis ssp. vestitus	Hairy Beach Sunflower		
	Hypericum cumulicola	Highlands Scrub St. John's-wort	E	
	Hypericum edisonianum	Edison's Ascyrum		SE

Taxon	Scientific Name	Common Name	ESA Status	State Status
	Illicium parviflorum	Yellow Anisetree		SE
	Justicia cooleyi	Cooley's Water-willow	E	
	Lantana depressa var. floridana	Florida Lantana		SE
	Lechea cernua	Nodding Pinweed		ST
	Lechea divaricata	Pine Pinweed		SE
	Liatris ohlingerae	Florida Gayfeather	E	
	Litsea aestivalis	Pondspice		
	Lupinus westianus var. aridorum	Scrub Lupine		ST
	Lythrum flagellare	Lowland Loosestrife		SE
	Malaxis unifolia	Green Adder's-mouth Orchid		SE
	Matelea floridana	Florida Milkvine		SE
	Matelea pubiflora	Trailing Milkvine		SE
	Mesadenus lucayanus	Florida Keys Ladies'-tresses		
	Monotropa hypopitys	American Pinesap		SE
	Najas filifolia	Narrowleaf Naiad		ST
	Nemastylis floridana	Fall-flowering Ixia		SE
	Nolina atopocarpa	Florida Bear-grass		ST
	Nolina brittoniana	Britton's Bear-grass	E	
	Nymphaea jamesoniana	James' Water-lily		SE
	Opuntia stricta	Erect Prickly-pear		ST
	Panicum abscissum	Cut-throat Grass		
	Parnassia grandifolia	Largeleaf Grass-of-Parnassus		
	Paronychia chartacea	Paper-like Whitlow-wort		SE
	Pavonia spinifex	Barb-fruit Mallow		
	Pecluma dispersa	Widespread Rockcap Fern		
	Pecluma plumula	Plumed Rockcap Fern		
	Pecluma ptilodon ssp. caespitosum	Palmleaf Rockcap Fern		
	Peperomia humilis var. humilis			SE
	Platanthera integra	Yellow Fringeless Orchid		SE
	Polygala lewtonii	Lewton's Polygala	E	
	Polygonella basiramia	Wireweed	E	
	Polygonella myriophylla	Small's Jointweed	E	
	Prunus geniculata	Scrub Plum	E	
	Pycnanthemum floridanum	Florida Mountainmint		ST
	Rhynchospora megaplumosa			SE
	Salix floridana	Florida Willow		SE
	Schizachyrium niveum	Scrub Bluestem		SE
	Sideroxylon alachuense	Alachua Sink Buckthorn		SE
	Sideroxylon lycioides	Buckthorn Bully		SE
	Spigelia loganioides	Florida Pinkroot		SE

Taxon	Scientific Name	Common Name	ESA Status	State Status
	Spiranthes floridana	Florida Ladies'-tresses		
	Spiranthes igniorchis	Fire Ladies'-tresses		
	Spiranthes lanceolata	Leafless Beaked Ladies'-tresses		
	Spiranthes lanceolata var. paludicola	Leafless Beaked Ladies'-tresses		
	Stylisma abdita	Flowering Southern Morning-glory		SE
	Tephrosia curtissii	Curtiss's Hoary-pea		
	Thelypteris reptans	Creeping Star-hair Fern		SE
	Thelypteris serrata	Toothed Lattice-vein Fern		SE
	Trichomanes petersii	Dwarf Filmy Fern		
	Trichomanes punctatum ssp. floridanum	Florida Filmy Fern		SE
	Triphora amazonica	Broadleaf Nodding-caps		
	Triphora craigheadii	Craighead's Nodding-caps		SE
	Triphora yucatanensis	Yucatan Nodding-caps		
	Vicia ocalensis	Ocala Vetch		SE
	Warea amplexifolia	Wide-leaf Warea	E	
	Warea carteri	Carter's Mustard	E	
	Zephyranthes simpsonii	Rain Lily		ST
	Ziziphus celata	Florida ziziphus	E	

Source: NatureServe 2024. ESA = Endangered Species Act, E = Endangered, T = Threatened, SE = State Endangered, and ST = State Threatened.

Appendix F

Government-to-Government Consultation with Federally Recognized Tribes

TECHNICAL NOISE STUDY REPORT: HUMMINGBIRD 7000W-B AND 8000-A UNMANNED AIRCRAFT PACKAGE DELIVERY OPERATIONS

REPORT NO. 112024

PREPARED FOR:

Federal Aviation Administration
Unmanned Aircraft Systems Integration Office (AUS)
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Acronyms and Abbreviations

AGL	above ground level
CONOPS	Concept of operations
dB	decibel
dBA	A-weighted decibel
DNL	day/night level
FAA	Federal Aviation Administration
Lmax	maximum sound level
SEL	sound exposure level
UA	unmanned aircraft

Chapter 1
Introduction

1.1 Purpose

The purpose of this report is to provide calculations of noise exposure for package delivery operations by Hummingbird unmanned aircraft (UA) developed by Wing Aviation LLC, a subsidiary of Alphabet, Inc. Noise exposure estimates are provided for two Hummingbird models: the Model 7000W-B and the Model 8000-A based on sound level testing data collected by AvEnviro Acoustics (2024a, 2024b).

The analysis in this report provides a methodology of estimating noise levels from UA operation that is limited to these specific UA models. Because the methods used in this report are based on collected measurements, they should not be applied to other UA models. The analysis does not include a geographic component, nor does it account for the presence of structures in urban areas.

Passby exposure levels at different distances from a nest or delivery point are based on as-tested conditions, which were intended to simulate all operation types for each UA model. Testing simulations consisted of the following operations:

- Manual package loading at a nest and takeoff toward delivery point
- Package offloading at a delivery point and departure back to nest
- Landing at a nest
- Remote launch, autoload of package at a nest, and takeoff
- Nearfield launch, autoload of package at a nest, and takeoff
- Hover in place
- En route (with and without a package)
- Preflight warmup (a.k.a. “Fitbit” operation)
- Nest homebase survey (a.k.a. “Geobit” operation)

Total DNL noise exposures are calculated based on various scales of package delivery and associated activities using passby exposure levels for the types of operation applicable to nests, delivery points and en route locations.

It is important to note that the results presented in this report shall supersede the results presented in the previous report, *Noise Assessment for Wing Aviation Proposed Package Delivery Operations with Hummingbird 7000W-B Unmanned Aircraft*, prepared March 17, 2023 by Harris Miller Miller and Hanson Inc (2023). The results in the previous Model 7000W-B report relied on certification measurements for en route and hover of a surrogate UA model. This is because sound level measurements had not yet been conducted for simulation of package delivery operations using the Model 7000W-B at the time the previous report was written. In contrast, the sound level measurements presented in this report are based closely on the concept of operations (CONOPS) for all modes of UA package delivery and associated operations.

1.2 Fundamental Concepts

Various noise descriptors or metrics have been developed to describe time-varying noise levels. The following metrics are used in this evaluation.

- Sound Exposure Level (SEL): SEL represents the total sound energy occurring over a specified period compressed into a one-second time interval. The SEL metric has broad utility in noise prediction and is a primary measurement collected for sound level testing of the two UA models.
- Day Night Average Sound Level (DNL): DNL is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10 decibel (dB) penalty applied to A-weighted sound levels occurring during nighttime hours between 10 p.m. and 7 a.m. The DNL is used in this analysis to describe noise exposure for daily operations from a nest, en route, or delivery point.
- Maximum Sound Level (Lmax): Lmax is the highest instantaneous sound level measured during a specified period.
- Community Noise Equivalent Level (CNEL): Similar to DNL, CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10 dB penalty applied to A-weighted sound levels occurring during the nighttime hours between 10 p.m. and 7 a.m. and a 5 dB penalty applied to the A-weighted sound levels occurring during evening hours between 7 p.m. and 10 p.m.

1.3 Regulatory Context

The noise exposure estimates in this document are intended to be used for environmental assessments of operations involving the Models 7000W-B and 8000-A, for compliance with the National Environmental Policy Act and operational requirements for a commercial carrier under 14 Code of Federal Regulations Part 135. The analysis method used in this report does not apply standard models such as the Aviation Environmental Design Tool, but instead applies an estimation method based on collected noise measurements. As such the application of this method is only applicable to the Model 7000W-B and 8000-A UAs.

Chapter 2
Methods

2.1 Sound Level Measurements

The analysis in this report used sound level testing data from two reports: *Noise Measurement Results: Wing Model 7000W-B Revision D*, dated November 4, 2024, prepared by AvEnviro Acoustics (2024a), and *Noise Measurement Results: Wing Model 8000-A Revision C*, dated October 28, 2024 also prepared by AvEnviro Acoustics (2024b).

2.1.1 Wing Model 7000W-B Sound Level Measurements

The Hummingbird 7000W-B is a hybrid UA featuring a multi-rotor design with sixteen round diameter propellers. This UA has fixed wing elements, including four motors for forward flight, while also using rotors to provide vertical lift and the capability to hover during packing loading and delivery operations. Packages are loaded or unloaded to the UA during hover by a retractable cord.

The 7000W-B UA weighs 14 pounds when combined with its maximum payload weight of 2.3 pounds. It has a wingspan of approximately 4.9 feet, a height of approximately 1 foot, and a length of approximately 3 feet. Model 7000W-B is shown in Figure 1.

Figure 1. Hummingbird Wing Model 7000W-B.

Sound level testing was conducted at the Wing flight test center in Hollister, California in March 2024. The testing protocol followed FAA direction given in the document, *Measuring Drone Noise for Environmental Review Process*, dated October 2023 (FAA 2023). A brief summary of test results is shown in Table 1. The test results that include forward flight assume a nominal cruise speed of 50.5 knots (AvEnviro Acoustics 2024a).

Table 1. Summary of Sound Level Testing, Model 7000W-B

Test Series	Altitude	Microphone Position	Average SEL (dBA)	Average Lmax (dBA)
En Route with Package	100 feet AGL	Under flight path	59.2	54.3
En Route without Package	100 feet AGL	Under flight path	55.5	50.3
Nest: Manual Loading and Takeoff	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	80.6	66.8
Delivery Point: Arrival, Delivery, Departure	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	83.4	71.9
Nest: Arrival, Landing	Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	78.1	68.2
Offsite Package Autoload	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	81.7	68.9
Nest: Nearfield launch, Autoload and Takeoff	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	82.1	68.6
Nest: Preflight warmup (a.k.a. “Fitbit”)	7 feet AGL	50 feet away from nest	80.3	64.0
Nest: Homebase survey (a.k.a. “Geobit”)	66 feet AGL	50 feet away from nest	81.0	66.2

Source: AvEnviro Acoustics 2024a.
AGL = above ground level
dBA = A-weighted decibel

2.1.2 Wing Model 8000-A Sound Level Measurements

The Hummingbird 8000-A is a hybrid UA featuring a multi-rotor design with twelve round diameter propellers. This UA has fixed wing elements, including four motors for forward flight, while also using rotors to provide vertical lift and the capability to hover during packing loading and delivery operations. Packages are loaded or unloaded to the UA during hover by a retractable cord.

The 8000-A UA weighs 24.3 pounds when combined with its maximum payload weight of 6.6 pounds. It has a wingspan of approximately 6 feet, a height of approximately 1 foot, and a length of approximately 6.2 feet. Model 8000-A is shown in Figure 2.

Figure 2. Wing Hummingbird 8000-A UA

Sound level testing was conducted at the Wing flight test center in Hollister, California in April 2024. The testing protocol followed FAA direction given in the document, *Measuring Drone Noise for Environmental Review Process*, dated October 2023 (FAA 2023). A brief summary of key test results is shown in Table 2. The test results that include forward flight assume a nominal cruise speed of 50.5 knots (AvEnviro Acoustics 2024b).

Table 2. Summary of Sound Level Testing, Model 8000-A

Test Series	Altitude	Microphone Position	Average SEL (dBA)	Average Lmax (dBA)
En Route with Package	100 feet AGL	Under flight path	64.7	58.7
En Route without Package [1]	100 feet AGL	Under flight path	62.7	55.5
Nest: Manual Loading and Takeoff	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	79.0	65.8
Delivery Point: Arrival, Delivery, Departure	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	83.6	71.5
Nest: Arrival, Landing	Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	77.7	66.3
Offsite Package Autoload	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	80.9	66.8
Nest: Nearfield launch, Autoload and Takeoff	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	81.6	66.8
Nest: Preflight warmup (a.k.a. “Fitbit”)	7 feet AGL	50 feet away from nest	77.1	63.2

Test Series	Altitude	Microphone Position	Average SEL (dBA)	Average Lmax (dBA)
Nest: Homebase survey (a.k.a. "Geobit")	66 feet AGL	50 feet away from nest	79.4	66.7

Source: AvEnviro Acoustics 2024b.

[1] Based on guidance from the test report, data for en route without a package is not used. This item uses the same sound level as en route with a package.

AGL = above ground level; dBA = A-weighted decibel

2.2 Analysis Procedure Methodology

To calculate SEL for receptors located near a nest or delivery point, a combination of actions are evaluated to define different types of operations, as a UA transitions between different operating modes of takeoff, hover, ascend, descend, and en route. The types of operations evaluated are the following:

- Manual package loading at nest
- Package delivery at a delivery point
- Landing at nest
- Package autoload at an offsite location
- Nearfield launch and package autoload at nest
- Preflight warmup (a.k.a. "Fitbit")
- Homebase survey (a.k.a. "Geobit")

The SEL calculation for each of these operation types involves the use of sound level data as measured by an array of microphones during simulation testing of each operation, as described in the noise measurement test reports (AvEnviro 2024a, AvEnviro 2024b). Microphones placed on a linear path relative to the UA launch point collected sound level data at distances of 25 feet, 50 feet, 100 feet , 200 feet, 400 feet and 800 feet. The incident SEL sound levels were used to determine attenuation rates between microphone positions, which were influenced by different degrees of en route and hover noise depending on the type of operation tested. However, as described in the noise measurement test reports, ambient noise from other sources heavily influenced data collected at the 400-foot and 800-foot positions (AvEnviro 2024a, 2024b). For this reason, the data collected at the 400-foot and 800-foot positions is not used in this analysis. At 800 feet, the SEL is equivalent to en route noise as measured during testing. As such, for the distances greater than 200 feet from the UA launch point, attenuation would assume a falloff rate consistent with an en route SEL level at 800 feet. At distances greater than 800 feet, the en route level is used.

DNL values are calculated for four types of locations: 1) a nest, 2) a delivery point, 3) an offsite autoloader, and 4) directly under the en route path. The DNL values at a nest are calculated by summing the sound energy for a launch and package loading operation with a return to land at the nest to describe sound levels for a single delivery cycle. UA noise from FitBit and GeoBit operations are also accounted for in DNL values from a nest. The DNL value for a single delivery cycle at each of the four locations is scaled for multiple UA operations using a logarithmic multiplier (i.e., log of the number of events multiplied by 10). adjusted by a factor of 49.4 to convert from SEL to DNL.

Chapter 3
Testing Procedure for Wing Operations

Sound level testing included a simulation of different UA operations to account for different activities that would take place at nest and delivery points. Each operation type includes a specific sequence of actions, described in the following subsections.

3.1 Manual Load and Takeoff

Sequence of manual package loading and takeoff operation from the launch point (e.g., nest):

1. Ascend from launch pad until reaching 33 feet above ground level AGL, then descend slightly to 22 feet AGL (about 9 seconds for 7000W-B, 11 seconds for 8000-A)
2. Hover at 22 feet AGL during package pickup (about 20 seconds for both models)
3. Aircraft with package ascends from 22 feet AGL to 165 feet AGL (about 14 seconds for both models)
4. Begin horizontal flight at constant acceleration until a speed of 50.5 knots is reached (about 13 seconds for 7000W-B, 15 seconds for 8000-A)
5. Maintain horizontal flight at constant velocity of 50.5 knots over microphone array

3.2 Delivery

Sequence of package delivery operation to a delivery point:

1. Aircraft with package approaches at 165 feet AGL above microphone array
2. Decelerate from 50.5 knots to zero (about 15 seconds for 7000W-B, 13 seconds for 8000-A)
3. Descend from 165 feet AGL to 22 feet AGL (about 20 seconds for 7000W-B, 28 seconds for 8000-A)
4. Hover at 22 feet AGL during package drop (about 12 seconds for both models)
5. Empty aircraft ascends from 22 feet AGL to 165 feet AGL (about 15 seconds for 7000W-B, 16 seconds for 8000-A)
6. Begin horizontal flight at constant acceleration until a speed of 50.5 knots (i.e., Vcruise) is reached (about 14 seconds for 7000W-B, 18 seconds for 8000-A)
7. Maintain horizontal flight at constant velocity of 50.5 knots over microphone array

3.2.1 Landing

Sequence of landing operation at nest:

1. Empty aircraft approaches at 165 feet AGL above microphone array
2. Decelerate from 50.5 knots to zero (about 14 seconds for both models)

3. Descend from 165 feet AGL to ground (for 7000W-B, the UA descends to 20 feet AGL in about 15 seconds and from 20 feet AGL to ground in about 13 seconds; for 8000-A, the UA descends to 20 feet AGL in about 24 seconds and from 20 feet AGL to ground in about 12 seconds)

3.2.2 Offsite Package Autoload

For offsite package autoload operation, the UA takes off from a distant nest location and approaches the offsite package loading point.

1. Empty aircraft approaches at 165 feet AGL above microphone array
2. Decelerate from 50.5 knots to zero (about 17 seconds for both models)
3. Descend from 165 feet AGL to 22 feet AGL (about 15 seconds for 7000W-B, 25 seconds for 8000-A)
4. Hover at 22 feet AGL during package pickup (about 22 seconds for both models)
5. Aircraft with package ascends from 22 feet AGL to 165 feet AGL (about 15 seconds for both models) Begin horizontal flight at constant acceleration until a speed of 50.5 knots (i.e., V_{cruise}) is reached (about 14 seconds for both models)
6. Maintain horizontal flight at constant velocity of 50.5 knots over microphone array

3.2.3 Nearfield Launch and Autoload

For nearfield launch, the UA takes off and approaches the package loading point from a nearby nest.

1. Empty aircraft ascends from nest 50 feet away to 165 feet AGL (about 15 seconds for 7000W-B, 16 seconds for 8000-A)
2. Transit to nearby autoloader (about 8 seconds for 7000W-B, 12 seconds for 8000-A)
3. Descend from 165 feet AGL to 14 feet AGL at constant velocity of (about 15 seconds for 7000W-B, 26 seconds for 8000-A)
4. Hover at 14 feet AGL during package pickup (about 22 seconds for both models)
5. Aircraft with package ascends from 14 feet AGL to 165 feet AGL (about 15 seconds for both models)
6. Begin horizontal flight at constant acceleration until a speed of 50.5 knots (i.e., Vcruise) is reached (about 14 seconds for both models)
7. Maintain horizontal flight at constant velocity of 50.5 knots over microphone array

3.2.4 Fitbit Operation

The Fitbit operation is a brief hover operation to warm up the battery and conduct preflight tests at the beginning of each day of flight operation. This would be done for each individual UA at the nest. Testing time varies but generally would be less than two minutes.

1. Climb to 7 feet AGL (about 3 seconds for both models)
2. Hover in place (assumes 118 seconds for 7000W-B, 49 seconds for 8000-A)

3. Descend from 7 feet AGL to ground (about 6 seconds for both models)

3.2.5 Geobit Operation

The Geobit operation is a brief hover operation above the nest to verify geolocation of ground-based infrastructure.

1. Climb to 66 feet AGL (about 8 seconds for both models)
2. Hover in place (about 25 seconds for both models)
3. Descend from 66 feet AGL to ground (about 40 seconds for both models)

Chapter 4
Sound Levels of UA Operations

4.1 Sound Levels for Wing Model 7000W-B

4.1.1 Manual Loading, Delivery and Landing

Calculated sound levels for Wing Model 7000W-B manual loading, delivery, and landing at the launch point are shown in Table 3.

Table 3. Model 7000W-B: Estimate of SEL for Manual Launch, Delivery and Landing at Nest

Distance between Launch Point and Receiver	Manual Load and Takeoff, dBA SEL[1]	Delivery, dBA SEL[2]	Return to Nest and Landing, dBA SEL[3]
25	86.6	88.4	83.2
50	80.6	83.5	78.1
75	76.8	79.9	75.0
100	74.1	77.3	72.8
125	72.6	75.5	71.1
150	71.4	74.0	69.6
175	70.3	72.7	68.4
200	69.4	71.6	67.4
225	68.3	70.4	66.2
250	67.3	69.4	65.0
275	66.4	68.5	64.0
300	65.6	67.6	63.1
325	64.9	66.8	62.3
350	64.2	66.1	61.5
375	63.5	65.4	60.8
400	62.9	64.8	60.1
425	62.4	64.2	59.5
450	61.8	63.7	58.8
475	61.3	63.1	58.3
500	60.9	62.6	57.7
525	60.4	62.1	57.2
550	60.0	61.7	56.7
575	59.6	61.3	56.3
600	59.2	60.8	55.8
625	58.8	60.4	55.4
650	58.4	60.1	55.0
675	58.1	59.7	54.6
700	57.7	59.3	54.2

Distance between Launch Point and Receiver	Manual Load and Takeoff, dBA SEL[1]	Delivery, dBA SEL[2]	Return to Nest and Landing, dBA SEL[3]
725	57.4	59.0	53.8
750	57.1	58.7	53.5
775	56.8	58.3	53.1
800	56.5	58.0	52.8
825	56.5	58.0	52.8
850	56.5	58.0	52.8
875	56.5	58.0	52.8
900	56.5	58.0	52.8
925	56.5	58.0	52.8
950	56.5	58.0	52.8
975	56.5	58.0	52.8
1000	56.5	58.0	52.8

Source: AvEnviro 2024a, ICF 2024.

[1] Assumes one en route trip with package on board.

[2] Assumes one en route trip with package on board plus one en route trip without a package.

[3] Assumes one en route trip without a package.

dBA = A-weighted decibel; SEL = sound exposure level

4.1.2 Sound Levels for Wing Model 7000W-B Autoload Actions

Calculated sound levels for offsite autoload, and nearfield launch and autoload for Model 7000W-B are shown in Table 4.

Table 4. Model 7000W-B: Estimate of SEL for Offsite Autoload and Nearfield Launch and Autoload Actions

Distance between Launch Point and Receiver	Offsite Autoload, dBA SEL[1]	Nearfield Launch and Autoload, dBA SEL[1]
25	87.1	87.1
50	81.7	82.1
75	78.7	79.2
100	76.6	77.1
125	75.0	75.3
150	73.6	73.9
175	72.5	72.7
200	71.5	71.6
225	70.4	70.3
250	69.3	69.2
275	68.4	68.1
300	67.6	67.2
325	66.8	66.3
350	66.1	65.5

Distance between Launch Point and Receiver	Offsite Autoload, dBA SEL[1]	Nearfield Launch and Autoload, dBA SEL[1]
375	65.4	64.7
400	64.8	64.0
425	64.2	63.4
450	63.6	62.8
475	63.1	62.2
500	62.6	61.6
525	62.1	61.1
550	61.7	60.6
575	61.2	60.1
600	60.8	59.6
625	60.4	59.2
650	60.0	58.7
675	59.7	58.3
700	59.3	57.9
725	59.0	57.6
750	58.7	57.2
775	58.3	56.8
800	58.0	56.5
825	58.0	56.5
850	58.0	56.5
875	58.0	56.5
900	58.0	56.5
925	58.0	56.5
950	58.0	56.5
975	58.0	56.5
1000	58.0	56.5

Source: AvEnviro 2024a, ICF 2024.

[1] Assumes one incoming en route trip without a package plus one outgoing en route trip with package on board.

dBA = A-weighted decibel; SEL = sound exposure level

4.1.3 Sound Levels for Wing Model 7000W-B FitBit and GeoBit Actions

Calculated sound levels for Fitbit and Geobit operations for Model 7000W-B are shown in Table 5.

Table 5. Model 7000W-B: Estimate of SEL for FitBit and GeoBit Actions

Distance between Launch Point and Receiver	FitBit, dBA SEL	GeoBit, dBA SEL
25	87.3	85.3
50	80.3	81.0
75	76.5	78.0
100	73.8	75.9

Distance between Launch Point and Receiver	FitBit, dBA SEL	GeoBit, dBA SEL
125	72.2	74.0
150	70.9	72.4
175	69.8	71.1
200	68.8	69.9
225	68.0	68.9
250	67.2	68.0
275	66.5	67.1
300	65.9	66.4
325	65.3	65.7
350	64.8	65.1
375	64.3	64.5
400	63.8	63.9
425	63.4	63.4
450	63.0	62.9
475	62.6	62.4
500	62.2	62.0
525	61.8	61.5
550	61.5	61.1
575	61.2	60.8
600	60.9	60.4
625	60.6	60.0
650	60.3	59.7
675	60.0	59.4
700	59.8	59.1
725	59.5	58.8
750	59.3	58.5
775	59.0	58.2
800	58.8	57.9
825	58.6	57.6
850	58.4	57.4
875	58.2	57.1
900	58.0	56.9
925	57.8	56.6
950	57.6	56.4
975	57.4	56.2
1000	57.2	56.0

Source: AvEnviro 2024a, ICF 2024.
dBA = A-weighted decibel; SEL = sound exposure level

4.1.4 En Route Sound Levels for Wing Model 7000W-B

The SEL for an en route overflight with a package loaded on the Model 7000W-B was measured to be 59.2 dBA. The en route overflight SEL for a Model 7000W-B with no package was measured to be 55.5 dBA (AvEnviro 2024a). During testing, en route measurements were taken with UA in forward

flight at an altitude of 100 feet AGL, which is lower than the expected operating altitude of 165 feet AGL. To adjust the measured en route sound level to the operating altitude of 165 feet AGL, a data correction factor using the logarithm of the ratio of altitudes multiplied by 12.5 was added to the en route SEL, consistent with procedures described in 14 CFR Part 36. The corrected SEL values were calculated to be 56.5 dBA with a package and 52.8 dBA without a package. These corrected en route sound levels were used for distances 800 feet or greater from the nest or delivery site.

4.2 Sound Levels for Wing Model 8000-A

4.2.1 Manual Loading, Delivery and Landing

Calculated sound levels for Wing Model 8000-A manual loading, delivery and landing at the launch point are shown in Table 6.

Table 6. Model 8000-A: Estimate of SEL for Manual Launch, Delivery and Landing at Nest

Distance between Launch Point and Receiver	Manual Load and Takeoff, dBA SEL[1]	Delivery, dBA SEL[2]	Return to Nest and Landing, dBA SEL[3]
25	84.4	87.3	81.8
50	79.0	83.6	77.7
75	76.9	80.7	75.4
100	75.4	78.6	73.7
125	74.4	77.0	71.6
150	73.6	75.7	70.0
175	72.9	74.6	68.5
200	72.3	73.7	67.3
225	71.4	72.9	66.7
250	70.6	72.2	66.1
275	69.9	71.5	65.6
300	69.3	70.9	65.2
325	68.7	70.3	64.7
350	68.1	69.8	64.3
375	67.6	69.3	64.0
400	67.1	68.9	63.6
425	66.7	68.5	63.3
450	66.3	68.1	63.0
475	65.9	67.7	62.7
500	65.5	67.4	62.5
525	65.1	67.0	62.2
550	64.8	66.7	62.0
575	64.4	66.4	61.7
600	64.1	66.1	61.5
625	63.8	65.8	61.3
650	63.5	65.5	61.1

Distance between Launch Point and Receiver	Manual Load and Takeoff, dBA SEL[1]	Delivery, dBA SEL[2]	Return to Nest and Landing, dBA SEL[3]
675	63.2	65.3	60.9
700	63.0	65.0	60.7
725	62.7	64.8	60.5
750	62.5	64.6	60.3
775	62.2	64.3	60.1
800	62.0	64.1	60.0
825	62.0	64.1	60.0
850	62.0	64.1	60.0
875	62.0	64.1	60.0
900	62.0	64.1	60.0
925	62.0	64.1	60.0
950	62.0	64.1	60.0
975	62.0	64.1	60.0
1000	62.0	64.1	60.0

Source: AvEnviro 2024b, ICF 2024.

[1] Assumes one en route trip with package on board.

[2] Assumes one en route trip with package on board plus one en route trip without a package.

[3] Assumes one en route trip without a package.

dBA = A-weighted decibel; SEL = sound exposure level

4.2.2 Sound Levels for Wing Model 8000-A Autoload Actions

Calculated sound levels for offsite autoload, and nearfield launch and autoload for Model 8000-A are shown in Table 7.

Table 7. Model 8000-A: Estimate of SEL for Offsite Autoload and Nearfield Launch and Autoload Actions

Distance between Launch Point and Receiver	Offsite Autoload, dBA SEL[1]	Nearfield Launch and Autoload, dBA SEL[1]
25	85.2	85.4
50	80.9	81.6
75	78.6	79.1
100	77.0	77.4
125	75.9	76.0
150	75.0	74.9
175	74.2	73.9
200	73.5	73.1
225	72.7	72.2
250	72.0	71.3
275	71.3	70.5
300	70.8	69.8
325	70.2	69.2

Distance between Launch Point and Receiver	Offsite Autoload, dBA SEL[1]	Nearfield Launch and Autoload, dBA SEL[1]
350	69.7	68.6
375	69.2	68.1
400	68.8	67.5
425	68.4	67.1
450	68.0	66.6
475	67.6	66.2
500	67.3	65.8
525	67.0	65.4
550	66.6	65.0
575	66.3	64.6
600	66.1	64.3
625	65.8	64.0
650	65.5	63.6
675	65.3	63.3
700	65.0	63.1
725	64.8	62.8
750	64.5	62.5
775	64.3	62.2
800	64.1	62.0
825	64.1	62.0
850	64.1	62.0
875	64.1	62.0
900	64.1	62.0
925	64.1	62.0
950	64.1	62.0
975	64.1	62.0
1000	64.1	62.0

Source: AvEnviro 2024b, ICF 2024.

[1] Assumes one incoming en route trip without a package plus one outgoing en route trip with package on board.

dBA = A-weighted decibel; SEL = sound exposure level

4.2.3 Sound Levels for Wing Model 8000-A FitBit and GeoBit Actions

Calculated sound levels for Fitbit and Geobit operations for Model 8000-A are shown in Table 8.

Table 8. Model 8000-A: Estimate of SEL for FitBit and GeoBit Actions

Distance between Launch Point and Receiver	FitBit, dBA SEL	GeoBit, dBA SEL
25	84.1	84.4
50	77.1	79.4
75	73.6	75.3
100	71.1 [1]	72.5 [1]
125	69.1	70.2
150	67.5	68.4
175	66.2	66.8
200	65.0	65.5
225	64.0	64.3
250	63.1	63.3
275	62.2	62.3
300	61.5	61.4
325	60.8	60.6
350	60.1	59.9
375	59.5	59.2
400	59.0	58.6
425	58.4	57.9
450	57.9	57.4
475	57.5	56.8
500	57.0	56.3
525	56.6	55.8
550	56.2	55.4
575	55.8	54.9
600	55.4	54.5
625	55.1	54.1
650	54.7	53.7
675	54.4	53.3
700	54.1	52.9
725	53.8	52.6
750	53.5	52.2
775	53.2	51.9
800	52.9	51.6
825	52.6	51.3
850	52.4	51.0
875	52.1	50.7
900	51.9	50.4

Distance between Launch Point and Receiver	FitBit, dBA SEL	GeoBit, dBA SEL
925	51.6	50.1
950	51.4	49.9
975	51.2	49.6
1000	51.0	49.4

Source: AvEnviro 2024b, ICF 2024.

[1] The SEL value for FitBit and GeoBit operations at 100 feet was adjusted from the test report to use a falloff rate from the 50 foot to the 200 foot value due to no valid passes during testing.

dBA = A-weighted decibel; SEL = sound exposure level

4.2.4 En Route Sound Levels for Wing Model 8000-A

The SEL for an en route overflight with a package loaded on the Model 8000-A was measured to be 64.7 dBA. The en route overflight SEL for a Model 8000-A with no package was measured to be 62.7 dBA (AvEnviro 2024b). During testing, en route measurements were taken with UA in forward flight at an altitude of 100 feet AGL, which is lower than the expected operating altitude of 165 feet AGL. To adjust the measured en route sound level to the operating altitude of 165 feet AGL, a data correction factor using the logarithm of the ratio of altitudes multiplied by 12.5 was added to the en route SEL, consistent with procedures described in 14 CFR Part 36. The corrected SEL values were calculated to be 62.0 dBA with a package and 60.0 dBA without a package. These corrected en route sound levels were used for distances 800 feet or greater from the nest or delivery site.

Chapter 5
Noise Exposure from UA Operations

This chapter presents estimated DNL values for package delivery operations assuming different rates of delivery for a nest. This analysis assumes all package deliveries would occur during daytime hours only (i.e., 7:00 a.m. to 10:00 p.m.), so no nighttime penalties are applied to package deliveries. Fitbit operations would be done before package delivery operations each day, and are assumed to be done before 7:00 a.m. As such nighttime penalties would apply to Fitbit operations. Geobit operations would be conducted on an intermittent basis at the rate of about one event per week. To simulate a loudest case, Geobit operations are included in the DNL analysis.

5.1 Noise Exposure from a Nest

A single delivery operation consists of launch, package load, departure, return and landing phases, and the full cycle of these actions are accounted for in noise exposure at a nest. In addition to package deliveries, the noise exposure values include up to 24 nighttime Fitbit operations and one Geobit operation. Therefore, the DNL value at a nest accounts for the following:

- Package loading operations: manual, offsite package autoload, or nearfield autoload (up to 400 events)
- Landings at nest post-delivery (up to 400 events)
- FitBit (240 DNL equivalent events)
- GeoBit (1 DNL equivalent event)

Estimated DNL noise exposure distances at a nest operating Model 7000W-B UAs are shown in Table 9 for Manual loading and Table 10 for Nearfield Autoloading. Noise exposure DNL values are shown at different scales: from 1 delivery per day to 400 deliveries per day. The noise exposure values assume a departure and return flight path restricted to a single trajectory over a receiver array with distances of 25 to 1,000 feet from the nest. According to the calculations, package loading operations would exceed 65 DNL at 35 feet from a nest location, at a rate of 400 package loading operations per day for both loading scenarios.

Table 9. DNL Noise Exposure Distances at Nest for Model 7000W-B for Different Scales of Operation, Manual Launch Option

Average Daily Deliveries per Nest[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	35	50	85	160
5	<25	35	50	90	165
10	<25	35	55	90	165
15	<25	35	55	90	170
20	<25	35	55	90	175
25	<25	35	55	95	175
50	<25	40	60	100	195

Average Daily Deliveries per Nest[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
75	<25	40	65	105	210
100	<25	40	65	115	220
150	<25	45	70	125	245
200	<25	45	75	140	265
300	30	50	85	165	295
400	35	55	95	185	325

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m. except for Fitbit, which would be done before 7:00 a.m. DNL = day/night average sound level

Table 10. DNL Noise Exposure Distances at Nest for Model 7000W-B for Different Scales of Operation, Nearfield Launch Option

Average Daily Deliveries per Nest[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	35	50	85	160
5	<25	35	50	90	165
10	<25	35	55	90	170
15	<25	35	55	95	175
20	<25	35	55	95	180
25	<25	35	55	95	185
50	<25	40	60	105	205
75	<25	40	65	120	220
100	<25	40	70	125	235
150	<25	45	80	145	260
200	<25	50	85	160	285
300	30	55	100	190	320
400	35	65	115	215	350

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m. except for Fitbit, which would be done before 7:00 a.m. DNL = day/night average sound level

Estimated DNL noise exposure distances at a nest operating Model 8000-A UAs are shown in Table 11 for Manual loading and Table 12 for Nearfield Autoloading. Noise exposure DNL values are shown at different scales: from 1 delivery per day to 400 deliveries per day. The noise exposure values assume a departure and return flight path restricted to a single trajectory over a receiver array with distances of 25 to 1,000 feet from the nest. According to the calculations, package loading operations would exceed 65 DNL at less than 25 feet from a nest location, at a rate of 400 package loading operations per day for both loading scenarios.

Table 11. DNL Noise Exposure Distances at Nest for Model 8000-A for Different Scales of Operation, Manual Launch Option

Average Daily Deliveries per Nest[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	<25	40	65	110
5	<25	<25	40	65	115
10	<25	<25	40	65	120
15	<25	<25	40	70	125
20	<25	<25	45	70	130
25	<25	<25	45	75	135
50	<25	<25	45	85	160
75	<25	30	50	95	190
100	<25	30	50	105	215
150	<25	35	60	125	255
200	<25	40	70	145	300
300	<25	45	85	180	375
400	<25	45	100	215	440

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m. except for Fitbit, which would be done before 7:00 a.m.
DNL = day/night average sound level

Table 12. DNL Noise Exposure Distances at Nest for Model 8000-A for Different Scales of Operation, Nearfield Launch Option

Average Daily Deliveries per Nest[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	<25	40	65	110
5	<25	<25	40	65	115
10	<25	<25	40	70	120
15	<25	<25	45	70	130
20	<25	<25	45	75	135
25	<25	<25	45	75	140
50	<25	<25	50	90	170
75	<25	30	55	105	200
100	<25	35	60	115	225
150	<25	35	70	140	270
200	<25	40	80	160	315
300	<25	50	100	200	390
400	<25	55	120	235	455

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m. except for Fitbit, which would be done before 7:00 a.m.
DNL = day/night average sound level

5.2 Noise Exposure from Offsite Package Autoloading

Estimated DNL noise exposure distances at an offsite package autoloader location for the Model 7000W-B are shown in Table 13. The DNL exposures assume an arrival and departure flight path restricted to a single trajectory over a receiver array with distances of 25 to 1,000 feet. A single delivery operation consists of arrival, package autoload, and departure phases. According to calculations, package delivery operations would exceed 65 DNL at less than 25 feet from an offsite autoloading location at a rate of 400 deliveries per day to a single delivery site.

Table 13. DNL Noise Exposure Distances at an Offsite Package Autoloading Location for Model 7000W-B, for Different Scales of Operation

Average Daily Deliveries per Nest[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	<25	<25	<25	<25
5	<25	<25	<25	<25	<25
10	<25	<25	<25	<25	40
15	<25	<25	<25	<25	50
20	<25	<25	<25	30	55
25	<25	<25	<25	35	65
50	<25	<25	<25	50	95
75	<25	<25	35	60	115
100	<25	<25	40	70	140
150	<25	<25	50	90	175
200	<25	30	55	105	205
300	<25	40	70	135	245
400	<25	45	80	160	280

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m.
DNL = day/night average sound level

Estimated DNL noise exposure distances at an offsite package autoloader location for the Model 8000-A are shown in Table 14. The DNL exposures assume an arrival and departure flight path restricted to a single trajectory over a receiver array with distances of 25 to 1,000 feet. A single delivery operation consists of arrival, package autoload, and departure phases. According to calculations, package delivery operations would exceed 65 DNL at less than 25 feet from an offsite autoloading location at a rate of 400 deliveries per day to a single delivery site.

Table 14. DNL Noise Exposure Distances at Nest for Model 8000-A for Different Scales of Operation, Remote Launch Option

Average Daily Deliveries per Nest[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	<25	<25	<25	<25
5	<25	<25	<25	<25	<25
10	<25	<25	<25	<25	30
15	<25	<25	<25	<25	40
20	<25	<25	<25	<25	50
25	<25	<25	<25	<25	60
50	<25	<25	<25	45	95
75	<25	<25	<25	55	135
100	<25	<25	30	70	170
150	<25	<25	40	95	230
200	<25	<25	50	115	275
300	<25	30	65	165	355
400	<25	40	80	205	430

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m.
DNL = day/night average sound level

5.3 En Route Noise Exposure

Noise exposure from UA en route trajectories would be loudest directly under the flight path. In practice, UAs would serve many delivery points from a given nest, however in areas where there is a high demand for deliveries, en route UA noise may be intermittently audible depending on the level of existing ambient noise. Based on calculations however, even if the louder of the two Hummingbird UA models (Model 8000-A) under en route conditions used the same en route trajectory for delivery service to surrounding areas, the noise exposure level accounting for both the delivery and return paths would be no higher than 40.7 DNL at a rate of up to 400 deliveries per day. Considering that en route UA noise would not exceed 45 DNL under any delivery scenarios, this was not quantified further.

5.4 Noise Exposure from a Delivery Site

Estimated DNL noise exposure distances at a delivery point for the Model 7000W-B are shown in Table 15. The DNL exposures assume an arrival and departure flight path restricted to a single trajectory over a receiver array with distances of 25 to 1,000 feet. A single delivery operation consists of arrival, package delivery, and departure phases. According to calculations, package delivery operations would exceed 65 DNL at 30 feet from a nest location at a rate of 400 deliveries per day to a single delivery site.

Table 15. DNL Noise Exposure Distances at a Delivery Point for Model 7000W-B for Different Scales of Operation

Average Daily Deliveries at Delivery Point[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	<25	<25	<25	<25
5	<25	<25	<25	<25	35
10	<25	<25	<25	<25	50
15	<25	<25	<25	30	60
20	<25	<25	<25	40	65
25	<25	<25	<25	45	75
50	<25	<25	35	60	100
75	<25	<25	40	70	125
100	<25	<25	50	80	145
150	<25	30	60	100	180
200	<25	40	65	115	205
300	<25	45	80	140	245
400	30	55	90	165	280

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m.
DNL = day/night average sound level

Estimated DNL noise exposure distances at a delivery point for the Model 8000-A are shown in Table 16. The DNL exposures assume an arrival and departure flight path restricted to a single trajectory over a receiver array with distances of 25 to 1,000 feet. A single delivery operation consists of arrival, package delivery, and departure phases. According to calculations, package delivery operations would exceed 65 DNL at less than 25 feet from a nest location at a rate of 400 deliveries per day to a single delivery site.

Table 16. DNL Noise Exposure Distances at a Delivery Point for Model 8000-A for Different Scales of Operation

Average Daily Deliveries at Delivery Point[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	<25	<25	<25	<25
5	<25	<25	<25	<25	<25
10	<25	<25	<25	<25	45
15	<25	<25	<25	<25	60
20	<25	<25	<25	35	70
25	<25	<25	<25	40	80
50	<25	<25	<25	65	120
75	<25	<25	40	80	155
100	<25	<25	45	95	185
150	<25	<25	60	120	235

Average Daily Deliveries at Delivery Point[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
200	<25	35	70	140	280
300	<25	45	90	180	365
400	<25	55	105	210	435

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m.
DNL = day/night average sound level

5.5 Cumulative Noise Exposure

Criteria for significance of impacts and changes in noise exposure are defined in FAA Order 1050.1F *Environmental Impacts: Policies and Procedures* (FAA 2015). Order 1050.1F Exhibit 4-1 states the following with respect to threshold of significance for a proposed action:

> The action would increase noise by DNL 1.5 dB or more for a noise sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the no action alternative for the same timeframe. For example, an increase from DNL 65.5 dB to 67 dB is considered a significant impact, as is an increase from DNL 63.5 dB to 65 dB.

A cumulative increase in noise from a proposed action can be calculated using the difference between the additional noise exposure introduced by a proposed action and the no action alternative. The cumulative DNL increase associated with different values of the proposed action is shown in Table 17.

Table 17. Cumulative Increase in DNL due to a Proposed Action

Proposed Action minus No Action (x)	Cumulative Increase in DNL (Δ)
$x < -3.8$ dB	$\Delta < 1.5$ dB
-3.8 dB $< x < 0.0$ dB	1.5 dB $< \Delta <$ 3 dB
0.0 dB $< x <$ 3.3 dB	3 dB $< \Delta <$ 5 dB
3.3 dB $< x$	5 dB $< \Delta$

For air traffic airspace and procedure actions where the study area is larger than the immediate vicinity of an airport, Order 1050.1F specifies the following change-of-exposure criteria to identify locations where noise exposure levels will increase by a magnitude considered reportable. An action that would increase noise exposure by 3 dB where no action is between 60 and 65 DNL, or by 5 dB where no action is between 45 and 60 DNL would be considered reportable.

Chapter 6
References

AvEnviro Acoustics. 2024a. *Environmental Noise Assessment: Wing Model 7000W-B Revision D.*

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Code of Federal Regulations (CFR). *Noise Standards: Aircraft Type and Airworthiness Certification.* Available: https://www.ecfr.gov/current/title-14/chapter-I/subchapter-C/part-36. Accessed: July 23, 2024.

Federal Aviation Administration (FAA). 2015. Order 1050.1F. *Environmental Impacts: Policies and Procedures*. Appendix B. Available: https://www.faa.gov/documentLibrary/media/Order/FAA_Order_1050_1F.pdf#page=113 Accessed: July 23, 2024.

Federal Aviation Administration (FAA) Office of Environment and Energy. 2023. Drone Team, AEE-100. *Measuring Drone Noise for Environmental Review Process*. Draft Measurement Protocol for Applications for EA Noise Analysis V05, PowerPoint Presentation, October 2023.

Harris Miller Miller and Hanson. 2023. *Noise Assessment for Wing Aviation Proposed Package Delivery Operations with Hummingbird 7000W-B Unmanned Aircraft*, prepared March 17, 2023.

ICF International. 2024. *Noise Modeling for the Technical Noise Study Report: Hummingbird 7000W-B and 8000-A Unmanned Aircraft Package Delivery Operations.* Dallas-Fort Worth, TX. Prepared for the Federal Aviation Administration.

Wing Aviation LLC. 2024. Description of Proposed Action and Alternatives, Supplemental EA for Package Delivery Operations for Dallas-Fort Worth Metro.

Federal Aviation Administration

Memorandum

Date: November 12, 2024

To: David Senzig (Acting), Noise Division Manager, Office of Environment and Energy (AEE-100)

From: Shelia S. Neumann, Ph.D., P.E., Flight Standards (AFS), General Aviation and Commercial Operations Branch, AFS-752

Subject: Environmental Assessment (EA) Noise Methodology Approval Request for Amending Wing Aviation LLC's Operations Specifications for Drone Operations in Central Florida

AFS requests AEE approval of the noise methodology to be used for the Environmental Assessment (EA) for Wing Aviation LLC (Wing) operations using Hummingbird 7000W-B Unmanned Aircraft and Hummingbird 8000-A (UAs) (commonly referred to as drones) in Central Florida and an associated operating area to provide package delivery services as a Title 14, Code of Federal Regulations (14 CFR) Part 135 operator as described below.

As required under the National Environmental Policy Act (NEPA), the FAA must consider the potential for environmental impacts in informing the agency's decision to approve proposed Federal actions, including the potential for noise impacts as detailed in FAA Order 1050.1F.

As the FAA does not currently have a standard approved noise model for UA, this memo serves as a request for written approval from AEE-100 to use the methodology proposed in the following sections to support the noise analysis for this EA.

Description of Aircraft and Proposed Operations

AFS is evaluating Wing's request to amend its B050 Operations Specifications (OpSpec), *Authorized Areas of En Route Operations, Limitations, and Provisions,* specifically to a reference section titled Limitations, Provisions, and Special Requirements, dated March 17, 2022. The amendment would add a new paragraph with descriptive language about the Central Florida operating area boundaries and would allow Wing to conduct up to 400 deliveries per day per nest. Wing is projecting to establish up to 150 nests in the Central Florida operating area under the scope of the proposed action. FAA's approval of an amendment is required before these operations can occur.

Wing is proposing to use the Hummingbird 7000W-B, which features a multi-rotor design with 16 round diameter propellers. The Hummingbird 7000W-B drone system consists of three main components: the launch pads (contained in “nests”), the drone, and the software. Flight missions are automatically planned by Wing’s flight planning software. A mission originates from a nest location, and Wing’s software automatically assigns, deconflicts, and routes each flight to the delivery location and back to a nest. Each nest site would include a controlled area wherein UA flights are launched and recovered. Wing is proposing to use the Hummingbird 7000W-B and 8000-A to conduct full-scale commercial UA delivery operations in Central Florida. Each drone flight would vary in duration, depending on the location of the delivery point. Hummingbird 8000-A is a multi-rotor design with 12 round diameter propellers. Its weight is under 25 pounds when combined with its maximum payload weight of 5 pounds and has a wingspan of approximately 6 feet, a height of approximately 1 foot, and a length of approximately 6.2 feet.

Remote pickup operations from each nest would be supported at up to 12 partner establishments depending upon demand and nest capacity. Pickup operations would follow general flight phases and parameters identical to typical delivery operations and would include the addition of a pickup phase. The pickup phase is similar to the delivery phase.

Wing anticipates the updated fleet makeup would be comprised of 70 to 80 percent 7000W-B aircraft and 20 to 30 percent 8000-A aircraft. The fleet mix of individual nests would be variable based on payload, route, and demand characteristics; nests with a wider range of offerings are anticipated to carry higher proportions of 7000W-B Aircraft.

Wing is projecting to establish up to 150 nests throughout Central Florida to include Tampa and Orlando metropolitan operating and surrounding areas. Proposed operations would include approximately 400 deliveries per day, per nest, and would occur only during daylight hours, approximately 7:00 a.m. to 10:00 p.m., to include holidays. Wing is not proposing to conduct night operations (defined as 10:00 p.m. to 7:00 a.m.) and would not typically operate over water. However, operating hours would also include in-nest checkout flights between 6:00 a.m. and 7:00 a.m.

Noise Analysis Methodology

AFS requests the use of the noise analysis methodology described in Report No. 112024 for “Technical Noise Study Report: Hummingbird 7000W-B and 8000-A Unmanned Aircraft Package Delivery Operations,” dated November 4, 2024.

Federal Aviation Administration

Memorandum

Date: November 12, 2024

To: Shelia S. Neumann, Ph.D., Flight Standards (AFS), General Aviation and Commercial Branch, (AFS-752)

From: Sandy Liu, Manager (Acting), Noise Division, Office of Environment and Energy (AEE-100) Sandy R Liu SANDY R LIU Digitally signed by SANDY R LIU Date: 2024.11.12 14:51:31 -05'00'

Subject: Environmental Assessment (EA) Noise Methodology Approval Request for Amending Wing Aviation LLC's Operations Specifications for Drone Operations in Central Florida

The Office of Environment and Energy, Noise Division (AEE-100), has reviewed the proposed non-standard noise modeling methodology to be used for Wing Aviation LLC (Wing) operations using the Hummingbird 7000W-B and 8000-A unmanned aircraft (UA) throughout Central Florida metropolitan area. This request is in support of the Environmental Assessment for Wing to amend operations specifications for drone operations in Central Florida metropolitan area.

Wing is proposing to expand its UA retail package delivery capabilities by extending hours of operations, establishing up to 150 nests, and providing remote pickup and delivery services. Wing's intent is to offer service throughout Central Florida including Tampa and Orlando metropolitan areas from a network of nests, where each would serve a specific area, thereby avoiding an over-concentration of flights surrounding any given nest. Wing's nests would continue to be located in commercially zoned areas, such as shopping centers, large individual retailers, and shopping malls. Wing would maintain its total number of daily operations per nest of 400 flights per operational day. Current Wing delivery operations occur between 7:00 a.m. and 7:00 p.m. Wing proposes to extend delivery operations to 7:00 a.m. to 10:00 p.m. In addition, operations would include low altitude (<8ft) in-nest hover checks, or Fitness Built in Tests (FitBITs) between 6:00 a.m. and 7:00 a.m. in preparation for the normal operational day which would begin no earlier than 7:00 a.m. Additionally, higher hover flights (approximately 60 feet) may be performed up to 18 times per nest, per week, where the UA makes a separate hover flight to update the reference map of the nest; these flights are termed Geography Built In Test (GeoBITs) because of their similarity to the FitBIT stationary hover flight over the nest.

As the FAA does not currently have a standard approved noise model for assessing UA, and in accordance with FAA Order 1050.1F, all non-standard noise analysis in support of the noise impact analysis for the National Environmental Policy Act (NEPA) must be approved by AEE. This letter serves as AEE's response to the method developed in Report No. 112024 for "Technical Noise Study Report: Hummingbird 7000W-B and 8000-A Unmanned Aircraft Package Delivery Operations," dated November 4, 2024.

The proposed methodology appears to be adequate for this analysis; therefore, AEE concurs with the methodology proposed for this project. Please understand that this approval is limited to this particular Environmental Review, location, vehicle, and circumstances. Any additional projects using this or other methodologies or variations in the vehicle will require separate approval.

Appendix G
SHPO Consultation

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

State Historic Preservation Office
Florida Department of State, Florida Division of Historical Resources
R.A. Gray Building
500 South Bronough Street
Tallahassee, Florida 32399-0250

June 11, 2024

Via electronic submission to CompliancePermits@dos.myflorida.com.

Re: Concurrence with Proposed Area of Potential Effects for Drone Delivery Operations in Central Florida metropolitan and surrounding areas

State Historic Preservation Officer:

The Federal Aviation Administration (FAA) is currently evaluating a proposal from Wing Aviation, LLC doing business as Wing, to introduce drone package delivery operations in Central Florida metropolitan and surrounding areas. The FAA has determined the proposed action, which requires FAA approvals to enable operations, is an undertaking as defined under the regulations implementing Section 106 of the National Historic Preservation Act (36 CFR § 800.16(y)). The purpose of this letter is to coordinate with the State Historic Preservation Officer (SHPO) and request concurrence on the definition of the Area of Potential Effects (APE).

Proposed Undertaking

Unmanned Aircraft

Two Unmanned Aircraft (UA) would be primarily used for package deliveries: Wing's Hummingbird 7000W-B and 8000-A as described below and shown in Attachment A.

- Hummingbird 7000W-B.
    - Multi-rotor design with 16 round diameter propellers.
    - Weight under 15 pounds when combined with its maximum payload weight of 2.7 pounds.
    - Has a wingspan of approximately 4.9 feet, a height of approximately 1 foot, and a length of 4 feet.
- 8000-A.
    - Multi-rotor design with 12 round diameter propellers.

- Weight under 25 pounds when combined with its maximum payload weight of 5 pounds.
- Has a wingspan of approximately 6 feet, a height of approximately 1 foot, and a length of approximately 6.2 feet.

All Wing aircraft use electric power from rechargeable lithium-ion batteries.

Wing anticipates the Orlando-Tampa fleet makeup would be comprised of 70 to 80 percent 7000W-B aircraft and 20 to 30 percent 8000-A aircraft. The fleet mix of individual nests would be variable based on payload, route, and demand characteristics; nests with a wider range of offerings are anticipated to carry higher proportions of 7000W-B Aircraft.

Flight Operations

The UA would generally be operated at an altitude of 150–300 feet above ground level (AGL) and always below an altitude of 400 feet AGL while en route to and from delivery locations. At a delivery location, the UA would descend vertically to a stationary hover at 23 feet AGL and lower a package to the ground by a retractable line for delivery. Once a package has been lowered to the ground, the UA would then retract the line, ascend vertically to a cruise altitude, and depart the delivery area enroute back to a nest.

The UA would fly a predefined flight path that is set prior to takeoff. Flight missions are automatically planned by Wing's flight planning software. A mission originates from a nest location, and Wing's software automatically assigns, deconflicts, and routes each flight to the delivery location and back to a nest. Each nest site would include a controlled area wherein UA flights are launched and recovered.

A typical flight profile can be broken into the following general flight phases: takeoff, enroute outbound, delivery, enroute inbound, and landing.

Takeoff

Once the UA receives a mission and is cleared for takeoff from a launch pad, the UA takes off from the ground vertically to an altitude of 23 feet AGL and hovers for 30 seconds while the package is loaded. The UA then climbs to the en route altitude (150–300 feet AGL).

En Route Outbound

The en route outbound phase is the part of flight in which the fully loaded UA transits from the nest or a remote pickup location to a delivery point on a predefined flight path. During this flight phase, the UA would typically operate at an altitude of 150–300 feet AGL and a typical airspeed of 59 miles per hour (mph). The UA has a single set cruise airspeed, which would not be exceeded.

Delivery

The delivery phase consists of descent from the en route altitude to a delivery point, such as a residential yard, driveway, parking lot, or common area. The UA descends vertically to 23 feet AGL while maintaining position over the delivery point. The UA hovers at 23 feet AGL for approximately 30 seconds while lowering its package and then proceeds to climb vertically back to enroute altitude. The minimum

distance a human should be from the UA during delivery is a 6-foot radius from underneath the center of the UA.

En Route Inbound

The UA continues to fly at an altitude of 150–300 feet AGL and a speed of 59 mph towards the nest.

Landing

Upon reaching the nest, the UA slowly descends over its assigned landing pad and lands on the pad.

Remote Pickup Operations

Remote pickup operations from each nest would be supported at up to 12 partner establishments depending upon demand and nest capacity. Pickup operations would follow general flight phases and parameters identical to typical delivery operations and would include the addition of a pickup phase. The pickup phase is similar to the delivery phase. The UA descends from its close transit altitude (safe altitude above local terrain and obstacles) to 14.5 feet AGL and lowers the package hook. The UA then passes approximately 10 feet laterally over the autoloader. The autoloader's Y-shaped poles passively guide the package hook to a narrow slot that ensures secure attachment of the package. The package is then retracted to the UA before it proceeds to climb to the enroute altitude. Remote pickup operations from descent to finish are expected to take no longer than 1 minute and 30 seconds (90 seconds). Delivery, en route return, and landing operations would then occur as described above.

Area of Potential Effects
In accordance with 36 CFR § 800.4(a)(1), the FAA has defined the APE in consideration of the undertaking's potential direct and indirect effects. The proposed APE is the drone operating area outlined in red in **Attachment B**. The operating area would stretch from the west coast of Florida, along the Gulf of Mexico, to the east coast of Florida, along the Atlantic Ocean, and would be approximately 14,168 square miles.

Conclusion
The FAA requests your concurrence on the definition of the proposed APE. Your response within the next 30 days will greatly assist us in our environmental review process. If you would like to consult with the FAA about the proposed APE, please contact Dr. Shelia Neumann via email at 9-faa-drone-environmental@faa.gov.

Sincerely,

Derek Hufty
Manager, General Aviation and Commercial Branch (AFS-750)
Emerging Technologies Division
Office of Safety Standards, Flight Standards Service

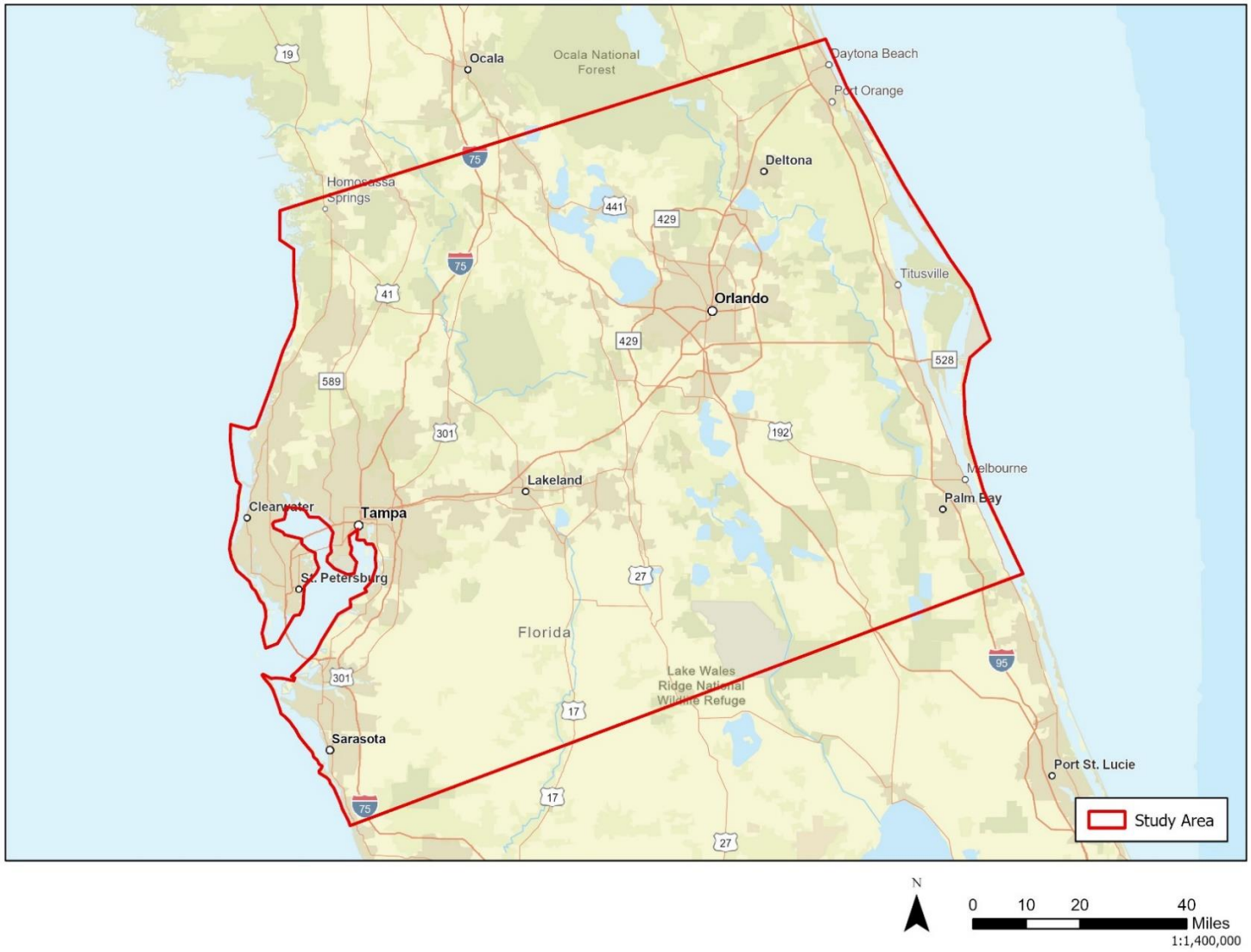
Enclosures:
Attachment A – UAS Images
Attachment B – Proposed Area of Potential Effects

Attachment A

Wing Hummingbird 7000W-B UA

Wing Hummingbird 8000-A UA

Attachment B
Proposed Area of Potential Effects



FLORIDA DEPARTMENT of STATE

RON DESANTIS
Governor

CORD BYRD
Secretary of State

Mr. Derek W. Hufty
Manager, General Aviation and Commercial Branch (AFS-750)
Federal Aviation Administration
Aviation Safety
800 Independence Ave., S.W.
Washington, D.C. 20591

September 17, 2024

Re: DHR Project No.: 2024-3435
Requested Concurrence with Proposed Area of Potential Effects for Drone Delivery Operations in Central Florida Metropolitan and Surrounding Areas

Dear Mr. Hufty:

This office reviewed the referenced project for possible impact to historic properties listed, or eligible for listing, in the *National Register of Historic Places.* The review was conducted in accordance with Section 106 of the *National Historic Preservation Act of 1966*, as amended and *36 CFR Part 800: Protection of Historic Properties*.

Based on the information provided, we find the proposed area of potential effect acceptable. We look forward to continuing consultation with your agency on the potential effects form this undertaking.

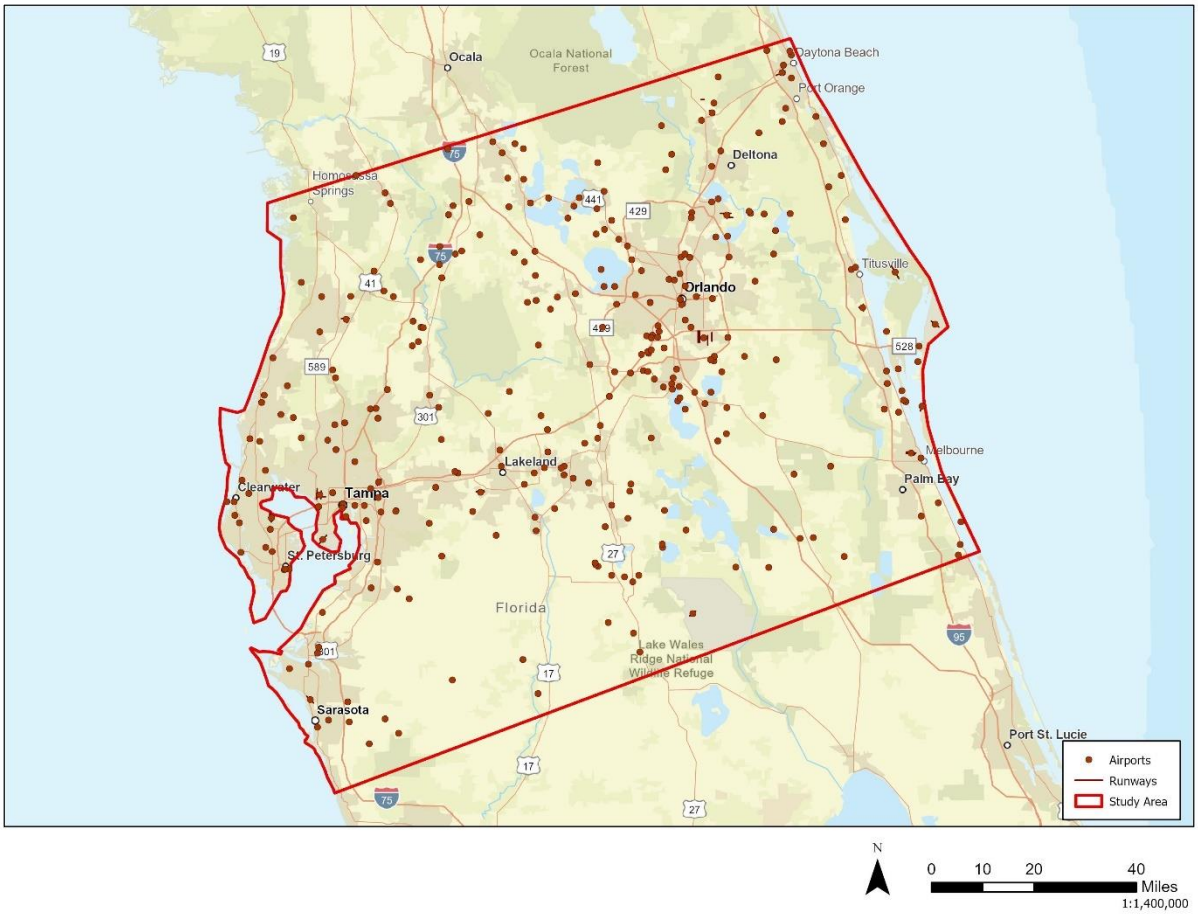
If you have any questions concerning our comments, please contact Scott Edwards, Historic Preservationist, by electronic mail *scott.edwards@dos.myflorida.com*, or at 850.245.6333 or 800.847.7278.

Sincerely,

Kelly L Chase
For
Alissa Slade Lotane
Director, Division of Historical Resources
and State Historic Preservation Officer

Appendix H

Central Florida Metropolitan and Surrounding Areas Airports



Appendix I
Community Engagement Plan

Community Integration Best Practices

At Wing our community engagement efforts fall into three pillars: educate, listen, and respond. These three components support an outreach strategy for a successful integration with the community when launching a new technology.

Educate

Education starts with sharing about the concept of drone delivery not only to community members, but also to the state & local government. The concept of drone operations with certain preconceptions, some of which may be negative, and apply those thoughts to any and all drone operations without recognizing that drone platforms vary widely in how they operate and for which applications they are used.

State & Local Government

It is important to conduct these meetings early in the process of beginning a drone operation for several reasons:

- To ensure that local decision-makers are equipped with early knowledge of the situation so they can be an informed voice with their constituents.
- To get to key stakeholders early so that they are hearing accurate information directly from the drone operator rather than potential misinformation from other sources that would require effort.
- To provide an opportunity to begin two-way conversations and build relationships with stakeholders, allowing ample time for them to approach us after an initial meeting with further questions and to provide us time to follow up with responses on any concerns.

Holding these conversations early allows ample time for the outcome of these meetings to inform future outreach, so that insights gleaned from stakeholders can help the company tailor their outreach approach and their service more effectively to the specific needs and priorities of the community. The purpose of these initial meetings is to introduce your company to local officials, describe to them your plans and goals, expand on the benefits of your services, provide the officials with an opportunity to ask questions or express concerns, and to solicit advice from local officials on other important stakeholders to talk to and any particular actions that should be taken in becoming a member of the community.

Listen

Capturing Public Sentiment

While engaging with a community, it is important to be able to track the extent and nature of the feedback provided. Being able to quantify the number of community members we spoke to can be important information for federal regulators, local leadership, and internal discussions that can shape the future direction of the company. Capturing information regarding the sentiment of community members and if they feel positively or negatively towards drone delivery is important. Understanding the overall sentiment can be extremely important in analyzing success in a market and gauging how to grow and adapt.

Outreach Events

Apart from participating in broader community festivals or events, our outreach events will often fall into two categories: a community booth, or a community demonstration. At Wing, booths will involve a table where staff can display the drone, a representative package used in our deliveries, and accompanying materials that help demonstrate how the technology works. The display drone is very effective in attracting the attention of community members. It is also a good way of introducing people, particularly children, to the aircraft in a way that is not intimidating and allows them to examine the components up close.

Respond

Community members may approach the concept of drone operations with certain preconceptions, some of which may be negative, and apply those thoughts to any and all drone operations without recognizing that drone platforms vary widely in how they operate and for which applications they are used. It is important to respond to questions, comments, concerns, and feedback that the community is providing us.

MID-ATLANTIC AVIATION PARTNERSHIP
VIRGINIA TECH™

Wing

Community Engagement: Best Practices for Drone Operators

The Wing-MAAP team's guide to working with communities

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INTRODUCTION

This document contains information and background that Wing and Virginia Tech's Mid-Atlantic Aviation Partnership (MAAP) have found to be helpful in engaging with a community prior to and during operation of a drone package delivery service. The information has been collected through engagement during multiple launches of Wing's delivery service - in Australia, Finland and the United States - and ranges from providing briefings to high-level public officials to direct conversations with community members at public events. It does not include discussion of engagement through media or social media, but is instead focused on our attempts to engage directly with community members in person.

With most new and emerging technologies, adoption depends on customers and communities seeing the value of the new service provided and embracing rather than resisting new ways to receive products. Wing and MAAP recognize that the only way for a drone platform to be successful is to provide a service that customers find useful, and that the larger community deems acceptable. Without community acceptance, the service simply won't work. To that end, Wing and MAAP make it a priority to engage with and assimilate into a community prior to introducing our drone delivery service. And whenever possible, we act on community feedback to adopt changes and improvements to our service.

Humility is an essential quality when launching a drone delivery service in a new market. Each community has its own needs and sensitivities; its own history and way of life. While we may know our technology better than anyone else, community members know best the kind of service they require. Approaching community engagement with an understanding that the community itself has some of the answers to a successful drone operation is an important principle.

It is also important to note that different applications of drone technology involve different levels of engagement with members of a community. A package delivery service like what Wing provides is inherently a high-visibility application that involves a great deal of direct interaction with customers as well as non-customers. For that reason, Wing and MAAP used an intensive, high-touch approach of engaging community members prior to launching the service. Other drone applications may involve less interaction with community members, and therefore each and every element of the strategy discussed below may not apply.

OVERALL STRATEGY

For our community engagement efforts, Wing and MAAP incorporated three overarching principles in our approach: educate, listen and respond. These three components support an outreach strategy that furthers our broader goal of launching a service that best meets the community's needs and minimizes impacts that may be perceived as negative.

A Note About COVID-19:

As noted throughout this document, a key to effective outreach is to have direct, in-person conversations with community members to convey information and elicit feedback. During the COVID-19 pandemic, those opportunities are extremely limited or simply not available at all. Instead, Wing and MAAP have pursued engagement opportunities online and in the form of virtual meetings. Phone calls and video conference presentations to local groups and organizations have taken the place of booths at festivals and in-person meetings. These events still allow Wing and MAAP to continue conversations with community members and highlight new developments with the drone delivery service, which is particularly relevant given the surge in demand for our services during the pandemic. Having already established strong community connections through outreach efforts prior to launching service, Wing and MAAP were able to draw from those relationships to understand and respond effectively to the community's changing needs. Additional strategies include highlighting service updates through local media channels and supporting local fundraising efforts for frontline workers during the pandemic.

Educate

Perhaps the most important component of gaining community acceptance is educating community members on what your particular drone platform is, as well as what it is not. Community members may approach the concept of drone operations with certain preconceptions, some of which may be negative, and apply those thoughts to any and all drone operations without recognizing that drone platforms vary widely in how they operate and for which applications they are used.

At Wing, as with many other drone companies, an enormous amount of effort went into customizing our drone service and package delivery system to meet particular performance requirements while sacrificing other capabilities that are not essential to our operations and, in some cases, could engender public concerns (e.g. we do not employ a camera with images viewable by the pilot). As part of that process, we have also worked to address key concerns that we hear frequently about UAS technology.

When speaking with community members, concerns are generally raised around recurring themes; particularly safety, privacy and noise. Those concerns could be developed through personal experience, but are often based on news reports or general background about drones that don't necessarily apply to all of the various different platforms that now exist.

Being present in a community before your drone service has begun provides the opportunity to educate community members about how your service operates, what benefits it provides and how you plan to establish appropriate channels for continued community interaction. It also allows you to hear about particular concerns, explain how you have addressed or plan to address those concerns, and to clear up any misconceptions about how your particular drone platform operates.

For example, many people share concerns about drones taking video footage of their homes or activities. When we have community events, we explain that Wing drones have a downward-facing, low resolution, grayscale camera that is used for navigational purposes. Community members who have expressed concerns appreciate the information about Wing and our operations.

Bringing an understanding to the general public of the benefits of drone services, while noting the ways in which recurring concerns have been taken into account, can be one of the most challenging yet effective efforts in developing public acceptance.

Listen

Direct in-person presence allows for dialogue: helping the drone operator get crucial feedback from potential customers while allowing people to share their thoughts and concerns in a way that reassures them they are being heard by the drone operator. These interactions can also provide key insight for the drone operator on how to make meaningful improvements to its service.

It can be helpful in both the short- and long-term to develop a system to collect data on public sentiment that will allow you to track general trends and reactions

(detailed below in the "Capturing Public Sentiment" section). Conversations at a community festival booth can sometimes be brief, but providing contact information so that individuals can follow up with real people has proven to be helpful in continuing those conversations and building relationships.

Listening to the views of community members and extending these conversations means community members feel they are being heard and are part of the process of developing a new service. Because sentiment towards drone delivery and drone operations in general will vary widely in a diverse community, it will likely be impossible to address or resolve every individual's potential concerns. However, providing an avenue for community members to directly voice their opinions can be constructive and contribute to the success of a drone service in the community.

For larger operations, listening to community members also involves conveying relevant input to the appropriate department or team. To ensure the experience is effective from a community member's perspective, that means that the staff member taking feedback must see that feedback is delivered to the appropriate staff who can address it. Failure to follow up on a question raised by a community member, particularly if part of a broader trend, can spoil the outreach efforts and poison the well for your company's longer-term relationship with that community.

Respond

An important component to listening involves the ability to respond to whatever feedback is provided. First, consistency in responses provided is important so developing a common script that all team members can work from ensures that community members are receiving the consistent responses to common questions. Team members working at outreach events could come from varied backgrounds or have varied levels of expertise, so working from a standardized set of responses to commonly asked questions will help to avoid any confusion for community members who could otherwise come away from an interaction having received discordant or conflicting information.

When well-founded complaints or concerns are voiced, it is important to respond with concrete action in an attempt to resolve the issue. In the case of Wing's engagement, much of the feedback has involved the provision of service itself: Can we provide service to an address or neighborhood? Can we provide additional services - deliveries over a longer time period or provide additional items for delivery?

In many ways, this can be viewed as positive feedback, as it shows that community members and customers enjoy the current service and would like to see it expanded. When possible and when it makes sense from the perspective of growing the service

long-term, Wing attempts to accommodate these requests. For example, we have expanded our merchant offerings on the app in Australia to include additional merchants who offer a much larger selection of goods for delivery to our customers and we continue to explore ways to expand our delivery area.

Other feedback could involve complaints about a drone operation: when and where the operation takes place, proximity to certain areas or homes, the noise or other disturbance associated with operations, etc. As an example, in its early operations Wing received feedback related to the noise emitted by our drone operations. In response, Wing addressed those concerns by taking measures such as redesigning our hover propellers to reduce both the volume and pitch of noise generated by our drones. Another example is that Wing has designed its route planning software to randomize routes in a way that distinct "drone highways" or specific routes are not taken for each and every flight in an effort to minimize repeatedly flying over any given land parcel when making deliveries. In addition, locating the base of operations in a commercial district rather than in close proximity to quiet residential areas can ensure that the highest concentration of flight activity is localized in a part of town already busy with commercial activity.

Being able to demonstrate that a drone operator can and will take action to address community concerns is effective when talking to community members to show that drone industry participants value the feedback they receive and take concrete actions to do something about it. Not every concern can be addressed with a direct solution, but experience has shown that community members value efforts taken to listen and address issues raised within the communities being served.

STATE & LOCAL GOVERNMENT

Well in advance of the date scheduled for operations to begin, a drone operator may want to set up meetings with the relevant state and local government officials, as well as other important stakeholders who are known within the community. Local government officials include the Mayor and City Manager, members of the Town or City Council, County Board of Supervisors and key staff, local economic development officials and others that may be identified as being important.

State officials would include key members of the governor's team and cabinet, department of aviation officials, local members of the state General Assembly as well as their staff.

It is important to conduct these meetings early in the process of beginning a drone operation for several reasons:

- To ensure that local decision-makers are equipped with early knowledge of the situation so they can be an informed voice with their constituents.
- To get to key stakeholders early so that they are hearing accurate information directly from the drone operator rather than potential misinformation from other sources that would require effort.
- To provide an opportunity to begin two-way conversations and build relationships with stakeholders, allowing ample time for them to approach us after an initial meeting with further questions and to provide us time to follow up with responses on any concerns.

Holding these conversations early allows ample time for the outcome of these meetings to inform future outreach, so that insights gleaned from stakeholders can help the company tailor their outreach approach and their service more effectively to the specific needs and priorities of the community.

The purpose of these initial meetings is to introduce your company to local officials, describe to them your plans and goals, expand on the benefits of your services, provide the officials with an opportunity to ask questions or express concerns, and to solicit advice from local officials on other important stakeholders to talk to and any particular actions that should be taken in becoming a member of the community. Perhaps most importantly, these meetings help with forging important relationships with key stakeholders in a friendly, introductory environment.

This initial set of meetings with local elected and state officials can be followed by additional meetings with important stakeholders in the community, which can include potential supporters who can speak positively of your presence to other community members as well as potential groups who may be cautious about embracing drone delivery services.

ADDITIONAL STAKEHOLDERS/PARTNERS

Stakeholders include the local chamber of commerce, leaders at local educational institutions, leading voices in various different local communities or groups (e.g. particular cultural associations, active technology/robotics or environmental groups, local AARP chapter, etc.). Given that drone technology must safely share the skies with other types of aircraft, it is also important to have your company's drone pilots and technical experts meet with members of the local aviation community to explain your concept of operations and provide lines of communication to ensure any and all questions can be answered.

Experience has shown that conducting these meetings with a respected local partner, if possible, can be very effective in allaying concerns and driving support. As an example, in launching its Virginia operations, Wing's partnership with MAAP, a division within Virginia Tech, carried with it the valuable affiliation with the university. Including representatives from MAAP in meetings reinforced with the local community that Wing had the support of a trusted local partner.

IDENTIFYING OUTREACH OPPORTUNITIES

Every community presents opportunities for a drone company to engage with community members simply through participating in the large-scale, public events that are hosted within a community each year. These can range from farmers' markets to street fairs, health & wellness events to music or food festivals. Some events won't be appropriate for engaging in discussions about providing drone services. However, events that attract a good cross-section of the community and that allow you to rent out or set up a booth can provide a great opportunity to engage with the community. Something as simple as scanning community event calendars can be helpful in identifying good options. If you are unfamiliar with a community, local elected officials or other community leaders are often happy to suggest good options.

It can be worthwhile to think creatively about outreach opportunities. Consider securing a presence at events that may not traditionally be associated with a new and emerging technology like drone operations. As an example, Wing and MAAP have had success by identifying outreach opportunities such as home shows, aging

conferences and AARP chapter meetings to start conversations with community members about the benefits of drone package delivery. Thinking about drone operations as a way of improving people's everyday lives rather than just an exciting new technology can change people's perspectives and helps to re-frame the way that a community views the role of drone operations. This perspective can also be helpful in identifying outreach events and framing your message as you engage with community members at those events.

CAPTURING PUBLIC SENTIMENT

While engaging with a community about your company's drone operations, it is important to be able to track the extent and nature of the feedback provided. Being able to quantify the number of community members that you spoke to can be important information for federal regulators, local leadership and internal discussions that can shape the future direction of the company. In addition, capturing information about whether community members feel positively or negatively towards your operations and what specific factors weigh into those feelings can be extremely important in analyzing your success in a market and gauging how to grow and adapt.

In a common situation, a drone company team member will find herself staffing a booth at a community festival or other public place and engaging in one-on-one (or group) conversations with community members in somewhat crowded environments. Those situations are not always conducive to taking timely and specific notes about particular questions or concerns that a community member may voice. To address that challenge, one possible solution is to incorporate a system of tracking public sentiment by using tablets during events and minimizing the amount of work an employee would have to do at the event to provide an accurate sense of a community member's feedback. Using a document with predetermined categories that generally describe the nature of positive or negative sentiments can quickly provide information about the number of people sharing feedback, and what specific type of concern it is. Staff can also take notes after the interaction if more specificity is needed. For particularly crowded and chaotic events, it can be effective to designate one person on staff to focus on collecting feedback with the tablet rather than engaging in conversations with community members.

Feedback collected at community events is valuable to ascertain information about broader trends. By having direct contacts with thousands of community members, it allows you to get a good cross section of community views about your service. In the case of the Wing-MAAP team, for example, these direct, organic conversations

inform us about how a particular community values the convenience, product offerings or environmental benefits of our service, and allow us to hear questions or concerns. In addition, collecting feedback through the use of a document with predetermined categories allows for collection of standardized data across multiple markets with the ability to run comparative analysis between those markets.

During community outreach events, there is the potential for uncomfortable or tense conversations with members of the public who may disagree with the service or have more general concerns about new technology. This could involve someone using offensive or derogatory language, acting physically aggressive, or using a cell phone to record an awkward exchange. In Wing's experience having hosted over 100 information booths across three countries, uncomfortable situations have been extremely limited and relatively mild in nature. Nonetheless, it is important to remain prepared in case a situation arises.

If such a situation arises, it is advisable to use conflict resolution practices such as maintaining eye contact, actively listening, and keeping a friendly rapport while also making a note of any action items. Actions items could include tracking down follow up information that a team member doesn't have at the ready in order to share with the community member at a later date. For public events, always consider security arrangements, including taking note of any law enforcement presence. Consider adopting a policy of requiring at least two team members present in order to avoid leaving one employee to handle a situation by him or herself. Developing and talking through an action plan beforehand is also important so that team members are confident in what steps to take if such a situation arises.

GUIDELINES FOR COMMUNITY OUTREACH EVENTS

Apart from participating in broader community festivals or events, your drone operation's outreach events will often fall into two categories: a community stall/booth, or a community demonstration. At Wing, stalls/booths will involve a table where staff can display the drone, a representative package used in our deliveries, and accompanying materials that help demonstrate how the technology works. We have found that simply having the drone itself on display is very effective in attracting the attention of community members. It is also a good way of introducing people, particularly children, to the aircraft in a way that is not intimidating and allows them to examine the components up close.

Flight demonstrations can be even more effective in allowing community members to see how the technology actually works. Staff can identify suitable plots of land in a community that can host members of the public while also being able to provide for a safe demonstration of the drone technology. During a flight demonstration event, it is advisable to space out the flights so that community members can filter in and out of the event and still witness how the system works. At flight demonstrations, staff should also have a stall or booth to help with providing informational materials, answering questions, and helping people sign up to use the service.

OUTREACH EXPERIENCE FOR THE WING-MAAP TEAM IN VIRGINIA

Wing began its drone delivery operations in Christiansburg, Virginia in October, 2019 in partnership with Virginia Tech's MAAP and the Virginia Center for Innovative Technology under the U.S. Department of Transportation's Integration Pilot Program. Leading up to the launch of service, Wing and MAAP jointly executed a comprehensive community outreach strategy that closely followed the principles laid out above.

Targeted Outreach with Government Officials and Local Stakeholders

In the summer and early fall of 2019, Wing and MAAP scheduled meetings with Town Council members for the Town of Christiansburg, members of the Montgomery County Board of Supervisors, the Governor's office, and federal and state legislators who represent the region. In these meetings, we briefed officials on the background of Wing, our plans for operations in Christiansburg and our strategy to engage local community members about the upcoming service. In each meeting, we also solicited feedback from the officials in an effort to gauge their level of support, understand any advice they had for us to maximize our success, and learn of additional stakeholders in the community we should meet with directly. These initial meetings also served as friendly introductions to lay the groundwork for constructive longer-term relationships going forward.

In addition to elected leaders, the Wing-MAAP team also met with prominent local stakeholders and members of key groups. These groups ranged from the local chamber of commerce to law enforcement and first responders, including the local police and fire departments as well as the county sheriff.

Wing and MAAP team members with Christiansburg Mayor Michael Barber

We also scheduled meetings with key aviation stakeholders to ensure coordination with other groups who would be using shared or neighboring airspace. These groups included the manager of the local airport, leaders in the local medivac and helicopter community as well as members of the local drone hobbyist community. We were careful to include our pilots and technical staff in these meetings in order to engage in discussions that could delve into specific and technical aviation issues.

Presence at Widely-Attended Community Events

Wing and MAAP worked to identify community festivals in the region that would be suitable for securing a Wing-MAAP booth where we could provide flyers and background materials to distribute, display a drone and our delivery mechanism to demonstrate our technology in-person, and have staff on hand to explain our plans and answer questions.

MAAP and Wing team members at Christiansburg's Touch-A-Truck festival

The events ranged from the largest regional street festival to much smaller and more intimate gatherings that attracted more modest foot traffic. As an example, Wing and MAAP team members staffed a booth at Steppin' Out Blacksburg, a two day festival that generally attracts roughly 40,000 attendees. Other events included the Kiwanis Wilderness Festival, the Christiansburg Food Truck Rodeo, and multiple appearances at the local farmers market and a kiosk in the indoor mall.

Attending these events allowed Wing and MAAP to interact with a large number of community members, educating them about our drone delivery service while also getting important feedback from potential customers. Having a presence at a range of different events also allowed us to build awareness with a wide variety of community members from different neighborhoods and income brackets.

Importantly, Wing and MAAP continued to have a presence at community events and local gathering places after the initial launch of our delivery service. This continued presence helped demonstrate a commitment to the community and allowed community members to continue dialogue with us. Discussions changed over time as well, with initial conversations focused on educating the public about who we are and what we do and later conversations focused on troubleshooting how people can sign up for the service and taking suggestions for how the service could be improved.

The Wing-MAAP team has also found ways to expand our outreach once the delivery service was up and running. We have invited several groups of community members, including entire classes of middle and high school students, to Wing's base of operations in Christiansburg to provide background on the drone delivery operation and educate more generally on drone technology and safe operation. The Wing-MAAP team has found these opportunities to be very well received by student groups and an effective tool to help generate enthusiasm among local students to pursue careers in the field.

Tour of Wing's Christiansburg operation

Hosting Information Sessions and Flight Demonstrations

Wing and MAAP hosted multiple events that allowed for community members to witness the drone delivery system in person prior to Wing's service officially beginning.

Wing organized a widely-attended gathering, held at a large centrally-located outdoor space. Wing sent invitations by mail to a large majority of the residences within the delivery footprint, inviting community members and local leaders to attend a picnic event on a Saturday afternoon. At the event, Wing, MAAP and other partners each had booths staffed by employees to provide information and materials with details about how the service would work. Most importantly, over the course of the event Wing made drone deliveries to the event every 15 minutes to allow attendees to witness how the technology works up close. Exhibiting the delivery system in person prompted constructive questions from attendees and potential customers. It also served to build a comfort level in, as well as excitement about, the upcoming service that we would offer.

In addition to the picnic-style event, Wing and MAAP hosted smaller scale demonstrations at other venues around town. These events were announced beforehand on local media and, although they did not include the enticement of free food, also provided the opportunity for attendees to witness deliveries firsthand. At each event, Wing and MAAP had staff and background materials on hand to provide helpful information and answer questions between deliveries.

Hosting multiple flight demonstration events provided different opportunities for community members to view the delivery system prior to launch in case one particular date wasn't suitable for everyone. Varied venues around town helped us expose a cross section of the community to the service. We have found that witnessing the experience in person was an extremely effective tool in educating the community about drone delivery and helped create local excitement about its benefits.

Taken as a whole, Wing and MAAP found the strategy described above to be successful in creating an overwhelmingly positive community response to the drone delivery service. Engaging early and establishing constructive relationships with leaders and community members helped pave the way for a successful launch of the delivery service and began a constructive dialogue with the community from which we continue to benefit as we work to modify and improve the service.

Appendix J
Coastal Zone Management Act

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Florida State Clearinghouse
Florida Department of Environmental Protection
3900 Commonwealth Boulevard
Tallahassee, Florida 32399

Via electronic submission to state.clearinghouse@dep.state.fl.us

RE: Wing Unmanned Aircraft Delivery Operations (Central Florida) – Coastal Zone Management Act

Dear Florida State Clearinghouse:

The Federal Aviation Administration (FAA) is currently evaluating a proposal from Wing Aviation, LLC, (Wing) to conduct unmanned aircraft (UA; also referred to as a drone) small package delivery operations in Central Florida using its Hummingbird 7000W-B and 8000-A UAs. The FAA has determined that the proposed action, which would encompass all FAA approvals necessary to enable operations, is an unlisted activity under Florida's coastal management plan. Consistent with 15 CFR 930.54(a)(2) and FAA Order 1050.1F, the FAA is providing written notice of Wing's submission of an application for FAA authorization for an unlisted activity. FAA respectfully requests your review and concurrence of this activity's consistency with the Florida Coastal Management Program.

Project Description

Wing is proposing to conduct UA commercial delivery services in Central Florida. Wing has a Part 135 Air Carrier Operating Certificate from the FAA, which allows it to carry the property of another for compensation or hire beyond visual line of sight (BVLOS) using its Hummingbird Unmanned Aircraft System (UAS). The certificate contains a stipulation that operations must be conducted in accordance with the provisions and limitations specified in the carrier's Operations Specifications (OpSpecs).[1] Wing is seeking to obtain an OpSpecs and other FAA approvals necessary to conduct UA commercial package delivery operations in Central Florida (**see Attachment A**).

The FAA grants multiple approvals for package delivery proposals, including waivers of 14 CFR Section 91.113(b) for BVLOS operations and Certificates of Waiver or Authorization. However, the issuance or amendment of an OpSpec specifically enabling package delivery flights in a defined operating area is the key approval for UA operations. The FAA has statutory and regulatory obligations related to Part 135 certificates and associated OpSpecs. It must issue an operating certificate if it determines, after investigation, that the applicant can operate safely and complies with relevant regulations. Operating

[1] An Operations Specifications is a document that defines the scope of aircraft operations that the FAA has authorized.

certificates specify terms for safety, authorized locations, and U.S. airways for air carrier operations. They also require compliance with provisions and limitations in the OpSpec. A Part 135 certificate holder cannot operate in a geographical area without specific authorization in its OpSpec, which includes "authorization and limitations for routes and areas of operations." Air carriers may request OpSpec amendments, which the FAA may approve if it finds the changes are consistent with safety and the public interest. Once this determination is made, the FAA must act on the amendment request.

Wing projects establishing up to 150 sites in Central Florida. Wing projects operating a maximum of 400 delivery flights per operating day per nest, with operating hours initially occurring between 7:00 am to 7:00 pm and then extending to 7:00 am to 10:00 pm, 7 days of the week, including holidays. In addition, operations would include low altitude (<8ft) in-nest hover checks, or Fitness Built in Tests (FitBITs) between 6:00 a.m. and 7:00 a.m. in preparation for the normal operational day which would begin no earlier than 7:00 a.m. Additional, higher hover flights (approximately 60 feet) may be performed up to 18 times per nest, per week, where the UA makes a separate hover flight to update the reference map of the nest; these flights are termed Geography Built In Test (GeoBITs) because of their similarity to the FitBIT stationary hover flight over the nest and would occur during regular operating hours (7:00 a.m. to 10:00 p.m.). Wing is not proposing to conduct operations from 10:00 pm to 6:00 am.

The UA would be transporting consumer goods in partnership with merchants in the community. There would be variability in the number of flights per day based on customer demand and weather conditions. Initially, Wing expects to fly less than 400 flights per day from each nest and then gradually increase to 400 deliveries per day as consumer demand rises. Even in the locations where the service areas of nests overlap, deliveries would not exceed 400 per day.

The description of the proposed action is divided into two components: installation of Wing Infrastructure, consisting of nests and autoloader locations; and Flight Operations, which details UA models, UA flight, and delivery.

<u>Project Component: Wing Infrastructure</u>

Wing is proposing to distribute nests throughout the operating area (**see Attachment A**). Wing's nests would be sited on paved landing areas established in pre-existing parking lots in commercially zoned areas, such as shopping centers, large individual retailers, and shopping malls. Each nest would house up to two dozen (24) aircraft (UA) on launch pads and would be surrounded by fencing in some cases. One or more merchants will partner with Wing at each nest for UA deliveries. Nests would be distributed throughout Central Florida following a measured rollout plan to be developed with Wing's partners and continuing best practices from Wing's established community outreach program, and in compliance with state and local statutory and regulatory requirements. The only infrastructure erected for this project would be autoloaders, "Y"-shaped passive stands designed for automated pick up of packages without landing (**see Attachment B**). Autoloaders would not require ground disturbance for installation and would be anchored through existing pavement, to existing poles, or ballasted for temporary use. The autoloaders would be controlled and operated by Wing and its partners. The autoloaders would be approximately 10 feet tall, 7 feet wide at the mouth, and 6 feet long, and would include a clear zone of approximately 2 parking spaces. Individual autoloader locations (either within a nest or offsite) would typically include up to three autoloaders within or in the vicinity of most nest sites, with a handful more distributed locations having up to 10 autoloaders, depending on market demand, for a total installation of 100-300 autoloaders distributed throughout the operating area.

<u>Project Component: Flight Operations</u>

Unmanned Aircraft

The primary UAs that would be used for the proposed operations are Wing's Hummingbird 7000W-B and 8000-A UAs. The Hummingbird 7000W-B features a multi-rotor design with sixteen (16) round diameter propellers and the 8000-A features a multi-rotor design with twelve (12) round diameter propellers (see **Attachment B**). The Hummingbird 7000W-B UA weighs under 15 pounds when combined with its maximum payload weight of 2.7 pounds. It has a wingspan of approximately 4.9 feet, a height of approximately 1 foot, and a length of approximately 4 feet. The 8000-A UA weighs under 25 pounds when combined with its maximum payload weight of 5 pounds. It has a wingspan of approximately 6 feet, a height of approximately 1 foot, and a length of approximately 6.2 feet. To avoid the potential for significant noise impacts, Wing would site its nests and autoloaders at least 120 feet away from a noise-sensitive area when the nest is located within the controlled surface area of Class B, Class C, and Class D airspace and at least 65 feet away from a noise-sensitive area in all other areas within the study area, which is defined as Wing's proposed nest locations and service area. Remote pickups and pickup flight paths would not occur within 80 feet of noise-sensitive areas when located within the controlled surface area of Class B, Class C, and Class D airspace and at least 45 feet away from a noise-sensitive area in all other areas within the study area. All of Wing's aircraft use electric power from rechargeable lithium-ion batteries.

A typical flight profile can be broken into the following general flight phases: takeoff, en route outbound, delivery, en route inbound, and landing. This profile is described in more detail below.

Takeoff

Once the UA receives a mission and is cleared for takeoff from a launch pad, the UA takes off from the ground vertically to an altitude of 23 feet above ground level (AGL) and hovers for 30 seconds while the package is loaded. The UA then climbs to the en route altitude as described below.

En Route Outbound

The UA would fly a predefined flight path that is set prior to takeoff. Flight missions are automatically planned by Wing's flight planning software. A mission originates from a nest location, and Wing's software automatically assigns, deconflicts, and routes each flight to the delivery location and back to a nest. Each nest site would include a controlled area wherein UA flights are launched and recovered.

The UA would generally be operated at an altitude of 150 to 300 feet AGL and always below an altitude of 400 feet AGL while en route to and from delivery locations. The en route outbound phase is the part of flight in which the fully loaded UA transits from the nest or a remote pickup location to a delivery point on a predefined flight path. During this flight phase, the UA would typically operate at an altitude of 150–300 feet AGL and a typical airspeed of 59 miles per hour (mph). The UA has a single set cruise airspeed, which would not be exceeded.

Delivery

The delivery phase consists of descent from the en route altitude to a delivery point, such as a residential yard, driveway, parking lot, or common area. The UA descends vertically to 23 feet AGL and lowers a package to the ground by a retractable line for delivery while maintaining position over the delivery point. The UA hovers at 23 feet AGL for approximately 30 seconds while lowering its package. The minimum distance a human should be from the UA during delivery is a 6-foot radius from underneath the center of the UA. Once a package has been lowered to the ground, the UA would then

retract the line, ascend vertically to a cruise altitude, and depart the delivery area en route back to a nest.

En Route Inbound

The UA continues to fly at an altitude of 150 to 300 feet AGL and a speed of 59 mph towards the nest.

Landing

Upon reaching the nest, the UA slowly descends over its assigned landing pad and lands on the pad.

Remote Pickup Operations

Remote pickup operations from each nest would be supported at up to 12 partner establishments depending upon demand and nest capacity. Pickup operations would follow general flight phases and parameters identical to typical delivery operations and would include the addition of a pickup phase. The pickup phase is similar to the delivery phase. The UA descends from its close transit altitude (safe altitude above local terrain and obstacles) to 14.5 feet AGL and lowers the package hook. The UA then passes approximately 10 feet laterally over the autoloader. The autoloader's Y-shaped poles passively guide the package hook to a narrow slot that ensures secure attachment of the package. The package is then retracted to the UA before it proceeds to climb to the enroute altitude. Remote pickup operations from descent to finish are expected to take no longer than 1 minute and 30 seconds (90 seconds). Delivery, en route return, and landing operations would then occur as described above.

Project Effects

Wing Infrastructure

Nests would be located in commercially zoned areas within parking lots of shopping centers and large individual retailers. Infrastructure for this project would consist almost entirely of pre-existing hardstand and would involve no ground disturbance. The only aboveground structures would consist of autoloaders no more than 10 feet in height and 7 feet wide. Standoff distances of 65 or 120 feet between nest locations and noise-sensitive uses and 65 or 80 feet between autoloader locations and noise-sensitive uses would be required, thus avoiding or minimizing potential visual and audible effects.

Flight Operations

Wing UAs would fly at altitudes of between 150 and 300 feet at a speed of 59 miles per hour; for comparison, the usual cruising speed for most birds ranges from 20 to 30 miles per hour. UA flights would be visible as small airborne objects flying at about twice the speed of bird flight. Therefore, visual effects of en route flight operations would be rapid, intermittent, and barely noticeable. Takeoff, loading, and delivery operations would involve UAs hovering close to the ground surface for approximately 30 seconds before ascending to flight altitude. UA takeoff and loading operations would occur at least 65 or 120 feet away from any noise-sensitive locations. However, deliveries may occur at or adjacent to noise-sensitive uses and would involve the UA hovering at 23 feet AGL for approximately 30 seconds.

Predicted Sound Levels

FAA conducted a noise analysis using sound level measurement data for the UA Hummingbird 7000W-B and the 8000-A to determine potential audible effects from flight operations. **Table 1** provides noise data for both the 7000W-B and 8000-A.

Table 1. Sound Level Test Results, Model 7000W-B and 8000-A

UAS	Estimated maximum SEL (dB) (takeoff, delivery, and landing)[1]	Average maximum SEL (dBA) (en route with package)	Average maximum SEL (dBA) (en route without package	Nominal cruise speed (knots)	Altitude (AGL)
7000W-B	83.4 dB	56.5 dBA	52.8 dBA	50.5	165 ft
8000-A	83.6 dB	62.0 dBA	60.0 dBA	50.5	165 ft

1) Takeoff, delivery, and landing SELs measured 50 ft from nest location. AGL = above ground level; dB = decibels; dBA = A-weighted decibels; ft = feet; SEL = Sound Exposure Level

As an explanation of this table, dBA stands for A-weighted decibels, a unit of measurement which approximates the sensitivity of the human ear. This is a logarithmic scale, meaning that a 10-dBA increase is the equivalent of doubling loudness of a noise. Noise for takeoff, delivery, and landing for both Wing UA types is less than 84 dB for 30 seconds, approximating the noise level of a freight train at a 100-foot distance from an observer. Flight operations for the 7000W-B UA model at 165 feet AGL is 56.5 dBA SEL, approximating the noise level inside an average urban residence. The flight operations of the 8000-A model is 62.0 dBA SEL, approximating the noise level of a conversation heard from a 3-foot distance. Predicted sound levels decrease as distances from the UA increase. Overall, audible effects of flight operations would be intermittent. Most operational noise levels would be non-intrusive except for takeoff, loading, and deliveries.

Coastal Resources

The proposed action is not expected to directly affect Florida's shorelines or change the use of shoreline zones. Wing's infrastructure would be sited in pre-existing commercial areas, such as parking lots, with no ground disturbance or new development impacting coastal resources. Flight operations would occur above ground level (150–300 feet) and inland, largely in urban areas, and would not involve the development or disturbance of any land. The proposed action would not result in discharges, habitat disturbances, or other activities that could impact coastal ecosystems, water quality, or marine life.

Conclusion

The FAA requests your agency's review of the unlisted activity described above for consistency with the Florida Coastal Management Program. Your response within the next 30 days will greatly assist us in our environmental review process.

If you have any questions or need additional information, please contact Dr. Shelia Neumann at (240) 210-0264 or via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

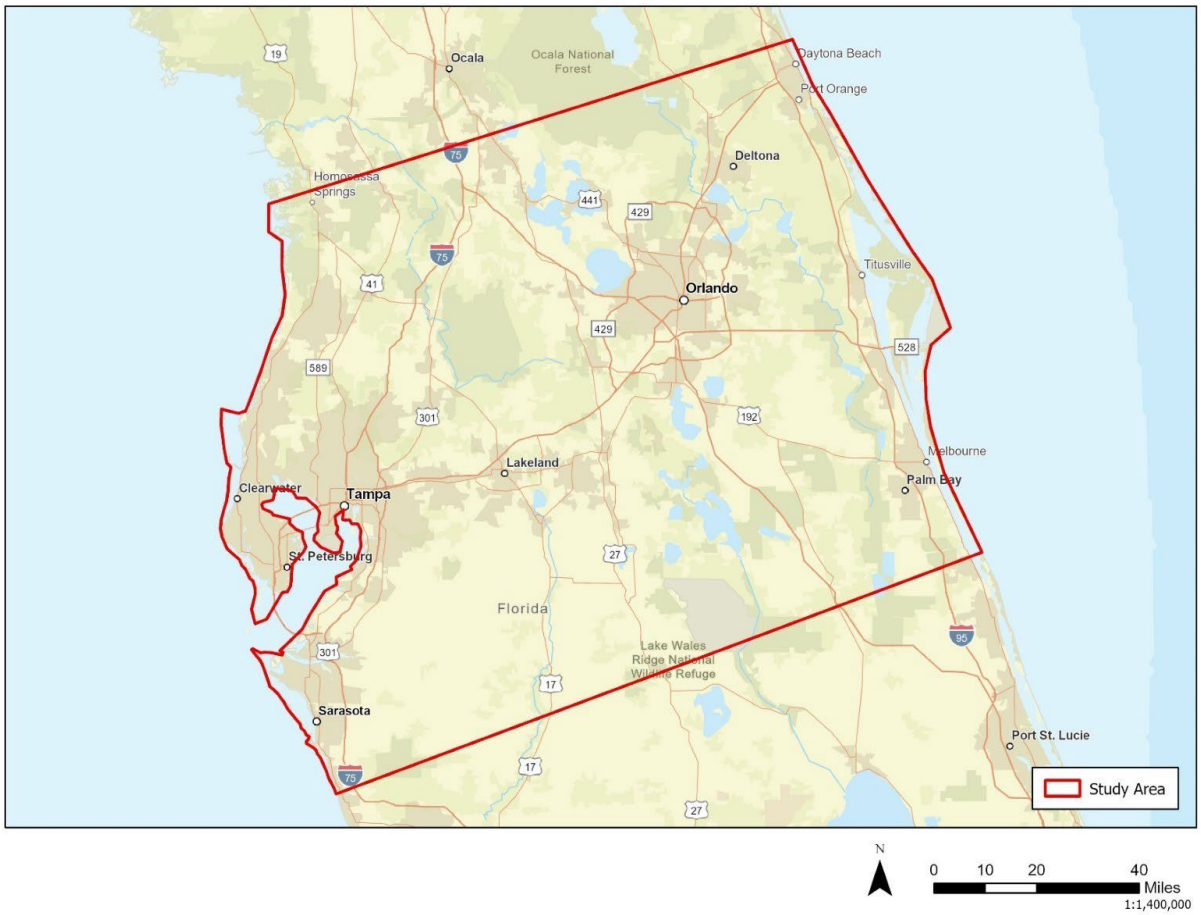
Derek Hufty
Manager, General Aviation and Commercial Branch (AFS-750)
Emerging Technologies Division
Office of Safety Standards, Flight Standards Service

Enclosures:

Attachment A. Area of Potential Effects

Attachment B. Wing's Hummingbird 7000W-B and 8000-A Unmanned Aircraft

Attachment A. Area of Potential Effects



Attachment B. Wing's Hummingbird 7000W-B and 8000-A Unmanned Aircraft

Figure 1. Wing Hummingbird 7000W-B UA

Figure 2. Wing Hummingbird 8000-A UA

Figure 3. Wing Hummingbird and Autoloader

Appendix K

USFWS Section 7 ESA Consultation

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Field Office Supervisor
U.S. Fish and Wildlife Service
Florida Ecological Services Field Office
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Vero Beach, Florida 32960-3559
Submitted to:
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SUBJECT: Endangered Species Act Section 7 Consultation for Unmanned Aircraft Commercial Package Delivery Operations in Central Florida

In accordance with Section 7 of the Endangered Species Act (ESA), the Federal Aviation Administration (FAA) is requesting U.S. Fish and Wildlife Service (USFWS) concurrence that the FAA's action of authorizing Wing Aviation LLC (Wing) to expand its unmanned aircraft (UA or drone) small package delivery operations in the Tampa and Orlando, Florida metropolitan areas ***may affect, but is not likely to adversely affect***, the Florida bonneted bat, tricolored bat, Florida panther, southeastern beach mouse, West Indian manatee, crested caracara, eastern black rail, Everglade snail kite, Florida scrub-jay, piping plover, red-cockaded woodpecker, red knot, wood stork, American crocodile, Atlantic salt marsh snake, blue-tailed mole skink, eastern indigo snake, green sea turtle, hawksbill sea turtle, leatherback sea turtle, loggerhead sea turtle, and sand skink. Our biological evaluation is provided below, including a brief background, project description, identification of the action area, and a discussion of potential effects to ESA-listed species.

Background

Wing currently operates under 14 Code of Federal Regulations (CFR) Part 135 from the Dallas-Fort Worth metro area, Texas. Wing has a Part 135 Air Carrier Operating Certificate from the FAA, which allows it to carry the property of another for compensation or hire beyond visual line of sight (BVLOS). The certificate contains a stipulation that operations must be conducted in accordance with the provisions and limitations specified in the carrier's Operations Specifications (OpSpecs).[1] Wing is applying to the FAA to add nest sites and operating hours included in its OpSpecs for the Tampa and Orland, Florida greater metropolitan areas (hereafter central Florida).

Project Description

Wing has requested the FAA amend the OpSpecs in Wing's Part 135 air carrier certificate to enable expansion of its commercial drone package delivery operations in central Florida metro (see **Figure 1**). Wing is proposing UA retail package delivery operations from up to 150 sites (hereafter "nests") distributed throughout the action area. Wing proposes to operate a maximum of 400 flights per operating day from each nest, with each flight taking a package to a customer delivery address before returning to a nest. The UA would be transporting healthcare products and other consumer goods in partnership with merchants in the community. There would be variability in the number of flights per day based on customer demand and weather conditions. Initially, Wing expects to fly much less than

400 flights per day from each nest, and gradually ramp up to no more than 400 flights per day as consumer demand increases. The maximum potential number of total eventual operations would be 60,000 (400 Ops*150 Nests). Flights would not occur over water and are specifically planned using proprietary software to avoid repeated exposures to individual locations.

Wing is proposing to disperse nests throughout the operational area (**Figure 1**), each located in a commercial area, such as a shopping center, large retailer, shopping mall, etc. Each nest would house up to two dozen aircraft on charging pads and one or more merchants may use each nest for drone deliveries. Nests would be distributed throughout central Florida following a measured rollout plan developed with Wing's partners and continuing best practices from Wing's established community outreach program. The proposed operations would occur from 6:00am to 10:00pm for 7 days of the week, including holidays. In addition, operations would include low altitude (<8ft) in-nest hover checks, or Fitness Built in Tests (FitBITs) between 6:00 a.m. and 7:00 a.m. in preparation for the normal operational day which would begin no earlier than 7:00 a.m. Additional, higher hover flights (approximately 60 feet) may be performed up to 18 times per nest, per week, where the UA makes a separate hover flight to update the reference map of the nest; these flights are termed Geography Built In Test (GeoBITs) because of their similarity to the FitBit stationary hover flight over the nest and would occur during regular operating hours.

Unmanned Aircraft

The primary UAs used for the proposed operations are Wing's Hummingbird 7000W-B and 8000-A models. Specifications of these models are as follows:

- Hummingbird 7000W-B.
    - Multi-rotor design with 16 round diameter propellers (**Figure 1**).
    - Weight under 15 pounds when combined with its maximum payload weight of 2.7 pounds.
    - Has a wingspan of approximately 4.9 feet, a height of approximately 1 foot, and a length of 4 feet.
- 8000-A.
    - Multi-rotor design with 12 round diameter propellers (**Figure 2**).
    - Weight under 25 pounds when combined with its maximum payload weight of 5 pounds.
    - Has a wingspan of approximately 6 feet, a height of approximately 1 foot, and a length of approximately 6.2 feet.

All Wing aircraft use electric power from rechargeable lithium-ion batteries. Wing anticipates that the central Florida fleet makeup would be comprised of 70 to 80 percent 7000W-B aircraft and 20 to 30 percent 8000-A aircraft. The fleet mix of individual nests would be variable based on payload, route, and demand characteristics; nests with a wider range of offerings are anticipated to carry higher proportions of 7000W-B Aircraft.

Flight Operations

The UA would be operated at an altitude of 150–300 feet above ground level (AGL) and always below an altitude of 400 feet AGL while en route to and from delivery locations. At a delivery location, the UA would descend vertically to a stationary hover and lower a package to the ground by line for delivery. Once a package has been lowered to the ground, the UA would then retract the line, ascend vertically to a cruise altitude, and depart the delivery area en route back to a nest.

The UA would fly a predefined flight path that is set prior to takeoff. Flight missions are automatically planned by Wing's flight planning software. A mission is associated with a nest location, and Wing's

software automatically assigns, deconflicts, and routes each flight. Each nest site would have access to a controlled area wherein UA flights are launched and recovered.

A typical flight profile can be broken into the following general flight phases: takeoff, en route outbound, delivery, en route inbound, and landing.

Takeoff

Once the UA is cleared for takeoff at a launch pad, the UA takes off from the ground vertically to an altitude of 23 feet AGL and hovers for 30 seconds while the package is loaded. The UA then climbs to the en route altitude (150–300 feet AGL).

En Route Outbound

The en route outbound phase is the part of flight in which the fully loaded UA transits from the nest to a delivery point on a predefined flight path. During this flight phase, the UA will typically operate at an altitude of 150–300 feet AGL and a typical airspeed of 51 knots.

Delivery

The delivery phase consists of descent from the en route altitude to a delivery point to deliver a package. The UA descends vertically to 23 feet AGL while maintaining position over the delivery point. The UA hovers at 23 feet AGL for approximately 30 seconds while dropping the package and then proceeds to climb vertically back to en route altitude.

En Route Inbound

The UA continues to fly at an altitude of 150–300 feet AGL and a speed of 51 knots towards the nest.

Landing

Upon reaching the nest, the UA slowly descends over its assigned landing pad and lands on the pad.

Remote Pickup Operations

Remote pickup operations from each nest would be supported at up to 12 partner establishments depending upon demand and nest capacity. Pickup operations would follow general flight phases and parameters identical to typical delivery operations and would include the addition of a pickup phase. The pickup phase is similar to the delivery phase. The UA descends from its close transit altitude (safe altitude above local terrain and obstacles) to 14.5 feet AGL and lowers the package hook. The UA then passes approximately 10 feet laterally over the autoloader. The autoloader's Y-shaped poles passively guide the package hook to a narrow slot that ensures secure attachment of the package. The package is then retracted to the UA before it proceeds to climb to the en route altitude. Remote pickup operations from descent to finish are expected to take no longer than 1 minute and 30 seconds (90 seconds). Delivery, en route return, and land operations would then occur as described above.

<u>Predicted Sound Levels</u>

The FAA conducted a noise analysis using sound level measurement data for the UA— the Hummingbird 7000W-B and 8000-A. Generally, the 7000W-B generates larger sound levels during takeoff and landing but lower sound levels during transit than the 8000-A. The estimated maximum sound exposure level (SEL) for the takeoff and landing phases of flight of the 7000W-B is approximately 80.6 A-weighted decibels (dBA) at about 50 feet from the drone whereas the estimated maximum SEL for the same flight phases of the 8000-A is 79.0 dBA as shown in Tables 1–2 in the noise report (see **Attachment B** for the noise report). Both platforms generate similar noise at delivery, with the 7000W-B generating 83.4 dBA SEL and 8000-A generating 83.6 dBA (Tables 1-2, **Attachment B**). The maximum SEL for the en route phase of the 8000-A is approximately 62.0 dBA when the drone is flying 50 knots at 165 feet AGL and the maximum SEL for the en route phase of the 7000W-B with the same flight parameters is 56.5 dBA (Sections 4.1.4 and 4.2.4 in **Attachment B**). Predicted sound levels decrease as distances from the drone increase. The majority of en route flight operations will be conducted with the quieter 7000W-B platform, although the specific of distribution of operations between platforms would be variable based

on payload, route, and demand characteristics.

Action Area

The action area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR § 402.02). The action area is defined as Wing's proposed operating area (see **Figure 1**). This area captures all possible flight routes to the delivery areas and where potential effects (e.g., visual, auditory, physical) to listed species could occur.

According to the U.S. Environmental Protection Agency and Florida Department of Environmental Protection Agency, the action area is entirely within the Southern Coastal Plain level III ecoregion and overlaps four level IV ecoregions: Gulf Coast Flatwoods (northwestern portion of the action area), Southwestern Florida Flatwoods (western portion of the action area), Central Florida Ridges and Uplands (central portion of the action area), and Eastern Florida Flatwoods (eastern portion of the action area) (Griffith et al. 1999). The following is a general description of each of these ecoregions in Florida; however, note that much of the land surface in the action area is developed or disturbed, as it contains the cities of Clearwater, St. Petersburg, Sarasota, Tampa, Spring Hill, Kissimmee, Orlando, Sanford, Daytona Beach, and Melbourne. Outside these cities, much of the land has been converted to suburban development and agriculture. There are forest patches interspersed throughout the action area, particularly along drainages and near waterbodies.

- The Gulf Coast Flatwoods region in Florida is a low, predominantly flat, forested region just inland from the coast. Soils are primarily acidic and low in nutrients and are underlain by a mix of sand, shell fragments, silt and clay, and peat. The climate of the region is subtropical, with high rainfall and humidity year-round. Vegetation of the region originally consisted of woodland and open savanna. Common native vegetation includes slash pine (*Pinus elliottii*), long leaf pine (*Pinus palustris*), saw palmetto (*Serenoa repens*) canopies with wiregrass (*Aristida stricta*) herbaceous layers (Griffith et al. 1999).
- The Southwestern Florida Flatwoods are amongst the most extensive terrestrial ecoregions in Florida. Soils are acidic, sandy, and low in organic and clay content. Flooding is common during summer months due to relatively poor drainage. Vegetation of the region originally consisted of woodland and open savanna. Common native vegetation includes slash pine , long leaf pine , saw palmetto canopies with wiregrass herbaceous layers (Griffith et al. 1999).
- The Central Florida Ridges and Uplands extends 275 miles from east to west and from the northern edge of the panhandle into the central area of the peninsula. The area is characterized by low rolling sandhills and separates the coastal plains on either edge. Most of the typical native vegetation communities consist of sandhill, scrub, and xeric hammock communities which were dependent on frequent fire (Griffith et al. 1999).
- The Eastern Florida Flatwoods is a low, predominantly flat, forested region inland from the Atlantic coast. It contains similar soil composition, climate, and vegetation communities as the Gulf Coast and Southwestern Flatwoods (Griffith et al. 1999).

ESA-Listed Species and Critical Habitat in the Action Area

The FAA acquired the Official Species List (see **Attachment A**) from the USFWS Information for Planning and Conservation (IPaC) online system to identify ESA-listed species and designated critical habitat in the action area (**Table 1**). The action area contains designated critical habitat for the aboriginal prickly-apple (*Harrisia aboriginum*), Florida bonneted bat (*Eumops floridanus*), Florida bristle fern (*Trichomanes punctatum ssp. Floridanum*), green sea turtle (*Chelonia mydas*), loggerhead sea turtle (*Caretta caretta*), piping plover (*Charadrius melodus*), red knot (*Calidris melodus*), and West Indian manatee (*Trichechus manatus*).

Table 1. ESA-Listed and Candidate Species Potentially Present in the Action Area

Common Name	Scientific Name	ESA Status
Mammals		
Florida bonneted bat	*Eumops floridanus*	Endangered
Tricolored bat	*Perimyotis subflavus*	Proposed Endangered
Florida Panther	*Puma concolor coryi*	Endangered
Puma	*Puma concolor*	Similarity of Appearance (Threatened)
Southeastern beach mouse	*Peromyscus polionotus niveventris*	Threatened
West Indian manatee	*Trichechus manatus*	Threatened
Birds		
Crested caracara	*Caracara plancus audubonii*	Threatened
Eastern black rail	*Laterallus jamaicensis ssp. jamaicensis*	Threatened
Everglade snail kite	*Rostrhamus sociabilis plumbeus*	Endangered
Florida scub-jay	*Aphelocoma coerulecens*	Threatened
Piping plover	*Charadrius melodus*	Threatened
Red-cockaded woodpecker	*Picoides borealis*	Endangered
Red knot	*Calidris canutus rufa*	Threatened
Whooping crane	*Grus americana*	Endangered; Experimental Population, Non-Essential
Wood stork	*Mycteria americana*	Threatened
Reptiles		
American alligator	*Alligator mississippiensis*	Similarity of Appearance (Threatened)
American crocodile	*Crocodylus acutus*	Threatened
Atlantic salt marsh snake	*Nerodia clarkia taeniata*	Threatened
Blue-tailed mole skink	*Eumeces egregious lividus*	Threatened
Eastern indigo snake	*Drymarchon couperi*	Threatened
Green sea turtle	*Chelonia mydas*	Threatened
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened
Sand skink	*Neoseps reynoldsi*	Threatened
Fishes		
Gulf sturgeon	*Acipenser oxyrinchus*	Threatened
Insects		
Miami blue butterfly	*Cyclargus thomasi bethunebakeri*	Endangered
Monarch butterfly	*Danaus plexippus*	Candidate
Flowering Plants		
Aboriginal prickly-apple	*Harrisia aboriginum*	Endangered
Avon park harebells	*Crolatalria avonensis*	Endangered
Beautiful pawpaw	*Deeringothamnus pulchellus*	Endangered
Britton's beargrass	*Nolina brittoniana*	Endangered
Brooksville bellflower	*Campanula robinsiae*	Endangered
Carter's mustard	*Warea carteri*	Endangered
Cooley's water-willow	*Justicia cooleyi*	Endangered
Florida Bonamia	*Bonamia grandiflora*	Threatened
Florida ziziphus	*Zizipush celata*	Endangered
Fragrant prickly-apple	*Cereus eriophorus var. fragrans*	Endangered
Garrett's mint	*Dicerandra christmanii*	Endangered
Highlands scrub hypericum	*Hypericum cumulicola*	Endangered
Lakela's mint	*Dicerandra immaculata*	Endangered
Lewton's polygala	*Polygala lewtonii*	Endangered

Common Name	Scientific Name	ESA Status
Longspurred mint	*Dicerandra conutissima*	Endangered
Okeechobee gourd	*Cucurbita okeechobeensis ssp. okeechobeensis*	Endangered
Papery whitlow-wort	*Paronchia chartacea*	Threatened
Pigeon wings	*Clitoria fragrans*	Threatened
Pygmy fringe-tree	*Chionthus pygmaeus*	Endangered
Rugel's pawpaw	*Deeringothamnus rugelii*	Endangered
Sandlace	*Polygonella myriophylla*	Endangered
Scrub blazingstar	*Liatris ohlingerae*	Endangered
Scrub buckwheat	*Eriogonum lonifolium var. gnaphalifolium*	Threatened
Scrub lupine	*Lupinus aridorum*	Endangered
Scrub mint	*Dicerandra frutescens*	Endangered
Scrub plum	*Prunus geniculata*	Endangered
Short-leaved rosemary	*Conradina brevifolia*	Endangered
Snakeroot	*Eryngium cuneifolium*	Endangered
Wide-leaf warea	*Awarea amplexifolia*	Endangered
Wireweed	*Polygonella basiramia*	Endangered
Ferns and Allies		
Florida bristle fern	*Trichomanes punctatum ssp. floridanum*	Endangered
Lichens		
Florida perforate cladonia	*Cladonia perforata*	Endangered

Potential Effects of the Action on ESA-Listed Species and Critical Habitat

The action does not include any ground construction or habitat modification. During nominal operations, the UA would not touch the ground except at the nests, which would be located in commercial areas, such as shopping centers. The action would not result in any physical disturbance to habitat. Therefore, the proposed action does not have the potential to affect any habitat or designated critical habitat present within the action area. The FAA has determined the action would have ***no effect*** on designated critical habitat for the aboriginal prickly-apple, Florida bonneted bat, Florida bristle fern, green sea turtle, loggerhead sea turtle, piping plover, red knot, and West Indian manatee.

UA noise, light emissions, and the potential for airborne strikes with flying species are the action's potential stressors or threats to ESA-listed species. Flight operations would take place mostly in urban and suburban environments, within airspace, and typically remain well above the tree line while en route to and from a nest. The duration of exposure by wildlife on the ground to visual or noise impacts from the UA would be of very short duration (approximately 30 seconds during takeoff/landing and delivery and a few seconds during the en route phase).

As noted above and shown in **Attachment B**, the highest estimated average SEL associated with Wing's proposed operations is 83.6 dBA, which would occur during delivery operations. For reference, the sound level of a diesel truck at 50 feet or a noisy urban environment during the day is approximately 80 to 90 dBA. The highest SEL on the ground when either UA is flying in the en route phase at an altitude of 165 feet AGL is estimated to be around 62.0 dBA, which is comparable to the sound of an air conditioning unit at 100 feet (60 dB).

A noise descriptor for noise effects on wildlife has not been universally adopted, but some research indicates SEL is the most useful predictor of responses. Characteristic of the bulk of research to date has been lack of systematic documentation of the source noise event. Many studies report "sound levels" without specifying the frequency spectrum or duration. A notable exception is a study sponsored by U.S. Air Force that identifies SEL as the best descriptor for response of domestic turkey poults to low-altitude aircraft overflights (Bradley et al. 1990). This study identified a threshold of response for disturbance of

domestic turkeys ("100 percent rate of crowding") as SEL 100 dBA. None of the predicted sound levels for the different flight phases exceed SEL 83.6 dBA.

The following paragraphs describe the anticipated effects of the action on the ESA-listed species listed in Table 1.

Bats

The Florida bonneted bat typically occupies semitropical forests, including pineland, tropical hardwood, mangrove areas, but is also found roosting in both natural and man-made structure (FWC 2011). It typically forages in in open, uncluttered areas and flies less than 10 meters AGL. The species roots singly or in small harem-like colonies containing one male and several females. Florida bonneted bats have low fecundity despite an extensive summer breeding season and gives birth to only one offspring per breeding season. The species may have the smallest range of any bat species in North America and has only been documented within four southern Florida counties: Carlotte, Lee, Collier, and Miami-Dade (Marks and Marks 2008). Predominant threats to Florida bonneted bats include habitat loss, limited roost availability, extreme weather, and pesticides from mosquito control operations (FWC 2011).

The tricolored bat typically uses trees, caves, or manmade structures for roosting and forages for insects during dusk, nighttime, and dawn time periods. Tricolored bats emerge early in the evening and forage at treetop level or above but may forage closer to ground later in the evening. This species exhibits slow, erratic, fluttery flight while foraging and are known to forage most commonly over waterways and forest edges (USFWS 2023). This species spends six to nine months per year hibernating in caves or mines. The USFWS has proposed to list the tricolored bat as an endangered species, primarily due to white-nose syndrome. Other factors that influence the tricolored bat's viability include wind-energy-related mortality, habitat loss, and effects from climate change.

Suitable habitat for both bat species roosting and feeding in the action area includes wooded areas, open water habitat, and manmade structures. Based on current data from the North American Bat Monitoring Program (USGS 2023), there is some probability of either species occurring in the action area, albeit lower in the predominantly urban and suburban environment where nests would be located and deliveries would occur (see **Figure 3**). Nests would be located in commercial areas and therefore not within high-quality roosting or foraging habitats.

Bats at roost or in flight could experience UA noise during the en route and delivery flight phases. Bats foraging at or near the tree line at the time a UA flies by would experience the greatest sound levels. Roosting bats or bats foraging near the ground at the time a UA flies by would experience lower sound levels. Bats may exhibit disturbance behaviors and change their flight paths to avoid drones in the event that flights overlap with bat activity areas (Ednie et al. 2021). Research suggests that drones have "minimal impact on bat behavior" (Fu et al. 2018) primarily from noise emissions. However, drone disturbance is temporary and bats are expected to return to normal foraging and flight activities shortly after the exposure to drone noise ends (Kuhlmann et al. 2022, Ednie et al. 2021). Given the estimated sound levels of the UA, the UA's linear flight profile to and from nests and delivery locations, the short period of time the UA would be in any particular location, and the low probability of encountering an individual tricolored bat in the action area, UA noise is not expected to adversely affect tricolored bats. Any increase in ambient sound levels caused by the UA's flight would only last a few seconds during the en route phase and approximately 30 seconds during a delivery.

Bats could also be struck by a drone, particularly during nighttime delivery operations while bats are foraging. Given the bat's ability to avoid flying into objects, the lower flight path of bats compared to those of the UA, the short period of time the UA would be in any one place, and the low probability of encountering a, ESA-listed bat during operations, the likelihood of the UA striking a bat is discountable.

Based on 1) operations occurring mostly in an urban environment, 2) the altitude at which the UA flies in the en route phase (150–300 feet AGL), 3) the expected low sound levels experienced by a bat, 4) any

increase in ambient sound levels would be short in duration, 5) the low probability of ESA-listed bats occurring in the action area, and 6) the low likelihood of the UA striking a bat, the FAA has determined the action ***may affect, but is not likely to adversely affect,*** the Florida bonneted bat and tricolored bat. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Terrestrial Mammals

Florida panther is the only breeding population of puma in the eastern United States and has been restricted to the Florida peninsula for over 100 years (FWC 2020). Florida panthers have been documented via verified occurrence records in 26 Florida counties and recent data indicate that Florida panthers are distributed into central Florida as far north as I-4. However, the majority of observations distributed within the action area are primarily dispersing males and the breeding population occurs well south. Florida panthers are carnivorous and prey mostly upon white-tailed deer, wild hogs, racoons, armadillos, and livestock. Florida panthers primarily in forested habitats of any size, but also can occur in wetlands, prairie grasslands, and upland shrublands to a lesser extent. Non-forested habitats are typically only used at night and most use occurs within 200 meters of forest cover. The predominant threats to the species are habitat loss from agricultural conversion and urbanization and vehicle collisions (FWC 2020).

Southeastern beach mouse (SEBM) occur in sparsely vegetated coastal sand dunes and adjacent scrub habitat, where it feeds on dune plant seeds and insects (USFWS 2019). Beach mouse breed rapidly with an average gestation of 28 to 30 days and littering intervals as short as 26 days. Local populations fluctuate largely on a seasonal and annual basis depending on food availability, habitat quality and quantity, catastrophic events, disease, and predation. SEBM once occupied over 360 km (224 miles) of Florida's central and southern Atlantic coast; it now occupies about 80 km (50 miles) of coastline (USFWS 2008). SEBM ranges are highly restricted and extant populations are only known to occur on county, state, and Federal lands including Smyrna Dunes Park, Canaveral National Seashore, Merritt Island National Wildlife Refuge, Kennedy Space Center, and Cape Canaveral Air Force Station in Volusia and Brevard counties. Current threats to the species include loss of dune habitat due to human development, coastal erosion, sea level rise, climate change, predation by house cats, and interspecific resource competition from house mice (USFWS 2019).

The action does not include ground disturbance and therefore would not physically impact potential Florida panther or SEBM habitat. If present in the action area during operations, these animals could experience en route noise. Given the estimated sound levels of the UA, the UA's linear flight profile to and from nests and delivery locations, the low probability of encountering an individual Florida panther or SEBM during operations, and the short period of time the UA would be in any particular location, UA noise is not expected to adversely affect either species. Further, the chances of any one individual experiencing multiple overflights of a UA are low given the low population numbers of the two species and their limited distribution throughout the action area.

Based on 1) operations occurring mostly in an urban environment, 2) the expected low sound levels experienced by a Florida panther or SEBM, 4) any increase in ambient sound levels would be short in duration, and 5) the low probability of a Florida panther or SEBM occurring in the action area, the FAA has determined that the action ***may affect, but is not likely to adversely affect,*** the Florida panther and Southeastern beach mouse. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Marine Mammals

West Indian manatees occur primarily in Florida and southeastern Georgia but can range as far north as Rhode Island on the Atlantic coast and as far west as Texas on the Gulf coast (USFWS 2001). The species feeds opportunistically on a variety of submerged, floating, and emergent vegetation, although seagrasses are typically a staple of their diet in coastal areas. They primarily feed in shallow grass beds near deep channels. Manatees migrate seasonally based on water temperature, aggregating in warm-water refuge areas during winter months and disperse along the coast, rivers, and canals during summer

months. Breeding typically occurs from March through November and females typically only give birth to one calf. The predominant threats to manatees are death or serious injury resulting from boat strikes, although entrapment in water control structures, entanglement in fishing gear, and ingestion of marine debris also pose danger to the species.

The action does not include ground disturbance and therefore would not physically impact potential West Indian Manatee habitat. If present in the action area near operation, West Indian Manatees could experience en route noise. Given the estimated sound levels of the UA, the UA's linear flight profile to and from nests and delivery locations, avoidance of flights over water, the low probability of encountering an individual manatee during operations, and the short period of time the UA would be in any particular location, UA noise is not expected to adversely affect West Indian Manatee. Further, the chances of any one individual experiencing multiple overflights of a UA are low given the low population numbers of the species and limited distribution throughout the action area.

Based on 1) operations occurring mostly in an urban environment, 2) the expected low sound levels experienced by a West Indian manatee, 4) any increase in ambient sound levels would be short in duration, 5) the avoidance of flights over water, and 6) the low probability of a manatee occurring near a delivery location, the FAA has determined that the action ***may affect, but is not likely to adversely affect,*** the West Indian manatee. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Birds

The Audubon's crested caracara occurs in a wide variety of semi-open habitats offering open ground for hunting and dense cover for nesting (FWC 2023). In Florida, the species inhabits wet prairies with cabbage palms, and may occur in pastures and wooded areas with saw palmetto, cypress, scrub oaks (FWC 2023). Habitat loss and fragmentation along with alteration of the natural fire regime, which results in habitat becoming unsuitable for the species, have been the primary historical pressures on the species (USFWS 2009). Urbanization and the conversion of cattle ranching to crop production, particularly sugar cane, or development are the main factors that continue to cause habitat fragmentation and loss (USFWS 2019).

The eastern black is a subspecies of black rail that occurs in salt, brackish, and freshwater wetlands in the eastern United States (east of the Rocky Mountains), Mexico, Brazil, Central America, and the Caribbean. The species requires dense overhead cover, moist to saturated soils, and persistent emergent wetland plants (USFWS 2019). Predominant threats to the species include habitat fragmentation and wetland conversion for agricultural and urban development, fire suppression, hydrological alteration, and climate change. Sea level rise in coastal areas is a growing threat to the species (USFWS 2019).

The everglade snail kite is a medium-sized raptor which occurs primarily in central Florida, Cuba, and Isla de la Juventud. The species occurs in shallow freshwater marshes and shallow grassy shorelines of lakes. In florida, this includes waters of the Kissimmee Valley, the headwaters of St. Johns River, Lake Okeechobee, the Loxahatchee National Wildlife Refuge, Big Cypress National Preserve, and Everglades National Park (FWC No Date). The species feeds exclusively on apple snails (*Pomacea*) captured at the surface of the water. Primary threats to the species include the loss and fragmentation of wetlands, proliferation of exotic apple snails which are more difficult for young snail kites to consume, and human harassment (FWC No Date).

The Florida scrub-jay is endemic to oak-dominated scrub habitats in Florida (FWC No Date). The species occurs in sand pine and xeric scub, as well as scrubby flatwoods. Degradation and loss of habitat from human activities have resulted in substantial declines in the abundance and distribution of the species. The remaining populations are reproductively isolated, of small size, and are projected to continue to decline (USFWS 2019). The predominant threats to the species are habitat loss, fragmentation, and degradation from urban development and agriculture as well as the disruption of natural fire regimes (FWC No Date).

The piping plover is a small, sand-colored shorebird that nests and feeds along coastal sand and gravel beaches throughout the Eastern seaboard. The species forages around the high tide wrack zone and along the ocean edge as areas are exposed, eating mainly arthropods and marine worms (USFWS 2016). Factors of decline for the piping plover include changes in quality or quantity of riverine habitat due to damming and water withdrawals, habitat destruction and degradation, human disturbance, predation, and spread of invasive plants (USFWS 2016).

The red-cockaded woodpecker (RCW) is a non-migratory and territorial resident of fire-dependent, mature southern pine forests, with particular emphasis on longleaf pine ecosystems. Historically, the species ranged from New Jersey to Florida and west to Texas (USFWS 2020). In Florida, the species occurs in hydric slash pine flatwoods, xeric pine uplands in the panhandle region, and sparse pine forests in the vicinity of Orlando, FL and the Big Cypress National Preserve. Predominant threats to the species include habitat loss, fragmentation, and degradation from urban and agricultural development in addition to the suppression of natural fire regimes.

The red knot breeds in the northern arctic region. Overwintering typically occurs in the southern hemisphere, but some birds overwinter in Florida. The Atlantic Coast of Florida also is a common stopover during spring and fall migrations. The red knot forages along the shoreline (USFWS 2019). In the southeastern U.S., the red knot population is believed to be moderately resilient. Regional abundance estimates suggest the populations in this region have been mostly stable since the 1980s. Factors of decline for the red knot include loss of habitat, disruption of natural predator cycles on breeding grounds, reduced prey availability, and asynchronies in timing of their migratory cycle (USFWS 2019).

The wood stork is the only stork that occurs in North America. Wood storks are large, thick wading birds with long legs. They have a long neck and a long, thick bill. The birds are white with black flight feathers and tail. The head lacks feathers, is dark, and appears scaly (USFWS 2019). Wood stork prey on fish and crustaceans in both fresh and saltwater habitats. They generally nest near wetland habitats using bald cypress, sweetgum, and mangroves for nesting. Predominant threats to the species include habitat fragmentation and wetland conversion for agricultural and urban development, fire suppression, hydrological alteration, and climate change. Sea level rise in coastal areas is a growing threat to the species (USFWS 2019).

The action does not involve ground disturbance or vegetation removal and therefore would not physically impact any foraging or nesting habitat. If present in the action area, ESA-listed birds could experience UA noise during the en route and delivery flight phases. Birds resting or foraging at or near the tree line at the time a UA flies by would experience the greatest sound levels. Birds near the ground at the time a UA flies by would experience lower sound levels. Given the estimated sound levels of the UA, the UA's linear flight profile to and from nests and delivery locations, the low probability of encountering an individual ESA-listed birds in developed and agricultural areas, and the short period of time the UA would be in any particular location, UA noise is not expected to adversely affect ESA-listed birds. Further, the chances of any individual experiencing multiple overflights of a UA are low given the mobility of the birds. One study found that, in most instances, drones within 4 meters of birds did not cause a behavioral response (Vas et al. 2015). In another study, drones barely elicited behavioral responses in terrestrial mammals (Mulero-Pázmány et al. 2017).

ESA-listed birds could be struck by a UA in flight when foraging above tree tops or in flight between foraging sites or during migration. The risk of a strike is low given their ability to fly and avoid the UA, as well as the low probability of encountering ESA-listed birds during drone deliveries.

Based on 1) operations occurring mostly in an urban environment, 2) the altitude at which the UA flies in the en route phase (150–300 feet AGL); 3) the expected low sound levels experienced by ESA-listed birds, 4) any increase in ambient sound levels would be short in duration, 5) the low probability of encountering ESA-listed birds in developed nest and delivery areas, and 6) the low likelihood of the UA striking an ESA-listed bird, the FAA has determined that the action ***may affect, but is not likely to adversely affect*** ESA-

listed birds. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Terrestrial and Aquatic Reptiles

American crocodile primarily occurs in mangrove swamps, mangrove-lined bays, creeks, and inland swamps (UFWS 2019). In Florida, this range shifts seasonally from exposed shorelines during nesting season to fresh and brackish inland swamps, creeks, and bays. Generally, the species appears to prefer less saline waters, and prefer the presence of shelter in the form of undercut banks, snags, and roots with access to waters deeper than 1 meter. The current distribution of the species is limited to southern Florida, including coastal areas of Miami-Dade, Monroe, Collier, and Lee counties although historically the species has ranged as far north as Palm Beach and Tampa counties along the east and west coastlines. Predominant threats to the species include habitat modification and degradation through urban, suburban, and agricultural development, human disturbance and encroachment in estuarine areas, and extreme weather patterns.

Atlantic salt marsh snake occur in coastal salt marshes and mangrove swamps of varying salinity. They are typically associated with saltwort flats and salt grass-bordered creeks. The species is typically observed at night where they feed on small fishes, frogs and, and fiddler crabs (USFWS 2019). The species is distributed in a narrow geographic coastal band from southern Texas, east along the Gulf of Mexico coastline, around the Florida peninsula, and up the east coast of Florida as far as Volusia county. The predominant threat to the species is habitat loss and modification through urban and agricultural development of coastal salt marshes.

Blue-tail mole skinks occupy the xeric upland habitats of the Central Ridge in peninsular Florida. The species primarily occurs in rosemary and oak-dominated scrub, turkey oak barrens, high pine, and xeric hammock environments in ares with few plant roots, open canopies, scattered vegetation, and patches of bare sand (USFWS 2019). The species tend to be clumped in distribution in areas with optimal surface litter, soil moisture, and prey distribution. Blue-tail mole skinks only occur in Highlands, Polk, and Osceola counties and is rare throughout its range. The predominant threat to the species is habitat loss and degradation through residential, commercial, and agricultural development.

Eastern indigo snakes are found throughout the southeastern U.S., but primarily occurs in the coastal plains of Georgia and Florida. Across this range, the eastern indigo snake inhabit pine flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammocks, freshwater marsh edges, agricultural fields, coastal dunes, and human altered habitats (USFWS 2019). Habitat variety is important for the species given their winter sheltering habitat requirements and ranging foraging behavior. Underground refugia is a key requirement of the species and they are closely associated with gopher tortoise presence in xeric requirements. In Florida, the species occurs widely in nearly every county of the state. Habitat loss and fragmentation by residential and commercial development is the predominant threat to the species.

Sand skinks occur in xeric upland ecosystems and are most abundant in open canopy areas free of abundant roots with bare sand between high pine and scrub systems (USFWS 2019). In Florida, the species occur in the sandy ridges of central Florida across Highlands, Lake, Marion, Osceola, Polk, and Putnam counties. Sand skinks burrow or “swim” through sand to hunt arthropod prey and typically are most active from February to May. The predominant threats to the species are modification and destruction of habitat for agricultural and urban development as well as disruption of natural fire regimes.

The action does not include ground disturbance and therefore would not physically impact mangrove, wetland, swamp, or xeric upland habitats. Although the habitat quality of the majority of the operating area (i.e., suburban and urban environments) is low for ESA-listed species and UAs would not overfly water areas, terrestrial reptiles could potentially experience en route noise. However, given the estimated sound levels of the UA, the UA’s linear flight profile to and from nests and delivery locations,

the low probability of encountering an individual during operations, and the short period of time the UA would be in any particular location, UA noise is not expected to adversely affect either species. Further, the chances of any one individual experiencing multiple overflights of a UA are low given the mobility of the animals.

Based on 1) operations occurring mostly in an urban environment, 2) the altitude at which the UA flies in the en route phase (150–300 feet AGL); 3) the expected low sound levels experienced by ESA-listed reptiles, 4) any increase in ambient sound levels would be short in duration, and 5) the low probability of a either species occurring in the action area, the FAA has determined that the action ***may affect, but is not likely to adversely affect,*** the American crocodile, Atlantic salt marsh snake, blue-tail mole skink, eastern indigo snake, and sand skink. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Sea Turtles

Green sea turtle is found in tropical and sub-tropical waters worldwide. In the U.S., the species occur in coastal waters from Texas to Massachusetts. Florida waters and coastal areas host important feeding and nesting sites for green sea turtles, with large-scale nesting on the east coast in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties (USFWS 2019). The species occupy three predominant habitat types: high energy oceanic beaches, convergence zones in pelagic areas, and benthic feeding grounds in shallow, protected waters. Nesting occurs onshore above high-water lines from May through November. Predominant onshore threats to the species include artificial lighting, beach nourishment, beach armoring, and human disturbance during nesting season.

Hawksbill sea turtles occur in tropical and subtropical water so the Indian, Pacific, and Atlantic oceans. In the continental U.S., the species is known to occur in southern Florida, the northern Gulf of Mexico, Texas, and Puerto Rico (USFWS 2019). Although the species can occur along the eastern seaboard as far north as Massachusetts, sightings are rare north of Florida. In Florida, the species occurs primarily in the waters of the Florida Keys and reefs off Palm Beach county and nesting is restricted to the southeastern coast of Florida in Broward, Miami-Dade, and Volusia counties from July to October. Predominant onshore threats to the species include artificial lighting, beach nourishment, beach armoring, and human disturbance during nesting season.

Leatherback sea turtles occur globally in the waters of the Indian, Pacific, and Atlantic oceans. The species is highly migratory and is believed to be the most pelagic of all sea turtle species where they feed on jelly fish, siphonophores, and salpae (USFWS 2019). Leatherback sea turtles are known to nest along the eastern seaboard from Florida to South Carolina. In Florida, the species often share nesting beaches with loggerhead and green sea turtles and regularly nest along the east coast in Indian River, St. Lucie, Martin, Palm Beach, Broward, and Miami-Dade counties from February through November. Predominant onshore threats to the species include artificial lighting, beach nourishment, beach armoring, and human disturbance during nesting season.

Loggerhead sea turtles occur in temperate and tropical oceanic waters throughout the Indian, Pacific, and Atlantic Ocean where they primarily feed on benthic invertebrates. Globally, the species ranges as far north as Newfoundland and as far south as Argentina (USFWS 2019). Loggerheads are the most common species of sea turtle in South Florida and major nesting concentrations occur along both the Atlantic and Gulf of Mexico Coastlines. Nesting is most prevalent along the east coast, with approximately 80 percent of observed nesting occurring in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties from March through November. Predominant onshore threats to the species include artificial lighting, beach nourishment, beach armoring, and human disturbance during nesting season.

The action does not include ground disturbance and therefore would not physically impact nesting habitat for any species of sea turtle. Although UAs would not overfly water areas and operating hours would not primarily occur during nighttime nesting hours, nesting sea turtles could potentially

experience some en route noise or light emissions from UAs. However, sea turtles are low-frequency hearing specialists and likely have limited ability to perceive the predominantly high frequency noise emitted by transiting UAs (Piniak et al. 2012; Rees et al. 2018). The limited available data suggest that nesting sea turtles are not disturbed by UA activity in their vicinity and would not be disturbed by nearby transiting UAs (Bevan et al. 2018; Selles-Rios et al. 2022). Although artificial night lighting is a predominant stressor to these species, light emissions from UAs are limited to collision prevention lighting after civil twilight hours and would not noticeably contribute to the ambient light environment of nesting beaches or to the disorientation of nesting turtles or their hatchlings. Given the estimated sound levels of the UA, the UA's linear flight profile to and from nests and delivery locations, the low probability of encountering an individual turtle during operations, and the short period of time the UA would be in any particular location, UA noise and light emissions iare not expected to adversely affect sea turtles. Further, the chances of any one individual experiencing multiple overflights of a UA are low given the the limited number of deliveries expected in the vicinity of nesting and the relatively short-timespan that nesting turtles are on shore during operating hours.

Based on 1) operations occurring mostly in an urban environment, 2) the altitude at which the UA flies in the en route phase (150–300 feet AGL); 3) the expected low sound and light levels experienced by ESA-listed rsea turtles, 4) any increase in ambient sound or light levels would be short in duration, and 5) the relatively low probability of the species occurring in the action area, the FAA has determined that the action ***may affect, but is not likely to adversely affect,*** the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and hawksbill sea turtle. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Fish

Gulf sturgeon is not susceptible to disturbance from UA noise, collision risk, or light emissions. The action does not involve any flights over water, ground-disturbing activities, or activities within suitable habitat for this species. As there is no plausible route of effect to this species, the FAA determined the action would have ***no effect*** on gulf sturgeon.

Insects

The Miami blue butterfly inhabits tropical hardwood hammock, tropical pine rocklands, and beachside scrub (FWC No Date). The species feeds on three plant hosts: balloonvine, gray nickerbean, and blackbead and can produce multiple generations between February and November. Historically, the species occurred in east and west coastal Florida counties as far north as Hillsborough and Volusia counties, but has not been observed on mainland Florida since 1980. Habitat loss and degradation were the largest historical threats to the species. Given that Miami blue butterflies likely do not occur within the Action Area and the action does not involve any ground-disturbance or habitat degradation, the FAA has determined the action would have ***no effect*** on Miami blue butterfly.

The monarch butterfly is a candidate for federal listing. The primary threat to monarch butterflies is habitat loss, including the loss of breeding, migratory, and overwintering habitat. Pesticide use and climate change are also threats. The action would not physically affect butterfly habitat or host plants. Monarch butterflies could be struck by drones en route to and from delivery; however, strikes are not likely given the species' mobility. Information regarding drone impacts on insects is limited, and there have been no widespread negative impacts identified in the scientific literature. Based on the information available and the limited scale of operations, the action is not expected to adversely affect the monarch butterfly.

Flowering Plants, Ferns and Allies, and Lichens

Flowering plants, ferns and allies, and lichens are not susceptible to disturbance from UA noise, collision risk, or light emissions. The action does not involve any ground-disturbing activities or activities within suitable habitat for these species. As there is no plausible route of effect to these species, the FAA

determined the action would have ***no effect*** on all flowering plants, ferns and allies, and lichens potentially present within the action area.

Conclusion

Based on the analysis above, the FAA has determined the action ***may affect, but is not likely to adversely affect***, the Florida bonneted bat, tricolored bat, Florida panther, SEBM, West Indian Manatee, crested caracara, eastern black rail, Everglade snail kite, Florida scrub-jay, piping plover, red-cockaded woodpecker, red knot, wood stork, American crocodile, Atlantic salt marsh snake, blue-tailed mole skink, eastern indigo snake, green sea turtle, hawksbill sea turtle, leatherback sea turtle, loggerhead sea turtle, and sand skink. The FAA appreciates your review of the proposed project and requests your concurrence with our effects determinations for these three species. If you have any questions, please contact Dr. Shelia Neumann at 9-faa-drone-environmental@faa.gov.

Sincerely,

_____

Derek Hufty

Manager, General Aviation and Commercial Branch (AFS-750)

Emerging Technologies Division

Office of Safety Standards, Flight Standards Service

Attachments: Figure 1. Action Area
Figure 2. Hummingbird Unmanned Aircraft
Figure 3. Tricolored Bat Mean Occupancy Probabilities
Attachment A. USFWS Official Species List
Attachment B. Noise Assessment Report

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Figure 1. Action Area

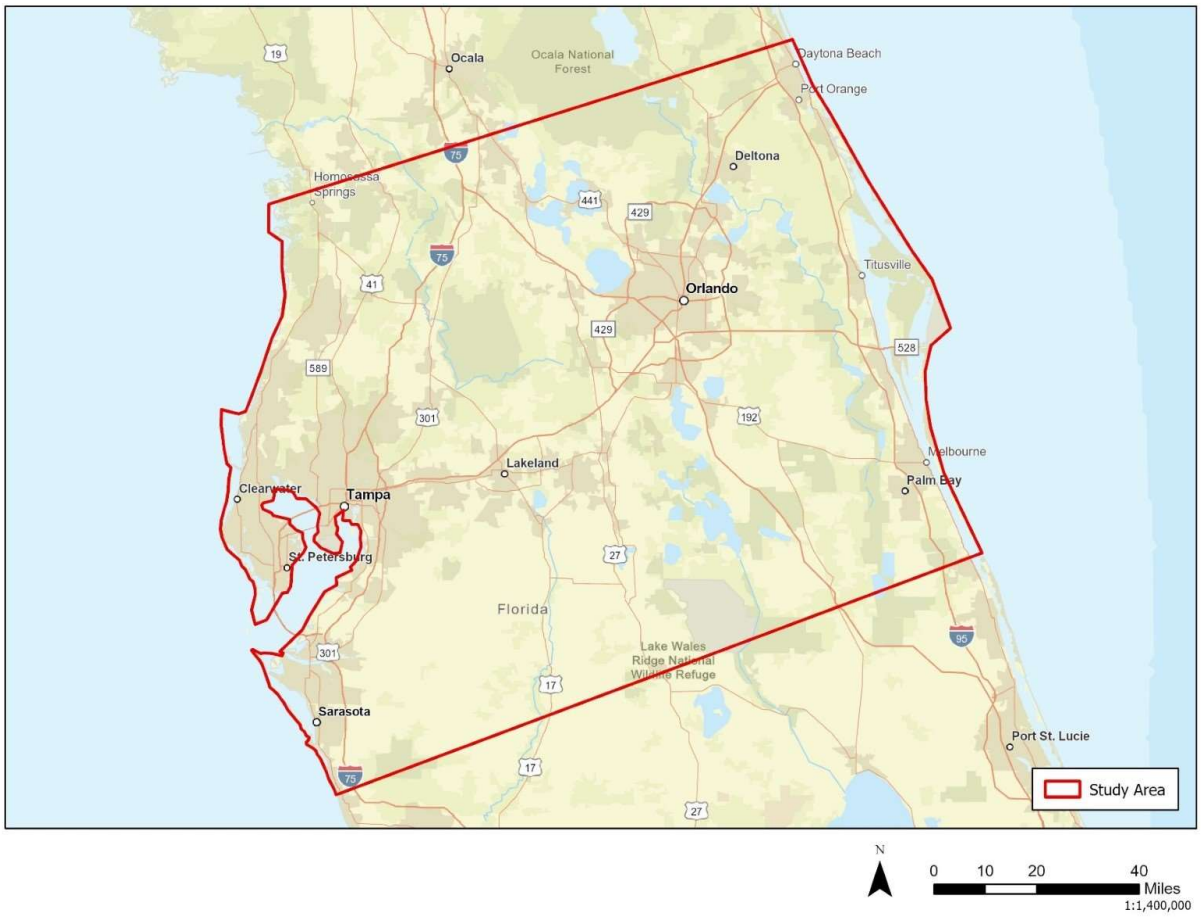
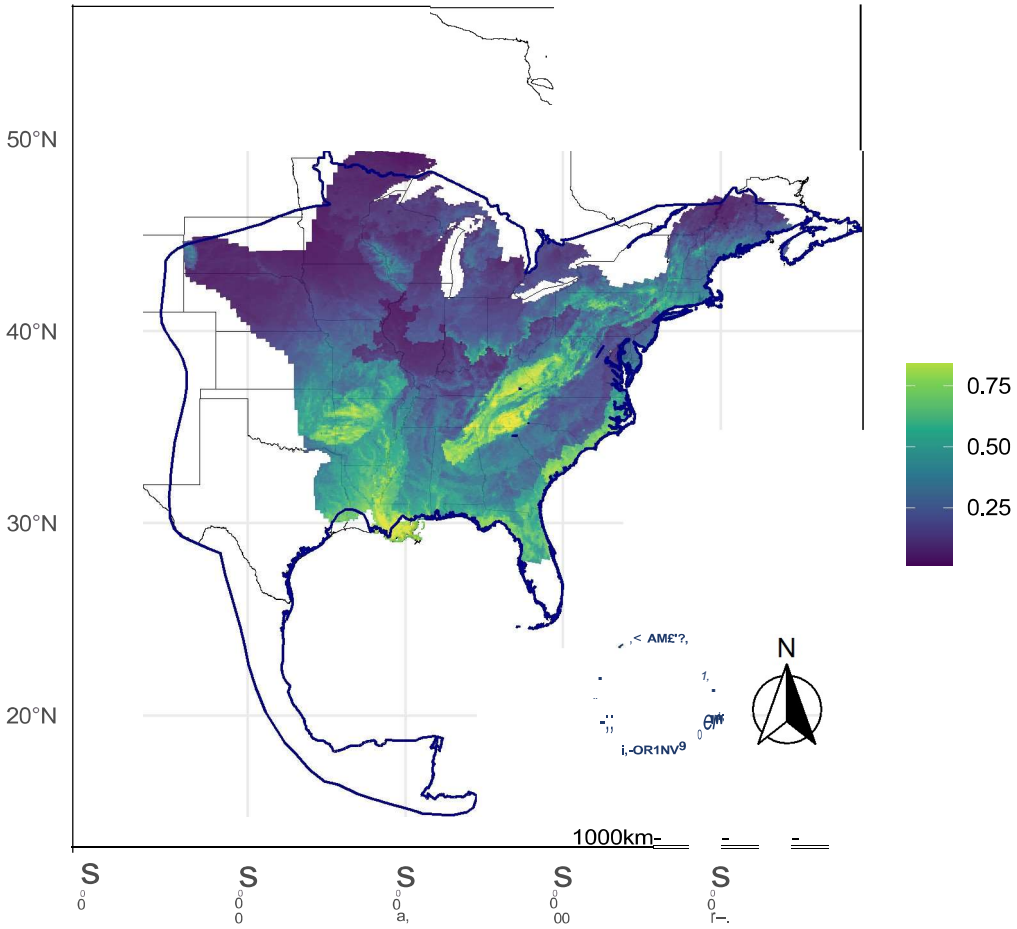


Figure 2. Wing Hummingbird Unmanned Aircraft with Package Attached

Figure 3. Tricolored Bat Mean Occupancy Probabilities



Perimyotis subflavus (PESU) mean occupancy probabilities (color bar) predicted in each NABat grid cell in the modeled species range for 2019. Probabilities are depicted against the reference range map (blue polygon; M. Turner written communication, August 20, 2021) and borders of U.S. states and Canadian provinces/territories.

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Attachment A. USFWS Official Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
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In Reply Refer To: 08/15/2024 14:44:55 UTC
Project Code: 2024-0130805
Project Name: Wing Central Florida EA

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. **Please include your Project Code, listed at the top of this letter, in all subsequent correspondence regarding this project.** Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of

this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Marine Mammals
- Coastal Barriers
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Florida Ecological Services Field Office
777 37th St
Suite D-101
Vero Beach, FL 32960-3559
(352) 448-9151

PROJECT SUMMARY

Project Code: 2024-0130805
Project Name: Wing Central Florida EA
Project Type: Drones - Use/Operation of Unmanned Aerial Systems
Project Description: Wing Aviation, LLC (Wing), a subsidiary of Alphabet Inc., holds a Federal Aviation Administration (FAA) standard air carrier certificate under 14 Code of Federal Regulations (CFR) Part 135 (Part 135), which allows holders to conduct on-demand or scheduled (commuter) operations, and a 49 United States Code (U.S.C.) Section 44807 exemption, which allows Wing to carry the property of another for compensation or hire beyond visual line of sight (BVLOS) using its Hummingbird Unmanned Aircraft System (UAS).

Wing is proposing to conduct UA retail package delivery operations from up to 150 sites in the Central Florida metro and surrounding areas using Wing's Hummingbird 7000W-B and 8000-A. . Wing's intent is to offer service throughout the Central Florida metro and surrounding areas from a network of nests, where each would serve a specific area, thereby avoiding an over-concentration of flights surrounding any given nest. Each nest houses up to 24 aircraft and each has a delivery range of approximately 6 miles. Wing proposes a maximum of 150 nest locations within the Central Florida metro and surrounding areas. Site locations of seven initial nests are provided in Table 1. Wing's nests would be located in commercially zoned areas, such as shopping centers, large individual retailers, and shopping malls. Wing projects operating a maximum of 400 delivery flights per operating day from each nest, with operations initially occurring between 7:00 a.m. and 7:00 p.m. and then extending to 7:00 a.m. to 10:00 p.m. In addition, operations would include low altitude (<8ft) in-nest hover checks (referred to as FitBITs) between 6:00 a.m. and 7:00 a.m. in preparation for the normal operational day which would begin no earlier than 7:00 a.m.

Nests would be distributed throughout the Central Florida metro and surrounding areas following a measured rollout plan to be developed with Wing's partners and continuing best practices from Wing's established community outreach program, and in compliance with state and local statutory and regulatory requirements. Wing's nests would be located in established parking lots of commercially zoned areas whose use is consistent with local zoning and land use requirements, such as shopping centers, large individual retailers, and shopping malls. Remote pickup infrastructure consisting of an autoloader (Figure 2.2.7) would be installed within existing or proposed nests or at offsite locations, utilized during limited remote pickup and delivery operations, and would also be located within commercially zoned areas. Individual autoloader locations (either

within a nest or offsite) would typically include up to three autoloaders within or in the vicinity of most nest sites, with a handful more distributed locations having up to 10 autoloaders, depending on market demand, for a total installation of 100-300 autoloaders distributed throughout the operating area.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@28.1919084,-81.72369024900419,14z

Counties: Florida

ENDANGERED SPECIES ACT SPECIES

There is a total of 61 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Florida Bonneted Bat *Eumops floridanus* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8630	Endangered
Florida Panther *Puma (=Felis) concolor coryi* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1763 General project design guidelines: https://ipac.ecosphere.fws.gov/project/SLZVUCQMSVFQZL6D7PLBMZRWHQ/documents/generated/7123.pdf	Endangered
Puma (=mountain Lion) *Puma (=Felis) concolor (all subsp. except coryi)* Population: FL No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6049	Similarity of Appearance (Threatened)
Southeastern Beach Mouse *Peromyscus polionotus niveiventris* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3951	Threatened
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location overlaps the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469 General project design guidelines: https://ipac.ecosphere.fws.gov/project/SLZVUCQMSVFQZL6D7PLBMZRWHQ/documents/generated/7281.pdf	Threatened

BIRDS

NAME	STATUS
Crested Caracara (audubon""s) [fl Dps] *Caracara plancus audubonii* Population: FL DPS No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8250	Threatened
Eastern Black Rail *Laterallus jamaicensis ssp. jamaicensis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10477	Threatened
Everglade Snail Kite *Rostrhamus sociabilis plumbeus* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7713	Endangered

NAME	STATUS
Florida Grasshopper Sparrow *Ammodramus savannarum floridanus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/32	Endangered
Florida Scrub-jay *Aphelocoma coerulescens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6174	Threatened
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red-cockaded Woodpecker *Picoides borealis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7614	Endangered
Rufa Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: U.S.A. (AL, AR, CO, FL, GA, ID, IL, IN, IA, KY, LA, MI, MN, MS, MO, NC, NM, OH, SC, TN, UT, VA, WI, WV, western half of WY) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/758	Experimental Population, Non-Essential
Wood Stork *Mycteria americana* Population: AL, FL, GA, MS, NC, SC No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8477 General project design guidelines: https://ipac.ecosphere.fws.gov/project/SLZVUCQMSVFQZL6D7PLBMZRWHQ/documents/generated/6954.pdf	Threatened

REPTILES

NAME	STATUS
American Alligator *Alligator mississippiensis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/776	Similarity of Appearance (Threatened)
American Crocodile *Crocodylus acutus* Population: U.S.A. (FL) There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6604	Threatened
Atlantic Salt Marsh Snake *Nerodia clarkii taeniata* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7729	Threatened

NAME	STATUS
Blue-tailed Mole Skink *Eumeces egregius lividus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2203	Threatened
Eastern Indigo Snake *Drymarchon couperi* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/646	Threatened
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **proposed** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened
Sand Skink *Neoseps reynoldsi* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4094	Threatened

FISHES

NAME	STATUS
Gulf Sturgeon *Acipenser oxyrinchus (=oxyrhynchus) desotoi* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/651	Threatened

INSECTS

NAME	STATUS
Miami Blue Butterfly *Cyclargus thomasi bethunebakeri* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3797	Endangered
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

FLOWERING PLANTS

NAME	STATUS
Aboriginal Prickly-apple *Harrisia (=Cereus) aboriginum (=gracilis)* Population: There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2833	Endangered
Avon Park Harebells *Crotalaria avonensis* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7093	Endangered
Beautiful Pawpaw *Deeringothamnus pulchellus* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4069	Endangered
Britton's Beargrass *Nolina brittoniana* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4460	Endangered
Brooksville Bellflower *Campanula robinsiae* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5809	Endangered
Carter's Mustard *Warea carteri* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5583	Endangered
Cooley's Water-willow *Justicia cooleyi* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4653	Endangered
Florida Bonamia *Bonamia grandiflora* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2230	Threatened
Florida Ziziphus *Ziziphus celata* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2950	Endangered
Fragrant Prickly-apple *Cereus eriophorus var. fragrans* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/982	Endangered
Garrett's Mint *Dicerandra christmanii* Population:	Endangered

NAME	STATUS
No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8333	
Highlands Scrub Hypericum *Hypericum cumulicola* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2940	Endangered
Lakela's Mint *Dicerandra immaculata* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6390	Endangered
Lewton's Polygala *Polygala lewtonii* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6688	Endangered
Longspurred Mint *Dicerandra cornutissima* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1660	Endangered
Okeechobee Gourd *Cucurbita okeechobeensis ssp. okeechobeensis* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5999	Endangered
Papery Whitlow-wort *Paronychia chartacea* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1465	Threatened
Pigeon Wings *Clitoria fragrans* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/991	Threatened
Pygmy Fringe-tree *Chionanthus pygmaeus* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1084	Endangered
Rugel's Pawpaw *Deeringothamnus rugelii* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5355	Endangered
Sandlace *Polygonella myriophylla* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5745	Endangered

NAME	STATUS
Scrub Blazingstar *Liatris ohlingerae*	Endangered
Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/864	
Scrub Buckwheat *Eriogonum longifolium var. gnaphalifolium*	Threatened
Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5940	
Scrub Lupine *Lupinus aridorum*	Endangered
Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/736	
Scrub Mint *Dicerandra frutescens*	Endangered
Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/799	
Scrub Plum *Prunus geniculata*	Endangered
Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2238	
Short-leaved Rosemary *Conradina brevifolia*	Endangered
Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2929	
Snakeroot *Eryngium cuneifolium*	Endangered
Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7487	
Wide-leaf Warea *Warea amplexifolia*	Endangered
Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/412	
Wireweed *Polygonella basiramia*	Endangered
Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1718	

FERNS AND ALLIES

NAME	STATUS
Florida Bristle Fern *Trichomanes punctatum ssp. floridanum*	Endangered
Population: There is **final** critical habitat for this species. Your location overlaps the critical habitat.	

NAME	STATUS

Species profile: https://ecos.fws.gov/ecp/species/8739

LICHENS

NAME	STATUS
Florida Perforate Cladonia *Cladonia perforata*	Endangered

Population:
No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/7516

CRITICAL HABITATS

There are 8 critical habitats wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Aboriginal Prickly-apple *Harrisia (=Cereus) aboriginum (=gracilis)* https://ecos.fws.gov/ecp/species/2833#crithab	Final
Florida Bonneted Bat *Eumops floridanus* https://ecos.fws.gov/ecp/species/8630#crithab	Final
Florida Bristle Fern *Trichomanes punctatum ssp. floridanum* https://ecos.fws.gov/ecp/species/8739#crithab	Final
Green Sea Turtle *Chelonia mydas* https://ecos.fws.gov/ecp/species/6199#crithab	Proposed
Loggerhead Sea Turtle *Caretta caretta* https://ecos.fws.gov/ecp/species/1110#crithab	Final
Piping Plover *Charadrius melodus* https://ecos.fws.gov/ecp/species/6039#crithab	Final
Rufa Red Knot *Calidris canutus rufa* https://ecos.fws.gov/ecp/species/1864#crithab	Proposed
West Indian Manatee *Trichechus manatus* https://ecos.fws.gov/ecp/species/4469#crithab	Final

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

The following FWS National Wildlife Refuge Lands and Fish Hatcheries lie fully or partially within your project area:

FACILITY NAME

ARCHIE CARR NATIONAL WILDLIFE REFUGE
https://www.fws.gov/our-facilities?$keywords="%5C%22ARCHIE+CARR+NATIONAL+WILDLIFE+REFUGE%5C%22"

CHASSAHOWITZKA NATIONAL WILDLIFE REFUGE
https://www.fws.gov/our-facilities?$keywords="%5C%22CHASSAHOWITZKA+NATIONAL+WILDLIFE+REFUGE%5C%22"

CRYSTAL RIVER NATIONAL WILDLIFE REFUGE
https://www.fws.gov/our-facilities?$keywords="%5C%22CRYSTAL+RIVER+NATIONAL+WILDLIFE+REFUGE%5C%22"

EVERGLADES HEADWATERS NATIONAL WILDLIFE REFUGE AND CONSERVATION AREA
https://www.fws.gov/our-facilities?$keywords="%5C%22EVERGLADES+HEADWATERS+NATIONAL+WILDLIFE+REFUGE+AND+CONSERVATION+AREA%5C

LAKE WALES RIDGE NATIONAL WILDLIFE REFUGE
https://www.fws.gov/our-facilities?$keywords="%5C%22LAKE+WALES+RIDGE+NATIONAL+WILDLIFE+REFUGE%5C%22"

LAKE WOODRUFF NATIONAL WILDLIFE REFUGE
https://www.fws.gov/our-facilities?$keywords="%5C%22LAKE+WOODRUFF+NATIONAL+WILDLIFE+REFUGE%5C%22"

MERRITT ISLAND NATIONAL WILDLIFE REFUGE
https://www.fws.gov/our-facilities?$keywords="%5C%22MERRITT+ISLAND+NATIONAL+WILDLIFE+REFUGE%5C%22"

PELICAN ISLAND NATIONAL WILDLIFE REFUGE
https://www.fws.gov/our-facilities?$keywords="%5C%22PELICAN+ISLAND+NATIONAL+WILDLIFE+REFUGE%5C%22"

PINELLAS NATIONAL WILDLIFE REFUGE
https://www.fws.gov/our-facilities?$keywords="%5C%22PINELLAS+NATIONAL+WILDLIFE+REFUGE%5C%22"

ST. JOHNS NATIONAL WILDLIFE REFUGE
https://www.fws.gov/our-facilities?$keywords="%5C%22ST.+JOHNS+NATIONAL+WILDLIFE+REFUGE%5C%22"

BALD & GOLDEN EAGLES

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are likely bald eagles present in your project area. For additional information on bald eagles, refer to Bald Eagle Nesting and Sensitivity to Human Activity

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

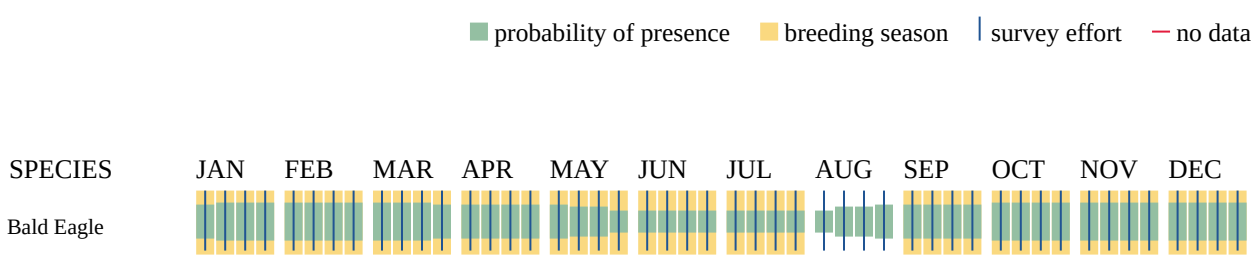
Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Non-BCC
Vulnerable

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Kestrel *Falco sparverius paulus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9587	Breeds Apr 1 to Aug 31

NAME	BREEDING SEASON
American Oystercatcher *Haematopus palliatus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8935	Breeds Apr 15 to Aug 31
Audubon's Shearwater *Puffinus lherminieri* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9635	Breeds Mar 1 to Aug 5
Bachman's Sparrow *Peucaea aestivalis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/6177	Breeds May 1 to Sep 30
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Band-rumped Storm-petrel *Hydrobates castro* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/1226	Breeds elsewhere
Black Scoter *Melanitta nigra* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10413	Breeds elsewhere
Black Skimmer *Rynchops niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Black-capped Petrel *Pterodroma hasitata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/4748	Breeds elsewhere
Black-legged Kittiwake *Rissa tridactyla* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10459	Breeds elsewhere

NAME	BREEDING SEASON
Brown Pelican *Pelecanus occidentalis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/6034	Breeds Jan 15 to Sep 30
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Common Eider *Somateria mollissima* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10457	Breeds Jun 1 to Sep 30
Common Loon *gavia immer* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/4464	Breeds Apr 15 to Oct 31
Common Murre *Uria aalge* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10453	Breeds Apr 15 to Aug 15
Cory's Shearwater *Calonectris diomedea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10452	Breeds elsewhere
Double-crested Cormorant *phalacrocorax auritus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/3478	Breeds Apr 20 to Aug 31
Dovekie *Alle alle* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/6041	Breeds elsewhere
Florida Burrowing Owl *Athene cunicularia floridana* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/11977	Breeds Mar 15 to Aug 31

NAME	BREEDING SEASON
Great Blue Heron *Ardea herodias occidentalis* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/10590	Breeds Jan 1 to Dec 31
Great Shearwater *Puffinus gravis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/9634	Breeds elsewhere
Gull-billed Tern *Gelochelidon nilotica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9501	Breeds May 1 to Jul 31
Henslow's Sparrow *Centronyx henslowii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3941	Breeds elsewhere
King Rail *Rallus elegans* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8936	Breeds May 1 to Sep 5
Least Tern *Sternula antillarum antillarum* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/11919	Breeds Apr 25 to Sep 5
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Long-tailed Duck *Clangula hyemalis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/7238	Breeds elsewhere
Magnificent Frigatebird *Fregata magnificens* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9588	Breeds Oct 1 to Apr 30
Mangrove Cuckoo *Coccyzus minor* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9581	Breeds Apr 20 to Aug 20

NAME	BREEDING SEASON
Manx Shearwater *Puffinus puffinus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10465	Breeds Apr 15 to Oct 31
Painted Bunting *Passerina ciris* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9511	Breeds Apr 25 to Aug 15
Pectoral Sandpiper *Calidris melanotos* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9561	Breeds elsewhere
Pomarine Jaeger *Stercorarius pomarinus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10458	Breeds elsewhere
Prairie Warbler *Setophaga discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9513	Breeds May 1 to Jul 31
Razorbill *Alca torda* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10461	Breeds Jun 15 to Sep 10
Red Phalarope *Phalaropus fulicarius* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10469	Breeds elsewhere
Red-breasted Merganser *Mergus serrator* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10693	Breeds elsewhere
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10

NAME	BREEDING SEASON
Red-necked Phalarope *Phalaropus lobatus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10467	Breeds elsewhere
Red-throated Loon *Gavia stellata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/9589	Breeds elsewhere
Reddish Egret *Egretta rufescens* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/7617	Breeds Mar 1 to Sep 15
Ring-billed Gull *Larus delawarensis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10468	Breeds elsewhere
Roseate Tern *Sterna dougallii* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10661	Breeds May 10 to Aug 31
Royal Tern *Thalasseus maximus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10471	Breeds Apr 15 to Aug 31
Ruddy Turnstone *Arenaria interpres morinella* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/10633	Breeds elsewhere
Saltmarsh Sparrow *Ammospiza caudacuta* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9719	Breeds May 15 to Sep 5
Semipalmated Sandpiper *Calidris pusilla* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9603	Breeds elsewhere

NAME	BREEDING SEASON
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Sooty Shearwater *Ardenna grisea* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10417	Breeds elsewhere
Sooty Tern *Onychoprion fuscatus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10695	Breeds Mar 10 to Jul 31
Surf Scoter *Melanitta perspicillata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10463	Breeds elsewhere
Swallow-tailed Kite *Elanoides forficatus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8938	Breeds Mar 10 to Jun 30
Thick-billed Murre *Uria lomvia* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10700	Breeds Apr 15 to Aug 15
Whimbrel *Numenius phaeopus hudsonicus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/11991	Breeds elsewhere
White-crowned Pigeon *Patagioenas leucocephala* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/4047	Breeds May 1 to Sep 30
White-winged Scoter *Melanitta fusca* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10462	Breeds elsewhere

NAME	BREEDING SEASON
Willet *Tringa semipalmata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10669	Breeds Apr 20 to Aug 5
Wilson's Plover *Charadrius wilsonia* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9722	Breeds Apr 1 to Aug 20
Wilson's Storm-petrel *Oceanites oceanicus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10416	Breeds elsewhere
Worthington's Marsh Wren *Cistothorus palustris griseus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9560	Breeds Apr 10 to Aug 31
Yellow Rail *Coturnicops noveboracensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9476	Breeds elsewhere

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (▪)

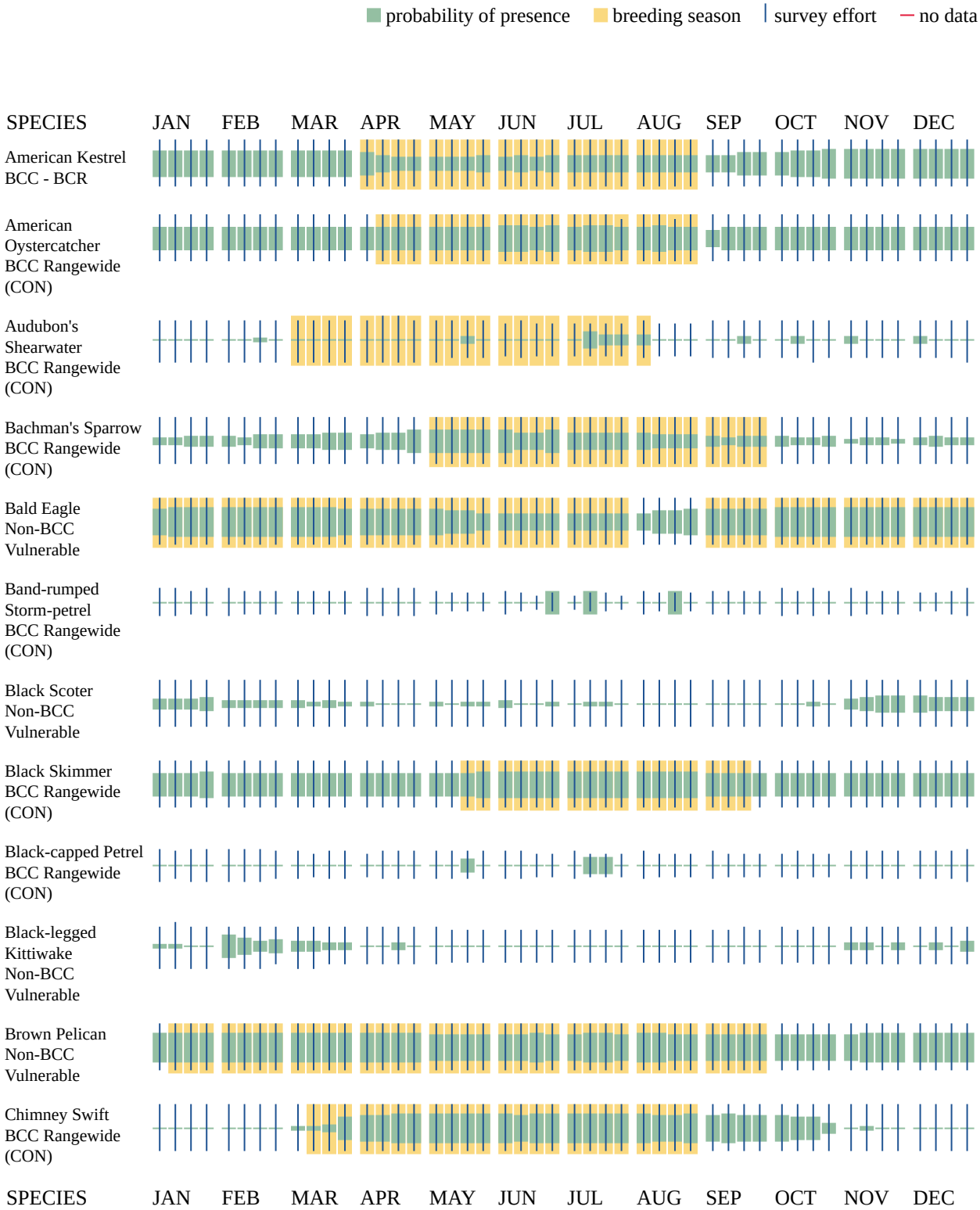
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

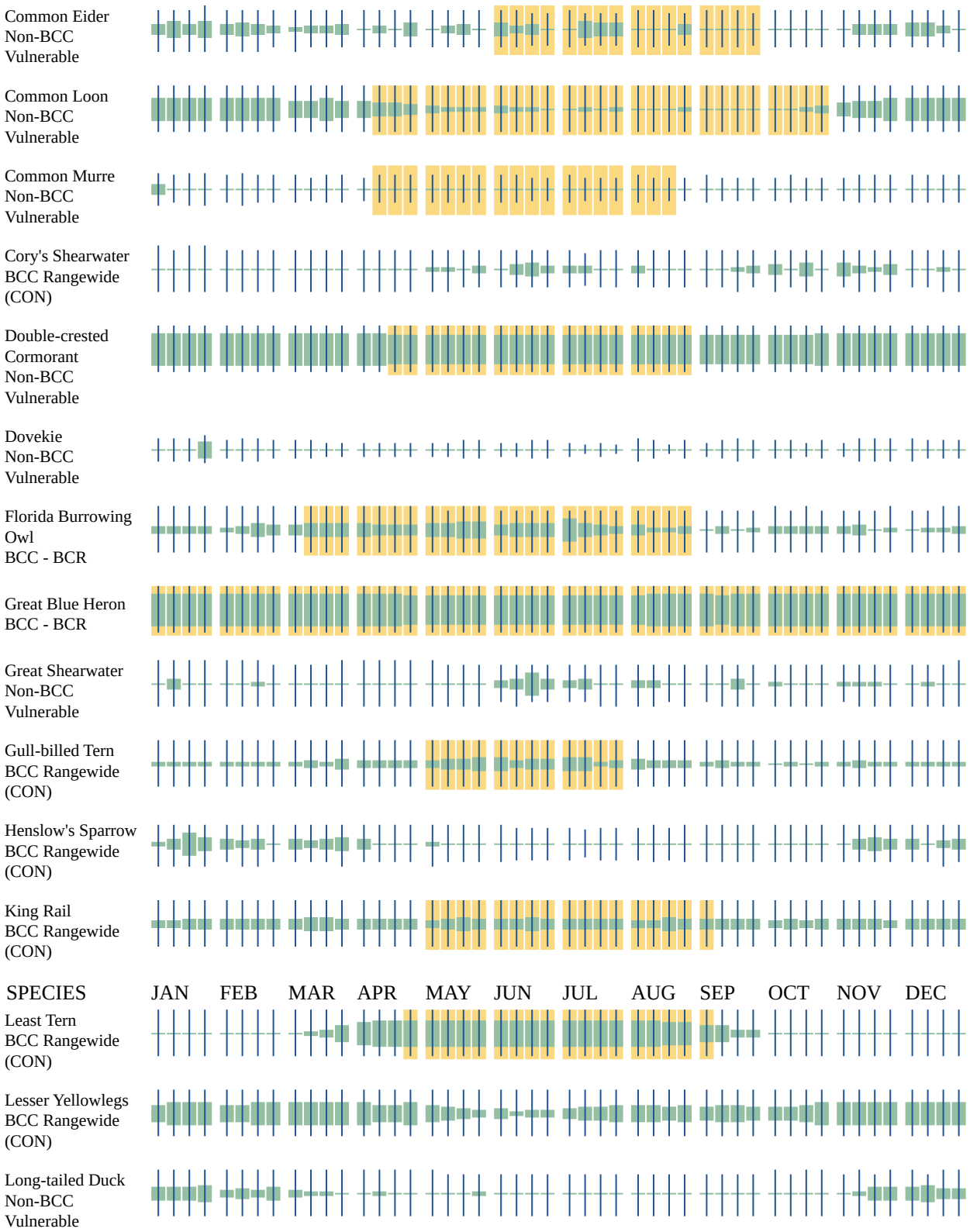
Breeding Season (▪)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

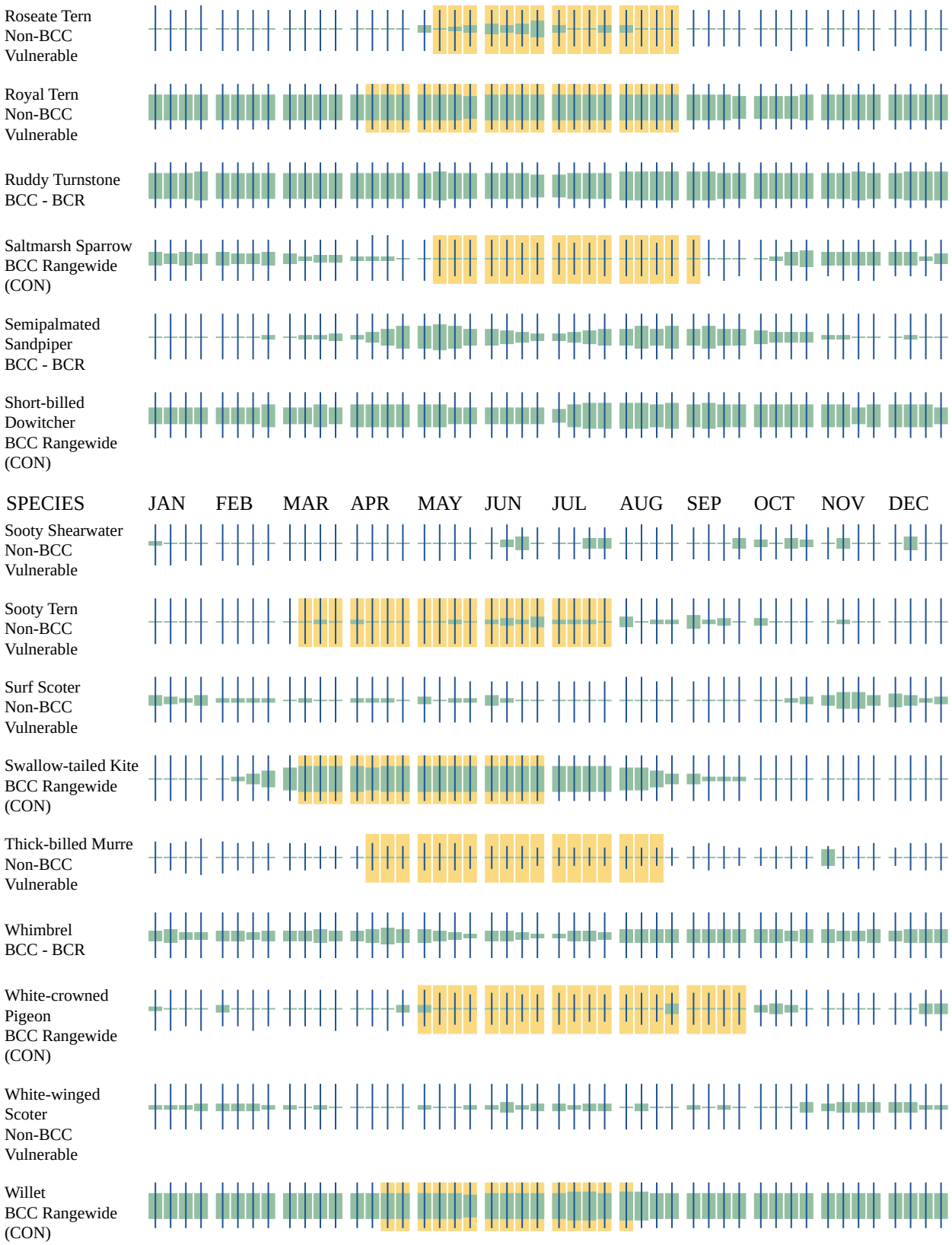
No Data (–)

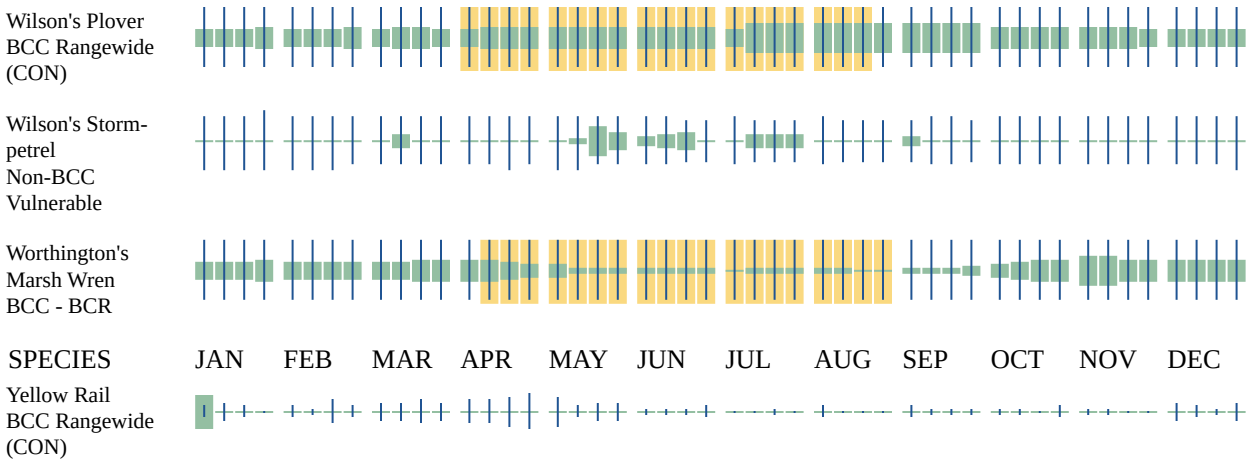
A week is marked as having no data if there were no survey events for that week.




Common Eider
Non-BCC
Vulnerable
Common Loon
Non-BCC
Vulnerable
Common Murre
Non-BCC
Vulnerable
Cory's Shearwater
BCC Rangewide
(CON)
Double-crested
Cormorant
Non-BCC
Vulnerable
Dovekie
Non-BCC
Vulnerable
Florida Burrowing
Owl
BCC - BCR
Great Blue Heron
BCC - BCR
Great Shearwater
Non-BCC
Vulnerable
Gull-billed Tern
BCC Rangewide
(CON)
Henslow's Sparrow
BCC Rangewide
(CON)
King Rail
BCC Rangewide
(CON)
SPECIES
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Least Tern
BCC Rangewide
(CON)
Lesser Yellowlegs
BCC Rangewide
(CON)
Long-tailed Duck
Non-BCC
Vulnerable


Magnificent Frigatebird BCC - BCR
Mangrove Cuckoo BCC - BCR
Manx Shearwater BCC Rangewide (CON)
Painted Bunting BCC - BCR
Pectoral Sandpiper BCC Rangewide (CON)
Pomarine Jaeger Non-BCC Vulnerable
Prairie Warbler BCC Rangewide (CON)
Razorbill Non-BCC Vulnerable
Red Phalarope Non-BCC Vulnerable
SPECIES
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Red-breasted Merganser Non-BCC Vulnerable
Red-headed Woodpecker BCC Rangewide (CON)
Red-necked Phalarope Non-BCC Vulnerable
Red-throated Loon Non-BCC Vulnerable
Reddish Egret BCC Rangewide (CON)
Ring-billed Gull Non-BCC Vulnerable


Roseate Tern
Non-BCC
Vulnerable
Royal Tern
Non-BCC
Vulnerable
Ruddy Turnstone
BCC - BCR
Saltmarsh Sparrow
BCC Rangewide
(CON)
Semipalmated
Sandpiper
BCC - BCR
Short-billed
Dowitcher
BCC Rangewide
(CON)
SPECIES
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Sooty Shearwater
Non-BCC
Vulnerable
Sooty Tern
Non-BCC
Vulnerable
Surf Scoter
Non-BCC
Vulnerable
Swallow-tailed Kite
BCC Rangewide
(CON)
Thick-billed Murre
Non-BCC
Vulnerable
Whimbrel
BCC - BCR
White-crowned
Pigeon
BCC Rangewide
(CON)
White-winged
Scoter
Non-BCC
Vulnerable
Willet
BCC Rangewide
(CON)



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

COASTAL BARRIERS

Projects within the John H. Chafee Coastal Barrier Resources System (CBRS) may be subject to the restrictions on Federal expenditures and financial assistance and the consultation requirements of the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 et seq.). For more information, please contact the local Ecological Services Field Office or visit the CBRA Consultations website. The CBRA website provides tools such as a flow chart to help determine whether consultation is required and a template to facilitate the consultation process.

SYSTEM UNIT (SU)

Most new Federal expenditures and financial assistance, including Federal flood insurance, are prohibited within System Units. ***Federally-funded projects within System Units require consultation with the Service.*** *Consultation is not required for projects using private, state, or local funds.*

OTHERWISE PROTECTED AREA (OPA)

OPAs are denoted with a "P" at the end of the unit number. The only prohibition within OPAs is on Federal flood insurance. ***CBRA consultation is not required for projects within OPAs.*** *However, agencies providing disaster assistance that is contingent upon a requirement to purchase flood insurance after the fact are advised to disclose the OPA designation and information on the restrictions on Federal flood insurance to the recipient prior to the commitments of funds.*

UNIT	NAME	TYPE	SYSTEM UNIT ESTABLISHMENT DATE	FLOOD INSURANCE PROHIBITION DATE
FL-78	Rattlesnake Key	SU	11/16/1990	11/16/1990
FL-78	Rattlesnake Key	SU	12/21/2018	11/16/1991
FL-78	Rattlesnake Key	SU	12/21/2018	12/21/2018
FL-82	Bishop Harbor	SU	11/16/1990	11/16/1990
FL-82	Bishop Harbor	SU	12/21/2018	12/21/2018
FL-83	Cockroach Bay	SU	11/16/1990	11/16/1990
FL-83	Cockroach Bay	SU	12/21/2018	12/21/2018
P08	Ponce Inlet	SU	10/18/1982	10/1/1983
P08	Ponce Inlet	SU	11/16/1990	11/16/1990
P08	Ponce Inlet	SU	12/21/2018	12/21/2018
P09A	Coconut Point	SU	10/18/1982	10/1/1983
P09A	Coconut Point	SU	11/16/1990	11/16/1990
P09A	Coconut Point	SU	12/21/2018	12/21/2018
P10	Vero Beach	SU	11/16/1990	11/16/1990
P22	Casey Key	SU	10/18/1982	10/1/1983
P22	Casey Key	SU	11/16/1990	11/16/1990
P22	Casey Key	SU	12/21/2018	12/21/2018
P23	Longboat Key	SU	10/18/1982	10/1/1983
P23	Longboat Key	SU	11/16/1990	11/16/1990
P24	The Reefs	SU	10/18/1982	10/1/1983
P24	The Reefs	SU	11/16/1990	11/16/1990
P24A	Mandalay Point	SU	10/18/1982	10/1/1983
P24A	Mandalay Point	SU	11/16/1990	11/16/1990

UNIT	NAME	TYPE	SYSTEM UNIT ESTABLISHMENT DATE	FLOOD INSURANCE PROHIBITION DATE
FL-07P	Canaveral	OPA	N/A	11/16/1991
FL-13P	Spessard Holland Park	OPA	N/A	11/16/1991
FL-13P	Spessard Holland Park	OPA	N/A	12/21/2018
FL-72P	Lido Key	OPA	N/A	11/16/1991
FL-72P	Lido Key	OPA	N/A	12/21/2018
FL-73P	De Soto	OPA	N/A	11/16/1991
FL-73P	De Soto	OPA	N/A	12/21/2018
FL-85P	Sand Key	OPA	N/A	11/16/1991
FL-85P	Sand Key	OPA	N/A	12/21/2018
FL-86P	Caladesi/Honeymoon Islands	OPA	N/A	11/16/1991
FL-87P	Anclote Key	OPA	N/A	11/16/1991
P08P	Ponce Inlet	OPA	N/A	10/1/1983
P08P	Ponce Inlet	OPA	N/A	12/21/2018
P09AP	Coconut Point	OPA	N/A	11/16/1990
P09AP	Coconut Point	OPA	N/A	12/21/2018
P10P	Vero Beach	OPA	N/A	10/1/1983
P10P	Vero Beach	OPA	N/A	11/16/1991
P23P	Longboat Key	OPA	N/A	11/16/1991
P24P	The Reefs	OPA	N/A	11/16/1991

MARINE MAMMALS

Marine mammals are protected under the Marine Mammal Protection Act. Some are also protected under the Endangered Species Act[1] and the Convention on International Trade in Endangered Species of Wild Fauna and Flora[2].

The responsibilities for the protection, conservation, and management of marine mammals are shared by the U.S. Fish and Wildlife Service [responsible for otters, walruses, polar bears, manatees, and dugongs] and NOAA Fisheries[3] [responsible for seals, sea lions, whales, dolphins, and porpoises]. Marine mammals under the responsibility of NOAA Fisheries are **not** shown on this list; for additional information on those species please visit the Marine Mammals page of the NOAA Fisheries website.

The Marine Mammal Protection Act prohibits the take of marine mammals and further coordination may be necessary for project evaluation. Please contact the U.S. Fish and Wildlife Service Field Office shown.

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1. The Endangered Species Act (ESA) of 1973.
2. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is a treaty to ensure that international trade in plants and animals does not threaten their survival in the wild.
3. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

NAME

West Indian Manatee *Trichechus manatus*
Species profile: https://ecos.fws.gov/ecp/species/4469

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

Due to your project's size, the list below may be incomplete, or the acreages reported may be inaccurate. For a full list, please contact the local U.S. Fish and Wildlife office or visit https://www.fws.gov/wetlands/data/mapper.HTML

ESTUARINE AND MARINE DEEPWATER

- E1ABL
- E1AB3L
- E1UBL
- E1ABLx

ESTUARINE AND MARINE WETLAND

- E2ABM

IPAC USER CONTACT INFORMATION

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TECHNICAL NOISE STUDY REPORT: HUMMINGBIRD 7000W-B AND 8000-A UNMANNED AIRCRAFT PACKAGE DELIVERY OPERATIONS

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Acronyms and Abbreviations

AGL	above ground level
CONOPS	Concept of operations
dB	decibel
dBA	A-weighted decibel
DNL	day/night level
FAA	Federal Aviation Administration
Lmax	maximum sound level
SEL	sound exposure level
UA	unmanned aircraft

Chapter 1
Introduction

1.1 Purpose

The purpose of this report is to provide calculations of noise exposure for package delivery operations by Hummingbird unmanned aircraft (UA) developed by Wing Aviation LLC, a subsidiary of Alphabet, Inc. Noise exposure estimates are provided for two Hummingbird models: the Model 7000W-B and the Model 8000-A based on sound level testing data collected by AvEnviro Acoustics (2024a, 2024b).

The analysis in this report provides a methodology of estimating noise levels from UA operation that is limited to these specific UA models. Because the methods used in this report are based on collected measurements, they should not be applied to other UA models. The analysis does not include a geographic component, nor does it account for the presence of structures in urban areas.

Passby exposure levels at different distances from a nest or delivery point are based on as-tested conditions, which were intended to simulate all operation types for each UA model. Testing simulations consisted of the following operations:

- Manual package loading at a nest and takeoff toward delivery point
- Package offloading at a delivery point and departure back to nest
- Landing at a nest
- Remote launch, autoload of package at a nest, and takeoff
- Nearfield launch, autoload of package at a nest, and takeoff
- Hover in place
- En route (with and without a package)
- Preflight warmup (a.k.a. “Fitbit” operation)
- Nest homebase survey (a.k.a. “Geobit” operation)

Total DNL noise exposures are calculated based on various scales of package delivery and associated activities using passby exposure levels for the types of operation applicable to nests, delivery points and en route locations.

It is important to note that the results presented in this report shall supersede the results presented in the previous report, *Noise Assessment for Wing Aviation Proposed Package Delivery Operations with Hummingbird 7000W-B Unmanned Aircraft*, prepared March 17, 2023 by Harris Miller Miller and Hanson Inc (2023). The results in the previous Model 7000W-B report relied on certification measurements for en route and hover of a surrogate UA model. This is because sound level measurements had not yet been conducted for simulation of package delivery operations using the Model 7000W-B at the time the previous report was written. In contrast, the sound level measurements presented in this report are based closely on the concept of operations (CONOPS) for all modes of UA package delivery and associated operations.

1.2 Fundamental Concepts

Various noise descriptors or metrics have been developed to describe time-varying noise levels. The following metrics are used in this evaluation.

- Sound Exposure Level (SEL): SEL represents the total sound energy occurring over a specified period compressed into a one-second time interval. The SEL metric has broad utility in noise prediction and is a primary measurement collected for sound level testing of the two UA models.
- Day Night Average Sound Level (DNL): DNL is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10 decibel (dB) penalty applied to A-weighted sound levels occurring during nighttime hours between 10 p.m. and 7 a.m. The DNL is used in this analysis to describe noise exposure for daily operations from a nest, en route, or delivery point.
- Maximum Sound Level (Lmax): Lmax is the highest instantaneous sound level measured during a specified period.
- Community Noise Equivalent Level (CNEL): Similar to DNL, CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10 dB penalty applied to A-weighted sound levels occurring during the nighttime hours between 10 p.m. and 7 a.m. and a 5 dB penalty applied to the A-weighted sound levels occurring during evening hours between 7 p.m. and 10 p.m.

1.3 Regulatory Context

The noise exposure estimates in this document are intended to be used for environmental assessments of operations involving the Models 7000W-B and 8000-A, for compliance with the National Environmental Policy Act and operational requirements for a commercial carrier under 14 Code of Federal Regulations Part 135. The analysis method used in this report does not apply standard models such as the Aviation Environmental Design Tool, but instead applies an estimation method based on collected noise measurements. As such the application of this method is only applicable to the Model 7000W-B and 8000-A UAs.

Chapter 2
Methods

2.1 Sound Level Measurements

The analysis in this report used sound level testing data from two reports: *Noise Measurement Results: Wing Model 7000W-B Revision D*, dated November 4, 2024, prepared by AvEnviro Acoustics (2024a), and *Noise Measurement Results: Wing Model 8000-A Revision C*, dated October 28, 2024 also prepared by AvEnviro Acoustics (2024b).

2.1.1 Wing Model 7000W-B Sound Level Measurements

The Hummingbird 7000W-B is a hybrid UA featuring a multi-rotor design with sixteen round diameter propellers. This UA has fixed wing elements, including four motors for forward flight, while also using rotors to provide vertical lift and the capability to hover during packing loading and delivery operations. Packages are loaded or unloaded to the UA during hover by a retractable cord.

The 7000W-B UA weighs 14 pounds when combined with its maximum payload weight of 2.3 pounds. It has a wingspan of approximately 4.9 feet, a height of approximately 1 foot, and a length of approximately 3 feet. Model 7000W-B is shown in Figure 1.

Figure 1. Hummingbird Wing Model 7000W-B.

Sound level testing was conducted at the Wing flight test center in Hollister, California in March 2024. The testing protocol followed FAA direction given in the document, *Measuring Drone Noise for Environmental Review Process*, dated October 2023 (FAA 2023). A brief summary of test results is shown in Table 1. The test results that include forward flight assume a nominal cruise speed of 50.5 knots (AvEnviro Acoustics 2024a).

Table 1. Summary of Sound Level Testing, Model 7000W-B

Test Series	Altitude	Microphone Position	Average SEL (dBA)	Average Lmax (dBA)
En Route with Package	100 feet AGL	Under flight path	59.2	54.3
En Route without Package	100 feet AGL	Under flight path	55.5	50.3
Nest: Manual Loading and Takeoff	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	80.6	66.8
Delivery Point: Arrival, Delivery, Departure	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	83.4	71.9
Nest: Arrival, Landing	Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	78.1	68.2
Offsite Package Autoload	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	81.7	68.9
Nest: Nearfield launch, Autoload and Takeoff	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	82.1	68.6
Nest: Preflight warmup (a.k.a. “Fitbit”)	7 feet AGL	50 feet away from nest	80.3	64.0
Nest: Homebase survey (a.k.a. “Geobit”)	66 feet AGL	50 feet away from nest	81.0	66.2

Source: AvEnviro Acoustics 2024a.
AGL = above ground level
dBA = A-weighted decibel

2.1.2 Wing Model 8000-A Sound Level Measurements

The Hummingbird 8000-A is a hybrid UA featuring a multi-rotor design with twelve round diameter propellers. This UA has fixed wing elements, including four motors for forward flight, while also using rotors to provide vertical lift and the capability to hover during packing loading and delivery operations. Packages are loaded or unloaded to the UA during hover by a retractable cord.

The 8000-A UA weighs 24.3 pounds when combined with its maximum payload weight of 6.6 pounds. It has a wingspan of approximately 6 feet, a height of approximately 1 foot, and a length of approximately 6.2 feet. Model 8000-A is shown in Figure 2.

Figure 2. Wing Hummingbird 8000-A UA

Sound level testing was conducted at the Wing flight test center in Hollister, California in April 2024. The testing protocol followed FAA direction given in the document, *Measuring Drone Noise for Environmental Review Process*, dated October 2023 (FAA 2023). A brief summary of key test results is shown in Table 2. The test results that include forward flight assume a nominal cruise speed of 50.5 knots (AvEnviro Acoustics 2024b).

Table 2. Summary of Sound Level Testing, Model 8000-A

Test Series	Altitude	Microphone Position	Average SEL (dBA)	Average Lmax (dBA)
En Route with Package	100 feet AGL	Under flight path	64.7	58.7
En Route without Package [1]	100 feet AGL	Under flight path	62.7	55.5
Nest: Manual Loading and Takeoff	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	79.0	65.8
Delivery Point: Arrival, Delivery, Departure	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	83.6	71.5
Nest: Arrival, Landing	Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	77.7	66.3
Offsite Package Autoload	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	80.9	66.8
Nest: Nearfield launch, Autoload and Takeoff	Hover: 13 feet AGL, Flight: 165 feet AGL	Under flight path, 50 feet away from takeoff point	81.6	66.8
Nest: Preflight warmup (a.k.a. “Fitbit”)	7 feet AGL	50 feet away from nest	77.1	63.2

Test Series	Altitude	Microphone Position	Average SEL (dBA)	Average Lmax (dBA)
Nest: Homebase survey (a.k.a. "Geobit")	66 feet AGL	50 feet away from nest	79.4	66.7

Source: AvEnviro Acoustics 2024b.

[1] Based on guidance from the test report, data for en route without a package is not used. This item uses the same sound level as en route with a package.

AGL = above ground level; dBA = A-weighted decibel

2.2 Analysis Procedure Methodology

To calculate SEL for receptors located near a nest or delivery point, a combination of actions are evaluated to define different types of operations, as a UA transitions between different operating modes of takeoff, hover, ascend, descend, and en route. The types of operations evaluated are the following:

- Manual package loading at nest
- Package delivery at a delivery point
- Landing at nest
- Package autoload at an offsite location
- Nearfield launch and package autoload at nest
- Preflight warmup (a.k.a. "Fitbit")
- Homebase survey (a.k.a. "Geobit")

The SEL calculation for each of these operation types involves the use of sound level data as measured by an array of microphones during simulation testing of each operation, as described in the noise measurement test reports (AvEnviro 2024a, AvEnviro 2024b). Microphones placed on a linear path relative to the UA launch point collected sound level data at distances of 25 feet, 50 feet, 100 feet , 200 feet, 400 feet and 800 feet. The incident SEL sound levels were used to determine attenuation rates between microphone positions, which were influenced by different degrees of en route and hover noise depending on the type of operation tested. However, as described in the noise measurement test reports, ambient noise from other sources heavily influenced data collected at the 400-foot and 800-foot positions (AvEnviro 2024a, 2024b). For this reason, the data collected at the 400-foot and 800-foot positions is not used in this analysis. At 800 feet, the SEL is equivalent to en route noise as measured during testing. As such, for the distances greater than 200 feet from the UA launch point, attenuation would assume a falloff rate consistent with an en route SEL level at 800 feet. At distances greater than 800 feet, the en route level is used.

DNL values are calculated for four types of locations: 1) a nest, 2) a delivery point, 3) an offsite autoloader, and 4) directly under the en route path. The DNL values at a nest are calculated by summing the sound energy for a launch and package loading operation with a return to land at the nest to describe sound levels for a single delivery cycle. UA noise from FitBit and GeoBit operations are also accounted for in DNL values from a nest. The DNL value for a single delivery cycle at each of the four locations is scaled for multiple UA operations using a logarithmic multiplier (i.e., log of the number of events multiplied by 10). adjusted by a factor of 49.4 to convert from SEL to DNL.

Chapter 3
Testing Procedure for Wing Operations

Sound level testing included a simulation of different UA operations to account for different activities that would take place at nest and delivery points. Each operation type includes a specific sequence of actions, described in the following subsections.

3.1 Manual Load and Takeoff

Sequence of manual package loading and takeoff operation from the launch point (e.g., nest):

1. Ascend from launch pad until reaching 33 feet above ground level AGL, then descend slightly to 22 feet AGL (about 9 seconds for 7000W-B, 11 seconds for 8000-A)
2. Hover at 22 feet AGL during package pickup (about 20 seconds for both models)
3. Aircraft with package ascends from 22 feet AGL to 165 feet AGL (about 14 seconds for both models)
4. Begin horizontal flight at constant acceleration until a speed of 50.5 knots is reached (about 13 seconds for 7000W-B, 15 seconds for 8000-A)
5. Maintain horizontal flight at constant velocity of 50.5 knots over microphone array

3.2 Delivery

Sequence of package delivery operation to a delivery point:

1. Aircraft with package approaches at 165 feet AGL above microphone array
2. Decelerate from 50.5 knots to zero (about 15 seconds for 7000W-B, 13 seconds for 8000-A)
3. Descend from 165 feet AGL to 22 feet AGL (about 20 seconds for 7000W-B, 28 seconds for 8000-A)
4. Hover at 22 feet AGL during package drop (about 12 seconds for both models)
5. Empty aircraft ascends from 22 feet AGL to 165 feet AGL (about 15 seconds for 7000W-B, 16 seconds for 8000-A)
6. Begin horizontal flight at constant acceleration until a speed of 50.5 knots (i.e., Vcruise) is reached (about 14 seconds for 7000W-B, 18 seconds for 8000-A)
7. Maintain horizontal flight at constant velocity of 50.5 knots over microphone array

3.2.1 Landing

Sequence of landing operation at nest:

1. Empty aircraft approaches at 165 feet AGL above microphone array
2. Decelerate from 50.5 knots to zero (about 14 seconds for both models)

3. Descend from 165 feet AGL to ground (for 7000W-B, the UA descends to 20 feet AGL in about 15 seconds and from 20 feet AGL to ground in about 13 seconds; for 8000-A, the UA descends to 20 feet AGL in about 24 seconds and from 20 feet AGL to ground in about 12 seconds)

3.2.2 Offsite Package Autoload

For offsite package autoload operation, the UA takes off from a distant nest location and approaches the offsite package loading point.

1. Empty aircraft approaches at 165 feet AGL above microphone array
2. Decelerate from 50.5 knots to zero (about 17 seconds for both models)
3. Descend from 165 feet AGL to 22 feet AGL (about 15 seconds for 7000W-B, 25 seconds for 8000-A)
4. Hover at 22 feet AGL during package pickup (about 22 seconds for both models)
5. Aircraft with package ascends from 22 feet AGL to 165 feet AGL (about 15 seconds for both models) Begin horizontal flight at constant acceleration until a speed of 50.5 knots (i.e., V_{cruise}) is reached (about 14 seconds for both models)
6. Maintain horizontal flight at constant velocity of 50.5 knots over microphone array

3.2.3 Nearfield Launch and Autoload

For nearfield launch, the UA takes off and approaches the package loading point from a nearby nest.

1. Empty aircraft ascends from nest 50 feet away to 165 feet AGL (about 15 seconds for 7000W-B, 16 seconds for 8000-A)
2. Transit to nearby autoloader (about 8 seconds for 7000W-B, 12 seconds for 8000-A)
3. Descend from 165 feet AGL to 14 feet AGL at constant velocity of (about 15 seconds for 7000W-B, 26 seconds for 8000-A)
4. Hover at 14 feet AGL during package pickup (about 22 seconds for both models)
5. Aircraft with package ascends from 14 feet AGL to 165 feet AGL (about 15 seconds for both models)
6. Begin horizontal flight at constant acceleration until a speed of 50.5 knots (i.e., Vcruise) is reached (about 14 seconds for both models)
7. Maintain horizontal flight at constant velocity of 50.5 knots over microphone array

3.2.4 Fitbit Operation

The Fitbit operation is a brief hover operation to warm up the battery and conduct preflight tests at the beginning of each day of flight operation. This would be done for each individual UA at the nest. Testing time varies but generally would be less than two minutes.

1. Climb to 7 feet AGL (about 3 seconds for both models)
2. Hover in place (assumes 118 seconds for 7000W-B, 49 seconds for 8000-A)

3. Descend from 7 feet AGL to ground (about 6 seconds for both models)

3.2.5 Geobit Operation

The Geobit operation is a brief hover operation above the nest to verify geolocation of ground-based infrastructure.

1. Climb to 66 feet AGL (about 8 seconds for both models)
2. Hover in place (about 25 seconds for both models)
3. Descend from 66 feet AGL to ground (about 40 seconds for both models)

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Chapter 4
Sound Levels of UA Operations

4.1 Sound Levels for Wing Model 7000W-B

4.1.1 Manual Loading, Delivery and Landing

Calculated sound levels for Wing Model 7000W-B manual loading, delivery, and landing at the launch point are shown in Table 3.

Table 3. Model 7000W-B: Estimate of SEL for Manual Launch, Delivery and Landing at Nest

Distance between Launch Point and Receiver	Manual Load and Takeoff, dBA SEL[1]	Delivery, dBA SEL[2]	Return to Nest and Landing, dBA SEL[3]
25	86.6	88.4	83.2
50	80.6	83.5	78.1
75	76.8	79.9	75.0
100	74.1	77.3	72.8
125	72.6	75.5	71.1
150	71.4	74.0	69.6
175	70.3	72.7	68.4
200	69.4	71.6	67.4
225	68.3	70.4	66.2
250	67.3	69.4	65.0
275	66.4	68.5	64.0
300	65.6	67.6	63.1
325	64.9	66.8	62.3
350	64.2	66.1	61.5
375	63.5	65.4	60.8
400	62.9	64.8	60.1
425	62.4	64.2	59.5
450	61.8	63.7	58.8
475	61.3	63.1	58.3
500	60.9	62.6	57.7
525	60.4	62.1	57.2
550	60.0	61.7	56.7
575	59.6	61.3	56.3
600	59.2	60.8	55.8
625	58.8	60.4	55.4
650	58.4	60.1	55.0
675	58.1	59.7	54.6
700	57.7	59.3	54.2

Distance between Launch Point and Receiver	Manual Load and Takeoff, dBA SEL[1]	Delivery, dBA SEL[2]	Return to Nest and Landing, dBA SEL[3]
725	57.4	59.0	53.8
750	57.1	58.7	53.5
775	56.8	58.3	53.1
800	56.5	58.0	52.8
825	56.5	58.0	52.8
850	56.5	58.0	52.8
875	56.5	58.0	52.8
900	56.5	58.0	52.8
925	56.5	58.0	52.8
950	56.5	58.0	52.8
975	56.5	58.0	52.8
1000	56.5	58.0	52.8

Source: AvEnviro 2024a, ICF 2024.

[1] Assumes one en route trip with package on board.

[2] Assumes one en route trip with package on board plus one en route trip without a package.

[3] Assumes one en route trip without a package.

dBA = A-weighted decibel; SEL = sound exposure level

4.1.2 Sound Levels for Wing Model 7000W-B Autoload Actions

Calculated sound levels for offsite autoload, and nearfield launch and autoload for Model 7000W-B are shown in Table 4.

Table 4. Model 7000W-B: Estimate of SEL for Offsite Autoload and Nearfield Launch and Autoload Actions

Distance between Launch Point and Receiver	Offsite Autoload, dBA SEL[1]	Nearfield Launch and Autoload, dBA SEL[1]
25	87.1	87.1
50	81.7	82.1
75	78.7	79.2
100	76.6	77.1
125	75.0	75.3
150	73.6	73.9
175	72.5	72.7
200	71.5	71.6
225	70.4	70.3
250	69.3	69.2
275	68.4	68.1
300	67.6	67.2
325	66.8	66.3
350	66.1	65.5

Distance between Launch Point and Receiver	Offsite Autoload, dBA SEL[1]	Nearfield Launch and Autoload, dBA SEL[1]
375	65.4	64.7
400	64.8	64.0
425	64.2	63.4
450	63.6	62.8
475	63.1	62.2
500	62.6	61.6
525	62.1	61.1
550	61.7	60.6
575	61.2	60.1
600	60.8	59.6
625	60.4	59.2
650	60.0	58.7
675	59.7	58.3
700	59.3	57.9
725	59.0	57.6
750	58.7	57.2
775	58.3	56.8
800	58.0	56.5
825	58.0	56.5
850	58.0	56.5
875	58.0	56.5
900	58.0	56.5
925	58.0	56.5
950	58.0	56.5
975	58.0	56.5
1000	58.0	56.5

Source: AvEnviro 2024a, ICF 2024.

[1] Assumes one incoming en route trip without a package plus one outgoing en route trip with package on board.

dBA = A-weighted decibel; SEL = sound exposure level

4.1.3 Sound Levels for Wing Model 7000W-B FitBit and GeoBit Actions

Calculated sound levels for Fitbit and Geobit operations for Model 7000W-B are shown in Table 5.

Table 5. Model 7000W-B: Estimate of SEL for FitBit and GeoBit Actions

Distance between Launch Point and Receiver	FitBit, dBA SEL	GeoBit, dBA SEL
25	87.3	85.3
50	80.3	81.0
75	76.5	78.0
100	73.8	75.9

Distance between Launch Point and Receiver	FitBit, dBA SEL	GeoBit, dBA SEL
125	72.2	74.0
150	70.9	72.4
175	69.8	71.1
200	68.8	69.9
225	68.0	68.9
250	67.2	68.0
275	66.5	67.1
300	65.9	66.4
325	65.3	65.7
350	64.8	65.1
375	64.3	64.5
400	63.8	63.9
425	63.4	63.4
450	63.0	62.9
475	62.6	62.4
500	62.2	62.0
525	61.8	61.5
550	61.5	61.1
575	61.2	60.8
600	60.9	60.4
625	60.6	60.0
650	60.3	59.7
675	60.0	59.4
700	59.8	59.1
725	59.5	58.8
750	59.3	58.5
775	59.0	58.2
800	58.8	57.9
825	58.6	57.6
850	58.4	57.4
875	58.2	57.1
900	58.0	56.9
925	57.8	56.6
950	57.6	56.4
975	57.4	56.2
1000	57.2	56.0

Source: AvEnviro 2024a, ICF 2024.
dBA = A-weighted decibel; SEL = sound exposure level

4.1.4 En Route Sound Levels for Wing Model 7000W-B

The SEL for an en route overflight with a package loaded on the Model 7000W-B was measured to be 59.2 dBA. The en route overflight SEL for a Model 7000W-B with no package was measured to be 55.5 dBA (AvEnviro 2024a). During testing, en route measurements were taken with UA in forward

flight at an altitude of 100 feet AGL, which is lower than the expected operating altitude of 165 feet AGL. To adjust the measured en route sound level to the operating altitude of 165 feet AGL, a data correction factor using the logarithm of the ratio of altitudes multiplied by 12.5 was added to the en route SEL, consistent with procedures described in 14 CFR Part 36. The corrected SEL values were calculated to be 56.5 dBA with a package and 52.8 dBA without a package. These corrected en route sound levels were used for distances 800 feet or greater from the nest or delivery site.

4.2 Sound Levels for Wing Model 8000-A

4.2.1 Manual Loading, Delivery and Landing

Calculated sound levels for Wing Model 8000-A manual loading, delivery and landing at the launch point are shown in Table 6.

Table 6. Model 8000-A: Estimate of SEL for Manual Launch, Delivery and Landing at Nest

Distance between Launch Point and Receiver	Manual Load and Takeoff, dBA SEL[1]	Delivery, dBA SEL[2]	Return to Nest and Landing, dBA SEL[3]
25	84.4	87.3	81.8
50	79.0	83.6	77.7
75	76.9	80.7	75.4
100	75.4	78.6	73.7
125	74.4	77.0	71.6
150	73.6	75.7	70.0
175	72.9	74.6	68.5
200	72.3	73.7	67.3
225	71.4	72.9	66.7
250	70.6	72.2	66.1
275	69.9	71.5	65.6
300	69.3	70.9	65.2
325	68.7	70.3	64.7
350	68.1	69.8	64.3
375	67.6	69.3	64.0
400	67.1	68.9	63.6
425	66.7	68.5	63.3
450	66.3	68.1	63.0
475	65.9	67.7	62.7
500	65.5	67.4	62.5
525	65.1	67.0	62.2
550	64.8	66.7	62.0
575	64.4	66.4	61.7
600	64.1	66.1	61.5
625	63.8	65.8	61.3
650	63.5	65.5	61.1

Distance between Launch Point and Receiver	Manual Load and Takeoff, dBA SEL[1]	Delivery, dBA SEL[2]	Return to Nest and Landing, dBA SEL[3]
675	63.2	65.3	60.9
700	63.0	65.0	60.7
725	62.7	64.8	60.5
750	62.5	64.6	60.3
775	62.2	64.3	60.1
800	62.0	64.1	60.0
825	62.0	64.1	60.0
850	62.0	64.1	60.0
875	62.0	64.1	60.0
900	62.0	64.1	60.0
925	62.0	64.1	60.0
950	62.0	64.1	60.0
975	62.0	64.1	60.0
1000	62.0	64.1	60.0

Source: AvEnviro 2024b, ICF 2024.

[1] Assumes one en route trip with package on board.

[2] Assumes one en route trip with package on board plus one en route trip without a package.

[3] Assumes one en route trip without a package.

dBA = A-weighted decibel; SEL = sound exposure level

4.2.2 Sound Levels for Wing Model 8000-A Autoload Actions

Calculated sound levels for offsite autoload, and nearfield launch and autoload for Model 8000-A are shown in Table 7.

Table 7. Model 8000-A: Estimate of SEL for Offsite Autoload and Nearfield Launch and Autoload Actions

Distance between Launch Point and Receiver	Offsite Autoload, dBA SEL[1]	Nearfield Launch and Autoload, dBA SEL[1]
25	85.2	85.4
50	80.9	81.6
75	78.6	79.1
100	77.0	77.4
125	75.9	76.0
150	75.0	74.9
175	74.2	73.9
200	73.5	73.1
225	72.7	72.2
250	72.0	71.3
275	71.3	70.5
300	70.8	69.8
325	70.2	69.2

Distance between Launch Point and Receiver	Offsite Autoload, dBA SEL[1]	Nearfield Launch and Autoload, dBA SEL[1]
350	69.7	68.6
375	69.2	68.1
400	68.8	67.5
425	68.4	67.1
450	68.0	66.6
475	67.6	66.2
500	67.3	65.8
525	67.0	65.4
550	66.6	65.0
575	66.3	64.6
600	66.1	64.3
625	65.8	64.0
650	65.5	63.6
675	65.3	63.3
700	65.0	63.1
725	64.8	62.8
750	64.5	62.5
775	64.3	62.2
800	64.1	62.0
825	64.1	62.0
850	64.1	62.0
875	64.1	62.0
900	64.1	62.0
925	64.1	62.0
950	64.1	62.0
975	64.1	62.0
1000	64.1	62.0

Source: AvEnviro 2024b, ICF 2024.

[1] Assumes one incoming en route trip without a package plus one outgoing en route trip with package on board.

dBA = A-weighted decibel; SEL = sound exposure level

4.2.3 Sound Levels for Wing Model 8000-A FitBit and GeoBit Actions

Calculated sound levels for Fitbit and Geobit operations for Model 8000-A are shown in Table 8.

Table 8. Model 8000-A: Estimate of SEL for FitBit and GeoBit Actions

Distance between Launch Point and Receiver	FitBit, dBA SEL	GeoBit, dBA SEL
25	84.1	84.4
50	77.1	79.4
75	73.6	75.3
100	71.1 [1]	72.5 [1]
125	69.1	70.2
150	67.5	68.4
175	66.2	66.8
200	65.0	65.5
225	64.0	64.3
250	63.1	63.3
275	62.2	62.3
300	61.5	61.4
325	60.8	60.6
350	60.1	59.9
375	59.5	59.2
400	59.0	58.6
425	58.4	57.9
450	57.9	57.4
475	57.5	56.8
500	57.0	56.3
525	56.6	55.8
550	56.2	55.4
575	55.8	54.9
600	55.4	54.5
625	55.1	54.1
650	54.7	53.7
675	54.4	53.3
700	54.1	52.9
725	53.8	52.6
750	53.5	52.2
775	53.2	51.9
800	52.9	51.6
825	52.6	51.3
850	52.4	51.0
875	52.1	50.7
900	51.9	50.4

Distance between Launch Point and Receiver	FitBit, dBA SEL	GeoBit, dBA SEL
925	51.6	50.1
950	51.4	49.9
975	51.2	49.6
1000	51.0	49.4

Source: AvEnviro 2024b, ICF 2024.

[1] The SEL value for FitBit and GeoBit operations at 100 feet was adjusted from the test report to use a falloff rate from the 50 foot to the 200 foot value due to no valid passes during testing.

dBA = A-weighted decibel; SEL = sound exposure level

4.2.4 En Route Sound Levels for Wing Model 8000-A

The SEL for an en route overflight with a package loaded on the Model 8000-A was measured to be 64.7 dBA. The en route overflight SEL for a Model 8000-A with no package was measured to be 62.7 dBA (AvEnviro 2024b). During testing, en route measurements were taken with UA in forward flight at an altitude of 100 feet AGL, which is lower than the expected operating altitude of 165 feet AGL. To adjust the measured en route sound level to the operating altitude of 165 feet AGL, a data correction factor using the logarithm of the ratio of altitudes multiplied by 12.5 was added to the en route SEL, consistent with procedures described in 14 CFR Part 36. The corrected SEL values were calculated to be 62.0 dBA with a package and 60.0 dBA without a package. These corrected en route sound levels were used for distances 800 feet or greater from the nest or delivery site.

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Chapter 5
Noise Exposure from UA Operations

This chapter presents estimated DNL values for package delivery operations assuming different rates of delivery for a nest. This analysis assumes all package deliveries would occur during daytime hours only (i.e., 7:00 a.m. to 10:00 p.m.), so no nighttime penalties are applied to package deliveries. Fitbit operations would be done before package delivery operations each day, and are assumed to be done before 7:00 a.m. As such nighttime penalties would apply to Fitbit operations. Geobit operations would be conducted on an intermittent basis at the rate of about one event per week. To simulate a loudest case, Geobit operations are included in the DNL analysis.

5.1 Noise Exposure from a Nest

A single delivery operation consists of launch, package load, departure, return and landing phases, and the full cycle of these actions are accounted for in noise exposure at a nest. In addition to package deliveries, the noise exposure values include up to 24 nighttime Fitbit operations and one Geobit operation. Therefore, the DNL value at a nest accounts for the following:

- Package loading operations: manual, offsite package autoload, or nearfield autoload (up to 400 events)
- Landings at nest post-delivery (up to 400 events)
- FitBit (240 DNL equivalent events)
- GeoBit (1 DNL equivalent event)

Estimated DNL noise exposure distances at a nest operating Model 7000W-B UAs are shown in Table 9 for Manual loading and Table 10 for Nearfield Autoloading. Noise exposure DNL values are shown at different scales: from 1 delivery per day to 400 deliveries per day. The noise exposure values assume a departure and return flight path restricted to a single trajectory over a receiver array with distances of 25 to 1,000 feet from the nest. According to the calculations, package loading operations would exceed 65 DNL at 35 feet from a nest location, at a rate of 400 package loading operations per day for both loading scenarios.

Table 9. DNL Noise Exposure Distances at Nest for Model 7000W-B for Different Scales of Operation, Manual Launch Option

Average Daily Deliveries per Nest[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	35	50	85	160
5	<25	35	50	90	165
10	<25	35	55	90	165
15	<25	35	55	90	170
20	<25	35	55	90	175
25	<25	35	55	95	175
50	<25	40	60	100	195

Average Daily Deliveries per Nest[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
75	<25	40	65	105	210
100	<25	40	65	115	220
150	<25	45	70	125	245
200	<25	45	75	140	265
300	30	50	85	165	295
400	35	55	95	185	325

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m. except for Fitbit, which would be done before 7:00 a.m. DNL = day/night average sound level

Table 10. DNL Noise Exposure Distances at Nest for Model 7000W-B for Different Scales of Operation, Nearfield Launch Option

Average Daily Deliveries per Nest[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	35	50	85	160
5	<25	35	50	90	165
10	<25	35	55	90	170
15	<25	35	55	95	175
20	<25	35	55	95	180
25	<25	35	55	95	185
50	<25	40	60	105	205
75	<25	40	65	120	220
100	<25	40	70	125	235
150	<25	45	80	145	260
200	<25	50	85	160	285
300	30	55	100	190	320
400	35	65	115	215	350

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m. except for Fitbit, which would be done before 7:00 a.m. DNL = day/night average sound level

Estimated DNL noise exposure distances at a nest operating Model 8000-A UAs are shown in Table 11 for Manual loading and Table 12 for Nearfield Autoloading. Noise exposure DNL values are shown at different scales: from 1 delivery per day to 400 deliveries per day. The noise exposure values assume a departure and return flight path restricted to a single trajectory over a receiver array with distances of 25 to 1,000 feet from the nest. According to the calculations, package loading operations would exceed 65 DNL at less than 25 feet from a nest location, at a rate of 400 package loading operations per day for both loading scenarios.

Table 11. DNL Noise Exposure Distances at Nest for Model 8000-A for Different Scales of Operation, Manual Launch Option

Average Daily Deliveries per Nest[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	<25	40	65	110
5	<25	<25	40	65	115
10	<25	<25	40	65	120
15	<25	<25	40	70	125
20	<25	<25	45	70	130
25	<25	<25	45	75	135
50	<25	<25	45	85	160
75	<25	30	50	95	190
100	<25	30	50	105	215
150	<25	35	60	125	255
200	<25	40	70	145	300
300	<25	45	85	180	375
400	<25	45	100	215	440

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m. except for Fitbit, which would be done before 7:00 a.m.
DNL = day/night average sound level

Table 12. DNL Noise Exposure Distances at Nest for Model 8000-A for Different Scales of Operation, Nearfield Launch Option

Average Daily Deliveries per Nest[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	<25	40	65	110
5	<25	<25	40	65	115
10	<25	<25	40	70	120
15	<25	<25	45	70	130
20	<25	<25	45	75	135
25	<25	<25	45	75	140
50	<25	<25	50	90	170
75	<25	30	55	105	200
100	<25	35	60	115	225
150	<25	35	70	140	270
200	<25	40	80	160	315
300	<25	50	100	200	390
400	<25	55	120	235	455

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m. except for Fitbit, which would be done before 7:00 a.m.
DNL = day/night average sound level

5.2 Noise Exposure from Offsite Package Autoloading

Estimated DNL noise exposure distances at an offsite package autoloader location for the Model 7000W-B are shown in Table 13. The DNL exposures assume an arrival and departure flight path restricted to a single trajectory over a receiver array with distances of 25 to 1,000 feet. A single delivery operation consists of arrival, package autoload, and departure phases. According to calculations, package delivery operations would exceed 65 DNL at less than 25 feet from an offsite autoloading location at a rate of 400 deliveries per day to a single delivery site.

Table 13. DNL Noise Exposure Distances at an Offsite Package Autoloading Location for Model 7000W-B, for Different Scales of Operation

Average Daily Deliveries per Nest[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	<25	<25	<25	<25
5	<25	<25	<25	<25	<25
10	<25	<25	<25	<25	40
15	<25	<25	<25	<25	50
20	<25	<25	<25	30	55
25	<25	<25	<25	35	65
50	<25	<25	<25	50	95
75	<25	<25	35	60	115
100	<25	<25	40	70	140
150	<25	<25	50	90	175
200	<25	30	55	105	205
300	<25	40	70	135	245
400	<25	45	80	160	280

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m.
DNL = day/night average sound level

Estimated DNL noise exposure distances at an offsite package autoloader location for the Model 8000-A are shown in Table 14. The DNL exposures assume an arrival and departure flight path restricted to a single trajectory over a receiver array with distances of 25 to 1,000 feet. A single delivery operation consists of arrival, package autoload, and departure phases. According to calculations, package delivery operations would exceed 65 DNL at less than 25 feet from an offsite autoloading location at a rate of 400 deliveries per day to a single delivery site.

Table 14. DNL Noise Exposure Distances at Nest for Model 8000-A for Different Scales of Operation, Remote Launch Option

Average Daily Deliveries per Nest[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	<25	<25	<25	<25
5	<25	<25	<25	<25	<25
10	<25	<25	<25	<25	30
15	<25	<25	<25	<25	40
20	<25	<25	<25	<25	50
25	<25	<25	<25	<25	60
50	<25	<25	<25	45	95
75	<25	<25	<25	55	135
100	<25	<25	30	70	170
150	<25	<25	40	95	230
200	<25	<25	50	115	275
300	<25	30	65	165	355
400	<25	40	80	205	430

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m.
DNL = day/night average sound level

5.3 En Route Noise Exposure

Noise exposure from UA en route trajectories would be loudest directly under the flight path. In practice, UAs would serve many delivery points from a given nest, however in areas where there is a high demand for deliveries, en route UA noise may be intermittently audible depending on the level of existing ambient noise. Based on calculations however, even if the louder of the two Hummingbird UA models (Model 8000-A) under en route conditions used the same en route trajectory for delivery service to surrounding areas, the noise exposure level accounting for both the delivery and return paths would be no higher than 40.7 DNL at a rate of up to 400 deliveries per day. Considering that en route UA noise would not exceed 45 DNL under any delivery scenarios, this was not quantified further.

5.4 Noise Exposure from a Delivery Site

Estimated DNL noise exposure distances at a delivery point for the Model 7000W-B are shown in Table 15. The DNL exposures assume an arrival and departure flight path restricted to a single trajectory over a receiver array with distances of 25 to 1,000 feet. A single delivery operation consists of arrival, package delivery, and departure phases. According to calculations, package delivery operations would exceed 65 DNL at 30 feet from a nest location at a rate of 400 deliveries per day to a single delivery site.

Table 15. DNL Noise Exposure Distances at a Delivery Point for Model 7000W-B for Different Scales of Operation

Average Daily Deliveries at Delivery Point[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	<25	<25	<25	<25
5	<25	<25	<25	<25	35
10	<25	<25	<25	<25	50
15	<25	<25	<25	30	60
20	<25	<25	<25	40	65
25	<25	<25	<25	45	75
50	<25	<25	35	60	100
75	<25	<25	40	70	125
100	<25	<25	50	80	145
150	<25	30	60	100	180
200	<25	40	65	115	205
300	<25	45	80	140	245
400	30	55	90	165	280

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m.
DNL = day/night average sound level

Estimated DNL noise exposure distances at a delivery point for the Model 8000-A are shown in Table 16. The DNL exposures assume an arrival and departure flight path restricted to a single trajectory over a receiver array with distances of 25 to 1,000 feet. A single delivery operation consists of arrival, package delivery, and departure phases. According to calculations, package delivery operations would exceed 65 DNL at less than 25 feet from a nest location at a rate of 400 deliveries per day to a single delivery site.

Table 16. DNL Noise Exposure Distances at a Delivery Point for Model 8000-A for Different Scales of Operation

Average Daily Deliveries at Delivery Point[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
1	<25	<25	<25	<25	<25
5	<25	<25	<25	<25	<25
10	<25	<25	<25	<25	45
15	<25	<25	<25	<25	60
20	<25	<25	<25	35	70
25	<25	<25	<25	40	80
50	<25	<25	<25	65	120
75	<25	<25	40	80	155
100	<25	<25	45	95	185
150	<25	<25	60	120	235

Average Daily Deliveries at Delivery Point[1]	65 DNL Distance, feet	60 DNL Distance, feet	55 DNL Distance, feet	50 DNL Distance, feet	45 DNL Distance, feet
200	<25	35	70	140	280
300	<25	45	90	180	365
400	<25	55	105	210	435

Note: [1] Average daily deliveries are shown in terms of DNL equivalent. The CONOPS assumes all UA operations would be done between the hours of 7:00 a.m. and 10:00 p.m.
DNL = day/night average sound level

5.5 Cumulative Noise Exposure

Criteria for significance of impacts and changes in noise exposure are defined in FAA Order 1050.1F *Environmental Impacts: Policies and Procedures* (FAA 2015). Order 1050.1F Exhibit 4-1 states the following with respect to threshold of significance for a proposed action:

> The action would increase noise by DNL 1.5 dB or more for a noise sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the no action alternative for the same timeframe. For example, an increase from DNL 65.5 dB to 67 dB is considered a significant impact, as is an increase from DNL 63.5 dB to 65 dB.

A cumulative increase in noise from a proposed action can be calculated using the difference between the additional noise exposure introduced by a proposed action and the no action alternative. The cumulative DNL increase associated with different values of the proposed action is shown in Table 17.

Table 17. Cumulative Increase in DNL due to a Proposed Action

Proposed Action minus No Action (x)	Cumulative Increase in DNL (Δ)
$x < -3.8$ dB	$\Delta < 1.5$ dB
-3.8 dB $< x < 0.0$ dB	1.5 dB $< \Delta <$ 3 dB
0.0 dB $< x <$ 3.3 dB	3 dB $< \Delta <$ 5 dB
3.3 dB $< x$	5 dB $< \Delta$

For air traffic airspace and procedure actions where the study area is larger than the immediate vicinity of an airport, Order 1050.1F specifies the following change-of-exposure criteria to identify locations where noise exposure levels will increase by a magnitude considered reportable. An action that would increase noise exposure by 3 dB where no action is between 60 and 65 DNL, or by 5 dB where no action is between 45 and 60 DNL would be considered reportable.

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Chapter 6
References

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Appendix L

Public Comments and FAA Responses

Appendix K
Public Comments

PUBLIC COMMENTS AND FAA RESPONSES

Comment #1

From: Jacques Coulon <Jacques.Coulon@cityoforlando.net>
Sent: Monday, January 20, 2025 4:22 PM
To: 9-FAA-Drone-Environmental (FAA) <9-FAA-Drone-Environmental@faa.gov>
Cc: Tanya J Wilder <tanya.wilder@cityoforlando.net>; Christina Martin <christina.martin@cityoforlando.net>
Subject: Response to Draft EA for Wing Aviation - Central Florida

The introduction of Unmanned Aerial Systems (UAS) to the Central Florida Region is something that the City of Orlando has been preparing and planning for and the city appreciates the opportunity to review the draft Environmental Assessment (EA) for Wing Aviation, LLC Proposed Drone Package Delivery Operations in Central Florida. The city of Orlando has the following comments:

1. Emergency Operations: Additional information about how the UAS would operate in an on-board emergency should be provided. Are there alternative landing locations, automatic landing procedures, how is an onboard fire handled etc. and how local emergency responders would be notified if appropriate.
    a. Prior to the introduction of service training to local first responders should be provided to ensure proper response to any potential incidents involving a UAS.
2. Public Point of Contact: A community-facing point of contact from the UAS operator or store they are operating on behalf of should be identified so to whom the city can forward operational inquiries to.
3. City to Company Communications:
    a. Public Advisories: It would be beneficial for the City of Orlando to be able to provide public advisories to all UAS providers for large-scale events that are not eligible for Temporary Flight Restrictions (TFR)
    b. Emergency Situational Awareness: A set communication structure for the city to be able to provide real-time information regarding on-ground emergency management activities that could affect UAS operations should be included in the ConOps. These may be advisories for things such as active shooter situations, structure fires, large-scale car crash situations to assist in assuring that UAS operations do not interfere with life-safety operations.
4. UAS Data Access: The city and our first responders would benefit from access to real time and historical UAS information including location, altitude, type of UAS and any potentially hazardous materials. This will support the efforts of the city to

ensure that there are no nuisances, voyeurism, harassment, reckless endangerment, property damage, or other illegal acts arising from the use of the UAS, as permitted. The expectation is that this dashboard would be of similar or better fidelity to that of DJI Aeroscope

5. We are looking to ensure that all UASs that will be in operation will be fully compliant with all FAA Remote ID requirements.
6. Package Drop-Off Locations: While the initial pickup locations are not located within the City of Orlando limits the delivery zones extend to include properties located within the city. Regarding deliveries there is a need to understand:
    a. ROW: Packages will not be delivered outside of private property/within the city right-of-way. Ensuring the safety within the city ROW and maintaining access for all transportation needs is important to the city. UAS deliveries should not occur within the public ROW.
    b. City Owned Property: Unless specifically approved by the city no UAS deliveries should occur to any city-owned properties including city parks, buildings, community centers, etc. There must be a means to ensure compliance with this.

We look forward to the expansion of safe, responsible, community responsive mobility options, including UAS to better serve the residents and businesses of Orlando.

Jacques Coulon, AICP

Mobility Innovation Manager

407-246-2293

City of Orlando

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CITY OF ORLANDO

FAA RESPONSE

Thank you for your comments.

Emergency Operations

As outlined in the Appendix I, *Community Engagement Plan,* for an earlier initiative, Wing intends to meet with local law enforcement and first responders, including local police and fire departments, regarding emergency preparedness and procedures prior to and during operation of drone package delivery services. Further coordination with identified stakeholders will occur prior to nest installation.

Point of Contact

As outlined in the Appendix I *Community Engagement Plan*, in advance of the date scheduled for operations to start, Wing will facilitate further meetings with the relevant state and local government officials, including local government officials within the operating area (including Mayors and City Managers, members of City Councils, County Boards of Supervisors and key staff, local economic development officials). Further coordination with identified stakeholders will occur prior to nest installation.

City to Company Communications

Wing will collaborate and comply with the FAA on all operations, emergencies and airspace restrictions such as Temporary Flight Restrictions (TFRs) that have priority and are communicated to pilots through Notices to Airmen (NOTAMs). TFRs restrict all aircraft, unless permitted, in a specific area for a limited time. Pilots must check NOTAMs prior to flight. Wing's route planning software prepares optimized flight paths between the nest and delivery site. For events not eligible for TFRs, Wing is open to placing additional temporary restrictions and limitations for use when determining flight paths. When informed, Wing will route around in order to avoid potential disturbance of emergency situations. Wing encourages use of commercially available Unmanned Aircraft System Traffic Management (UTM) services so that emergency services can identify these areas and Wing's participating system can automatically accept and plan routes away from these activities.

UAS Data Access

49 U.S.C 44807(b) instructs the Secretary to base their determination on which types of UAS do not create a hazard to users of the National Airspace System (NAS) or the public. The Secretary delegated this authority to the Administrator on October 1, 2021 (49 CFR 1.83). In accordance with the statutory criteria provided in 49 U.S.C. § 44807, and in consideration of the size, weight, speed, and operational capability, proximity to airports and populated areas, and specific operations, the FAA determined that Wing's drones and operations do not create a hazard to users of the NAS or the public. As with all operations authorized to be conducted under a § 44807 exemption, the FAA set appropriate conditions and limitations to minimize risk and maintain an equivalent level of safety to that provided and intended by the rules that

would otherwise apply to the operation.

The FAA Hotline accepts reports related to the safety of the NAS, violations of Federal Aviation Regulations, aviation safety issues, and reports related to FAA employees or FAA facilities. The FAA Hotline provides a single venue for FAA employees, the aviation community, and the public to file their reports.

FAA Remote ID requirements

As part of its OpSpecs, Wing is responsible for complying with applicable federal, state, and local regulations, including FAA Remote ID requirements. Wing's aircraft are equipped with and broadcast FAA Remote ID information and are available through readily available consumer equipment.

Package Drop Off Locations

Wing deliveries are typically conducted at residential or business addresses. Wing is responsible for complying with applicable state and local laws relevant to establishing and conducting its operations – these include any ordinances regarding use of public spaces. Wing would coordinate with local agencies to establish commercial delivery zones in public areas.

Comment #2

From: Whatley, Cortez J <Cortez.Whatley@orlandohealth.com>
Sent: Monday, January 20, 2025 4:46 PM
To: 9-FAA-Drone-Environmental (FAA) <9-FAA-Drone-Environmental@faa.gov>
Subject: Orlando Health Comments Re: Notice of Availability (NOA) for the Draft Environmental Assessment (EA) for Wing Aviation LLC. Part 135 Package Delivery Operations in Central Florida Area

To whom it may concern,

Please review the following comment submitted on behalf of Orlando Health regarding the proposal by Wing Aviation LLC (Wing) to conduct a package delivery operation in Central Florida.

(1) an introduction where you explain why you are interested in the regulation, highlight any credentials or experience that may distinguish your comment from others, and whether you are commenting on your own behalf, on the behalf of another organization, or are endorsing or joining with another comment or commenter;

Orlando Health Orlando Regional Medical Center (ORMC) has been a trusted healthcare provider in Central Florida, offering the most advanced options available for surgical, medical, rehabilitative, and emergency care. Located in downtown Orlando, the 808-bed hospital is one of the largest tertiary facilities in the region and sees more than 85,000 patients per year including 3,400 major trauma cases. ORMC's life-saving surgical and medical care is available, 24 hours a day, seven days a week.

Our Air Care Team, the helicopter ambulance service, supported by the airborne emergency transport unit, responds to the scene and transports calls and serves all Orlando Health hospitals, the team also provides assistance and support to other hospitals located throughout Florida based on medical necessity. As the only Level 1 Trauma Center in Central Florida, various flight programs rely on ORMC in coordinating care of critically injured patients from across the state of Florida.

This continuum of care includes injury prevention, EMS and medical oversight of pre-hospital care, appropriate triage and transport, resuscitation and emergency care, surgical intervention, intensive and general acute care, rehabilitative services, behavioral health, social services, community re-integration plans and medical care follow-up.

We submit the following comment on our own behalf.

(2) a background where you clearly identify the issues within the regulatory action on which you are commenting, and list your recommendations upfront. If you are commenting on a particular word or phrase, or if you are responding to specific questions or requests for data, state this clearly and provide the relevant page number, column, and paragraph citation from the federal register document;

It is our understanding that Wing is seeking to amend its OpSpecs and other FAA approvals necessary to conduct unmanned aircraft (UA; also referred to as a drone) commercial package delivery operations in the Central Florida metropolitan (metro) and surrounding areas.

Orlando Health recognizes the potential positive impacts unmanned aircrafts may have within the Central Florida Region so long as they operate in a manner which does not cause risk of harm to residents, medical facilities, patients, employees, or other members of the Central Florida Community. For this reason, we submit the following comments:

- In order to reduce risk of harm to patients, facilities, aircraft, and the like, Orlando Health maintains that there should be restricted flight paths over, above, and adjacent to medical facilities, and buildings with helipads, particularly around the downtown Orlando area. Additionally, the FAA should restrict the number of unmanned aircraft that are permitted to fly around these areas.

- Orlando Health should receive notices of expected flight patterns when Wing is operational to better anticipate risk of harm to our Air Care team and any potential disruption of our emergency transportation operations.

- Orlando Health recommends that Wing deconflict software should, at minimum, include the following:

    - Manual shutdown of unmanned aircraft, when necessary
    - Flight avoidance of other aircraft
    - Automatic or manual process of unmanned aircraft aborting or stalling its delivery if there is the potential of collision with aircrafts or other objects

Cortez Whatley, J.D.
Manager, Local Government Affairs & Public Policy
External Affairs

ORLANDO HEALTH

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FAA RESPONSE

Thank you for your comments.

1. **Restrict ops over medical facilities and restrict number of unmanned aircraft permitted to fly around these areas.**
    a. Under the proposed action, Wing would establish up to 150 nests within the operating area (Central Florida metros and surrounding areas). Operating hours would occur from 6:00 a.m. to 10:00 p.m. with flights only leaving the nest area between 7:00 a.m. and 10:00 p.m. while maintaining an operational limit of 400 deliveries per nest per operating day. The exact timing and pace of nest installation is dependent on market conditions. Deliveries would mostly take place at residences. A 6-foot-radius clear space is required for delivery, such as a driveway, parking lot, field, common area, patio, or clear spaces surrounding multi-family dwellings, as determined during the delivery request process. Wing's flight planning software can automatically avoid overflights of identified medical facilities, schools (elementary, middle, and high school), preschools, or daycares with outdoor facilities based on the type of resource, time of day, and other factors. Wing has confirmed to the FAA that it will generally not conduct operations over these "fly less" areas during the scope of operations covered by this proposed action, including remote pickups, unless there is a specific purpose for Wing to enter one of these areas in coordination with the respective resource authority.
    b. 49 U.S.C 44807(b) instructs the Secretary to base their determination on which types of UAS do not create a hazard to users of the National Airspace System (NAS) or the public. The Secretary delegated this authority to the Administrator on October 1, 2021 (49 CFR 1.83). In accordance with the statutory criteria provided in 49 U.S.C. § 44807, and in consideration of the size, weight, speed, and operational capability, proximity to airports and populated areas, and specific operations, the FAA determined that Wing's drones and operations do not create a hazard to users of the NAS or the public. As with all operations authorized to be conducted under a § 44807 exemption, the FAA set appropriate conditions and limitations to minimize risk and maintain an equivalent level of safety to that provided and intended by the rules that would otherwise apply to the operation.
    c. Before beginning operations in a given area, Wing performs a review of the local airspace, identifies local aviation community members for outreach and places a set of initial restrictions. These initial restrictions include safe areas around all published heliports/helipads including those at medical facilities. Wing also monitors traffic patterns to confirm typical flight operational profiles of operators. Flights in closer proximity to these sites include direct outreach with the local operators to confirm assumptions of operations or develop necessary adjustments. In addition, Wing has a history of direct interface with several medical facilities including their on-site aviation departments and provides delivery services directly to medical facilities. These interfaces and services have been successful and without incident.

2. **Receive notices of expected flight paths.**
    a. The FAA Hotline accepts reports related to the safety of the National Airspace System, violations of Federal Aviation Regulations, aviation safety issues, and reports related to FAA employees or FAA facilities. The FAA Hotline provides a single venue for FAA employees, the aviation community, and the public to file their reports.
    b. Wing's flight paths are well controlled to avoid areas rather than follow particular routes. Wing works with local aviation community members to establish areas that are no-fly zones to reduce or avoid potential flight path conflicts,. As stated above, this coordination includes medical facilities with heliports and helipads.
3. **Software should include manual shut down, flight avoidance, and auto or manual abort or cancelation of ops in case of potential collisions.**
    a. Wing's flight planning software can automatically avoid identified medical facilities, schools (elementary, middle, and high school), preschools, or daycares with outdoor facilities based on the type of resource, time of day, and other factors. Wing has confirmed to the FAA that it will generally not conduct operations over these "fly less" areas during the scope of operations covered by this proposed action, including remote pickups, unless there is a specific purpose for Wing to enter one of these areas in coordination with the respective resource authority. In the event that the clear space contains obstructions such as trees or cars, the UA would abort the delivery and return to the nest. In addition, Wing's flight planning software is designed to increase variability in flight paths to minimize overflights of any given location; with the diversification of flight paths, the frequency of overflights would inversely scale as the distance from a nest increases.
    b. Each of Wing's UA is equipped with an automated onboard Detect and Avoid (DAA) system that includes an onboard ADS-B receiver (1090and 978Mhz). This system constantly monitors air traffic and takes automated avoidance action independent of human monitoring. In addition, a remote pilot oversees automated operations and is able to take additional action if needed.

Comment #3

Orange County Government (Florida) Comments to the Federal Aviation Administration on Draft Environmental Assessment for Wing Aviation, LLC Proposed Drone Package Delivery Operations in Central Florida

Chapter	Comments
Chapter 1 – Purpose and Need	
Section 1.4	Suggest noting if regional agencies were included in outreach. Florida has 27 Metropolitan Planning Organizations (MPO), several within the proposed operating area. Seven Orange County elected officials serve on the MetroPlan Orlando Board, which has a vital role in transportation coordination and funding.
Chapter 2 – Proposed Action and Alternatives	
Section 2.2	Suggest documentation of protected areas also note applicable buffers of military installations. Florida law requires local government coordination of potentially incompatible proposed development with certain listed military installations (s. 163.3175, FS). One of these facilities is Naval Support Activity Orlando, including Bugg Spring and Naval Ordnance Test Unit, in Orange County and Orlando. As Orange County and other local governments are pre-empted from most drone-related land development regulation by the provisions of Florida's Unmanned Aircraft Systems Act (UAS Act – s. 330.41, FS), coordination of permitting activity to determine appropriate buffers will not take place. The UAS Act limits drone operations at military installations, including flyover, contact, and interference with operations. However, a commitment by the applicant to more proactive coordination as part of site selection would help avoid compromising military operations and missions in a manner that affects the economic vitality of Central Florida, as noted in s. 163.3175, FS.
Section 2.2	Suggest revision for consistency with critical infrastructure facility and public/private school protections in Florida's Unmanned Aircraft Systems Act (s. 330.41, FS). State law also provides that drone operations may not interfere with statutorily-defined facilities (e.g. Orange County detention facilities, water and wastewater treatment facilities) or be operated over or within public or private school facilities. (s. 330.41(4)-(5), FS).
Section 2.2	Noise and frequent overflights may create a nuisance for local communities.
Section 2.2	A noise compliance and compatibility study would be helpful to determine whether the proposed delivery service will be compatible with surrounding areas and will comply with the County's noise ordinance (Ch. 15, Art. V,

	Orange County Code). While the ordinance exempts aircraft, the County's Environmental Protection Officer may still assess whether a variance is warranted for specific operational aspects of the proposed project.
Chapter 3 – Affected Environment and Environmental Consequences	
Section 3.2	The size of the generator fuel tanks may require registration with Orange County, consistent with Chapter 62-761, Florida Administrative Code, which outlines regulations for Aboveground Storage Tanks (ASTs) and Underground Storage Tanks (USTs). Orange County is contracted by the State of Florida for inspection and verification of AST and UST compliance, including all new installations, discharges, and closure of the ASTs and USTs.
Section 3.3.3	It is possible Wing Aviation may be required to submit a wildlife impact mitigation plan specific to Orange County's protected species and critical habitats, consistent with Ch. 15, Art. X, Orange County Code.
Section 3.3.3	For migratory birds, it is important to strengthen operational safeguards by avoiding flights during peak migratory seasons and over areas with nesting activity.
Section 3.4.2	Reference to "an inventory list of local parks" in Appendix B, which does not include one. Orange County Government has over 100 public parks.
Table 3.6-2	Recommend planning conservatively and using largest setback for residential and noise-sensitive areas.
Section 3.6.3.2	For overall noise exposure results, recommend 65 feet to be more conservative and noting examples of noise-sensitive uses. For nest placement within controlled surface areas, minimum setback of 120 feet from noise sensitive areas may not sufficiently mitigate noise impacts.
Section 3.6.8.3	Suggest revision based on reference to different metro area.
Chapter 4 – Cumulative Effects	
	No comments.

FAA RESPONSE

Thank you for your comments.

1. As detailed in the Appendix I, *Community Engagement Plan*, Wing may set up meetings with the relevant state and local government officials, including local government officials (including Mayor and City Manager, members of City Council, County Board of Supervisors and key staff, local economic development officials) in advance of the state scheduled for operations to begin. Further coordination with identified stakeholders will occur prior to the environmental review of individual nest locations.

2. Wing is required to comply with relevant federal, state, and local regulations, including Florida's Unmanned Aircraft Systems Act. Drones are prohibited from flying over designated national security sensitive facilities, including military bases classified as Flight Restriction Zones (FRZs), which prohibits drone operations from the ground up to 400 feet above ground level. Further coordination regarding these restrictions will occur prior to the environmental review of individual nest locations.

3. Wing is required to comply with relevant federal, state, and local regulations, including Florida's Unmanned Aircraft Systems Act. As discussed in Section 2.2, identifies schools that are classified as "fly less" areas, which can be automatically avoided by Wing's flight planning software. Wing confirmed to the FAA that it will generally not conduct operations over these "fly less" areas during the times of their use unless there is a specific purpose for Wing to enter one of these areas in coordination with the respective authority.

4. Associations between aviation noise and disruption to normal activity are key components in the establishment of FAA's residential noise impact thresholds defined in FAA Order 1050.1F. Use of DNL 65 dB as the threshold for significant noise exposure is designed to account for sleep disturbance, speech interference, and annoyance, among other factors. As detailed in Section 3.6 and Appendix D of the EA, the FAA has determined that the noise exposure levels resulting from the Proposed Action would not exceed the threshold of significance. The USFWS provided concurrence on Month, Day 2025 with the FAA determination that the proposed action may affect special status species but would not be likely to cause adverse effects.

   Section 3.6, *Noise and Noise Compatible Land Use*, states the UA's noise emissions could be perceptible in areas within the study area but would stay well below the level determined to constitute a significant impact (DNL 65 dB). As part of the environmental review of individual nest locations, the FAA will review the applicant's proposal to ensure the proposal would not result in land use compatibility issues with respect to noise. If the FAA identifies concerns, the FAA will work with the applicant to avoid the issue. The FAA encourages commenters to reach out to Wing regarding concerns related to potential noise disturbances. See Appendix D, *Noise*, for a detailed Technical Noise Study Report for the proposed operations.

   As described in Section 2.2, delivery noise is expected to be limited by individual customer demand, as any particular residential customer location is expected to receive, at most, only a

very small portion of any hub's daily capacity. Exceptions to this may occur in cases where a drone operator is delivering packages exclusively to a small number of locations on a recurring basis, such as with lab samples and medical supplies on a medical campus. However, those cases would generally not occur over noise-sensitive areas where noise levels below DNL 65 dB are considered compatible with aviation noise.

5. Wing is responsible for complying with applicable state and local laws relevant to establishing and conducting its operations, such as local noise ordinances and fuel storage tank requirements.

6. Wing is responsible for complying with applicable state and local laws relevant to establishing and conducting its operations. Further coordination with local wildlife services will occur prior to the environmental review of individual nest locations.

7. Further coordination with local wildlife services will occur prior to the environmental review of individual nest locations.

8. The Migratory Bird Treaty Act (16 U.S.C. §§ 703-712) protects migratory birds, including their nests, eggs, and parts, from possession, sale, purchase, barter, transport, import, export, and take. The Migratory Bird Treaty Act applies to migratory birds identified in 50 CFR § 10.13. Wing will address potential concerns regarding impacts on wildlife or habitat in the project area, including impacts to migratory birds. Wing will also implement a monitoring plan for bald eagles, including identification of nests in the operating area to establish an avoidance area to be maintained until the end of breeding season or when the nest has been vacated (Section 3.3.3.2, *Proposed Action, Special Species Status, Migratory Birds*). Wing regularly reports monitoring and avoidance measures to FWC and the USFWS Regional Migratory Bird Permit Office. See Section 3.3, *Biological Resources*, for additional analysis on impacts to biological resources

9. A table has been incorporated into Appendix B listing the properties portrayed in the figure.

10. Associations between aviation noise and disruption to normal activity are key components in the establishment of FAA's residential noise impact thresholds defined in FAA Order 1050.1F. Use of the DNL 65 dB as the threshold for significant noise exposure is designed to account for sleep disturbance, speech interference, and annoyance among other factors. As detailed in Section 3.6, *Noise and Noise-Compatible Land Use*, and Appendix D, *Noise*, of the EA, the FAA has determined that the noise exposure levels resulting from the Proposed Action would not exceed the threshold of significance.

11. Section 3.6 states that the UA's noise emissions could be perceptible in areas within the study area but would stay well below the level determined to constitute a significant impact (DNL 65 dB). As part of the environmental review of individual nest locations, the FAA will review the applicant's proposal to ensure the proposal would not result in land use compatibility issues with respect to noise. In nearly all cases, Wing's nests would not be located at the minimal distances included in the simplified analysis and would instead be well separated with lateral

distance or shielding to not have an effect on noise sensitive receivers. The FAA encourages commenters to reach out to Wing regarding concerns related to potential noise disturbances. Wing has elected to require that all nests would be placed at least 120 feet away from noise-sensitive areas within the controlled surface areas of Class B and Class D airspace to mitigate cumulative noise impacts. In addition, nests would be placed at least 65 feet away from noise-sensitive areas when they are outside of the controlled surface areas of Class B and Class D airspace. See Chapter 4 and Appendix D for additional discussion on cumulative effects. Further, Wing intends to maintain good community relations and placements of nests and pickup zones are individually evaluated to minimize the impact to the local community.

12. Section 4.8.3.1 has been revised.

Comment #4

SMALL UAV COALITION
A Partnership for Safety & Innovation

Draft Environmental Assessment – Wing Aviation, LLC

Drone Package Delivery Operations in Central Florida Area

Comments of Small UAV Coalition

January 20, 2025

filed with 9-FAA-Drone-Environmental@faa.gov

The Small UAV Coalition ("Coalition") is pleased to provide comments in support of the FAA's draft Environmental Assessment ("Supplemental EA") for drone package delivery operations by Wing Aviation, LLC ("Wing") in the Central Florida area, including Orlando, Daytona Beach, Tampa, Clearwater, and St. Petersburg metropolitan areas. The "major federal action" triggering review under the National Environmental Policy Act ("NEPA") is the FAA's amendment of Wing's Part 135 Operations Specifications ("OpSpecs").

Wing proposes to operate up to 150 nests, with each nest having up to 24 launching pads, with up to 400 total operations per day from each nest, and to operate at remote pick up areas offsite. Wing's request to operate in these areas, in addition to its operations in the DFW metro area, provides the FAA the opportunity to act on its intention to continue building the foundation for a nationwide approach to environmental assessments (EA). A truly programmatic approach will provide operators the flexibility to meet demand in communities across the United States while moving away from more rigid approaches that may not keep pace with the innovation occurring in this technology sector.

In this draft EA, Wing proposes generally to operate between 7 a.m. and 10 p.m., using both its Hummingbird 7000W and 8000-A models, with a range of six miles.

Wing will operate its drone delivery operations at least 120 feet from "noise-sensitive areas" in Class B, C, and D airspace, and at least 65 feet from such areas in other airspace. Nests will be located in parking lots in areas zoned for commercial use, such as shopping centers, shopping malls, and large retail stores, except for offsite autoloader operations. Remote pick up areas will be located also in commercial zones, within one mile of a nest.

The Coalition supports the FAA's conclusion in this draft EA as well as in other previous environmental assessments authorizing drone package delivery operations that no detailed analysis is necessary for nine of the 17 environmental review areas:

- air quality and emissions
- coastal resources
- farmlands
- hazardous materials, solid waste, and pollution prevention
- land use
- natural resources and energy supply
- socioeconomic impacts and children's environmental health and safety risks
- water resources (wetlands, floodplains, surface waters, and groundwater)
- waters (wild & scenic rivers)

The Coalition supports the FAA's determination that drone delivery operations do not result in a significant impact on noise, visual effects, historic, architectural, archeological, and cultural resources, DOT section 4(f) resources, biological resources (wildlife), environmental justice, and cumulative impacts from noise and to biological resources.

The Coalition has reviewed the noise impacts analysis in the draft EA and supporting information and agrees the noise impacts at Wing's proposed setback distances are below the DNL 65 threshold of significance. For any operations at a nest that may approach DNL 65, it is worth noting that nests are intentionally located in parking lots and Wing's commitment to locate its nests away from noise sensitive areas results in noise impacts well under DNL 65. The noise impacts during en route and delivery operations are considerably lower. For AutoLoader operations offsite the noise metric would exceed 65 DNL but only within 25 feet of

the location, which will be at commercial properties and not in close proximity to residences.

The Coalition agrees with the FAA's finding of no significant impacts to visual resources. See page 3-32:

> The proposed action would make no changes to any landforms or land uses; thus, there would be no effect on the visual character of the area. . . . The short duration when each UA flight could be seen from any resource in the study area and the low number of overflights within any given location would minimize any potential for significant visual impacts.

With respect to biological resources (wildlife), the FAA concluded that operations are not expected to significantly influence wildlife in the area "[b]ecause operations would occur mostly in the urban environment, typically well above the tree line and away from sensitive habitats and given the short duration of increased ambient sound levels." Page 3-13.

The Coalition also notes the FAA's conclusion at page 3-18 that "[t]here would be no physical use of Section 4(f) resources because occasional flyovers in the study area would not result in substantial impairment of Section 4(f) properties."

The Coalition agrees with the draft EA's statement, at page 3-31 (emphasis in original), that drone operations will bring benefits over operations that require a car or truck to pick up a package from a store.

> Drone package deliveries would provide additional access to small goods, such as groceries and medicine, which could present a positive effect on low-income and minority communities where individuals may not have reliable access to personal vehicles and/or other modes of transportation. For these reasons, the proposed action may result in a benefit to low-income and minority communities by providing additional and on-demand access to small goods.
>
> The proposed action *would not create impacts that exceed thresholds of significance* in other environmental impacts, nor would it generate impacts on the physical or natural environment that affect an EJ population in a way that the FAA determines are unique to the EJ population and significant to that population.

Accordingly, the Coalition supports the FAA's draft EA and urges the FAA to issue a Finding of No Significant Impact (FONSI).

Respectfully submitted,

Gregory S. Walden
Aviation Counsel
Small UAV Coalition
gregory.walden@dgagroup.com
202-403-9904

FAA RESPONSE

Thank you for your comments.

Comment #5

January 17, 2025

Submitted electronically via Email to 9-FAA-Drone-Environmental@faa.gov

Federal Aviation Administration, Suite 802W
C/O AVS Environmental
800 Independence Avenue, SW
Washington, DC 20591

Re: Notice of Availability, Notice of Public Comment Period, and Request for Comment on the Draft Environmental Assessment for Wing Aviation LLC Proposed Package Delivery Operations in Central Florida

To Whom It May Concern:

The Commercial Drone Alliance ("CDA")[1] appreciates the opportunity to submit comments on the Federal Aviation Administration's ("FAA") "Notice of Availability, Notice of Public Comment Period, and Request for Comment on the Draft Environmental Assessment for Wing Aviation LLC Proposed Package Delivery Operations in Central Florida" (hereafter the "Draft EA"). For the reasons set forth below, the CDA strongly supports the FAA's efforts to authorize an expansion of uncrewed aircraft systems ("UAS") commercial package delivery operations by Wing into Central Florida. The FAA's approval of Wing's UAS operations supports the federal government's ongoing efforts to implement its congressional mandate to fully integrate UAS into the National Airspace System ("NAS"). Moreover, Wing's existing authorized operations in communities across the United States demonstrate both its commitment to safe UAS operations and its ability to operate with no significant environmental impact to the community.[2] Further, approval will help normalize safe, scalable, economically viable, and environmentally advantageous commercial UAS package delivery operations in the United States.

[1] The CDA is an independent non-profit organization led by key leaders in the commercial drone industry. The CDA has actively participated in rulemakings and policy efforts to facilitate the safe and secure development and expansion of commercial drone operations. The CDA works with all levels of government to collaborate on policies for industry growth and seeks to educate the public on the safe and responsible use of commercial drones to achieve economic benefits and humanitarian gains. We bring together commercial drone end-users, manufacturers, service providers, advanced air mobility companies, drone security companies, and vertical markets including oil and gas, precision agriculture, construction, security, communications technology, infrastructure, newsgathering, filmmaking, and more. Learn more at https://www.commercialdronealliance.org/.

[2] *See, e.g.*, Federal Aviation Administration, *Final Environmental Assessment and Finding of No Significant Impact/ Record of Decision for Wing Aviation, LLC Proposed Drone Package Delivery Operations in Dallas–Fort Worth, Texas* (Nov. 2023), https://www.faa.gov/uas/advanced_operations/nepa_and_drones/Final_EA_for_Wing_at_DFW_Nov23_ADA_Signed.pdf; Federal Aviation Administration, *Final Environmental Assessment and Finding of No Significant Impact/ Record of Decision for Wing Aviation, LLC Proposed Drone Package Delivery Operations in Frisco and Little Elm, Texas* (Feb. 2022), https://www.faa.gov/sites/faa.gov/files/uas/advanced_operations/nepa_and_drones/Wing_Aviation_TX-EA_and_rec_of_decision.pdf; Federal Aviation Administration, *Final Environmental Assessment and Finding of No Significant Impact/ Record of Decision for Wing Aviation, LLC Proposed Drone Package Delivery Operations in Christiansburg, VA* (Dec. 2021), https://www.faa.gov/sites/faa.gov/files/uas/advanced_operations/nepa_and_drones/Wing_Christiansburg-record_of_decision.pdf.

The CDA recognizes that environmental review is a critical piece of the regulatory framework enabling UAS package delivery operations to scale commercially in the U.S. and commends the FAA for its analysis. Indeed, as the FAA has acknowledged in the EA process, drone delivery at scale has the potential to result in numerous societal benefits, including improving the environment, enhancing the economy, helping small businesses, and serving a broader range of people in different socioeconomic strata or with limited mobility options.[3] A wide variety of industries are counting on UAS to help decarbonize their operations, particularly those that currently rely on larger, louder gas-powered vehicles. Using drones for delivery can potentially replace tens of millions of car trips, which would not only eliminate hundreds of thousands of tons of vehicular CO_2 emissions but also reduce traffic congestion and accidents caused by surface transportation. Existing commercial drone deployments have already demonstrated a net positive impact on the environment. Relative to decarbonization, two 2021 studies found that drone-based delivery reduced delivery carbon emissions and energy usage by 96-98% compared to cars, a significantly larger reduction than switching to electric vehicles.[4] A study of the Dallas-Fort Worth metroplex estimated that drones could remove the equivalent of 11,000 cars from the road, which would avoid approximately 190 road accidents each year and eliminate 49,000 tons of annual CO_2 emissions.[5] Similarly, a September 2020 economic report published by the Virginia Tech Office of Economic Development found that enabling drone delivery in a single metropolitan area could avoid up to 294 million miles in road use and 580 car crashes per year.[6] This reduction in vehicle mileage also would reduce carbon emissions by 113,900 tons annually, equivalent to planting 46,000 acres per year of new forest.[7]

We support the FAA's efforts to approve amendments to Wing's air carrier Operations Specifications (OpsSpecs) to expand commercial drone delivery operations into Central Florida using Wing's Hummingbird 7000W-B and 8000-A UAS. Wing's requested amendment to its OpSpec is based upon the positive community responses from its previous delivery operations in the Dallas-Fort Worth metroplex, which demonstrate consumer demand for increasing commercial package delivery operations in Central Florida. Wing proposes the introduction of drone launch and recovery sites and a set number of delivery flights per day throughout the Central Florida metro and surrounding areas. The environmental and risk mitigation procedures proposed by Wing are similar to those successfully employed by Wing and approved by the FAA in the Dallas-Fort Worth, Frisco, and Little Elm communities in Texas as well as in Christiansburg, Virginia.

The FAA's evaluation is important to facilitate the widespread employment of commercial drones, including in support of small businesses. By expanding the footprint of serviceable customers, drone delivery programs have been shown to create more than $200,000 a year in increased business opportunities for local participating retailers and up to $284,000 in additional sales for local restaurants.[8] The result is not only an increase in small business revenue but safe and rapid delivery of goods to rural areas throughout the United

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[3] *See generally* Federal Aviation Administration, *Programmatic Environmental Assessment ("PEA") for Drone Package Delivery in North Carolina* (Jul. 2024), https://www.faa.gov/uas/advanced_operations/nepa_and_drones/FONSI_ROD_Final_PEA_for_Drone_Package_Delivery_in_NC.pdf.

[4] Rodrigues et al., *Drone flight data reveal energy and greenhouse gas emissions savings for small package delivery* (Nov. 2021), https://arxiv.org/abs/2111.11463; Edward Fu, *The Sustainability of Zipline's Autonomous Aerial Logistics* (Nov. 2021), https://assets.ctfassets.net/pbn2i2zbvp41/1LywKrs46rMBl1ip03MXT0/0194f92a3f02b82630eb0ea2ecc3b19f/The_Sustainability_of_Zipline___s_Autonomous_Aerial_Logistics__Nov_2020_.pdf.

[5] Accenture, *Faster, Safer and Greener: The Potential Impact of Delivery Drones in the Dallas-Fort Worth Metroplex* 5 (Feb. 2021), https://storage.googleapis.com/wing-static-us/us/Dallas%20Impact%20Report.pdf.

[6] Virginia Tech Office of Economic Development, *Measuring the Effects of Drone Delivery in the United States* vi (Sept. 2020), https://cece.vt.edu/content/dam/econdev_vt_edu/projects/technology/Virginia%20Tech%20%20Measuring%20the%20Effects%20of%20Drone%20Delivery%20in%20the%20United%20States_September%202020.pdf.

[7] *Id.*

[8] *Id.* at vii.

States. Importantly, commercial drones can provide these enormous benefits in an environmentally responsible, efficient, and cost-effective manner.

As UAS technology continues to evolve and drone delivery companies like Wing continue to expand across the United States, we urge the FAA to leverage its prior environmental review of Wing's package delivery operations and take a programmatic approach to its environmental reviews where appropriate to facilitate operations for a broader geographic region. Such an approach is consistent with Congress' recent mandate in the FAA Reauthorization Act of 2024, wherein Congress directed the FAA to "examine and integrate programmatic-level approaches to the requirements of the National Environmental Policy Act" and "leverage an environmental review for unmanned aircraft operations within a defined geographic region" as well as "leverage an environmental assessment or environmental impact statement for nationwide programmatic approaches for large scale distributed unmanned aircraft operations."[9] The CDA also emphasizes the importance of expeditiously rolling out a scalable process that could support the pace of industry's deployment of commercial drone operations across all states and applauds the FAA for the release of its October 2024 UAS NEPA Desk Reference. Each of these efforts will support the successful deployment of these technologies and the realization of the countless public benefits of UAS operations for American businesses and American communities.

The FAA has carried out a thorough evaluation and robust analysis of various environmental impacts and the CDA agrees with the FAA's conclusions in the draft EA regarding Wing's operations. The FAA analyzed various environmental categories in the draft EA, including (1) biological resources; (2) DOT Section 4(f) Resources; (3) historical, architectural, archaeological, and cultural resources; (4) noise and noise-compatible land use; (5) environmental justice; and (6) visual effects. For each of these categories, the FAA determined that the environmental effects of the proposed UAS operations would not meet the FAA's significance thresholds (where one has been established) or otherwise result in adverse impacts or significant cumulative impacts. We agree with the FAA's conclusions and therefore urge the FAA to finalize its preliminary determination that Wing's operations will not significantly affect the quality of the human environment (individually or cumulatively) and issue a Finding of No Significant Impact.

Over the past six years, Wing has consistently demonstrated its dedication to safety and community engagement throughout the United States, both of which are essential for successful commercial drone delivery operations. By enabling expanded drone delivery operations such as those under review here, the FAA is taking important steps to support the UAS industry's viability and enabling safe, efficient, and environmentally friendly commercial UAS operations that will benefit all members of the American public.

Sincerely,

Lisa Ellman

Lisa Ellman
Executive Director
Commercial Drone Alliance

[9] FAA Reauthorization Act of 2024, Pub. L. No. 118-63, tit. IX, § 909(c) (2024).

FAA RESPONSE

Thank you for your comments.

Comment #6

Florida Fish and Wildlife Conservation Commission

Commissioners
Rodney Barreto
Chairman
Coral Gables

Steven Hudson
Vice Chairman
Fort Lauderdale

Preston Farrior
Tampa

Gary Lester
Oxford

Albert Maury
Coral Gables

Gary Nicklaus
Jupiter

Sonya Rood
St. Augustine

Office of the
Executive Director
Roger A. Young
Executive Director

Charles "Rett" Boyd
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January 17, 2025

Chris Stahl
Florida Department of Environmental Protection
3900 Commonwealth Blvd., M.S. 47
Tallahassee, FL 32399-2400
Chris.Stahl@FloridaDEP.gov

Re: Federal Aviation Administration - Conduct Unmanned Aircraft Small Package Delivery Operations in Florida, FL202412180331C, Multiple Counties

Dear Mr. Stahl:

Florida Fish and Wildlife Conservation Commission (FWC) staff reviewed the above-referenced project and provides the following comments and recommendations for consideration in accordance with Chapter 379, Florida Statutes, and pursuant to the federal National Environmental Policy Act (NEPA), the federal Coastal Zone Management Act, and the State of Florida Coastal Management Program.

Project Description

The Federal Aviation Administration (FAA) has provided a request to review the proposal from Wing Aviation, LLC, (Wing) to conduct unmanned aircraft small package delivery operations from Volusia County in the northeast, south to Indian River County along the east coast, to Sarasota County on the west coast, north to Citrus County along the west coast, and all the counties in between. Wing has a Part 135 Air Carrier Operating Certificate from the FAA, which allows it to carry the property of another for compensation or hire beyond visual line of sight using its Hummingbird Unmanned Aircraft System (UAS).

Two drone models are specifically planned for uses described in the proposal, the Hummingbird 7000W-B and 8000-A. The Hummingbird 7000W-B has 16 propellors, weighs approximately 15 pounds, with a wingspan of 4.9 feet, height of 1 foot, and length of approximately 4 feet. The 8000-A has 12 propellors, weighs under 25 pounds, with a wingspan of 6 feet, height of 1 foot, and length of 6.2 feet.

Using both the Hummingbird 7000W-B and 8000-A. Wing anticipates establishing up to 150 sites, or "nests" in Central Florida, operating a maximum of 400 delivery flights per operating day, per nest, with operating hours initially between 7:00 am to 7:00 pm and then extending to 7:00 am to 10:00 pm, 7 days a week. Infrastructure for this project would consist almost entirely of pre-existing previously paved or improved areas and would involve limited ground disturbance. The only aboveground structures would consist of autoloaders no more than 10 feet in height and 7 feet wide. Each UAS would fly at altitudes of between 150 and 300 feet at a speed of 59 miles per hour. The UAS takeoff and loading operations would occur at least 65 or 120 feet away from any noise-sensitive locations, but deliveries may occur at or adjacent to noise-sensitive uses and would involve hovering at 23 feet Above Ground Level (AGL) for approximately 30 seconds. FAA conducted a noise analysis using sound level measurement data for the Hummingbird 7000W-B and the 8000-A to determine potential audible effects from flight operations. Noise for takeoff, delivery, and landing for both Wing UA types is less than 84 dB for 30 seconds, approximating the noise level of a freight train at a 100-foot distance from an observer.

Potentially Affected Resources

The information provided was preliminary with no final UAS routes or flight profiles, and no wildlife impact reduction measures were proposed by the applicant. Based on the wide variety of landcovers and habitats across the project boundary, FWC staff determined the following listed and managed species may be impacted by the proposed activities:

- Least tern (*Sternula antillarum*, State Threatened [ST])
- American oystercatcher (*Haematopus palliates*, ST)
- Black skimmer (*Rynchops niger*, ST)
- Snowy plover (*Charadrius nivosus,* ST)
- Florida sandhill crane (*Antigone canadensis pratensis*, ST)
- Little blue heron (*Egretta caerulea*, ST)
- Tricolored heron (*Egretta tricolor,* ST)
- Roseate spoonbill (*Platalea ajaja*, ST)
- Reddish egret (*Egretta rufescens*, ST)
- Southeastern American kestrel (*Falco sparverius paulus*, ST)
- Florida burrowing owl (*Athene cunicularia floridana*, ST)
- Florida bonneted bat (*Eumops floridanus*, Federally Endangered [FE])
- Tricolored bat (*Permimyotis subflavus*, Proposed FE)
- Bald eagle (*Haliaeetus leucocephalus*)

Comments and Recommendations

Wildlife Impact Avoidance Measures

Based on the times of day, the relatively large size of the drones, and their flight profiles, the proposed drone activities over Central Florida could cause avian and bat species to modify their behavior in response to the sight or sound of the vehicles. In general, many bird and bat species are typically active at dawn and dusk, including at the heights described, and therefore these activities could affect foraging and roosting movements. Also, some species, such as the Florida burrowing owl, are predated primarily by other avian species and may mistake a drone for a predatory bird and take cover. Additionally, some species, such as wading birds, shorebirds, and Florida sandhill cranes may flush or abandon their nests if flights get too close during the breeding season.

FWC staff recommends that the applicant review available resources and develop wildlife impact avoidance measures as project planning progresses. For example, FWC's *Species Conservation Measures and Permitting Guidelines* for both wading birds and imperiled beach-nesting birds (IBNBs) contain specific buffer distances and guidance on the proper use of drones in the vicinity of breeding, brood-rearing, roosting, and other important sites. Some available resources include:

- *Species Conservation Measures and Permitting Guidelines for the Little Blue Heron, Reddish Egret, Roseate Spoonbill, Tricolored Heron* (https://myfwc.com/media/18634/threatened-wading-birds-guidelines.pdf), Appendix B. Guidance for Using Unmanned Aerial Systems (UAS) Near Wading Birds
- *Species Conservation Measures and Permitting Guidelines for American Oystercatcher, Snowy Plover, Black Skimmer, and Least Tern* (https://myfwc.com/media/29766/ibnb-guidelines.pdf), Appendix F – Operation of Unmanned Aircraft Systems (UAS) Near Imperiled Beach Nesting Birds
- ShoreMapper for IBNBs (https://gis.myfwc.com/shoremapper/) provides distances to Recent Breeding sites, Critical Brood-rearing sites, and Critical Roosting sites

- FWC Imperiled Wading Bird Colony Viewer (https://myfwc.maps.arcgis.com/apps/webappviewer/index.html?id=faf1c29ce5e1484fb5d9f23fed436826) provides locations of colonies identified in the previous 5 years
- Audubon EagleWatch map tool (https://cbop.audubon.org/conservation/about-eaglewatch-program)

As stated, the potential use cases for drones described have the potential to impact some species of wildlife, including state-listed species. As project planning progresses, FWC staff would appreciate continuing coordination on the above issues, particularly as more information on planned travel routes and "nest" locations becomes available. FWC staff would like to meet with Wing staff to discuss potential impacts, available resources, and develop project- and species-specific protocols to reduce the likelihood of negative impacts to wildlife during these activities.

Federal Species

This proposed range may also contain habitat suitable for the federally listed and managed species identified above, including bald eagle nests. FWC staff recommends coordination with the U.S. Fish and Wildlife Service (USFWS) Florida Ecological Services Office (ESO) as necessary for information regarding potential impacts to these species. The USFWS ESO can be contacted at FW4FLESRegs@fws.gov.

FWC staff appreciates the opportunity to provide input on this project and finds it consistent with FWC's authorities under the Coastal Zone Management Act/ Florida's Coastal Management Program. For specific technical questions regarding the content of this letter, please contact Josh Cucinella at (352) 620-7330 or by email at Josh.Cucinella@MyFWC.com. All other inquiries may be sent to ConservationPlanningServices@MyFWC.com.

Sincerely,

Will Burnett

William Burnett, Director
Office of Conservation Planning Services

wb/jc
Federal Aviation Administration - Conduct Unmanned Aircraft Small Package Delivery Operations_60680_01172025

CC: Mike Millard, Federal Aviation Administration, 9-FAA-Drone-Environmental@faa.gov

FAA RESPONSE

Thank you for your comments.

Impacts to State and Federal Bird and Bat Species

On December 17, 2024, the FAA submitted a biological evaluation to the USFWS in accordance with Section 7 of the ESA and requested concurrence with the FAA's effect determination for the proposed project. The FAA is required to consult the USFWS or NMFS if an action may affect a federally listed species or critical habitat. If the FAA determines the action would have no effect on listed species or critical habitat, consultation is not required. Table 3.3-1 provides a list of ESA-listed, Proposed, and Candidate Species identified as potentially present within the study area. See Section 3.3.3 for additional information on impacts to special status species, including birds and bats. In addition, Wing is responsible for compliance with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The Migratory Bird Treaty Act (16 U.S.C. §§ 703-712) protects migratory birds, including their nests, eggs, and parts, from possession, sale, purchase, barter, transport, import, export, and take. The Migratory Bird Treaty Act applies to migratory birds identified in 50 CFR § 10.13. The Bald and Golden Eagle Protection Act prohibits anyone from "taking" a bald or golden eagle, including their parts, nests, or eggs, without a permit issued by the USFWS. Implementing regulations (50 CFR Part 22), and USFWS guidelines as published in the National Bald Eagle Management Guidelines, provide for additional protections against "disturbances." According to the IPaC report done for the Draft EA, the Bald Eagle is not a Bird of Conservation Concern in the study area but warrants attention under the Eagle Act. Wing has also established a direct line of communication with the Florida Fish and Wildlife Conservation Commission to discuss any potential concerns regarding impacts on wildlife or high-quality habitat in the project area.

Wing will also specifically coordinate with the managing entities of state parks and natural areas within the study area on the thoughtful placement and use of delivery sites within these areas as necessary.

Review of FWC Resources

The FAA and Wing appreciate the resources provided by FWC and agree that direct coordination will aid in the formulation of species-specific avoidance protocol. As discussed in the Draft EA, Wing has established 1,000 foot avoidance buffers for documented Bald Eagle nests and has committed to avoidance of overwater flight routes, which would minimize exposure of sensitive wading and shorebirds to disturbance. Additionally, Wing agrees to implement 330 feet avoidance buffers of imperiled wading bird colonies, breeding sites, critical brood rearing sites, and critical roosting sites as documented in ShoreMapper and the FWC Imperiled Wading Bird Colony Viewer. Description of the avoidance measures have been included in the Final EA Biological Resources section.

Wing's Nest Locations and Planned Travel Routes

Nests would be distributed throughout the Central Florida metropolitan areas and surrounding areas following a measured rollout plan to be developed with Wing's partners and continuing best practices from Wing's established community outreach program, and in compliance with state and local statutory and regulatory requirements. Wing's nests would be located in established parking lots of commercially zoned areas whose use is consistent with local zoning and land use requirements, such as shopping centers, large individual retailers, and shopping malls. Installation activities are brief and would only involve the placement of fencing around the nest and the delivery of a shipping container for UA storage. As part of the environmental review of individual nest locations, the FAA will review the applicant's proposal to ensure the proposal would not result in land use compatibility issues with respect to noise. In nearly all cases, Wing's nests would not be located at the minimal distances included in the simplified analysis and would instead be well separated with lateral distance or shielding to not have an effect on noise sensitive receivers. The FAA encourages commenters to reach out to Wing regarding concerns related to potential noise disturbances.

In terms of travel routes, Wing's flight planning software is designed to increase variability in flight paths to minimize overflights of any given location; with the diversification of flight paths, the frequency of overflights would inversely scale as the distance from a nest increases.