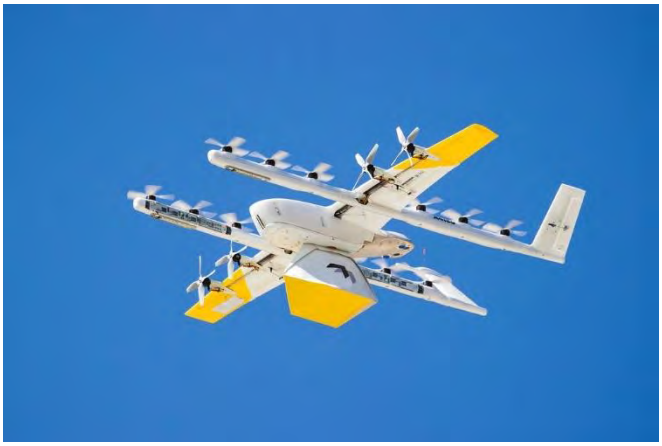
Federal Aviation Administration

Draft Environmental Assessment for Wing Aviation, LLC Proposed Drone Package Delivery Operations in Dallas–Fort Worth, Texas



September 2023

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Washington, D.C.

Notice of Availability of the Draft Environmental Assessment for Wing Aviation, LLC Proposed Package Delivery Operations in Dallas–Fort Worth, Texas

The Federal Aviation Administration (FAA) hereby gives Notice of Availability (NOA) for this draft Environmental Assessment (EA) that analyzes and discloses the potential environmental effects of the FAA decision to authorize Wing Aviation, LLC (Wing) to conduct unmanned aircraft (UA) commercial package delivery operations in the Dallas–Fort Worth (DFW), Texas metropolitan area.

Wing is seeking to amend its air carrier Operation Specifications (OpSpec) and other FAA approvals necessary to expand UA commercial package delivery operations in Texas. The FAA's approval of the amended OpSpec is considered a major federal action under the National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) NEPA–implementing regulations (40 Code of Federal Regulations Parts 1500–1508) and requires an environmental review. This draft EA has been prepared in accordance with the CEQ regulations and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.

The public comment period for the draft EA begins with the issuance of the NOA and lasts 30 days. The FAA encourages all interested parties to provide comments concerning the scope and content of the draft EA. The draft EA is available to view/download electronically at: https://www.faa.gov/uas/advanced_operations/nepa_and_drones/.

Comments may be directed in writing to 9-FAA-Drone-Environmental@faa.gov. Please reference the Wing DFW Texas EA in the e-mail subject line when sending comments. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment—including your personal identifying information—may be made publicly available at any time. While you can ask us in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

CONTACT INFORMATION: For any questions or to request a copy of the EA, please contact: 9-FAA-Drone-Environmental@faa.gov.

This draft EA becomes a federal document when evaluated, signed, and dated by the Responsible FAA Official.

Responsible FAA Official:

DAVID M MENZIMER

Digitally signed by DAVID M MENZIMER
Date: 2023.09.06 10:19:10 -07'00'

_____ Date: __August 8, 2023_____

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Acronyms and Abbreviations

AAD	Average Annual Day
ACS	American Community Survey
AGL	above ground level
APE	Area of Potential Effects
BVLOS	beyond visual line of sight
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
dB	decibel
dBA	A-weighted decibel
DFW	Dallas–Fort Worth
DNL	Day-Night Average Sound Level
EA	Environmental Assessment
EJ	Environmental Justice
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
HHS	Health and Human Services
IPaC	Information for Planning and Consultation
MBTA	Migratory Bird Treaty Act
metro	metropolitan
mph	miles per hour
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
OpSpec	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
UAS	Unmanned Aircraft System
USFWS	U.S. Fish and Wildlife Service
Wing	Wing Aviation, LLC
WR	Written Re-evaluation

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 (UAS). 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 (OpSpec).[3,4] Wing is seeking to amend its OpSpec to expand its unmanned aircraft (UA; also referred to as a drone) commercial package delivery operations in the Dallas–Fort Worth (DFW) metropolitan (metro) area (see Figure 2.2-1).

Wing currently conducts package delivery operations from three "nests"[5] in the northeastern part of the DFW area in the communities of Frisco and Little Elm, Texas; the 25 nests proposed as part of this UA expansion would include the three (3) currently operating nests (see Appendix I for location). Each nest houses between six (6) and 20 launch pads, and the drones have a delivery range of approximately six (6) miles. These operations have consisted of fewer than 100 deliveries per operating day per nest. The FAA prepared an Environmental Assessment (EA) for Wing's operations in Frisco and Little Elm and issued a Finding of No Significant Impact (FONSI) and a Record of Decision on February 9, 2022 (FAA 2022). The previous EA considered up to 100 deliveries per day in Frisco and Little Elm. After completion of the 2022 EA, Wing requested to add a third nest within the operating area that was previously analyzed as part of the EA. In response to Wing's request, the FAA prepared a Written Re-evaluation (WR) in accordance with FAA Order 1050.1F to determine if a supplemental EA was needed. In 2023, a second WR was prepared for a replacement location of an existing nest, to be located approximately 2.52 miles northeast of the existing Frisco Station nest location and located entirely within the boundaries of Wing's previously analyzed operating area. Both WRs concluded that Wing's proposal conformed to the prior environmental documentation, that the data contained in the 2022 EA remained substantially valid,

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

[2] 49 U.S.C. § 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. §§ 44703 or 44704 is required for the operation of certain UAS.

[3] An Operations Specifications is a document that defines the scope of aircraft operations that the 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 UA are assigned and where flights originate and return.

that there were no significant environmental changes, and that all pertinent conditions and requirements were met or would be met in the current action.

Wing is now proposing to extend its UA retail package delivery to additional communities in the DFW metro area. Wing's intent is to offer service throughout the DFW area from a network of nests, where each would serve a specific area, thereby avoiding an over-concentration of flights surrounding any given nest. Wing proposed a commercial cap of 25 nest locations, locations to be determined, with the exception of the 3 nests addressed in the 2022 EA and subsequent WRs discussed above. Any additional siting locations will be required to be submitted to the FAA for additional environmental review. Wing's nests would be located in commercial areas, such as shopping centers, large individual retailers, and shopping malls.

Wing's amended OpSpec to include the DFW area would allow Wing to serve the DFW area using its UA. Wing is also updating its foreseeable number of daily operations per nest from 100 to 400 flights per day to meet community demand as awareness and utilization of drone delivery increases in response to expanded availability.

The FAA's approval of the amended OpSpec is considered a major federal action under the National Environmental Policy Act (NEPA)[6] and Council on Environmental Quality (CEQ) NEPA–implementing regulations[7] and requires an environmental review. Wing prepared this draft EA under the supervision of the FAA[8] 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).

1.2 Purpose and Need

Wing is proposing to expand its current area of operations for UA commercial delivery service throughout the DFW metro area, which Wing, in its business judgment, has determined is an appropriate market for expansion. Wing's proposal is to begin full-scale commercial UA delivery operations in the DFW metro area, which is further discussed in Section 2.2, *Proposed Action*. Wing's initial operations in Frisco and Little Elm were intended as a pilot project to determine public demand for UA delivery services and evaluate whether scalable and cost-effective UA delivery expansion is possible in the area, as well as to provide Wing with an opportunity to assess

[6] 42 U.S.C. § 4321 et seq.

[7] 40 CFR Parts 1500–1508.

[8] See 40 CFR § 1506.5(a).

community response to commercial delivery operations. Wing's findings from these operations were used as the basis for the business case to expand to full-scale operations in DFW.

Part 135 operations involve multiple FAA approvals; however, the OpSpec is the approval that ultimately authorizes UA commercial delivery operations.[9] Wing's request for an OpSpec amendment to add new areas of operations requires FAA review and approval.

In general, Congress has charged the FAA with the safety of air commerce in the United States and to encourage the development of civil aeronautics. The *purpose* of FAA's 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 fulfill FAA's responsibilities as authorized by Title 49 of the U.S.C. The FAA has a statutory obligation to review Wing's request to amend the OpSpec and determine whether the amendment would affect safety in air transportation or air commerce, and to determine whether the public interest requires the amendment.

In addition, the FAA has specific statutory and regulatory obligations related to its amendment of a Part 135 certificate and the related OpSpec. The FAA is required to issue an operating certificate[10] 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."[11] 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."[12] Also included in air carrier certificates is a stipulation that the air carrier's operations must be conducted in accordance with the provisions and limitations specified in its OpSpec.[13]

The regulations also specify that a Part 135 certificate holder may not operate in a geographical area unless its OpSpec specifically authorizes the certificate holder to operate in that area.[14] The regulations implementing Section 44705 specify that an air carrier's approved OpSpec must include, among other things, "authorization and limitations for routes and areas of operations."[15] This action involves expanding the specified areas of operations in Wing's OpSpec. An air carrier's OpSpec 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."[16] After considering all material presented by a certificate holder, the FAA notifies the certificate holder of (1) the adoption of the applied-for amendment; (2) the partial adoption of the applied-for amendment; or (3) the denial of the applied-for amendment. The certificate holder may petition for reconsideration of a denial. If the

[9] See: https://www.faa.gov/licenses_certificates/airline_certification/135_certification/general_info.

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

[11] 49 U.S.C. § 44705.

[12] Id.

[13] 14 CFR § 119.5 (g), (l).

[14] 14 CFR § 119.5(j).

[15] 14 CFR § 119.49(a)(6).

[16] 14 CFR § 119.51(a); see also 49 U.S.C. § 44709.

FAA approves the amendment, following coordination with the certificate holder regarding its implementation, the amendment is effective on the date the FAA approves it.[17]

1.3 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 FAA's social media and an advertisement in the *Dallas Morning News* and *Fort Worth Star-Telegram* newspapers. The NOA provides information about the proposed action and requests public review and comments on this draft EA, which was published on the FAA's website[18] for a 30-day comment period. Interested parties are invited to submit comments on any environmental concerns related to the proposed action.

[17] 14 CFR § 119.51(c).

[18] 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

The CEQ NEPA–implementing regulations require agencies 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).[19] 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 issue the amendment to the OpSpec to enable Wing to expand commercial UA package delivery operations in DFW. Wing could continue operating its Hummingbird UA (7000W-A or 7000W-B) within Frisco and Little Elm under Part 135, which includes up to 100 deliveries per day, and at other locations under 14 CFR Part 107,[20] which limits operations to UA weighing less than 55 pounds and within visual line of sight. Consumers in the areas not served by UA would be expected to continue to use personal ground transportation to retrieve small goods. This alternative does not support the stated purpose and need.

2.2 Proposed Action

The proposed action is the FAA approval of an amendment to Wing's B050 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 DFW operating area boundaries shown in Figure 2.2-1. This amendment would allow Wing to expand the geographic scope of new nest locations as well as increase their number of daily operations from 100 to 400 deliveries per day from each nest. Wing is projecting to establish up to 25 nests in the DFW operating area under the scope of the proposed action. If, in the future, Wing wanted to exceed 25 nests in the operating area, additional safety and environmental review would be required. Operations, including nest placement and all UA flights, would be confined to the operating area depicted in Figure 2.2-1.[21]

[19] 40 CFR § 1502.14.

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

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

Nests would be distributed throughout the DFW metro area following a measured rollout plan to be developed with Wing's partners and continuing best practices from Wing's established community outreach program. Wing's nests would be located in established parking lots of commercial areas whose use is consistent with local zoning and land use requirements, such as shopping centers, large individual retailers, and shopping malls. To avoid the potential for significant noise impacts, Wing would site its nests at least 300 feet away from a noise-sensitive area[22] when the nest is located within the controlled surface area of Class B and Class D airspace[23] (refer to Figure 3.6-1) and at least 75 feet away from a noise-sensitive area in all other areas within the study area, which is defined as Wing's proposed operating area (see Figure 2.2-1). Each nest would serve an area with a 6-mile radius (Figure 2.2-2). Initially, Wing expects to fly considerably less than 400 deliveries 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 (see Figure 2.2-2), deliveries would not exceed 400 per day. Proposed operations would occur only during daylight hours, approximately 7:00 a.m. to 7:00 p.m., typically seven (7) days of the week and generally exclude holidays unless related to a community event or holiday-related promotion. Wing is not proposing to conduct night operations,[24] which is defined by 14 CFR Section 1.1 as the time between the end of evening civil twilight and the beginning of morning civil twilight, as published in the *Air Almanac*, converted to local time (U.S. Department of the Navy 2022).

[22] 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 105.1F, Paragraph 11-5.b(10).)

[23] Class B airspace is generally airspace from the surface to 10,000 feet mean sea level (MSL) surrounding the nation's busiest airports in terms of airport operations or passenger enplanements. Class D airspace is generally airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. For more information. See: https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/media/17_phak_ch15.pdf.

[24] If Wing wanted to operate at night, Wing would have to request an amendment to its exemption.

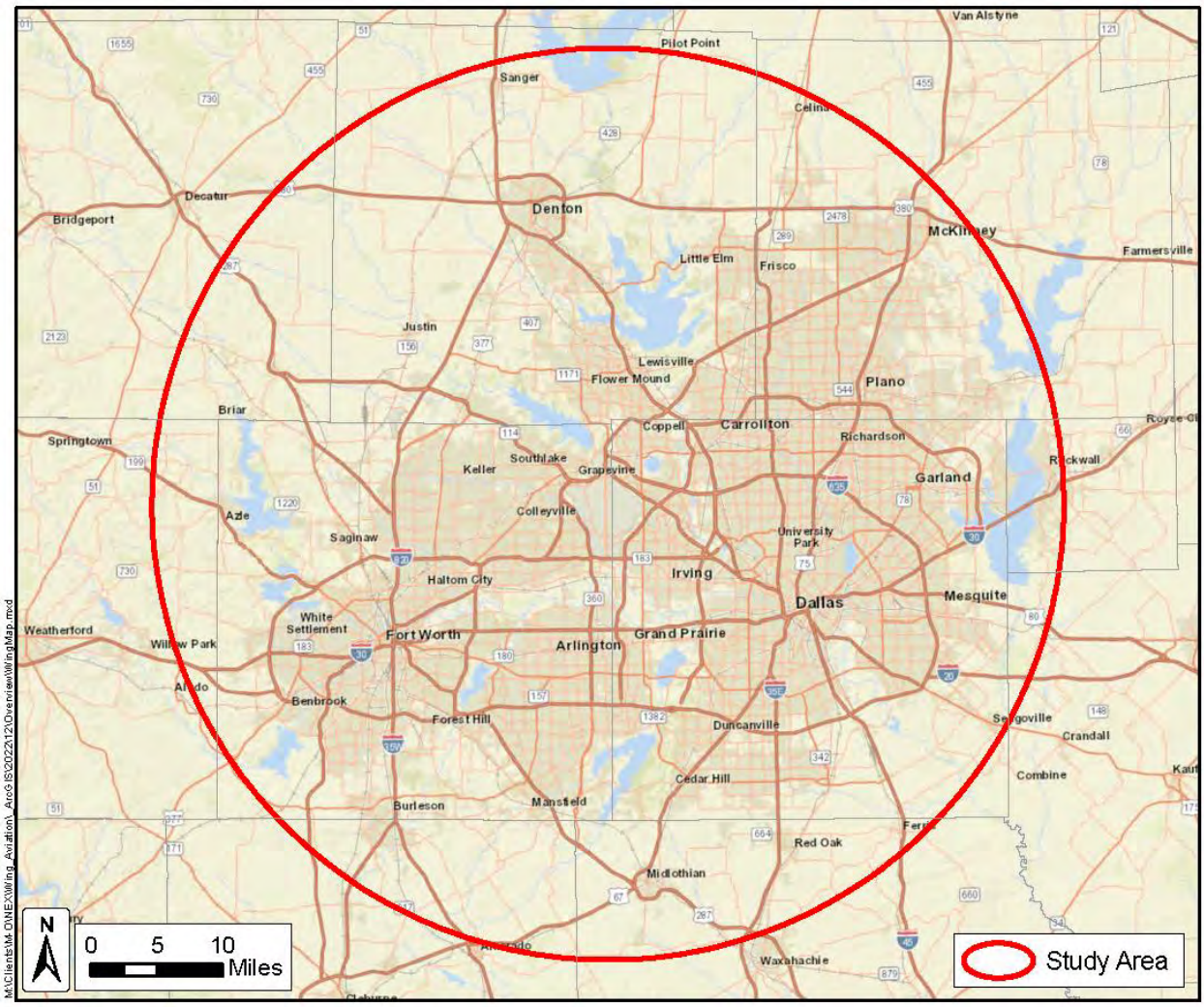

Figure 2.2-1. Wing's Proposed DFW Operating Area

Figure 2.2-2. Example Nest Location and Service Area in Little Elm, Texas

Each nest would contain up to two dozen (24) aircraft on charging 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. Each flight would take a package 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.

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 schools (elementary, middle, and high school), preschools, or daycare with outdoor facilities based on the type of resource, time of day, and other factors.[25] Wing has confirmed to the FAA that it will generally not conduct operations

[25] Wing's flight planning software is updated monthly.

over these "*fly less*"[26] areas during the scope of operations covered by this proposed action unless there is a specific purpose for Wing to enter one of these areas in coordination with the respective resource authority. 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

The primary UA used for these deliveries is Wing's Hummingbird 7000W-B, which features a multi-rotor design with 16 round diameter propellers (Figure 2.2-3 and Figure 2.2-4). The 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. This UA is similar to Wing's 7000W-A vehicle previously assessed in the Frisco and Little Elm Final EA and was updated for noise reductions in cruise flight. However, when predicting potential noise impacts, this EA uses the 7000W-A vehicle and therefore provides a conservative analysis regarding potential noise impacts of the 7000W-B. All Wing aircraft use electric power from rechargeable lithium-ion batteries.

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

[26] 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 DFW operating area.

Figure 2.2-4. Wing Hummingbird 7000W-A UA with Package Attached

2.2.2 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 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.

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 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 towards 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

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 by CEQ's NEPA–implementing regulations and 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
- Natural resources and energy supply
- Noise and noise-compatible land use
- Socioeconomics, environmental justice, and children's environmental health and safety risks
- Visual effects (including light emissions)
- 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 (40 CFR § 1502.15). 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 does 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 five (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 (Lyon-Hill et al. 2020). The proposed action is expected to decrease emissions from delivery services that contribute to greenhouse gases (GHG) emissions. The decreased emissions would have positive effects on climate change as the proposed action would replace vehicle miles traveled by GHG emitting vehicles. UA operations are not expected to be impacted by climate change impacts (e.g., rising sea levels, increasing temperatures). Therefore, the proposed action would not affect nor be affected by the impacts of climate change, and it is consistent with the January 9, 2023, CEQ *NEPA Guidance on Consideration of Greenhouse Gas Emissions and Climate Change*.[27]

- **Coastal Resources:** The proposed action would not directly affect any shorelines or change the use of shoreline zones and be inconsistent with any National Oceanic and Atmospheric Administration–approved state Coastal Zone Management Plan as there are no shorelines in the area of operations. The study area is approximately 250 miles from the nearest shoreline. The Texas Coastal Zone was reviewed from the Texas Coastal Management Program on May 16, 2023 (TGLO 2023).

- **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 made from recyclable and biodegradable materials and 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 261, *Identification and Listing of Hazardous Waste*.

[27] 88 *Federal Register* 1196.

- **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). All nest locations would be sited in accordance with all local land use ordinances and zoning requirements. Local jurisdictions in the DFW metro area may vary in the scope of their review and approval of commercial operations. Further, Section 2.2, *Proposed Action,* identifies the stand-off 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 five (5) of drone operations in a single U.S. metropolitan 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 flights would not operate at night, which is defined by 14 CFR Section 1.1 as the time between the end of evening civil twilight[28] and the beginning of morning civil

[28] According to the National Oceanic and Atmospheric Administration (NOAA) 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.).

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 closest wild and scenic river to the study area is the Cassatot River in Arkansas, approximately 150 miles northeast of the study area (National Park Service 2023b). The closest Nationwide Rivers Inventory river segment is the Brazos River approximately 22 miles west of the study area (National Park Service 2023c). 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.

3.3.1.1 Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973 (16 U.S.C. § 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. §§ 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 § 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 § 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 Texas Parks & Wildlife Department Ecoregions of Texas, the study area overlaps both the Blackland Prairies Ecoregion 29 on the east near Dallas and the Cross Timbers Ecoregion 32 in the western Fort Worth portion of the study area. Blackland Prairie is known for its productive, rich soils, gentle topography, and lush native grasslands. It is a true prairie grassland community, dominated by a diverse assortment of grasses. The Cross Timbers and Prairies Ecoregions are characterized by high density linear stands of trees with irregular plains and prairies, a vast mosaic of grasslands, and woodlands. The Cross Timbers are the primary ecological region in Northcentral Texas. Post oak and blackjack oak woodlands interspersed with grassland and prairie habitats characterize this community (Cross Timbers Urban Forestry Council 2019).

The majority of the land surface within the study area is urban and suburban. 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 DFW metro area is one of the fastest growing areas in the United States (Lee 2021). Existing vacant lands in and near the area are being developed from this expansion at a fast rate. The urban habitat in the DFW area includes agricultural areas; commercial areas (i.e., business parks, airports, landfills); communities; downtown areas; a military base; 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 (Chris

Jackson's DFW Urban Wildlife n.d.). 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 (December 7, 2022). 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 one species, the Texas fawnsfoot (*Truncilla macrodon*).

Table 3.3-1. IPaC Results

Species	Common Name	Species Name	ESA Status	Critical Habitat
Mammals	Tricolored Bat	*Perimyotis subflavus*	Proposed Endangered	N
Birds	Golden-cheeked Warbler	*Setophaga chrysoparia*	Endangered	N
	Piping Plover	*Charadrius melodus*	Threatened	N
	Red Knot	*Calidris canutus rufa*	Threatened	N
	Whooping Crane	*Grus americana*	Endangered	N
Clams	Texas Fawnsfoot	*Truncilla macrodon*	Proposed Threatened	Y
Insects	Monarch Butterfly	*Danaus plexippus*	Candidate	N

Based on the IPaC report, there are four ESA-listed bird species that could be present in the study area: the Golden-cheeked Warbler (*Setophaga chrysoparia*), an endangered species; the Piping Plover (*Charadrius melodus*), a threatened species; the Red Knot (*Calidris canutus rufa*), a threatened species; and the Whooping Crane (*Grus americana*), an endangered species. As noted in the IPaC report, both the Piping Plover and the Red Knot only need to be considered for wind energy projects. Therefore, no further analysis was conducted for those two species.

The Golden-cheeked Warbler nests exclusively in Texas from March to July in dense woodlands with tall Ashe juniper, oaks, and other hardwood trees that provide them with habitat. However, many juniper and oak woodlands have been cleared for urbanization and agriculture in the DFW area (Texas Parks & Wildlife 2023), and therefore there is little preferred habitat for this species within the study area. The Golden-cheeked Warbler prefers and is mostly restricted to the Texas Hill Country to the south and west and is not common to the Cross Timbers and Blackland Prairie. According to the IPaC report, the USFWS has not designated critical habitat for this species.

The Whooping Crane nests much farther north in Canada; there is no threat of disturbing that critical part of their lifecycle. However, Whooping Cranes often migrate through the DFW area to Texas' coastal plains in and around Aransas National Wildlife Refuge. It is possible that Whooping Cranes could use parts of several wetlands and/or waterbodies within the study area as stopover habitat on their way to wintering grounds along the Gulf Coast. A 2019 study evaluated several U.S.

Army Corps of Engineers lakes that the Aransas-Wood Buffalo Whooping Crane could potentially use as stopover habitat. The study found that Lake Ray Roberts, Lewisville Lake, Lavon Lake, and Benbrook Lake all have at least partial suitable habitat (McConnell 2021). In 2013, seven wandering Whooping Cranes from the non-migratory Louisiana population spent a few months living at Lewisville Lake, as documented by Chris Jackson from DFW Urban Wildlife (DFW Urban Wildlife n.d.). One of these cranes returned in 2014 but has not returned since. Whooping Cranes have not been observed at Lewisville Lake since 2014 and are considered rare in the area of the lake. Two Whooping Cranes were documented at Lake Ray Hubbard in 2014 by Chris Jackson (DFW Urban Wildlife n.d.) but have not been known to return to the area. According to iNaturalist, there have been seven separate observations of the Whooping Crane from 2013–2023 in the proposed study area (iNaturalist 2023). Three of the most recent observations occurred in 2022, just southwest of Fort Worth.

Additionally, the IPaC report includes the tricolored bat (*Perimyotis subflavus),* a proposed endangered species. In non-hibernating seasons (spring through fall), tricolored bats primarily roost among live or recently dead deciduous hardwood trees and forage along forest edges and over ponds and other waterbodies (USFWS n.d.-b). Hibernation is typically 6–9 months per year, occurring in the winter months, where they dwell in caves and mines (Texas Parks & Wildlife 2023).

Data received using the USFWS IPaC system also identified the monarch butterfly as potentially occurring in the study area. Monarchs occur throughout the United States during summer months and is a candidate species for federal listing. The preferred habitat for monarchs is open meadows, fields, and wetland edges with the presence of milkweed and flowering plants. Monarchs migrate through Texas in the fall and the spring through two major flyways. Monarchs enter the first flyway during the last days of September and travel from Wichita Falls to Eagle Pass. The second flyway is along the Texas coast and lasts roughly from the third week of October to the middle of November (Texas Parks & Wildlife n.d.-g).

The IPaC report includes the Texas fawnfoot as potentially occurring within the study area. The Texas fawnfoot is a freshwater mussel that is endemic to Texas and found in three river basins; Colorado, Brazos, and Trinity.

State Species of Greatest Conservation Need

In Texas, 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 state federal regulation (Texas Parks & Wildlife 2020). The counties identified in the study area that have been evaluated for SGCN include Denton, Collin, Tarrant, Dallas, Johnson, Ellis, Parker, Wise, Rockwall, and Kaufman Counties. The Texas Parks & Wildlife Department's database of Rare, Threatened, and Endangered Species of Texas lists 86 species of amphibians, birds, fish, mammals, reptiles, insects, crustaceans, mollusks, and plants in these counties considered as SGCN as defined in the 2012 Texas Conservation Action Plan. 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 Central Migratory Flyway where millions of birds, including songbirds, grassland birds, waterfowl, shorebirds, and raptors migrate north and south during spring and fall migration (Texas Parks & Wildlife n.d.-e).

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 towards an overflying hawk in its territory. Species of birds that exhibit mobbing and territorial defense behaviors that are known to occur in the DFW 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 Texas as spring and fall migrants, breeders, or winter residents (Cornell Lab n.d.). Bald Eagles and other raptors may exhibit territorial behavior when nesting; however, there is no breeding habitat within the study area (Cornell Lab n.d.; USFWS n.d.-c).

Table 3.3-2. Dallas–Fort Worth Metro Songbird 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 DFW 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 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.
Small songbirds	Include several species that exhibit breeding habitat and nest defense behaviors. Typically tree nesting species.	Smaller bird species like the diminutive Blue-grey Gnatcatcher (*Polioptila caerulea*) do not defend territories as large as the above-mentioned species, making them unlikely mobbing birds for conflicts with UAs.

Source: Texas Parks & Wildlife 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 Texas and found in cities (Texas Parks & Wildlife n.d.-e).

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 10,000 flights per day across the entire DFW metro 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 could continue to operate its Hummingbird UA (7000W-A or 7000W-B) within Frisco and Little Elm at the level analyzed in the 2022 EA (FAA 2022). Wing currently conducts package delivery operations from three nests. Each nest houses between six (6) and 20 launch pads, and the drones have a delivery range of approximately six (6) miles. These operations have consisted of fewer than 100 deliveries per operating day per nest. The primary impacts related to these actions would include noise and visual effects, and potential collisions with wildlife (FAA 2022). As discussed in the 2022 EA (FAA 2022), 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 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.

Special-Status Species

Federally Listed, Proposed, and Candidate Species

Federally endangered Whooping Cranes could pass through the study area during their annual fall migration in mid-September to wintering grounds along the Gulf Coast, and during their annual spring migration to Canada in late March to early April. Potential suitable habitat has been identified for Whooping Cranes at several lakes within the DFW area as discussed in detail in Section 3.3.2.1, *Special-Status Species*. However, Whooping Crane migration flights are usually between 1,000 and 6,000 feet (USFWS n.d.-b); therefore, it is not expected that occasional drone flights at 150–250 feet AGL would impact transitory Whooping Cranes at these altitudes. Additionally, the USFWS has used drones to survey Sandhill Cranes, a surrogate species for Whooping Crane behavior, and reported "no discernible effect" observed on the animals (USFWS n.d.-b). If Whooping Cranes are observed using habitat in the study area in future, Wing would coordinate with the Arlington Ecological Services Field Office of the USFWS, as well as the Texas Parks & Wildlife Department, to determine if any avoidance zones or other best management practices are needed. Therefore, based on operations occurring mostly in an urban environment, the altitude at which the UA flies in the en route phase, the expected low sound levels experienced by Whooping Cranes, short duration of increased ambient sound levels, the low probability of a Whooping Crane occurring in the study area, and the low likelihood of a UA striking a Whooping Crane, the FAA has determined that the proposed action "*may affect, but is not likely to adversely affect*," the Whooping Crane.

The federally endangered Golden-cheeked Warbler nests in the study area; however, their habitat is limited strictly to dense woodlands with tall Ashe juniper, oaks, and other hardwood trees (Texas Parks & Wildlife n.d.-a). The drones would only transit over this habitat type to reach customers. The proposed action is not expected to frequently encounter the Golden-cheeked Warbler. Therefore, based on operations occurring mostly in an urban environment, the altitude at which the UA flies in the en route phase, the expected low sound levels experienced by Golden-cheeked Warblers, short duration of increased ambient sound levels, the low probability of a Golden-cheeked Warbler occurring in the study area, and the low likelihood of a UA striking a Golden-cheeked Warbler, the FAA determined the proposed action "*may affect, but is not likely to adversely affect,"* the Golden-cheeked Warbler. In a letter from the USFWS dated May 8, 2023, the USFWS concurred with the FAA determination.

The tricolored bat is listed as proposed endangered and is therefore not protected under the Act; however, conferencing is necessary if it is determined a federal action is likely to jeopardize the continued existence of a proposed species. The USFWS concurred the proposed action does not indicate the need for conference on a proposed species.

The monarch butterfly is listed as a candidate species and is not afforded protection under the Act, but the species has been included for consideration during project planning for the purpose of reducing impacts.

Species of Greatest Conservation Need

The southeastern myotis bat, cave myotis bat, tricolored bat, big brown bat, eastern red bat, hoary bat, and big free-tailed bat are SGCN that could be present in the study area. Although these bat

species may occur within the study area, they are unlikely to encounter the vehicles as Wing's proposed operations would be limited to daylight hours. Bat activity increases as night approaches, and they are most active between the hours of dusk and dawn. Drone flights would stop at the end of civil twilight in the evening and begin no earlier than the emergence of civil twilight in the morning. Bats may exhibit disturbance behaviors and change their flight paths to avoid drones in the event that flights do overlap with dawn or dusk bat emergence (Ednie et al. 2021). Research suggests that drones have "minimal impact on bat behavior" (Fu et al. 2018) and that bats do not appear to be disturbed by drones (August and Moore 2018). As a result, the FAA has determined that the proposed action would cause no significant impact on bats.

The American bumblebee (*Bombus pensylvanicus*) is also considered a state SGCN and may be present in the study area. 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.

On April 20, 2023, 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. On May 8, 2023, the USFWS issued a letter in response concurring with the FAA's determination that the project, as proposed *"may affect, but is not likely to adversely affect,"* the Golden-cheeked Warbler and Whooping Crane.

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, and Common Grackle 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 has agreed to a monitoring plan for Bald Eagle nests that integrates multiple strategies and resources. This includes periodically checking online tools such as iNaturalist[29] to identify eagle nests that may occur in the operating area, as well as

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

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 the vehicle's flight path and the nest. This avoidance area will be maintained until the end of the breeding season or until a qualified biologist indicates the nest has been vacated.

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 (DOT) Act (codified at 49 U.S.C. § 30I)) 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[30] "[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

[30] 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.[31]

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 DOT Order 5610.1C, *Procedures for Considering Environmental Impacts*. The FAA also uses Federal Highway Administration (FHWA) regulations (23 CFR Part 774) and FHWA 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 DOT 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 Texas State Historic Preservation Officer (SHPO) website. By count, most of the Section 4(f) resources are local public parks, trails, and ballfields.

[31] 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.

Appendix B provides an inventory list of local parks in the study area (Texas Parks & Wildlife Department 2023). There are no wildlife refuges within the study area. These 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.[32]

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 Texas SHPO website, although most of these are considered for architectural or other purposes that would not typically be affected by UA operations. The FAA also consulted with the Texas SHPO in April 2023 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 could continue to operate its Hummingbird UA (7000W-A or 7000W-B) within Frisco and Little Elm at the level analyzed in the 2022 EA (FAA 2022). Operations would not result in a physical use of Section 4(f) properties. The FAA determined in the 2022 EA that infrequent UA overflights would not cause substantial impairment to any of the Section 4(f) resources in the study area and are not considered a constructive use of any Section 4(f) resource. During the scope of the no action alternative operations, Wing identified fly less properties and confirmed with the FAA that they will generally not conduct operations over these areas. The no action alternative is not expected to result in significant impacts on Section 4(f) properties from drone use because noise and visual effects from Wing's occasional overflights are not expected to diminish the activities, features, or attributes of the resources that contribute to their significance or enjoyment.

3.4.3.2 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

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

diversification of flight paths, the frequency of overflights would inversely scale as the distance from a nest increases. 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. § 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 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 224 historic properties and 145 historic districts occur within the APE (National Park Service 2023a). These historic properties and districts are listed in Appendices A and B of the attached Tribal and SHPO letters (Appendices F and G, respectively). The historic and cultural attributes of these sites are such that they typically would not be affected by UA overflights. In accordance with 36 CFR § 800.4(a)(1), the FAA consulted with the Texas SHPO in April 2023 and received concurrence on May 1, 2023, that "*no historic properties would be affected"* by the proposed action. The FAA also consulted with seven THPOs for tribes that may potentially attach religious or cultural significance to resources in the APE. The nine tribes are: (1) Apache Tribe of Oklahoma; (2) Comanche Nation, Oklahoma; (3) Coushatta Tribe of Louisiana; (4) Delaware Nation, Oklahoma; (5) Muscogee (Creek) Nation; (6) Tonkawa Tribe of Indians of Oklahoma; and (7) Wichita and Affiliated Tribes (Wichita, Keechi, Waco, & Tawakonie), Oklahoma; (8) Cherokee; and (9) Caddo. The FAA sent consultation letters to the nine tribes on April 20, 2023, regarding the entire APE and did not receive any responses or objections.

3.5.3 Environmental Consequences

3.5.3.1 No Action Alternative

Under the no action alternative, Wing could continue to operate its Hummingbird UA (7000W-A or 7000W-B) within Frisco and Little Elm at the level analyzed in the 2022 EA (FAA 2022). Effects from UA operations on historic properties are limited to non-physical, reversible impacts. The number of daily flights that Wing is projecting from either of the two nests—up to approximately 100 operations spreading in all directions from a nest—means that any historic or cultural resource would be subject to only a small number of overflights per day, if any. In the 2022 EA, the SHPO concurred that no historic properties would be affected and indicated that no cultural resources are present or would be affected. Therefore, 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

The nature of UA effects on historic properties is limited to non-physical, reversible impacts (i.e., the introduction of audible and/or visual elements). The number of daily flights that Wing is projecting from each nest—up to 400 deliveries per day spreading in all directions from each nest–means that any historic or cultural resource would be subject to only a small number of overflights per day, if any. Additionally, the FAA conducted a noise exposure analysis for the proposed action—as described in Section 3.6, *Noise and Noise-Compatible Land Use*—and concluded that noise levels would be below the FAA's threshold for significance, even in areas with the highest noise exposure. Based on the information available, the FAA made a finding of *no historic properties affected* in accordance with 36 CFR Part 800. The FAA received concurrence from the SHPO on May 1, 2023, that "*no historic properties would be affected*" by the proposed action (see Section 3.5.2). Therefore, the proposed action would not result in significant impacts on historical, architectural,

archaeological, or cultural resources. The FAA's tribal and historic 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. §§ 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 3,510 square miles, the approximate water area is 237 square miles, and the estimated population within the counties included in the study area is 6,574,000 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, existing aviation noise levels in the DFW study area are expected to be well below the FAA's threshold for significant noise exposure to residential land use (DNL 65 dB).

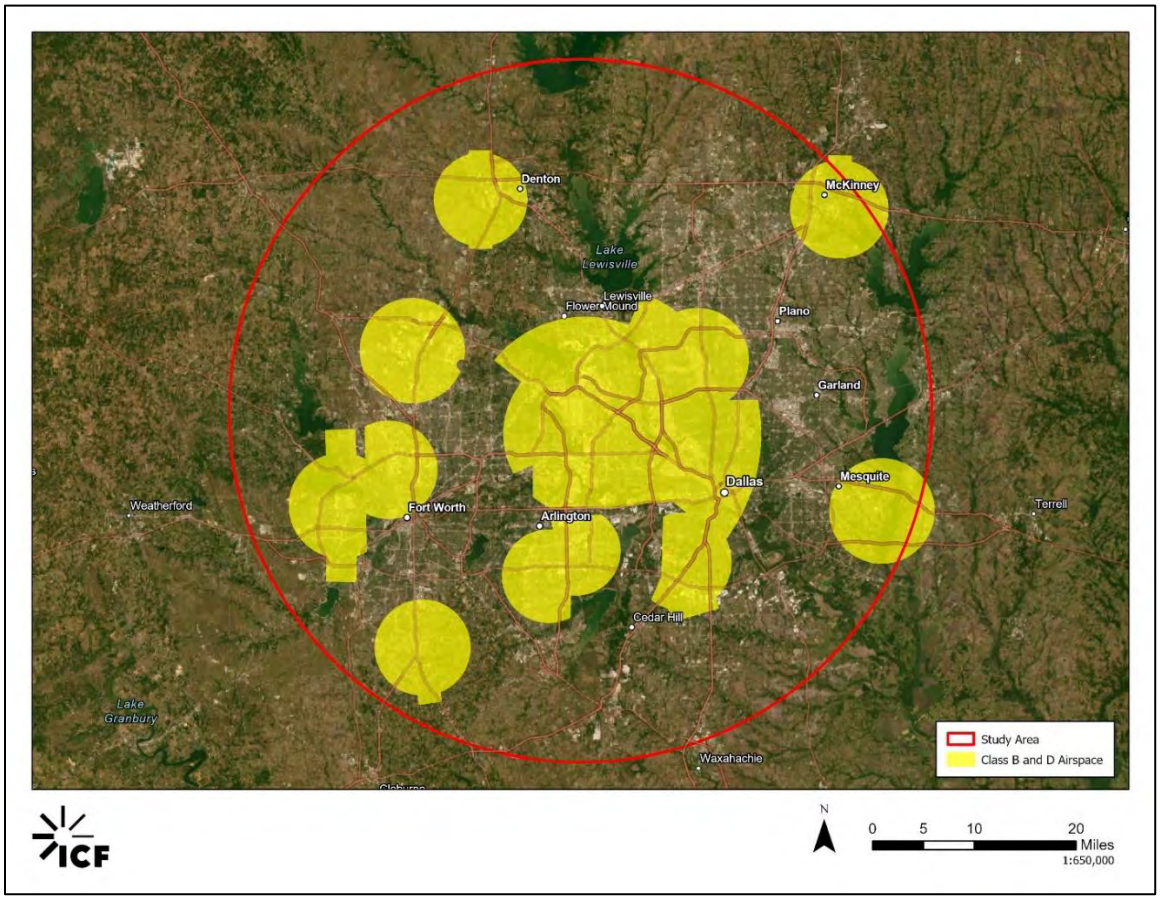

Figure 3.6-1. Class B and Class D Surface Areas

3.6.3 Environmental Consequences

3.6.3.1 No Action Alternative

Under the no action alternative, Wing could continue to operate its Hummingbird UA (7000W-A or 7000W-B) within Frisco and Little Elm at the level analyzed in the 2022 EA (FAA 2022). Noise impacts are expected to be similar to those discussed in the 2022 EA, which concluded impacts would not be significant. Therefore, 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 7 days per week for a conservative total of 312 days per year (operations would generally exclude holidays and days with severe weather), resulting in Average Annual Day (AAD) deliveries of 342. 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). Notably, the noise

assessment utilized noise emissions data for the Hummingbird 7000W-A UA as a surrogate for the Hummingbird 7000W-B UA, which was developed for a lower en route noise profile than the Hummingbird 7000W-A. Therefore, use of the 7000W-A noise profile is conservative for flight operations with either or both aircraft variants in any distribution. 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 (nest, en route, and delivery) as discussed in detail in the following sections.

Noise Exposure for Nest Operations

Based on a maximum of 400 daily deliveries per nest and 312 operating days per year, which is representative of 124,800 annual deliveries or 342 AAD deliveries, the DNL 65 dB contour extends 50 feet from the edge of any nest (Table 6 of Appendix D). Table 3.6-1 provides the extent of noise exposure for nest operations for the DNL 65 dB and lower noise levels.

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

Annual Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	DNL 50 dB	DNL 55 dB	DNL 60 dB	DNL 65 dB
≤360	≤131,400	300 feet	150 feet	75 feet	50 feet

Source: HMMH 2023.

As described in Section 2.2, *Proposed Action*, nests would be placed at least 300 feet away from noise-sensitive areas within the controlled surface areas of Class B and Class D airspace. In addition, nests would be placed at least 75 feet away from noise-sensitive areas when they are outside of the controlled surface areas of Class B 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 airport noise contours or become DNL 65 dB with the increase of DNL 1.5 dB because DNL 60- and 65-dB contours would not exceed the controlled surface areas of Class B and Class D airspace. Therefore, there would be no significant impact due to the nest operations.

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 150 feet AGL and travel at a ground speed of 59 mph (51 knots) during en route flight. The en route noise exposure is provided in Table 7 of Appendix D. The analysis shows that, based on 342 AAD deliveries, the en route noise levels would not exceed DNL 45 dB directly under the en route flight path.

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 maximum daily deliveries based on projections provided by Wing would be less than two deliveries per operating day. This analysis conservatively assumes five deliveries per day. The noise exposure for any one delivery point (without en route noise) is provided in Table 9 of Appendix D and summarized in Table 3.6-2 for various distances.

Table 3.6-2. DNL for Delivery Locations Based on Maximum Deliveries per Location

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	Estimated Delivery DNL at 28.3 Feet[1]	Estimated Delivery DNL at 50 Feet	Estimated Delivery DNL at 75 Feet	Estimated Delivery DNL at 100 Feet	Estimated Delivery DNL at 125 Feet
≤5	≤1,825	44.1	41.4	38.8	37.0	34.7

Source: HMMH 2023.
[1] Minimum Measured Listener Distance

A UA could possibly fly over a residential property, which would also have a delivery operation at the same time. The noise exposure is estimated by adding both en route and delivery operations. The en route contribution is calculated based on the expected maximum number of daily en route flights per nest minus the average number of daily deliveries per location (342–2). The total delivery noise exposure is then determined by the data in Table 3.6-2 plus Table 8 of Appendix D (en route). Utilizing the minimum distance of 28.3 feet, the total delivery DNL noise exposure is DNL 47.1 dB, which is well below the significance threshold of DNL 65 dB and would not be expected to increase DNL 1.5 dB.

Overall Noise Exposure Results

The maximum noise exposure levels are associated with nest operations, where DNL 65 dB occurs within 50 feet of a nest perimeter and DNL 60 dB occurs within 75 feet. As described in Section 2.2, *Proposed Action*, nests would be located at least 75 feet away from noise-sensitive areas. In addition, when nests are planned to be within the controlled surface areas of Class B and Class D airspaces, nest would be placed 300 feet away from noise-sensitive areas.

Based on the noise analysis, and the above project restrictions, the proposed action would not have a significant noise impact.

3.7 Environmental Justice

3.7.1 Definition of Resource and Regulatory Setting

Environmental justice (EJ) is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental, and commercial operations or policies. Meaningful Involvement means that people have an opportunity to participate in decisions about activities that may affect their environment and/or health, the public's contribution can influence the regulatory agency's decision, their concerns will be considered in the decision-making process, and the decision-makers seek out and facilitate the involvement of those potentially affected.

EO 14096, *Revitalizing Our Nation's Commitment to Environmental Justice for All,* Section 1-11 requires all federal agencies to the greatest extent practicable and permitted by law, to make achieving EJ part of its mission by identifying and addressing disproportionately high and adverse

human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

DOT Order 5610.2C, *Procedures for Considering Environmental Impact,* defines a minority person as a person who is Black, Hispanic or Latino, Asian American, American Indian and Alaskan Native, or Native Hawaiian and other Pacific Islander. A minority population is any readily identifiable group of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who would be similarly affected by a proposed DOT program, policy, or activity.

DOT Order 5610.2C defines a low-income person as a person whose median household income is at or below the Department of Health and Human Services (HHS) poverty guidelines. A low-income population is any readily identifiable group of low-income persons who live in geographic proximity, and, if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who will be similarly affected by a proposed DOT program, policy, or activity.

The FAA has not established a significance threshold for EJ. FAA Order 1050.1F indicates that factors that the FAA should consider in evaluating significance include whether the action would have the potential to lead to a disproportionately high and adverse impact on the EJ population (i.e., a low-income or minority population) due to significant impacts in other environmental impact categories, or 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. If a significant impact would affect low-income or minority populations at a disproportionately higher level than it would other population segments, an EJ issue is likely.

A disproportionately high and adverse effect on minority or low-income populations means an adverse effect that:

1. Is predominately borne by a minority population and/or a low-income population; or
2. Will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than adverse effects that will be suffered by the nonminority population and/or low-income population.

3.7.2 Affected Environment

Minority and low-income populations were mapped down to the county using the U.S. Census Bureau's 2021 American Community Survey (ACS) 1-year estimates. The ACS 1-year estimates were compared to HHS "poverty guidelines" to calculate the average percentage of households below the poverty threshold for each county.

The study area includes 10 counties: Wise, Denton, Collin, Parker, Tarrant, Dallas, Kaufman, Ellis, Rockwall, and Johnson. Due to the size and population of the DFW metro area, the aggregate of the 10 counties is defined as a reference area to provide a baseline to which individual counties are compared. The state of Texas and the United States were both added as additional references to provide context alongside the 10-county aggregate reference area. The comparison between the 10-county aggregate reference area and the individual county is used to determine communities of EJ concern.

Counties are identified as areas of concern where EJ demographics exceed those of the reference area by a "meaningfully greater" amount. A threshold value of 0 percent or greater than the average reference area was selected to define the "meaningfully greater" amount to ensure any potential EJ communities were identified. As a result, a county with a percentage of minority and/or low-income population greater than the reference area would be considered a community of EJ concern. Additionally, communities where EJ populations predominate (i.e., the population is equal to or greater than 50 percent) are also considered areas of EJ concern.

Table 3.7-1 and Table 3.7-2 summarize demographics data for the counties within the reference area. The data were gathered from the 2021 ACS 1-year estimates from the U.S. Census Bureau (USCB 2021). The HHS Poverty Guidelines were gathered from the HHS's Federal Poverty Income Guidelines, effective January 12, 2023 (HHS 2023).

Table 3.7-1. Selected Demographic Characteristics (Race) by County

Geographic Area	Total Population	White	% White	All Other Races	% All Other Races
Wise County	68,632	54,054	79%	14,578	21%
Denton County	906,422	526,363	58%	380,059	42%
Collin County	1,064,465	578,412	54%	486,053	46%
Parker County	148,222	122,995	83%	25,227	17%
Tarrant County	2,110,640	1,044,549	49%	1,066,091	51%
Dallas County	2,613,539	924,283	35%	1,689,256	65%
Kaufman County	145,310	87,435	60%	57,875	40%
Ellis County	192,455	118,993	62%	73,462	38%
Rockwall County	107,819	74,913	69%	32,906	31%
Johnson County	179,927	129,863	72%	50,064	28%
10-County Aggregate Reference Area	7,537,431	3,661,860	49%	3,875,571	51%
Texas	29,145,505	14,609,365	50%	14,536,140	50%
United States	331,449,281	204,277,273	62%	127,172,008	38%

Source: USCB 2021.

Table 3.7-2. Selected Demographic Characteristic (Poverty) by County

Geographic Area	Number of Households	Average Household Size	2023 HHS Poverty Guideline	% of Households Below Poverty
Wise County	24,449	2.9	$52,343.90	32.6%
Denton County	350,081	2.66	$50,133.70	23.3%
Collin County	399,810	2.76	$51,238.80	21.2%
Parker County	55,525	2.8	$51,238.80	28.2%
Tarrant County	771,657	2.72	$50,133.70	34.4%

Geographic Area	Number of Households	Average Household Size	2023 HHS Poverty Guideline	% of Households Below Poverty
Dallas County	975,062	2.62	$49,028.60	38.5%
Kaufman County	50,212	3.12	$54,554.10	28.5%
Ellis County	69,223	2.91	$52,343.90	36.4%
Rockwall County	39,329	2.94	$52,883.53	21.2%
Johnson County	64,338	2.86	$52,343.90	29.5%
10-County Aggregate Reference Area	2,760,357	2.82	$51,238.80	29.4%
Texas	10,796,247	2.68	$48,695.03	37.7%
United States	127,544,730	2.54	$46,151.26	36.5%

Sources: USCB 2021, HHS 2023.

Table 3.7-1 shows the racial demographic information for the reference area and the 10 counties within the DFW metro area. The percentage of minorities, collected by the ACS 1-year survey as "All Other Races," residing in the reference area is 51 percent (USCB 2021). The 0 percent threshold compared to the reference community and a predominately minority population (50 percent or greater) were used to determine communities of EJ concern.

Table 3.7-2 shows the income and poverty data for each area. The HHS Poverty Guidelines in Table 3.7-2 were determined by comparing the Federal Poverty Income Guidelines annual income per persons to the average household size provided by the ACS 1-year survey (HHS 2023). The poverty threshold is proportional to the household size, both of which are presented in the table. The percentage of households below poverty were determined by gathering the annual household income below the HHS Poverty Guideline. Similar to what was done for race, a 0 percent threshold was used to identify low-income populations to assess the potential for effects that disproportionately fall on low-income populations. Approximately 29.4 percent of the households residing in the reference area are living below poverty. Any county whose percent households below poverty equals or exceeds the reference area is identified as a community of EJ concern. Table 3.7-3 shows the counties of EJ concern as compared to the reference area.

Table 3.7-3. Communities of Environmental Justice Concern

County	% All Other Races	% Households Below Poverty
Wise County	X	32.6%
Tarrant County	51%	34.4%
Dallas County	65%	38.5%
Ellis County	X	36.6%
Reference Area	51%	29.4%

Sources: USCB 2021; HHS 2023.
X = Does not meet the threshold for consideration as an environmental justice community of concern.

Of the 10 counties, Tarrant County and Dallas County are communities of EJ concern due to the population of minorities compared to the reference area and/or their predominately minority

populations. Tarrant County (51 percent) and Dallas County (65 percent) consist of predominately minority populations (50 percent or greater), while Dallas County's minority population (65 percent) percentage is greater than that of the reference area (52 percent).

Four counties are communities of EJ concern due to the percent of households below poverty. Wise County (32.6 percent), Tarrant County (34.4 percent), Dallas County (38.5 percent), and Ellis County (36.4 percent) exceed the 0 percent threshold compared to the 29.4 percent households below poverty in the reference area.

3.7.3 Environmental Consequences

3.7.3.1 No Action Alternative

Under the no action alternative, Wing could continue to operate its Hummingbird UA (7000W-A or 7000W-B) within Frisco and Little Elm at the level analyzed in the 2022 EA (FAA 2022). Existing operations would not result in adverse effects on low-income or minority populations as the UA's noise would still be well below levels considered to constitute a significant impact (FAA 2022). Wing services would continue to provide additional and on-demand access to small goods while decreasing traffic congestion and GHG emissions. Therefore, the no action alternative is not expected to result in significant impacts on environmental justice communities.

3.7.3.2 Proposed Action

As discussed in this EA, the proposed action would not result in significant impacts for any environmental impact category. As noted in Section 3.6, *Noise and Noise-Compatible Land Use*, 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). In addition, Wing's service is meant to provide additional and on-demand access to small goods without making use of roads and provides a greater benefit in more congested areas. In urban settings, lower income areas are often within more densely populated settings, and those areas are often affected by greater traffic congestion that has a disproportionate effect on residents when it comes to accessing small goods, including groceries and food (C. Jackman, personal communication, May 2023). Commercial drone delivery services may therefore result in a positive effect on low-income and minority communities who may have no other mode of transportation. The proposed action would not result in disproportionately significant or adverse effects on minority or low-income populations. Because the proposed action would not create impacts exceeding thresholds of significance in other environmental impact categories, and because the proposed action would not generate impacts that affect an environmental justice population in a way that the FAA determines are unique and significant to that population, the proposed action would not result in significant environmental justice impacts or disproportionately high and adverse effects on minority and low-income populations.

3.8 Visual Effects (Visual Resources and Visual Character)

3.8.1 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.

3.8.2 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. When making a 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.[33] 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.

[33] 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.

3.8.3 Environmental Consequences

3.8.3.1 No Action Alternative

Under the no action alternative, Wing could continue to operate its Hummingbird UA (7000W-A or 7000W-B) within Frisco and Little Elm at the level analyzed in the 2022 EA (FAA 2022). Wing's drone operations would not alter any landforms or land uses, as discussed in the 2022 EA. Therefore, there will continue to be no effect on the visual character of the area from existing operations. Although the no action alternative involves drone airspace operations that could result in visual impacts on sensitive areas, such as Section 4(f) areas, where visual setting is a vital resource of the property, given the short flight durations and low number of proposed flights per day under the no action alternative, no significant impacts on visual resources and visual character are anticipated. Therefore, the no action alternative is not expected to result in significant visual effects.

3.8.3.2 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*. Light emissions were not analyzed in detail (Section 3.2) because flights would not operate at night. 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.

Chapter 4
Cumulative Effects

Consideration of cumulative impacts applies to the impacts resulting from implementing the proposed action along with other actions. The CEQ regulations define cumulative impacts as "effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time." (40 CFR § 1508.1(g)(3).)

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 cumulative impacts in the study area would largely be from noise. Additionally, Wing is championing an automated deconfliction network for UA avoidance across participating operators that is expected to be enacted in early 2024. Thus, this section will focus on the proposed action's potential cumulative impact on the noise environment.

Wing currently conducts package delivery operations from three nests in the northeastern part of the DFW area in the communities of Frisco and Little Elm, Texas; the 25 nests proposed as part of this UA expansion would include the 3 currently operating nests, for a maximum of 25 operating nests.

Because UA operations would occur in areas subject to other aviation noise sources, it is necessary to evaluate the cumulative 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 those other UA package delivery operators. 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 35 airports within the DFW metro area (see Appendix H). The potential for noise and compatible land use cumulative effects would result from UA and manned aircraft operating within an airport DNL 60 dB contour. As such, the potential for cumulative effects would be minimized because Wing has elected to require that all nests would be placed at least 300 feet away from noise-sensitive areas within the controlled surface areas of Class B and Class D airspace. In addition, nests would be placed at least 75 feet away from noise-sensitive areas when they are outside of the controlled surface areas of Class B and Class D airspace. The addition of Wing's commercial delivery service is not expected to result in cumulative effects with other existing Part 135 UAS operations, such as the Causey Aviation Unmanned, Inc. drone package delivery operations in Granbury and Rowlett, Texas, and other Part 107 operations. The proposed automated deconfliction network for UA avoidance would help reduce any such cumulative effects by limiting drone flightpath 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 cumulative 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 cumulative 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 cumulative effects are expected on the power grid or from energy sources.

The proposed action 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.

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 cumulative noise impacts. No other actions are anticipated to interact with the proposed action to result in cumulative effects; therefore, the proposed action is not expected to result in significant cumulative effects.

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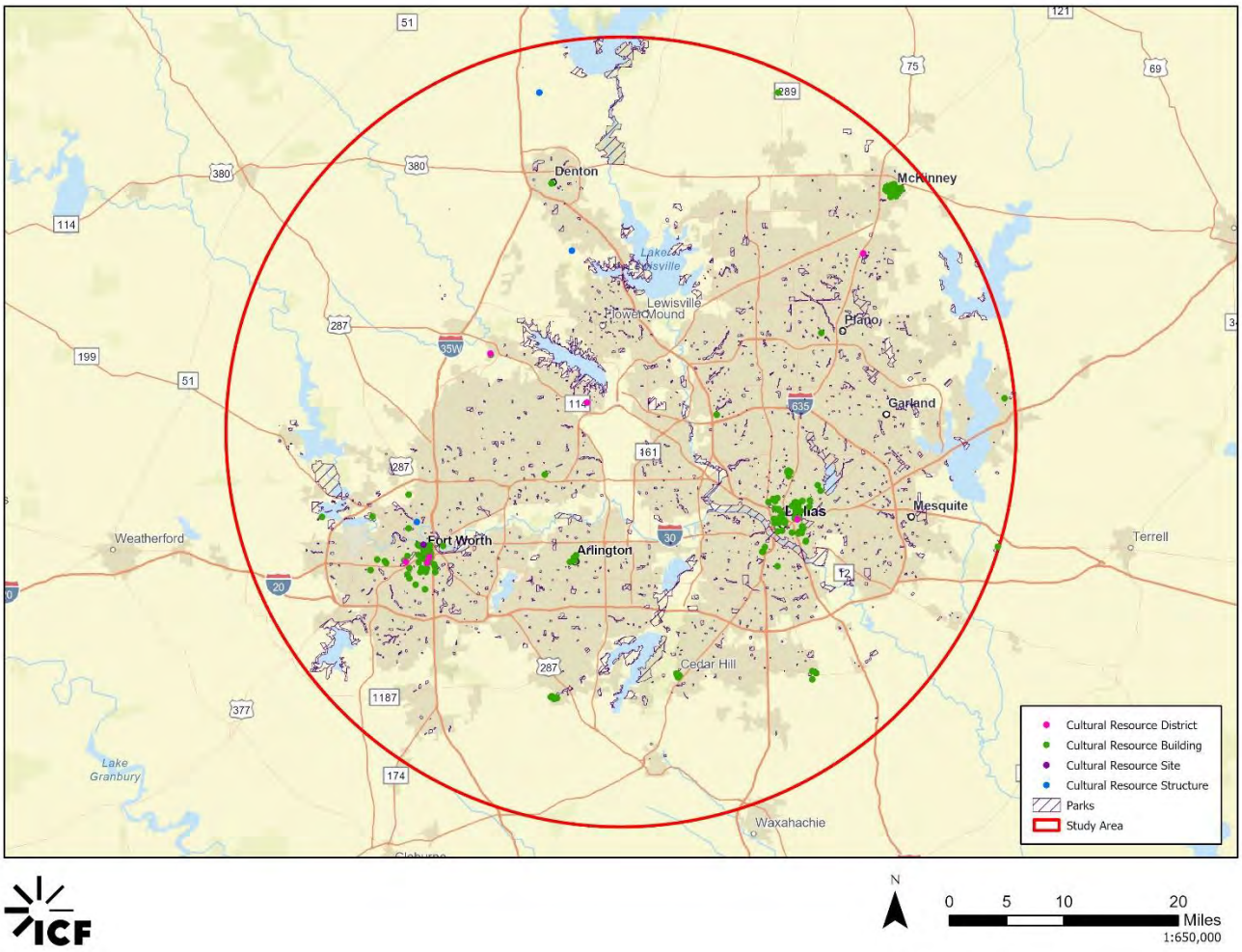
Appendix B
Section 4(f)



Appendix C
List of Preparers and Agencies and Persons Consulted

Name and Affiliation	Years of Industry Experience	EA Responsibility
FAA Evaluators		
Nicholas Baker, FAA AUS (UAS Integration Office, Safety & Integration Division)	15	Environmental Protection Specialist, Biological Resources, Document Review
Shelia Neumann Ph.D., P.E., FAA AFS (Office of Safety Standards, Flight Standards Service) General Aviation Operations	30	Environmental Protection Specialist, 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
Mike Millard, FAA AFS (Office of Safety Standards, Flight Standards Service) General Aviation Operations	42	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
Megan O'Donnell, ICF	8	Biologist and Document Preparation
Gray Jones, ICF	5	Research and Document Preparation

Appendix D
Noise

Federal Aviation Administration

Memorandum

Date: August 23, 2023

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

From: Christopher Hurst, Flight Standards (AFS), General Aviation Operations Branch, AFS-830

CHRISTOPHER A HURST Digitally signed by CHRISTOPHER A HURST Date: 2023.08.23 09:28:44 -05'00'

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

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 (UAs) (commonly referred to as drones) in Dallas-Fort Worth (DFW) 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 DFW operating area boundaries and would allow Wing to expand the geographic scope of new nest locations as well as increase their number of daily operations from 100 to 400 deliveries per day. Wing is projecting to establish up to 25 nests in the DFW 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 to conduct full-scale commercial UA delivery operations in the DFW metro area. Each drone flight would vary in duration, depending on the location of the delivery point. Wing is projecting to establish up to 25 nests in the DFW operating area. Proposed operations would include approximately 342 flights per day, per nest, and would occur only during daylight hours, approximately 7:00 a.m. to 7:00 p.m., generally excluding holidays unless related to a community event or holiday-related promotion. 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.

Noise Analysis Methodology

AFS requests the use of the noise analysis methodology described in Report No. 313090.002 002-2 for “Noise Assessment for Wing Aviation Proposed Package Delivery Operations with Hummingbird 7000W-B Unmanned Aircraft” dated March 17, 2023.

Federal Aviation Administration

Memorandum

Date: August 24, 2023

To: Christopher Hurst, Flight Standards, General Aviation Operations Branch, (AFS-830)

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

Digitally signed by David Senzig
Date: 2023.08.24 16:47:58 -04'00'

Subject: Environmental Assessment (EA) Noise Methodology Approval Request for Expanded Wing Aviation LLC Commercial Package Delivery Operations with the Hummingbird 7000W-B UA in the Dallas-Fort Worth, TX Metropolitan Area

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 unmanned aircraft (UA) from up to 25 nests located throughout the Dallas-Fort Worth (DFW), Texas metropolitan area. This request is in support of an Environmental Assessment (EA) for Wing to provide expanded package delivery services as a 14 CFR Part 135 operator in DFW and an associated operating area.

The Proposed Action is to use the Hummingbird 7000W-B UA to deliver packages from up to 25 launch and recovery locations referred to as a "nests" to potential delivery locations ("delivery points") within an approved expanded operating area encompassing most of the DFW metropolitan area. Typical operations of the UA will consist of a departure from the nest where the aircraft will quickly rise to an approximate cruising altitude between 150–350 feet above ground level (AGL), fly to the delivery location, then transition to hover mode and lower its altitude to approximately 23 feet AGL, where it will lower the package on its retractable cord to the ground. Following delivery, the aircraft will rise back to cruise altitude, and return back to the nest for landing.

Under the scope of this Proposed Action, Wing is asking to expand operations from its current three nests located in Frisco and Little Elm, TX to operate up to 25 nests throughout an expanded approved operating area in DFW. Each of the 25 nests would conduct between 100 to 400 deliveries per day and Wing anticipates each nest would conduct an average of 342 deliveries per day on an Average Annual Day (AAD) basis. Wing anticipates all delivery flight operations would occur only during daylight hours, approximately 7:00 a.m. to 7:00 p.m., and generally exclude holidays unless related to a community event or holiday-related promotion. Wing is not proposing to conduct night operations (defined as from 10:00 p.m. to 7:00 a.m. local time) and would not typically operate over water.

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 in HMMH Report No. 313090.002 002-2 for the "Noise Assessment for Wing Aviation Proposed Package Delivery Operations with Hummingbird 7000W-B Unmanned Aircraft" dated March 17, 2023.

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.

Noise Assessment for Wing Aviation Proposed Package Delivery Operations with Hummingbird 7000W-B Unmanned Aircraft

In support of U.S. Code of Federal Regulations Title 14, Part 135

Final

HMMH Report No. 313090.002 002-2
March 17, 2023

Prepared for:

Federal Aviation Administration

Unmanned Aircraft Systems Integration Office (AUS)
Unmanned Aircraft System (UAS) Environment Review
697DCK-22-D-00004

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Noise Assessment for Wing Aviation Proposed Package Delivery Operations with Hummingbird 7000W-B Unmanned Aircraft

In support of U.S. Code of Federal Regulations Title 14, Part 135

Final

HMMH Report No. 313090.002 002-2
March 17, 2023

Prepared for:

Federal Aviation Administration

Unmanned Aircraft Systems Integration Office (AUS)
Unmanned Aircraft System (UAS) Environment Review
697DCK-22-D-00004

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Contents

Tables

Figures

1 Introduction and Background

This document presents the methodology and estimation of noise exposure related to the proposed expansion of small Unmanned Aircraft (UA) package delivery operations conducted by Wing Aviation LLC (Wing), a subsidiary of Alphabet Inc., that develops and operates technology for sUAS package delivery. Wing is a commercial operator under the provisions of 14 CFR Part 135 and is proposing to expand its small package delivery operations at multiple potential locations in the continental United States.

Wing's UA bases of operations are known as nests which may include a group of functions such as the flight line, merchant operations, Pick-up Zones, Control rooms, maintenance area and aircraft storage. A nest site can have one to hundreds of aircraft operating, either in an open field or from an enclosed building.

Wing is proposing to conduct operations with the Hummingbird 7000W-B UA. This UA features a multi-rotor design with sixteen round diameter propellers. The UA incorporates twelve motors that are used for vertical propulsion and four motors that are used for forward propulsion.

The Wing 7000W-B UA is a multi-rotor vehicle weighing under 15 lbs when combined with its max payload weight of 2.7 lbs (1.2kg). It would generally be operated at an altitude range 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 vertically descend from its en route cruise altitude to a stationary hover at 23 feet AGL and an externally carried package would be lowered to the ground by cable for delivery. Once a package has been lowered to the ground, the UA would then retract the cable, ascend vertically to a cruise altitude, and depart the delivery area en route back to a nest.

The methodology proposed in this document provides quantitative guidance to FAA Environmental Specialists to inform environmental decision making on UA noise exposure from proposed Wing package delivery operations. The methods presented here are suitable for review of Federal actions under the requirements of the National Environmental Policy Act (NEPA) and other applicable environmental special purpose laws or other federal environmental review requirements at the discretion and approval of the FAA. In particular, this report is intended to function as a nonstandard equivalent methodology under FAA Order 1050.1F, and as such, would require prior written approval from FAA's Office of Environment and Energy (AEE) for each individual project for which a NEPA determination is sought.[1]

The methodology has been developed with data provided by Wing and FAA to date and, therefore, is limited to Wing operations with the Wing Hummingbird 7000W-B UA and the flight phases and maneuvers described herein. The noise analysis methodology and estimated noise levels of the proposed activities are based upon noise measurement data provided by Wing and FAA. Results of the noise analysis are presented in terms of the Yearly Day-Night Average Sound Level (DNL) based on varying levels of operations for areas at ground level below each phase of the flight.

[1] Discussion of the use of "…another equivalent methodology…" is discussed in FAA Order 1050.1F, July 16, 2015, Appendix B, Section B-1.2, available online at https://www.faa.gov/documentLibrary/media/Order/FAA_Order_1050_1F.pdf#page=113

Section 2 of this document describes the relevant noise and operations data provided by Wing and FAA. Section 3 describes the methodology to develop noise exposure estimates for the various UA flight phases associated with typical operations using available data. Section 4 presents the estimated DNL levels for various flight phases based on varying levels of typical operations as described to date.

2 Unmanned Aircraft Delivery Operations and Noise Measurement Data Set Descriptions

Two data sets form the basis of the noise assessment for the proposed Wing UA delivery operations. The data sets include a Wing provided document titled "NEPA Wing RFI 12082022.pdf" containing projected operations, vehicle parameters, and CONOPS detail, and noise measurement data collected for aircraft certification.

2.1 Operations, Flight Paths, and Flight Profile Data

Operations and flight profile data for the UA provided by Wing and FAA were reviewed to determine the characteristics of typical operations for a proposed operating area. Based on this review, the following subsections describe the assumptions made about the operations and flight profiles that were used to inform the development of the estimated noise exposure and the methodology for the noise analysis.

2.1.1 Operations

The methodology presented in this report can be used to assess UA noise for the proposed activity levels; however, FAA review and approval of its use at specified activity levels is required. The activity ranges shown in Section 4 represent what FAA considers low to moderate activity levels, and as appropriate for consideration with this methodology. At higher activity levels, this methodology may not be sufficient to inform an environmental determination and further consideration or refinements at the discretion of the FAA may be needed.

The DNL noise levels presented in this report are all shown consistent with effective daytime (7 AM to 10 PM) operations levels. For consideration of nighttime (10 PM to 7 AM) noise levels, a ten times operational weighting (equivalent to 10-decibel [dB] increase) should be applied.

Section 3.1 provides techniques to apply the operational weighting necessary to calculate effective operations for analysis with the DNL metric.

2.1.2 Flight Paths and Profiles

The UA will fly a predefined flight path that is set prior to takeoff. Flight missions are automatically planned by Wing's flight planning software resident on redundant servers running on Google infrastructure. A mission is associated with a nest location, and Wing software automatically assigns, deconflicts, and routes each flight. Each nest site will have access to a controlled area wherein UA flights are launched and recovered. There are numerous UA assigned to a single nest site.

Analysis of flight profile data provided by Wing and the FAA describes that a typical operation profile of the UA can be broken into five general flight phases: takeoff, transitions to and from vertical to horizontal flight, en route, delivery, and landing.

These five general flight phases can be combined to represent a typical operational profile further identified as:

1. Takeoff and Vertical Ascent
2. Transition and Acceleration Outbound
3. En Route Outbound
4. Delivery Deceleration and Transition
5. Delivery Descent, Delivery, and Ascent
6. Transition and Acceleration Inbound
7. En Route Inbound
8. Landing Deceleration and Transition
9. Vertical Descent and Landing

These phases represent the typical flight profile that Wing is expected to use for delivery operations. The subsections provide a narrative description of the five flight phases.

2.1.2.1 Takeoff and vertical ascent

For takeoff, the UA starts at the launch pad. Once it is cleared for takeoff, the UA takes off from the ground vertically at 787 ft/min to package loading altitude of 23 feet AGL and hovers for 30 seconds while package is being loaded. The UA then climbs at 787 ft/min to the en route altitude (150-300 feet AGL) in vertical flight mode (pointed upward).[2]

2.1.2.2 Transition and Acceleration Outbound

Once at the en route altitude of 150-300 feet AGL and still above the nest, the UA transitions from zero speed to cruise speed (51 knots) while changing from vertical flight mode to horizontal flight mode.

2.1.2.3 En Route Outbound

The En Route Outbound phase is defined as the part of flight in which the fully loaded UA transits from the nest to delivery points 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.

2.1.2.4 Delivery Deceleration and Transition

The UA decelerates from 51 knots in horizontal flight and transitions to vertical flight mode, coming to a position over the delivery point with zero speed.

[2] En Route altitude typically ranges between 150-300 feet AGL, corresponding to the CONOPS mentioned in Wing's NEPA_WPI_RFI_12082022.pdf document.

2.1.2.5 Delivery Descent, Delivery, and Ascent

The Delivery phase of flight is defined by descent from the En Route Outbound phase to a delivery point to deliver a package. This phase is assumed to start at maximum weight. The UA vertically descends from en route altitude to 23 feet AGL delivery altitude at 787 ft/min 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. The minimum distance a human can be from the UA during delivery is a 6-foot radius from underneath the center of the UA.

2.1.2.6 Transition and Acceleration Inbound

Once at the en route altitude of 150-300 feet AGL and still above the delivery point, the UA transitions from zero speed to cruise speed (51 knots) while changing from vertical flight mode to horizontal flight mode.

2.1.2.7 En Route Inbound

The UA continues to fly at en route altitude of 150-300 feet AGL and en route speed of 51 knots towards the nest at empty weight.

2.1.2.8 Landing Deceleration and Transition

The UA decelerates from 51 knots in horizontal flight and transitions to vertical flight mode, coming to a position over the nest with zero speed.

2.1.2.9 Vertical Descent and Landing

The UA while in vertical flight mode, descends over its assigned landing pad at 787 ft/min until approximately 20 feet AGL. The UA then slows down to descend to landing at approximately 98 ft/min until reaching the ground.

Table 1 provides a summary of the prior subsections and includes the assumptions regarding altitude, ground speed, and durations.

Table 1. Hummingbird 7000W-B Typical Flight Profiles

Source: NEPA_WPI_RFI_12082022.pdf

Flight Phase (General)	Description	Flight Segment (Detail)	Altitude (ft AGL)	Ground Speed (kts)	Duration (sec)
Takeoff and Vertical Ascent	Vertical launch from the nest on ground to en route altitude (150 - 300 ft AGL) while hovering for 30 seconds at package loading altitude (23 ft)	Takeoff	Ascend from 0 to 23	0	1.8
		Loading	23	0	30
		Climb to cruise altitude	Ascend from 23 to 150 – 300	0	9.7 – 21.1
Transition and Acceleration Outbound	Transition from zero speed above the nest at en route altitude to cruise speed (51 kts)	Acceleration to cruise speed	150 – 300	0 to 51	13
En Route Outbound	Flying at operational altitude (150 - 300 feet AGL) and speed (51 kts) to delivery point	Cruise to delivery point	150 – 300	51	Variable
Delivery Deceleration and Transition	Transition from cruise speed at en route altitude to zero speed above delivery point at en route altitude	Deceleration from cruise speed to zero	150 – 300	51 to 0	13
Delivery Descent, Delivery, and Ascent	Vertically descend from en route altitude to 23 ft AGL delivery altitude and hover for approximately 30 seconds to lower the package. Followed by vertical ascent back to en route altitude in vertical flight mode	Descent for delivery	Descend from 150 - 300 to 23	0	9.7 – 21.1
		Unloading	23	0	30
		Climb back to cruise altitude	Ascend from 23 to 150 - 300	0	9.7 – 21.1
Transition and Acceleration Inbound	Transition from zero speed above delivery point to en route altitude to cruise speed	Acceleration to cruise speed	150 – 300	0 to 51	13
En Route Inbound	Flying at operational altitude (150 - 300 feet AGL) and speed (51 kts) to nest at empty weight	Cruise back to the nest	150 – 300	51	Variable
Landing Deceleration and Transition	Transition from cruise speed at en route altitude to zero speed above the nest at en route altitude	Deceleration from cruise speed to zero	150 – 300	51 to 0	13
Descent and Landing	Descend from en route altitude to 20' at 787 ft/min then slowing down (98 ft/min) to land in vertical flight mode	Descent	Descend from 150 - 300 to 20	0	9.9 – 21.3
		Landing	Descend from 20 to 0	0	12.2

2.2 Acoustical Data

Noise estimates for the UA were calculated using the aircraft certification noise measurement data included in this section. The methodology used in the noise estimates' calculation is included in Section 3. The summary tables of the estimates are included in Section 3.3.

Aircraft certification noise measurements were collected for Wing's 7000W-A UA by JR Engineering in April of 2021[3]. These noise measurements were taken in accordance with an issue paper developed by FAA and Wing to create a noise certification basis for this aircraft. Further rulemaking action on the paper is expected in the future. This data set included measurements of multiple passes of level straight line overflights at 100 feet and 200 feet AGL. Overflight measurements were taken with the UA operating at Maximum Takeoff Weight (MTOW) with payload at a target cruise airspeed of 56 knots (29 m/s) and without payload at a target max airspeed of 70 knots (36 meters/second). Supplementary measurements were also collected for multiple instances of stationary hovers at 20 feet AGL. Table 2 presents a summary of the average measured Maximum A-weighted Sound Levels (LAmax) and Sound Exposure Levels (SEL) for overflights and stationary hovers.

Table 2. Aircraft Certification Noise Measurement Data Summary

Source: JR Engineering, 2021

Type	Altitude (AGL)	Package	Speed (knots)	Average LAmax (dB)	Average SEL (dB)
Overflight	100 ft	No	70	63	66
	100 ft	Yes	56	64	67
	200 ft	No	70	59	63
	200 ft	Yes	56	60	64
Hover*	20 ft	Yes	-	73	-

**UA at 20 ft AGL and 20 ft laterally from the microphone position*

Noise measurements of 7000W-A model are utilized for this analysis, as measurement data for the 7000W-B was not available. Wing reports that improvements made to the 7000W-B model have reduced the overall operating noise level of the UA, and as such use of the 7000W-A as a surrogate in this analysis is conservative for noise estimation.

[3] Engineering Coordination Memo and Data Files, Subject: "Data Submittal for AEE", JR Engineering 2021.

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3 Methodology for Data Analysis

The previously described data sets were used to develop a method to estimate community noise exposure that could result from Wing delivery operations. These would be operations originating from a single nest within each proposed area of operations and occurring daily between the hours of 7:00 AM and 10:00 PM. Numbers of daily and equivalent annual delivery operations would vary for different operating areas. There are currently no standardized tools or processes in place to conduct a noise assessment for the proposed operational scenario and UA; therefore, HMMH, with detailed technical guidance from the FAA Office of Environment and Energy, developed a customized noise exposure prediction process based on the available data to conduct this analysis. The process was developed around FAA's understanding of typical use of the UA by Wing. The following subsections describe the noise analysis methodology.

3.1 Application of Operations

The DNL metric applies a 10 dB weighting for operations between 10 PM and 7 AM. The 10 dB weighting is mathematically equivalent to 10 times the number of operations. Therefore, the operations near point *i* can be weighted to develop a daytime equivalent number of operations ($N_{Equiv,i}$). The generalized form is expressed in Equation (1).[4]

$$N_{Equiv,i} = W_{Day} \times N_{Day,i} + W_{Eve} \times N_{Eve,i} + W_{Night} \times N_{Night,i} \quad (1)$$

Where:

- $N_{Day,i}$ is the number of user-specified operations between 7 AM and 7 PM local time
- $N_{Eve,i}$ is the number of user-specified operations between 7 PM and 10 PM local time
- $N_{Night,i}$ is the number of user-specified operations between 10 PM and 7 AM local time
- W_{Day} is the day-time weighting factor, which is 1 operation for DNL
- W_{Eve} is the evening weighting factor, which is 1 operation for DNL
- W_{Night} is the night-time weighting factor, which is 10 operations for DNL

For the DNL metric, the number of DNL daytime equivalent operations, $N_{DNL,i}$ simplifies to

$$N_{DNL,i} = N_{Day,i} + N_{Eve,i} + 10 \times N_{Night,i} \quad (2)$$

In practice, Equation (2) can be further simplified by defining the user-defined operations between 7 AM and 10 PM as a single value, rather than tracking $N_{Day,i}$ and $N_{Eve,i}$ separately.

[4] Equation (2) includes the three time periods of day, evening, night for consistency with other FAA documents that discuss the development of time averaging metrics such as DNL from individual SELs when operations during the evening are weighted differently.

3.2 Nest Infrastructure

As noted in Section 1 and Section 2.1.2, Wing operates UAs from a nest. A single nest is anticipated to support multiple sets of launch and landing pads. For the purpose of the noise analysis, only one nest is considered at a time. All the operations for the nest (all the launch and landing pads) are considered to be collocated at the centroid of the nest.

3.3 Application of Acoustical Data

The DNL at a location can be estimated with a summation of the SELs.

For the purpose of calculating SEL, four specific activities are considered:

- The UA taking off from the nest and accelerating to cruise speed at en route altitude;
- En route travel of the UA between the nest, the delivery point, and return;
- Delivery maneuvers of the UA at the delivery point; and
- Landing related activities of the UA at the nest.

The following subsections develop the estimated SELs for the four specific activities as identified above using the data presented in Section 2.

3.3.1 General Assumptions

This analysis is based on the acoustic data tables presented in Section 2.2. The minimum distance for which measurements are available is 28.3 ft.

The analysis presented in this section provides estimates of expected sound exposure levels resulting from typical operations of the Hummingbird 7000W-B UA by Wing. The Day-Night Average Sound Levels (DNLs) can be estimated with a summation of the Sound Exposure Levels (SELs). The measurement SEL data provided in the aforementioned source cannot be directly used to estimate noise exposure from UA operations. Therefore, we utilize measurement data to develop aircraft SELs as a function of the aircraft speed and distance to the aircraft by integrating over discrete time intervals.

The aircraft's flight profile is separated into discrete time intervals. Each interval is assigned a time duration, fixed to one second in this analysis. For single discrete time interval, the aircraft's performance state (hover, climb, descend, accelerating, level flight/en route) are identified and aircraft's position, altitude, speed and acceleration are estimated.[5] The applicable en route SEL or the available LAmax hover noise data and assigned to the interval and the slant distances at the start and end of the time interval is calculated. The noise levels for the start and end of each segment are numerically integrated using the trapezoidal rule to develop a one second partial SEL associated with each interval.[6] This method assumes the LAmax measurements are omnidirectional that is valid for all orientations around

[5] This process using the equations of motion to fill in various elements of the profile that were not specifically provided. The equations of motion provide relationships of an object's position, speed and time. Acceleration is assumed to be constant across multiple time intervals while speed is changing.

[6] The numerical integration method in this application with the trapezoidal rule is limited to equal time intervals

the aircraft. This method also assumes sound level at the receiver is solely a function of distance to the aircraft with no additional atmospheric attenuation or propagation effects.

The SELs presented in the following subsections are presented at discrete distances to the UA's vertical profile relative to the point of delivery, takeoff, or landing. If additional values are needed for delivery, takeoff or landing, then SEL values at intermediary distances can be approximated by linear interpolation.

SEL values at distances less than 28.3 feet for takeoff, landing, or delivery should not be extrapolated because the deviation of the method of estimation value increases closer to the source.

The UA can be operated en route at a range of altitudes from 150 to 300 feet AGL, with the greatest noise level occurring at 150 feet AGL which would place to UA closest to a ground-based receiver. Therefore, to be conservative, this report assumes the UA operating at the lower 150 feet AGL en route altitude.

3.3.2 En Route

The maximum weight SELs are applicable for the UA carrying a package while flying outbound to a delivery point while the empty weight SELs are applicable for the UA flying inbound to the nest after the UA completes a delivery and/or is not carrying cargo, respectively. The available acoustic data, and a description of the associated performance conditions, are presented in Table 2.

Flight of the aircraft in still air is anticipated to be typically 51 knots, with a typical altitude of 150 feet AGL. Sound exposure level for a given point i (SEL_i) with the aircraft flying directly overhead at altitude (Alt_i) in feet and a ground speed (V_i) in knots, will be calculated based on the guidance in *14 CFR Part 36 Appendix J, Section J36.205 Detailed Data Correction Procedures*.[7] It should be noted that the equations presented in this Section are only applicable for an aircraft that is moving relative to a stationary receptor.

In particular, the sound exposure level adjustment for the altitude defined in 14 CFR Part 36 for a moving aircraft, is presented here as Equation (3).

$$\Delta J_1 = 12.5 \times \log_{10}\left(\frac{H_A}{H_T}\right), dB \quad (3)$$

where ΔJ_1 is the quantity in decibels that must be algebraically added to the measured SEL in order to estimate the SEL for a level flight path at an altitude differing from the altitude corresponding to the measured SEL; H_A is the reference height, in feet, corresponding to the measured SEL; H_T is the altitude at which an estimate of the SEL is being made; and the constant (12.5) accounts for the effects on spherical spreading and duration from the off-reference altitude. The value of ΔJ_1 is 0 if H_T is equal to H_A and can be negative if H_T is greater than (higher altitude) than H_A.

The sound exposure level adjustment for speed, as defined in 14 CFR Part 36, is presented here as Equation (4).

[7] 14 CFR Part 36 Noise Standards: Aircraft Type and Airworthiness Certification available at https://www.ecfr.gov/current/title-14/chapter-I/subchapter-C/part-36

$$\Delta J_3 = 10 \times \log_{10}\left(\frac{V_{RA}}{V_R}\right), dB \quad (4)$$

Where ΔJ_3 is the quantity in decibels that must be algebraically added to the measured SEL noise level to correct for the influence of the adjustment of the reference speed on the duration of the measured flyover event as perceived at the noise measurement station, V_R is the speed at which the vehicle will be estimated at, and V_{RA} is the speed associated with the measured SEL.

To estimate the SEL of the UA flying en route, the measured SEL made during overflight will be used. As shown in Table 3 , the SEL is 67 dB when the vehicle is at maximum weight, at 100 feet above ground and traveling at approximately 56 knots; therefore, adapting that to the maximum weight (outbound) en route condition when the UA is flying at an altitude of Alt_i feet AGL and ground speed of V_i knots can be made using Equation (5) to arrive at an estimate $SEL_{maximum\ weight}$ dB for that respective phase of flight.

$$SEL_{maximum\ weight} = 67 + 12.5 \times \log_{10}\left(\frac{100}{Alt_i}\right) + 10 \times \log_{10}\left(\frac{56}{V_i}\right), dB \quad (5)$$

For en route conditions with a package (assuming the UA is at maximum weight) and flight conditions of 51 knots and 150 ft AGL, the SEL is 65.2 dB.

Equation (6) presents the calculation for en route conditions at empty weight.

$$SEL_{empty\ weight} = 66 + 12.5 \times \log_{10}\left(\frac{100}{Alt_i}\right) + 10 \times \log_{10}\left(\frac{70}{V_i}\right), dB \quad (6)$$

For en route conditions while empty and flight conditions of 51 knots and a 150 ft AGL, the SEL is 65.2 dB.

3.3.3 Takeoff, Climb and Transition

Table 3 provides the estimated SEL for takeoff and climb associated with the flight phases described in Sections 2.1.2.1 and 2.1.2.2 and with simplified assumptions presented Section 3.3.1. SEL in this table represents the UA starting from rest at the nest on the ground. It climbs vertically and hovers for 30 seconds at package loading altitude of 23 ft and then continues climbing vertically to en route altitude of 150 ft AGL. The UA then accelerates to the en route speed of 51 knots and maintains 51 knots at an altitude of 150 ft AGL for outbound en route flight. The SEL values assume that the UA passes directly over the receiver during the transition to en route outbound flight and the outbound en route flight segment.

Table 3. Estimate of SEL for Takeoff, Climb, and Transition at Maximum Weight

Source: HMMH

Distance between Launch Pad and Receiver (ft) [a]	SEL (dB)
28.3	85.8
50	82.7
75	79.9
100	77.9
125	76.4
150	75.2
175	74.2
200	73.3
225	72.6
250	72.0
275	71.5
300	71.0
325	70.5
350	70.1
375	69.8
400	69.4
425	69.1
450	68.9
475	68.6
500	68.3
525	68.1
550	67.9
575	67.7
600	67.5
625	67.3
650	67.2
675	67.1
700	66.9
725	66.8
750	66.7
775	66.6
800	66.5
825	66.4
850	66.4
875	66.3
900	66.2
925	66.2
950	66.1
975	66.1
1000	66.0

Note:
a) Distance is along ground from landing point (launch pad) to receiver.

The available measured SELs for hover configuration (Table 4) are used for takeoff SEL estimation and specifically for the takeoff and climb profiles described in Section 2.1.2.1 and 2.1.2.2. It should be noted that the SEL values provided include vertical ascent and the horizontal flight that would occur after climb. As noted in Section 3.3.1, the values should only be used for distances between the nest and the receiver for distances of 28.3 feet to 1,000 feet.

Application of the SEL should be based on the position of the launch pad at a nest. If the exact location of the launch pad is not known, then using an outer boundary of the nest would be slightly conservative.

3.3.4 Delivery

Table 4 presents the SEL of the delivery profile discussed in Sections 2.1.2.4, 2.1.2.5, and 2.1.2.6. The SELs presented in the table are estimated for distances from the delivery point and can be applied radially as a circle with the delivery point in the center. The values assume that the UA passes directly over the receiver on both the en route inbound and outbound flight segments before and after completion of a delivery.

Table 4. Estimate of SEL for Delivery Profile

Source: HMMH

Distance between Delivery Point and Receiver (ft)[a]	SEL [b] (dB)
28.3	86.5
50	83.7
75	81.1
100	79.3
125	77.9
150	76.8
175	75.9
200	75.1
225	74.5
250	73.9
275	73.4
300	73.0
325	72.6
350	72.2
375	71.9
400	71.6
425	71.3
450	71.0
475	70.8
500	70.6
525	70.4
550	70.2
575	70.0
600	69.8
625	69.7
650	69.6
675	69.4
700	69.3
725	69.2

Distance between Delivery Point and Receiver (ft)[a]	SEL [b] (dB)
750	69.2
775	69.1
800	69.0
825	69.0
850	68.9
875	68.9
900	68.8
925	68.8
950	68.7
975	68.7
1000	68.7

Notes:
a) Distance is along ground from delivery point to receiver.
b) Delivery profile as described in 2.1.2. Flight phases "Delivery – Maximum Weight" and "Delivery – Empty Weight", starting directly over delivery point at an altitude of 150 feet AGL, and remaining over the delivery point through descent, delivery of the package, and climb back to an altitude of 150 feet AGL.

The available measured SELs for hover configuration (Table 5) are used for delivery SEL estimation and specifically for the delivery profile segments described in Sections 2.1.2.5, 2.1.2.5, and 2.1.2.6. Therefore, SEL values provided include some portion of inbound horizontal flight with deceleration from cruise speed to zero, descent from en route to delivery altitude, various maneuvers associated with the delivery, climb back to en route altitude, and some portion of horizontal flight with acceleration to cruise speed from zero. As noted in Section 3.3.1, the values should only be used for distances between the delivery point and the receiver for distances between 28.3 ft to 1000 feet.

3.3.5 Descent and Landing

Table 5 presents the SEL associated with the descent from en route altitude to landing at the nest on the ground, as discussed in Sections 2.1.2.8 and 2.1.2.9.

Table 5. Estimate of SEL for Descent and Landing at Empty Weight

Source: HMMH

Distance between Launch Pad and Receiver (ft) [a]	SEL (dB)
28.3	86.0
50	81.9
75	78.9
100	76.8
125	75.3
150	74.1
175	73.1
200	72.3
225	71.6
250	71.0
275	70.4
300	70.0
325	69.5
350	69.1

Distance between Launch Pad and Receiver (ft) [a]	SEL (dB)
375	68.8
400	68.5
425	68.1
450	67.9
475	67.6
500	67.4
525	67.1
550	66.9
575	66.8
600	66.6
625	66.5
650	66.4
675	66.3
700	66.2
725	66.1
750	66.0
775	66.0
800	65.9
825	65.9
850	65.8
875	65.8
900	65.7
925	65.7
950	65.7
975	65.6
1000	65.6
Note: a) Distance is along ground from landing point (launch pad) to receiver.	

It should be noted that the SEL values provided include descent from en route altitude and horizontal flight that would occur as the UA approached the landing at a nest. As noted in Section 3.3.1, the values in Table 6 should only be used for distances between the landing site at the nest and the receiver for distances of 28.3 feet to 1000 feet.

Application of the SEL should be based on the position of the closest landing pad at the nest. If the exact location of the landing pads is not known, then using an outer boundary of the nest extents would be slightly conservative.

3.4 Proposed DNL Estimation Methodology

The number of operations overflying a particular receiver on the ground will vary based on the proposed operating area and demand. For a given receiver location *i*, and a single instance of sound source *A*, the SEL for that sound source SEL_{iA} is (energy) summed for the average annual daily number of DNL daytime equivalent operations ($N_{DNL,iA}$) to compute the DNL, or equivalently, by Equation (7).

$$DNL_{iA} = SEL_{iA} + 10 \times \log_{10}\left(N_{DNL,iA}\right) - 49.4, \ (dB) \quad (7)$$

The above equation applies to an SEL value representing one noise source such as an UA takeoff or an UA landing. For cases where a particular receiver would be exposed to multiple sound sources (A through Z), the complete DNL at that point would be calculated with Equation (8).

$$DNL_i = 10 \times \log_{10}\left(10^{\left(\frac{DNL_{iA}}{10}\right)} + 10^{\left(\frac{DNL_{iB}}{10}\right)} + \cdots + 10^{\left(\frac{DNL_{iZ}}{10}\right)}\right), \ (dB) \quad (8)$$

For each of the conditions presented below, results will be presented in tabular format with the estimated DNL.

3.4.1 DNL for Nest

The takeoff and landing operations are anticipated to occur at the same location. Therefore, the results for both will be calculated for a single set of receptors. Operations will be assumed to be "head-to-head" in which case the takeoff and the landing flight paths will be the same.

Takeoff operations will be represented by a single sound level because the SEL estimation for takeoff considers the takeoff, climb, and some portion of the outbound en route flight. Similarly, the landing operations will be represented by a single sound level as the SEL estimation for landing considers a portion of inbound en route flight, descent, and landing.

The two noise sources representing the complete takeoff and landing cycle associated with a single delivery departing and returning at the distribution center will be added together with Equation (8).

3.4.2 DNL for En Route

En route includes the UA flying to and from the nest to delivery points as discussed in Section 2.1.2.3 and Section 2.1.2.7, respectively. A representative receiver will be positioned directly under the flight path, and the DNL will be calculated based on the altitude and speed-adjusted delivery SEL calculated in Section 3.3.2. Operations will be based on representative numbers defined in relevant materials and generally assume that a receiver under the flight path will be overflown by the UA while it is traveling both outbound at maximum weight and inbound at empty weight for a single delivery. The en route outbound noise level and the en route inbound noise level will be added together with Equation (8).

3.4.3 DNL for Delivery Points

Delivery operations will be represented by a single sound level consisting of the UA starting at en route altitude, descending vertically over the delivery point at maximum weight and performing the delivery profile over the delivery point, and then ascending vertically over the delivery point at empty weight and returning to en route altitude and speed (Section 3.3.4).

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4 Noise Exposure Estimate Results

This section presents the estimated noise exposure for Wing's proposed operations for a given set of average annual day (AAD) deliveries. The values presented are in tabular format and use of the table requires estimating the number of DNL Equivalent deliveries associated with the nest. One delivery includes the outbound takeoff and inbound landing and is representative of two operations.

The DNL Equivalent deliveries, $N_{DNL,i}$ as described in Section 3.1, is presented below as Equation (9).

$$Deliveries_{DNL,\ i} = Deliveries_{Day} + 10 \times Deliveries_{Night} \quad (9)$$

$Deliveries_{Day}$ are between 7 AM and 10 PM and $Deliveries_{Night}$ are between 10 PM and 7 AM. If a portion of a delivery (either takeoff or landing) occurs in the nighttime hours, then it should be counted within $Deliveries_{Night}$.

For estimating noise exposure, the noise levels for each flight phase should be considered separate based on the level of proposed operations for a given location. If a particular location is at the transition of different flight phases, the cumulative noise exposure should then be determined by adding the noise from each phase. For example, a typical mission profile will include noise from multiple flight phases:

1. UA departure from and return to a nest, including transition to and from vertical to horizontal en route flight;
2. En route flight at a defined altitude to and from a nest to a delivery point; and
3. Transition to and from horizontal en route flight to vertical flight at the delivery point, vertical descent to complete a delivery at the delivery point, and vertical ascent back to en route altitude for return to a nest.

4.1 Noise Exposure for Operations at the Nest

For operations at the Nest, the UA-related noises include takeoff, landing, and transitions from vertical to horizontal flight between the respective en route flight phases. To provide a conservative view, all operations are assumed to be on the same en route flight path with outbound and inbound flights traversing it in opposite directions.

Table 6 presents data for the proposed number of daily average DNL Equivalent deliveries (including the takeoff and climb, transition to en route outbound, transition from en route inbound, and descent and landing as detailed in Section 2.1.2), the estimated extent of DNL 45 dB, 50 dB, 55 dB, 60 dB, and 65 dB contours under the flight path, for an en route altitude of 150 ft, at a nest as described in Section 3.2. The results presented in Table 6 were rounded up conservatively to the nearest 25 ft intervals out to 1,000 feet using the data from Section 2.2. The actual noise levels, should they be calculated with greater precision or measured, are anticipated to be within the estimated extents depicted.[8]

[8] The calculation of the equations presented in Section 3 require that distance is provided. The DNL levels were calculated at 25-foot intervals from 28.3 to 1,000 ft as provided in Section 2.2.

Table 6. Estimated Extent of Noise Exposure from Nest per Number of Deliveries

Number of DNL Equivalent Deliveries Served Per Nest		Estimated Extent in Feet for				
Average Daily	Annual	DNL 45 dB	DNL 50 dB	DNL 55 dB	DNL 60 dB	DNL 65 dB
<= 1	<= 365	<28.3	<28.3	<28.3	<28.3	<28.3
<= 5	<= 1,825	50	28.3	<28.3	<28.3	<28.3
<= 10	<= 3,650	75	28.3	<28.3	<28.3	<28.3
<= 15	<= 5,475	75	50	28.3	<28.3	<28.3
<= 20	<= 7,300	100	50	28.3	<28.3	<28.3
<= 40	<= 14,600	150	75	50	28.3	<28.3
<= 60	<= 21,900	200	100	50	28.3	<28.3
<= 80	<= 29,200	225	125	50	28.3	<28.3
<= 100	<= 36,500	275	125	75	28.3	<28.3
<= 120	<= 43,800	300	150	75	50	28.3
<= 140	<= 51,100	350	150	75	50	28.3
<= 160	<= 58,400	375	175	100	50	28.3
<= 180	<= 65,700	425	175	100	50	28.3
<= 200	<= 73,000	475	200	100	50	28.3
<= 220	<= 80,300	500	200	100	50	28.3
<= 240	<= 87,600	550	225	100	50	28.3
<= 260	<= 94,900	600	225	125	75	28.3
<= 280	<= 102,200	650	250	125	75	28.3
<= 300	<= 109,500	700	250	125	75	28.3
<= 340	<= 124,100	900	275	125	75	28.3
<= 360	<= 131,400	Note e	300	150	75	50
<= 380	<= 138,700	Note e	300	150	75	50
<= 400	<= 146,000	Note e	325	150	75	50

Notes:
a) One delivery includes the outbound takeoff and inbound landing and is representative of two operations.
b) If a value for number of deliveries is not specifically defined in this table, use the next highest value. For example, if there are 50 average daily DNL Equivalent deliveries, use the entry for 60 average daily DNL Equivalent deliveries.
c) If a DNL value at an estimated extent is not specifically defined in this table, use the next highest value. For example, to determine the DNL at a distance of 70 feet for 60 daily DNL Equivalent Deliveries, use the value at 50 feet corresponding to DNL 55 dB.
d) 28.3 feet is the closest distance for which noise data is available. The DNL value for distances <28.3 ft is undefined.
e) The DNL noise level noted extends more than 1,000 feet from the nest based on the level of operations specified as the aircraft continues along its en route flight path. En route results in Section 4.2 may be more applicable in these instances for determining noise levels.

4.2 Noise Exposure under En Route Paths

For noise estimation under en route conditions, the UA is conservatively assumed to fly the same outbound flight path between the nest and the delivery point and inbound flight path back to the nest (Section 3.3.2). Therefore, each location under the en route path would be overflown twice for each delivery served by the respective overhead en route path.

Table 7 provides the estimated DNL for a location on the ground directly under an en route path for various counts of daily average DNL Equivalent deliveries. The en route noise calculated for each delivery includes both the inbound and outbound traversal of the en route path at 150 feet AGL and a ground speed of 51 knots.

Table 7. Estimated Noise Exposure Directly Under En Route Flight Paths

Number of DNL Equivalent Deliveries Served by Route		DNL - 150' AGL
Average Daily	Annual	
<= 1	<= 365	18.8
<= 5	<= 1,825	25.8
<= 10	<= 3,650	28.8
<= 15	<= 5,475	30.6
<= 20	<= 7,300	31.8
<= 40	<= 14,600	34.9
<= 60	<= 21,900	36.6
<= 80	<= 29,200	37.9
<= 100	<= 36,500	38.8
<= 120	<= 43,800	39.6
<= 140	<= 51,100	40.3
<= 160	<= 58,400	40.9
<= 180	<= 65,700	41.4
<= 200	<= 73,000	41.8
<= 220	<= 80,300	42.3
<= 240	<= 87,600	42.6
<= 260	<= 94,900	43.0
<= 280	<= 102,200	43.3
<= 300	<= 109,500	43.6
<= 340	<= 124,100	44.1
<= 360	<= 131,400	44.4
<= 380	<= 138,700	44.6
<= 400	<= 146,000	44.9

In some instances, the UA may overfly locations at operational levels that differ from both an inbound and outbound traversal of the en route path by the UA as described above and presented in Table 7. For these circumstances, Table 8 presents the equations for calculating the estimated DNL for a receiver directly under a specified given number of DNL Equivalent average daily individual overflights, defined as N_o.

Table 8. Estimated Noise Exposure Directly Under Overflights

Altitude for Overflight	Weight for Overflight	SEL for 1 Overflight (dB)	DNL for 1 Overflight between 7 AM and 10 PM (dB)[a]	DNL equation for the number of DNL Equivalent Overflights
150 feet AGL	Maximum	68.2	18.8	$10 \times \log_{10}(N_o) + 18.8$
200 feet AGL	Maximum	66.6	17.3	$10 \times \log_{10}(N_o) + 17.3$
250 feet AGL	Maximum	65.4	16.1	$10 \times \log_{10}(N_o) + 16.1$
300 feet AGL	Maximum	64.4	15.1	$10 \times \log_{10}(N_o) + 15.1$
350 feet AGL	Maximum	63.6	14.2	$10 \times \log_{10}(N_o) + 14.2$
N feet AGL	Maximum	$12.5 \times \log_{10}\left(\frac{150}{N_{ft}}\right) + 68.2$	$SEL_1\ dB - 49.4$	$10 \times \log_{10}(N_o) + DNL_1\ dB$

Notes:
a) The DNL value for a given number of average DNL Equivalent Operations, N_o, can be found by using the equations associated with operation of the UA at a specified altitude and speed interval. In this case, one operation represents a single overflight.
b) All values in this table are for level flight at 51 knots.

4.3 Noise Exposure for Operations at Delivery Point

Table 9 presents the estimated DNL values for a range of potential daily average DNL Equivalent delivery counts at a delivery point. Also included in Table 9 is the equation for calculating the estimated DNL for a specific number of daily average DNL delivery counts at a delivery point, defined as N_d, for instances where the number of deliveries may fall between the range of presented delivery count intervals. The DNL values include the vertical flight from en route to delivery altitude, the delivery maneuver, and the vertical flight from delivery to en route as discussed in Section 3.3.4. The minimum distance is 28.2 feet from vertical profile of the delivery point and corresponds to the minimum distance for which measurement data is available as discussed in Section 3.3.1. Values are also presented at 28.2 feet from the delivery point which corresponds to minimum distance from the available measurement data and analysis presented by FAA. Values were also calculated at distances of 50 feet, 75 feet, 100 feet, and 125 feet from the delivery point and are representative of distances from which nearby properties may experience noise from a delivery.[9]

[9] The 2021 US Census national average lot size for single-family sold homes was 15,218 square feet. This is representative of a property with dimensions of a 123.36 x 123.36 foot square. 125 feet represents a 125-foot lateral width of the parcel rounded up to the nearest 25 feet. https://www.census.gov/construction/chars/ See file "Soldlotsize_cust.xls" sheet MALotSizeSold. Accessed August 17, 2022.

Table 9. Estimated Noise Exposure at Various Distances from a Delivery Point per Number of Deliveries

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	Estimated Delivery DNL at 28.3 feet (Minimum Measured Listener Distance)	Estimated Delivery DNL at 50 feet	Estimated Delivery DNL at 75 feet	Estimated Delivery DNL at 100 feet	Estimated Delivery DNL at 125 feet
<= 1	<= 365	37.1	34.4	31.8	30.0	27.7
<= 5	<= 1,825	44.1	41.4	38.8	37.0	34.7
<= 10	<= 3,650	47.1	44.4	41.8	40.0	37.7
<= 15	<= 5,475	48.9	46.2	43.6	41.7	39.5
<= 20	<= 7,300	50.1	47.4	44.8	43.0	40.8
<= 40	<= 14,600	53.2	50.4	47.8	46.0	43.8
<= 60	<= 21,900	54.9	52.2	49.6	47.8	45.5
<= 80	<= 29,200	56.2	53.4	50.9	49.0	46.8
<= 100	<= 36,500	57.1	54.4	51.8	50.0	47.7
<= 120	<= 43,800	57.9	55.2	52.6	50.8	48.5
<= 140	<= 51,100	58.6	55.9	53.3	51.4	49.2
<= 160	<= 58,400	59.2	56.5	53.9	52.0	49.8
<= 180	<= 65,700	59.7	57.0	54.4	52.5	50.3
<= 200	<= 73,000	60.1	57.4	54.8	53.0	50.8
<= 220	<= 80,300	60.6	57.8	55.2	53.4	51.2
<= 240	<= 87,600	60.9	58.2	55.6	53.8	51.5
<= 260	<= 94,900	61.3	58.6	56.0	54.1	51.9
<= 280	<= 102,200	61.6	58.9	56.3	54.4	52.2
<= 300	<= 109,500	61.9	59.2	56.6	54.7	52.5
<= 340	<= 124,100	62.5	59.7	57.1	55.3	53.1
<= 360	<= 131,400	62.7	60.0	57.4	55.5	53.3
<= 380	<= 138,700	62.9	60.2	57.6	55.8	53.5
<= 400	<= 146,000	63.2	60.4	57.8	56.0	53.8

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5 Cumulative Noise Exposure

For instances where the proposed Wing Hummingbird 7000W-B operations would occur in areas subject to other aviation noise sources, it is necessary to evaluate the cumulative 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 and where Wing flight activity areas may overlap with those of other UA package delivery operators.

FAA *Order 1050.1F Environmental Impacts: Policies and Procedures* and the associated *1050.1F Desk Reference* defines the criteria for changes in noise exposure resulting from a proposed action and cumulative effects that are considered reportable and/or significant. *Order 1050.1F Section 4-3.3 Significance Thresholds* states the following pertaining to the environmental impact category of Noise and Noise Compatible Land Use.

> *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.*

Additionally, *Order 1050.1F Appendix B Section B-1.4 Environmental Consequences* requires additional reporting for air traffic airspace and procedure actions where the study area is larger than the immediate vicinity of an airport. In such cases noise exposure assessments should identify where noise will change by the following specified amounts:

1. For DNL 65 dB and higher: +1.5 dB
2. For DNL 60 dB to <65 dB: +3 dB
3. For DNL 45 dB to <60 dB: +5 dB

The FAA refers to noise changes meeting criteria 1 as “significant” and those meeting criteria 2 and 3 as “reportable”. Figure 1 presents the relationship between the dB difference in two noise sources and the increase resulting from the summation of those noise sources. The FAA’s change criteria of plus 1.5, 3, and 5 dB are also plotted on the curve for reference.

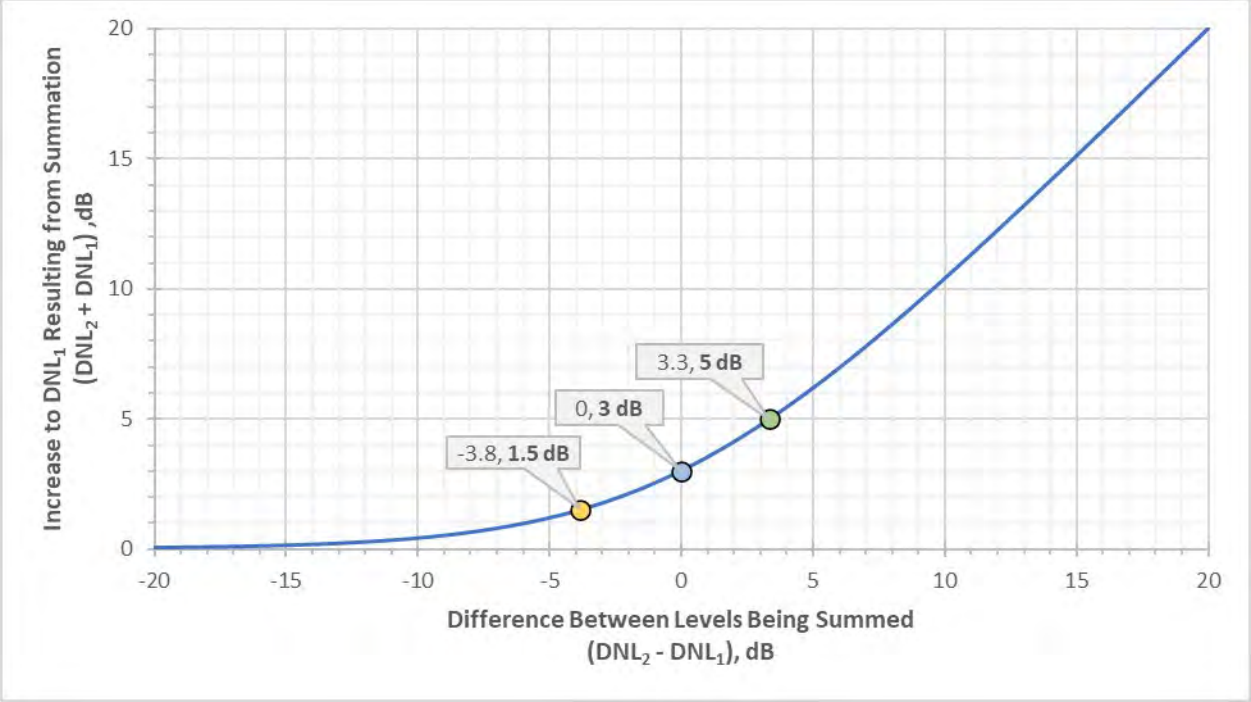

Figure 1. dB Increase Resulting from DNL Summation

Source: HMMH

Potential increases to DNL resulting from cumulative aviation noise effects can be evaluated with Figure 1 by considering the proposed action noise exposure as DNL_2 and the sum of all other aviation noise sources at the same location as DNL_1. If the difference between DNL_2 and DNL_1 is:

- Less than -3.8 dB, the increase in DNL would be less than 1.5 dB
- From -3.8 dB up to but not including 0 dB, the increase in DNL would range from 1.5 dB up to but not including 3 dB
- From 0 dB up to but not including 3.3 dB, the increase in DNL would range from 3 dB up to but not including 5 dB
- 3.3 dB or greater, the increase in DNL would be 5 dB or greater

Beyond differences of +/- 15 dB the curve becomes asymptotic to a slope of 1 and 0, illustrating that the addition of noise levels with differences greater than that results in effectively no increase from the higher of the two noise source levels being summed.

For noise assessment used in official environmental review documentation, the exact resulting combined noise exposure levels and associated changes should be calculated by use of Equation (8) presented earlier in Section 3.4**.** An example of applying Equation 8 to three aviation noise sources is presented in Table 10.

Table 10. Cumulative Noise Calculation Example

Noise Source	Noise Source Description	Single Source DNL (dB)	$10^{(DNL/10)}$	Combined Source DNL (dB) $10*Log_{10}(10^{(DNL/10)})$
1	Proposed Action (PA)	42	15848.9	-
2	Airport	55	316227.8	-
3	Other UAS	40	10000.0	-
2+3	Airport + Other UAS	-	326227.8	55.1
1+2+3	PA + Airport + Other UAS	-	342076.7	55.3
Delta	Change in Cumulative Noise	-	-	0.2

Appendix E
Biological Resources

Table E-1. State Species of Greatest Conservation Need in Denton, Collin, Tarrant, Dallas, Johnson, Ellis, Parker, Kaufman, Rockwall, and Wise Counties, Texas

Taxon	Scientific Name	Common Name	ESA Status	State Status
Amphibians				
	Ambystoma tigrinum	eastern tiger salamander		
	Desmognathus conanti	spotted dusky salamander		
	Anaxyrus woodhousii	Woodhouse's toad		
	Pseudacris streckeri	Strecker's chorus frog		
	Lithobates areolatus	southern crawfish frog		
Birds				
	Plegadis chihi	White-Faced Ibis		T
	Mycteria americana	Wood Stork		T
	Haliaeetus leucocephalus	Bald Eagle		
	Laterallus jamaicensis	Black Rail	LT	T
	Grus americana	Whooping Crane	LE	E
	Charadrius melodus	Piping Plover	LT	T
	Charadrius montanus	Mountain Plover		
	Calidris canutus rufa	Rufa Red Knot	LT	T
	Leucophaeus pipixcan	Franklin's Gull		
	Athene cunicularia hypugaea	Western Burrowing Owl		
	Anthus spragueii	Sprague's Pipit		
	Vireo atricapilla	Black-Capped Vireo		
	Setophaga chrysoparia	Golden-Cheeked Warbler	LE	E
	Calamospiza melanocorys	Lark Bunting		
	Calcarius ornatus	Chestnut-Collared Longspur		
Fish				
	Anguilla rostrata	American eel		
	Hybognathus nuchalis	Mississippi silvery minnow		

Taxon	Scientific Name	Common Name	ESA Status	State Status
Mammals				
	Myotis austroriparius	southeastern myotis bat		
	Myotis velifer	cave myotis bat		
	Perimyotis subflavus	tricolored bat		
	Eptesicus fuscus	big brown bat		
	Lasiurus borealis	eastern red bat		
	Lasiurus cinereus	hoary bat		
	Nyctinomops macrotis	big free-tailed bat		
	Sylvilagus aquaticus	swamp rabbit		
	Cynomys ludovicianus	black-tailed prairie dog		
	Ondatra zibethicus	muskrat		
	Ursus americanus	black bear		T
	Mustela frenata	long-tailed weasel		
	Spilogale putorius	eastern spotted skunk		
	Conepatus leuconotus	western hog-nosed skunk		
	Puma concolor	mountain lion		
Reptiles				
	Macrochelys temminckii	alligator snapping turtle		T
	Deirochelys reticularia miaria	western chicken turtle		
	Terrapene carolina	eastern box turtle		
	Terrapene ornata	western box turtle		
	Apalone mutica	smooth softshell		
	Ophisaurus attenuatus	slender glass lizard		
	Phrynosoma cornutum	Texas horned lizard		T
	Plestiodon septentrionalis	prairie skink		
	Heterodon nasicus	western hognose snake		
	Nerodia harteri	Brazos water snake		T
	Thamnophis sirtalis annectens	Texas garter snake		
	Crotalus horridus	timber (canebrake) rattlesnake		
	Crotalus viridis	western rattlesnake		
	Sistrurus tergeminus	western massasauga		

Taxon	Scientific Name	Common Name	ESA Status	State Status
	Sistrurus miliarius	pygmy rattlesnake		
Crustaceans				
	Caecidotea bilineata	no accepted common name		
	Procambarus steigmani	Parkhill Prairie crayfish		
Insects				
	Bombus pensylvanicus	American bumblebee		
	Pogonomyrmex comanche	Comanche harvester ant		
	Amblycorypha uhleri	no accepted common name		
	Arethaea ambulator	no accepted common name		
	Neotrichia juani	no accepted common name		
Mollusks				
	Lampsilis satura	sandbank pocketbook		T
	Pleurobema riddellii	Louisiana pigtoe		T
	Potamilus amphichaenus	Texas heelsplitter		T
	Potamilus streckersoni	Brazos heelsplitter		T
	Fusconaia chunii	Trinity pigtoe		T
	Truncilla macrodon	Texas fawnsfoot	PT	T
Plants				
	Matelea edwardsensis	plateau milkvine		
	Echinacea atrorubens	Topeka purple-coneflower		
	Liatris glandulosa	glandular gay-feather		
	Senecio quaylei	Quayle's butterweed		
	Geocarpon minimum	earth fruit	LT	T
	Cuscuta exaltata	tree dodder		
	Astragalus reflexus	Texas milk vetch		
	Dalea hallii	Hall's prairie clover		
	Dalea reverchonii	Comanche Peak prairie clover		
	Pediomelum cyphocalyx	turnip-root scurfpea		
	Pediomelum reverchonii	Reverchon's scurfpea		
	Phlox oklahomensis	Oklahoma phlox		
	Crataegus viridis var. glabriuscula	Sutherland hawthorn		

Taxon	Scientific Name	Common Name	ESA Status	State Status
	Agalinis auriculata	earleaf false foxglove		
	Agalinis densiflora	Osage Plains false foxglove		
	Yucca necopina	Glen Rose yucca		
	Carex shinnersii	Shinner's sedge		
	Cyperus grayioides	Mohlenbrock's sedge		
	Schoenoplectus hallii	Hall's baby bulrush		
	Hexalectris nitida	Glass Mountains coral-root		
	Hexalectris warnockii	Warnock's coral-root		

Source: Texas Parks & Wildlife Department 2020.
LT: Federally threatened; LE: Federally endangered; PT: Proposed threatened; T: Threatened; E: Endangered

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

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SUBJECT: Endangered Species Act Section 7 Consultation for Unmanned Aircraft Commercial Package Delivery Operations in Dallas-Fort Worth, Texas Area

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 Dallas-Fort Worth (DFW) metropolitan area ***may affect, but is not likely to adversely affect***, the tricolored bat (*Perimyotis subflavus*), golden-cheeked warbler (*Setophaga chrysoparia*), and whooping crane (*Grus americana*). 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

Over the past several years, Wing has been working under various FAA programs, including the Unmanned Aircraft Systems Integration Pilot Program and the BEYOND program, as well as the FAA's established processes to bring certificated commercial UA delivery into practice. Participants in these programs are among the first to prove their concepts—including package delivery by UA—using current regulations and exemptions and waivers from some of the regulatory requirements.

Wing currently operates under 14 Code of Federal Regulations (CFR) Part 135 from Frisco and Little Elm, 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) in those areas of Texas. 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 the DFW metropolitan area to the operating area included in its OpSpecs for Texas.

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

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 the DFW metropolitan area (see **Figure 1**). Wing projects operating 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. Wing projects establishing up to 25 nests in the DFW operating area. 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 could 10,000 (400 Ops*25 Nests).

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 the DFW metro area 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 during daytime hours (7am to 7pm), typically five days of the week (including weekends), and generally exclude holidays unless related to a community event or holiday-related promotion. Wing is not proposing to conduct nighttime operations (the time between the end of evening civil twilight and the beginning of morning civil twilight, as published in the Air Almanac, converted to local time).

Unmanned Aircraft

The primary UA used for the proposed operations is Wing's Hummingbird 7000W-B, which features a multi-rotor design with sixteen round diameter propellers (see **Figure 2**). The 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 7000W-B is a derivative design from the 7000W-A previously assessed for Frisco and Little Elm and was updated for noise reductions in cruise flight. All wing aircraft use electric power from rechargeable lithium-ion batteries.

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 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.

Predicted Sound Levels

The FAA conducted a noise analysis using sound level measurement data for a prior version of the UA—the Hummingbird 7000W-A. Wing reports that improvements made to the 7000W-B model have reduced the overall operating sound level of the UA, and as such, use of the 7000W-A as a surrogate in the noise analysis is conservative for noise estimation. The estimated maximum sound exposure level (SEL) for the takeoff, delivery, and landing phases of flight is approximately 86.5 decibels (dB) at about 28 feet from the drone as shown in Tables 3–5 in the noise report (see **Attachment B** for the noise report). Predicted sound levels decrease as distances from the drone increase. The average maximum SEL for the en route phase is approximately 64 dB when the drone is flying 56 knots at 200 feet AGL (Table 2 in **Attachment B**).

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 Texas Parks and Wildlife Department (TPWD), the action area overlaps two natural regions or ecoregions: Cross Timbers (on the western portion of the action area) and Blackland Prairie (on the eastern portion of the action area) (TPWD 2023a). 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 highly urbanized, as it contains the cities of Dallas, Fort Worth, Arlington, Garland, Plano, Frisco, and Denton. Outside these cities, much of the land has been converted to agricultural fields. There are forest patches interspersed throughout the action area, particularly along drainages and near waterbodies.

- The Cross Timbers region in north and central Texas includes areas with high density of trees and irregular plains and prairies. Soils are primarily sandy to loamy. Rainfall can be moderate,

but somewhat erratic, therefore moisture is often limiting during part of the growing season. Also known as the Osage Plains, it is the southernmost of three tallgrass prairies. It varies from savannah and woodland to the east and south, into shorter mixed-grass prairie to the west. As in the rest of the Great Plains, fire, topography, and drought maintained prairie and established the location of woodlands (TPWD 2023b).

- The Blackland Prairies region is named for the deep, fertile black soils that characterize the area. Blackland Prairie soils once supported a tallgrass prairie dominated by tall-growing grasses such as big bluestem, little bluestem, indiangrass, and switchgrass. Because of the fertile soils, much of the original prairie has been plowed to produce food and forage crops. The landscape is gently rolling to nearly level, and elevations range from 300 to 800 feet above sea level. Crop production and cattle ranching are the primary agricultural industries (TPWD 2023b).

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 Texas fawnsfoot (*Truncilla macrodon*).

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

Common Name	Scientific Name	ESA Status
Mammals		
Tricolored bat	*Perimyotis subflavus*	Proposed Endangered
Birds		
Golden-cheeked warbler	*Setophaga chrysoparia*	Endangered
Piping plover	*Charadrius melodus*	Threatened
Red knot	*Calidris canutus rufa*	Threatened
Whooping crane	*Grus americana*	Endangered
Clams		
Texas fawnsfoot	*Truncilla macrodon*	Proposed Threatened
Insects		
Monarch butterfly	*Danaus plexippus*	Candidate

The Official Species List states that the piping plover and red knot only need to be considered for wind energy projects. Since the action is not a wind energy project, these two species are not considered further.

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 wound 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 the Texas fawnsfoot critical habitat. The FAA has determined the action would have *no effect* on Texas fawnsfoot critical habitat.

UA noise 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 an urban environment, 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 SEL associated with Wing's proposed operations is 86.5 dB, which would occur when the drone is taking off from or landing at a nest in a commercial area and during a delivery. 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 dB. The SEL on the ground when the UA is flying in the en route phase at an altitude of 200 feet AGL is estimated to be around 64 dB, 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 dB. None of the predicted sound levels for the different flight phases exceed SEL 86.5 dB.

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

Tricolored Bat

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 2023a). This species spends six to nine months per year hibernating in caves or mines (TPWD 2023c). The USFWS has proposed to list the tricolored bat as an endangered species, primarily due to white-nose syndrome.[2] Other factors that influence the tricolored bat's viability include wind-energy-related mortality, habitat loss, and effects from climate change.

Suitable habitat for tricolored bat 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 a tricolored bats occurring in the action area, particularly in the urban environment where nests would be located and deliveries would occur (see **Figure 3**). Nests would be located in commercial areas and therefore not within suitable habitat for tricolored bats.

As stated above, Wing is proposing UA operations during the daytime. Therefore, the time period that represents the greatest potential for the action to affect a tricolored bat is at dawn and dusk. Also, the risk is only present for 3–6 months each year (i.e., when bats are not hibernating). Tricolored 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. 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

[2] 87 Federal Register 56381 (September 14, 2022).

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 around dawn and dusk when foraging. Given the bat's ability to avoid flying into objects, the short period of time the UA would be in any one place, and the low probability of encountering a tricolored 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 a tricolored bat 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 tricolored bat. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Golden-cheeked Warbler

Golden-cheeked warblers are insectivores that typically forage in forest habitats. Its entire nesting range is currently confined to habitat in 33 counties in central Texas; a portion of one of these counties (Johnson County) is located in the southwest section of the action area. Golden-cheeked warblers prefer mature Ashe juniper (*Juniperus ashei*) trees mixed with hardwood trees as nesting and foraging sites (preferring forested tracts greater than 12 acres). Many woodlands that were once present in the action have been cleared for urbanization and agriculture. The golden-cheeked warbler is listed under the ESA primarily due to habitat loss and fragmentation, since they have specific nesting habitat requirements (USFWS 2023b; TPWD 2023d).

The action does not involve ground disturbance or vegetation removal and therefore would not physically impact any golden-cheeked warbler suitable habitat. If present in the action area, golden-cheeked warblers 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 golden-cheeked warblers. 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).

Golden-cheeked warblers 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 the species' ability to fly and avoid the UA, as well as the low probability of encountering a golden-cheeked warbler during drone deliveries. Additionally, Wing has reported that there has never been a bird strike with its drones in the United States.

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 golden-cheeked warbler, 4) any increase in ambient sound levels would be short in duration, 5) the low probability of a golden-cheeked warbler occurring in the action area, and 6) the low likelihood of the UA

striking a warbler, the FAA has determined that the action ***may affect, but is not likely to adversely affect,*** the golden-cheeked warbler. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Whooping Crane

Whooping cranes use a variety of habitats, including wetlands, estuaries, pastures, agricultural fields, and shallow areas of open water habitats. They are omnivores that eat a variety of food including insects, reptiles, rodents, fish, small birds, mollusks, crustaceans, and berries. Whooping cranes breed in northwest Canada and migrate south and winter in Texas, primarily in the Aransas National Wildlife Refuge located on the Gulf coast (TPWD 2023e). The whooping crane is listed under the ESA primarily due to hunting pressures and habitat loss (USFWS 2023c; Cornell 2023). Suitable foraging habitat in the action area includes shallow areas of open water habitats, marshes, pastures, and agricultural fields.

The whooping crane may occur in the action area in the spring or fall months as it migrates to and from its breeding grounds in Canada and wintering grounds at the Aransas National Wildlife Refuge. The majority of migrant crane observations in Texas occur in the spring from March 19 – April 30 and fall from October 20 – November 24 (Pearse et al. 2020). The crane may use habitat (e.g., agricultural fields) in the action area as a stopover site to feed or rest during migration.

The action does not include ground disturbance and therefore would not physically impact potential foraging or resting habitat. If present in the action area during operations, whooping cranes 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 whooping crane during operations, and the short period of time the UA would be in any particular location, UA noise is not expected to adversely affect whooping cranes. 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).

Whooping cranes could be struck by a drone when in flight. The risk of a strike is low given the crane's limited occurrence in the action area and the crane's ability to fly and avoid the UA. Additionally, Wing has reported that there has never been a bird strike with its drones in the United States.

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 whooping crane, 4) any increase in ambient sound levels would be short in duration, 5) the low probability of a whooping crane occurring in the action area, and 6) the low likelihood of the UA striking a whooping crane, the FAA has determined that the action ***may affect, but is not likely to adversely affect,*** the whooping crane. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Texas Fawnsfoot

The Texas fawnsfoot is a freshwater mussel that is endemic to Texas and found in the three river basins: Colorado, Brazos, and Trinity. The action does not involve any ground-disturbing activities or activities within Texas fawnsfoot habitat. As there is no plausible route of effect to this species, the FAA determined the action would have ***no effect*** on the Texas fawnsfoot.

Monarch 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. While portions of the action area may contain potential summer breeding habitat, the entirety of Texas is within the migration path of monarch butterflies flying back and forth to wintering grounds in Mexico (TPWD 2023f).

The action would not physically affect monarch 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.

Conclusion

Based on the analysis above, the FAA has determined the action ***may affect, but is not likely to adversely affect***, the tricolored bat, golden-cheeked warbler, and whooping crane. 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 Mr. Mike Millard, of my staff, at 202-267-7906 or at Mike.Millard@faa.gov.

Sincerely,

DAVID M MENZIMER

Digitally signed by DAVID M MENZIMER
Date: 2023.04.20 08:39:20 -07'00'

Dave Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial 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

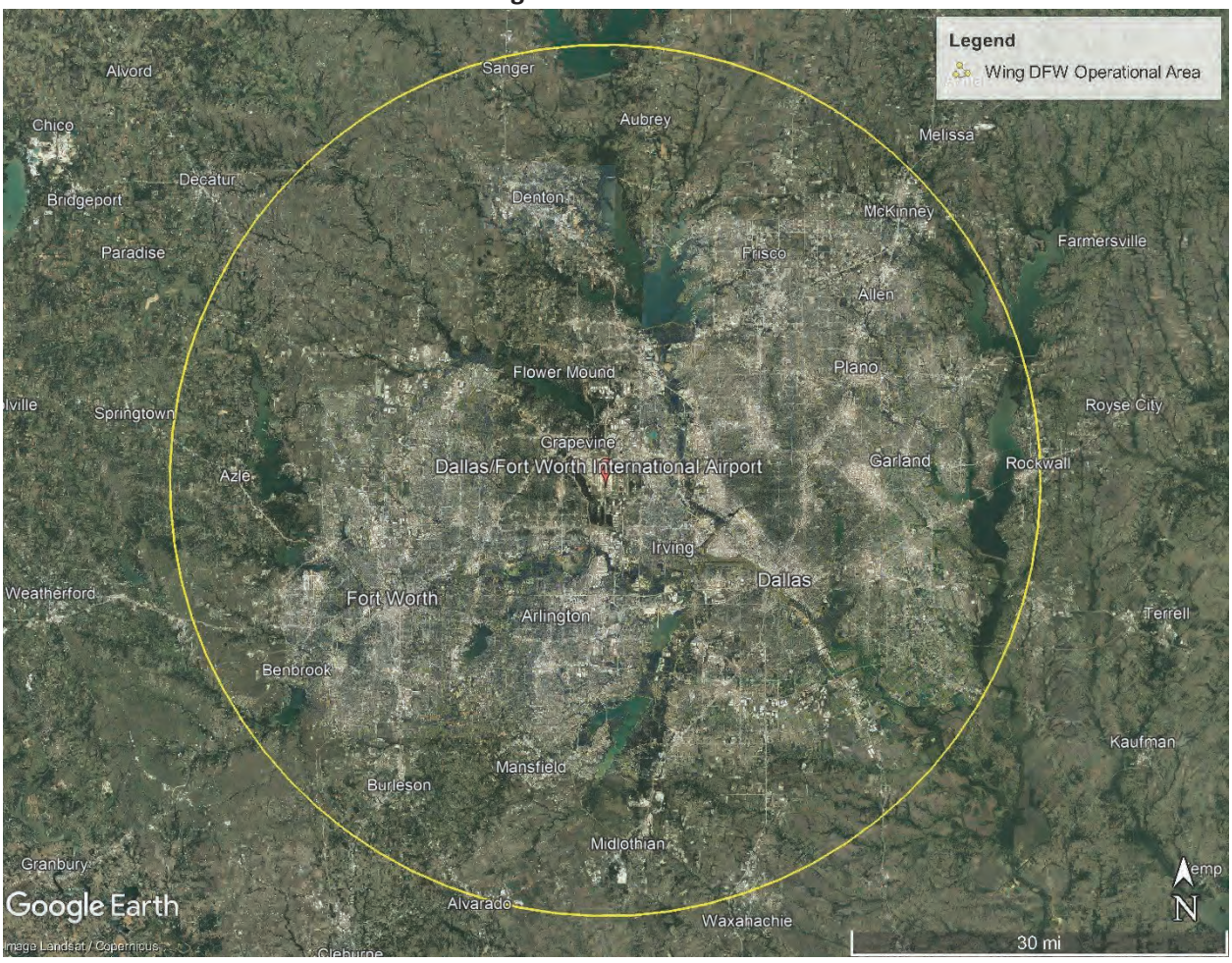
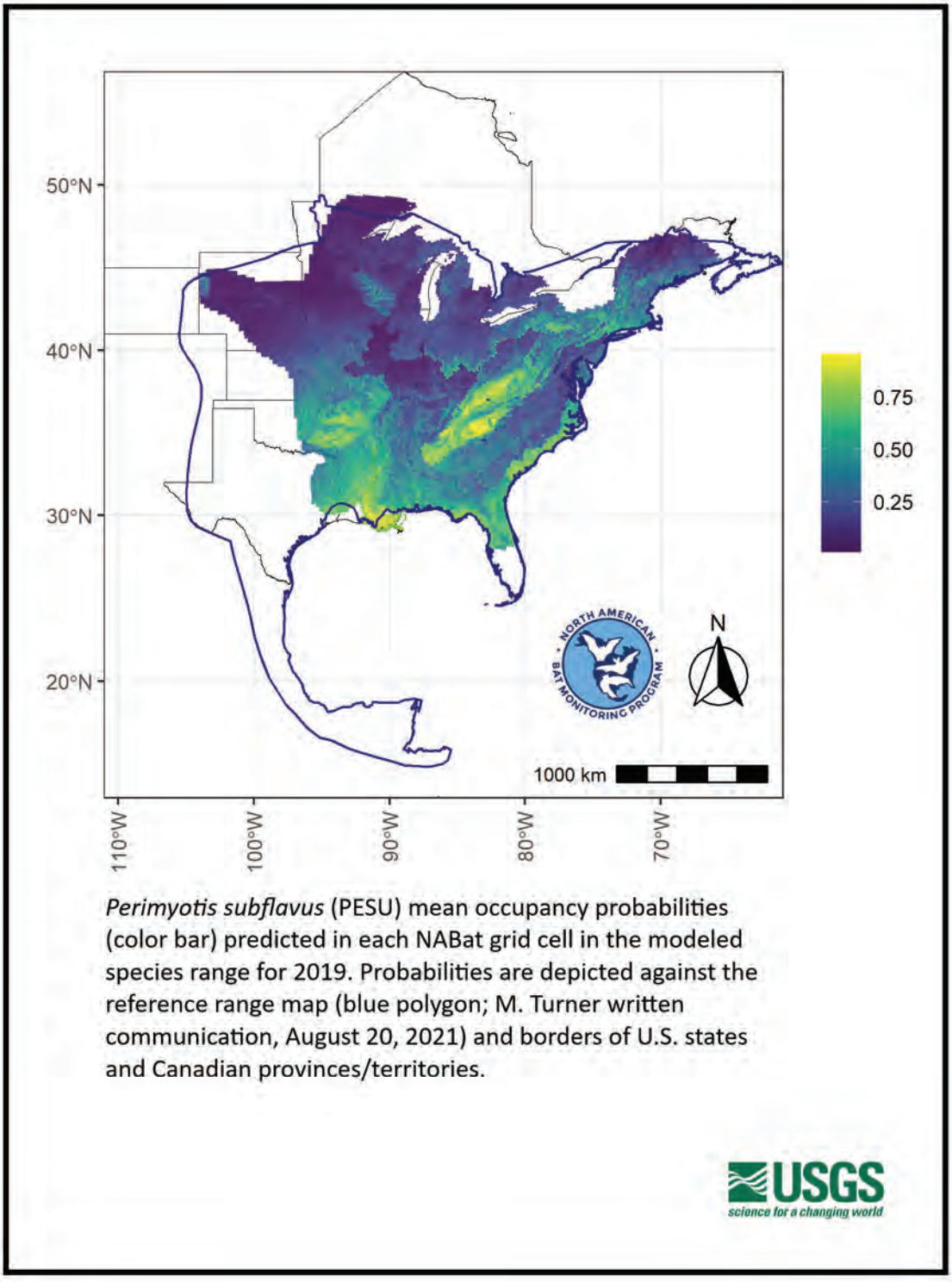


Figure 2. Wing Hummingbird Unmanned Aircraft with Package Attached

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.

Attachment A. USFWS Official Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arlington Ecological Services Field Office
2005 Ne Green Oaks Blvd
Suite 140
Arlington, TX 76006-6247
Phone: (817) 277-1100 Fax: (817) 277-1129
Email Address: arles@fws.gov

In Reply Refer To:
Project Code: 2023-0022477
Project Name: Wing

December 07, 2022

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, which may occur within the boundary of 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.).

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 section 7(a)(1) of the Act, Federal agencies are directed to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Under and 7(a)(2) and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to determine whether their actions may affect threatened and endangered species and/or designated critical habitat. A Federal action is an activity or program authorized, funded, or carried out, in whole or in part, by a Federal agency (50 CFR 402.02).

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 Federal actions 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.

After evaluating the potential effects of a proposed action on federally listed species, one of the following determinations should be made by the Federal agency:

1. *No effect* - the appropriate determination when a project, as proposed, is anticipated to have no effects to listed species or critical habitat. A "no effect" determination does not require section 7 consultation and no coordination or contact with the Service is necessary. However, the action agency should maintain a complete record of their evaluation, including the steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related information.
2. *May affect, but is not likely to adversely affect* - the appropriate determination when a proposed action's anticipated effects to listed species or critical habitat are insignificant, discountable, or completely beneficial. Insignificant effects relate to the size of the impact and should never reach the scale where "take" of a listed species occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not be able to meaningfully measure, detect, or evaluate insignificant effects, or expect discountable effects to occur. This determination requires written concurrence from the Service. A biological evaluation or other supporting information justifying this determination should be submitted with a request for written concurrence.
3. *May affect, is likely to adversely affect* - the appropriate determination if any adverse effect to listed species or critical habitat may occur as a consequence of the proposed action, and the effect is not discountable or insignificant. This determination requires formal section 7 consultation.

The Service has performed up-front analysis for certain project types and species in your project area. These analyses have been compiled into *determination keys*, which allows an action agency, or its designated non-federal representative, to initiate a streamlined process for determining a proposed project's potential effects on federally listed species. The determination keys can be accessed through IPaC.

The Service recommends that candidate species, proposed species, and proposed critical habitat be addressed should consultation be necessary. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found at: https://www.fws.gov/service/section-7-consultations

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please 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 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.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (https://www.fws.gov/library/collections/bald-and-golden-eagle-management). Additionally, wind energy projects should follow the wind energy guidelines (https://www.fws.gov/media/land-based-wind-energy-guidelines) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: https://www.fws.gov/media/recommended-best-practices-communication-tower-design-siting-construction-operation. The Federal Aviation Administration (FAA) released specifications for and made mandatory flashing L-810 lights on new towers 150-350 feet AGL, and the elimination of L-810 steady-burning side lights on towers above 350 feet AGL. While the FAA made these changes to reduce the number of migratory bird collisions (by as much as 70%), extinguishing steady-burning side lights also reduces maintenance costs to tower owners. For additional information concerning migratory birds and eagle conservation plans, please contact the Service's Migratory Bird Office at 505-248-7882.

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 Tracking Number 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
- Migratory Birds
- 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:

Arlington Ecological Services Field Office
2005 Ne Green Oaks Blvd
Suite 140
Arlington, TX 76006-6247
(817) 277-1100

Project Summary

Project Code: 2023-0022477
Project Name: Wing
Project Type: Drones - Use/Operation of Unmanned Aerial Systems
Project Description: Wing Drone Delivery Service - USFWS Consultation
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@32.89683015,-97.03799599999999,14z

Counties: Texas

Endangered Species Act Species

There is a total of 7 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. Note that 2 of these species should be considered only under certain conditions.

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
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Birds

NAME	STATUS
Golden-cheeked Warbler *Setophaga chrysoparia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/33	Endangered
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 does not overlap the critical habitat. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Clams

NAME	STATUS
Texas Fawnsfoot *Truncilla macrodon* There is **proposed** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8965	Proposed Threatened

Insects

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

Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Texas Fawnsfoot *Truncilla macrodon* https://ecos.fws.gov/ecp/species/8965#crithab	Proposed

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arlington, Texas, Ecological Services Field Office
501 West Felix Street, Suite 1105
Fort Worth, TX 76115

In Reply Refer To:
2023-0022477

May 8, 2023

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
800 Independence Ave., SW
Washington, DC 20591

RE: Endangered Species Act Section 7 Consultation for Unmanned Aircraft Commercial Package Delivery Operations for Dallas-Fort Worth metro area in Texas.

Dear Mr. Menzimer:

This responds to the Federal Aviation Administration's (FAA) April 20, 2023 letter requesting consultation pursuant to section 7 of the Endangered Species Act of 1973 as amended (16 U.S.C. 1531-1544) (Act). Your letter includes a Biological Evaluation (BE) for the proposed unmanned aircraft (UA) commercial package delivery operations in the Dallas-Fort Worth (DFW) metropolitan area. You concluded that the proposed action would have no effect on the Texas fawnsfoot (*Truncilla macrodon*), and may affect, but is not likely to adversely affect the tricolored bat (*Perimyotis subflavus*), monarch butterfly (*Danaus plexippus*), golden-cheeked warbler (*Setophaga chrysoparia*), and whooping crane (*Grus americana*). The piping plover (*Charadrius melodus*) and red knot (*Calidris canutus rufa*) were not considered, as consultation is only recommended for wind energy projects for those species.

The purpose of the proposed action is to conduct deliveries (up to 400 flights per day) from 25 nest located in the DFW operating area (action area, Figure 1), such as healthcare products and other partnerships with merchants in the area. Each nest would be located in a commercial area, such as a shopping center, large retailer, shopping mall, etc. The specific UA to be used, Wing's Hummingbird 7000W-B, weighs under 15 pounds, with a maximum payload weight of 2.7 pounds. Actions included in the proposed project that could affect listed species include the following:

- Unmanned aircraft flight operations within the DFW metropolitan area between nest and delivery sites:
    - Takeoff
    - En route outbound

- Delivery
- En route inbound
- Landing

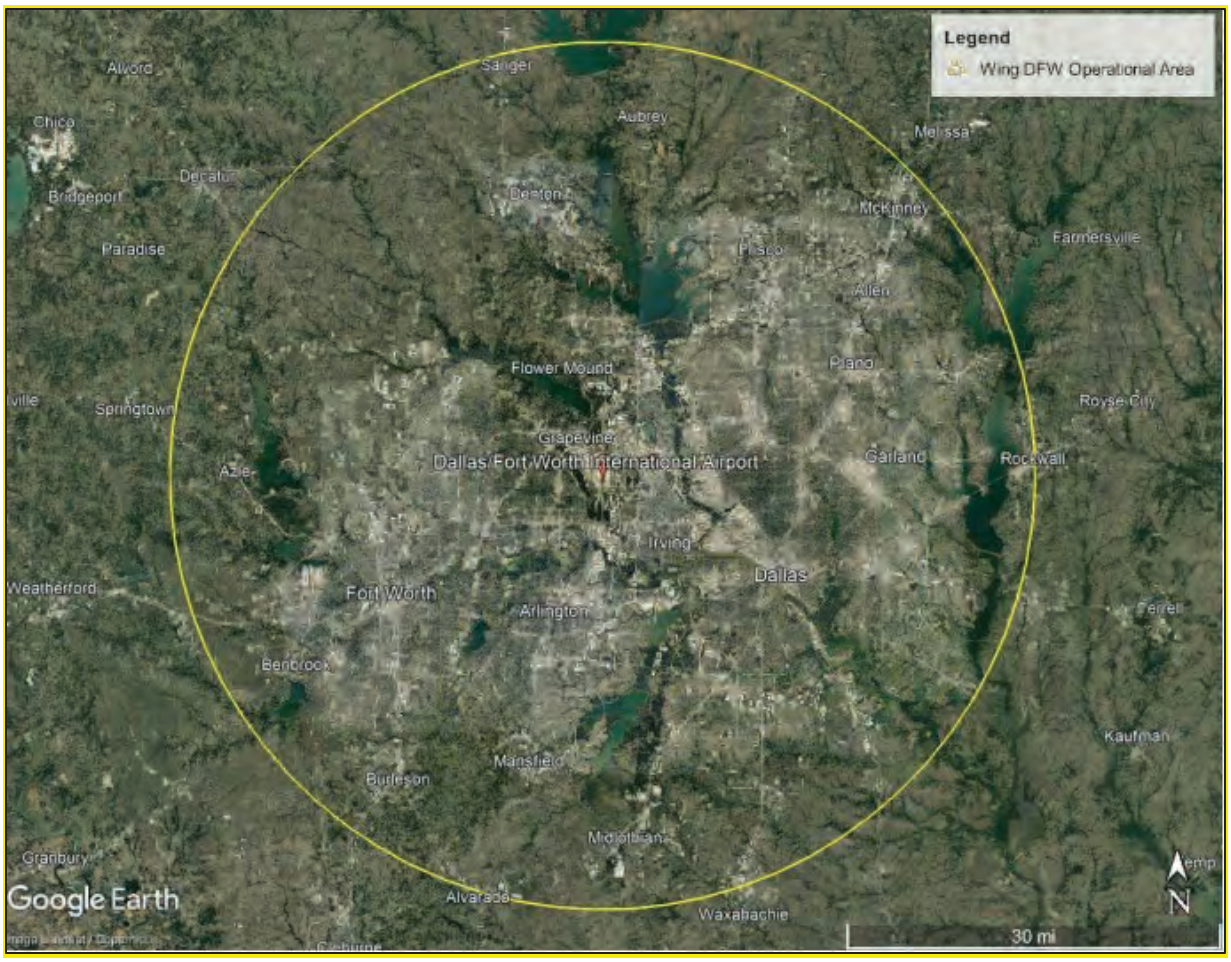

Figure 1. DFW Operational Area.

The federally-listed, proposed listed, and candidate species known to occur in the action area and relevant to the proposed action are the endangered golden-cheeked warbler (*Setophaga chrysoparia*) and whooping crane (*Grus americana*), the proposed threatened Texas fawnsfoot (*Truncilla macrodon*), the proposed endangered tricolored bat (*Perimyotis subflavis*), and the candidate monarch butterfly (*Danaus plexippus*). The proposed action area does contain proposed critical habitat for Texas fawnsfoot, but does not involve any ground-disturbing activities on or in the proposed critical habitat area. Proposed species are not currently protected under the Act; however, conferencing is necessary if it is determined a federal action is likely to jeopardize the continued existence of a proposed species. Your BE does not indicate the need for conference on the proposed species. Furthermore, candidate species are not afforded protection

under the Act, but we do suggest consideration of candidate species in project planning for the purpose of reducing impacts. We recommend you maintain the information used to make these determinations (evaluations, photos, habitat descriptions, etc.) with your project file.

The golden-cheeked warbler is a small, insectivorous neo-tropical songbird. The breeding range for the species encompasses areas in North central Texas through the eastern and south-central portions of the Edwards Plateau. Golden-cheeked warblers breed exclusively in the mixed Ashe juniper/deciduous woodlands. These songbirds require the shredding bark produced by mature Ashe junipers for nest material. Breeding habitat has diminished due to juniper eradication programs and continuing urbanization in central Texas. The species suffers from cowbird parasitism, which may be increasing as habitat becomes fragmented. Human presence may deter warblers from utilizing adjacent habitat, cause them to abandon habitat, or otherwise disrupt normal breeding, feeding, or sheltering activities during the breeding season, thereby degrading suitable habitat. 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 golden-cheeked warbler, 4) any increase in ambient sound levels would be short in duration, 5) the low probability of a golden-cheeked warbler occurring in the action area, and 6) the low likelihood of the UA striking a warbler," the FAA has determined that the action may affect, but is not likely to adversely affect, the golden-cheeked warbler. Any effects would be discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated).

Whooping cranes currently exist in three wild populations and in captivity at 12 sites. There is only one self-sustaining wild population, the Aransas-Wood Buffalo National Park population, which nests in Wood Buffalo National Park and adjacent areas in Canada, and winters in coastal marshes in Texas. The migratory corridor runs in an approximately straight line from northwest Canada through the Great Plains to overwinter on the Gulf Coast. The whooping crane breeds, migrates, winters, and forages in a variety of wetland and other habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural fields. The largest amount of stopover foraging time is spent feeding in harvested grain fields. While cranes generally avoid areas with human activity present (e.g., roads, neighborhoods, etc.), suitable stopover habitat for the species may be present in the proposed project areas. 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 whooping crane, 4) any increase in ambient sound levels would be short in duration, 5) the low probability of a whooping crane occurring in the action area, and 6) the low likelihood of the UA striking a whooping crane," the FAA has determined that the action may affect, but is not likely to adversely affect, the whooping crane. Any effects would be discountable or insignificant.

Based on the information provided within the BE, we concur with your determination that the project, as proposed may affect, but is not likely to adversely affect the golden-cheeked warbler and whooping crane pursuant to section 7 of the Act. Therefore, no further section 7 consultation will be required unless: 1) the identified action is subsequently modified in a manner that causes an effect on a listed species or designated critical habitat; 2) new information reveals the

identified action may affect federally listed species or designated critical habitat in a manner or to an extent not previously considered; or 3) a new species is listed or a critical habitat is designated under the Act that may be affected by the identified action. If new effects are identified in the future, section 7 consultation may need to be reinitiated.

Please note that this guidance does not authorize bird mortality for species that are protected under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. sec.703-712). If you believe migratory birds will be affected by this activity, we recommend you contact our Migratory Bird Permit Office at P.O. Box 709, Albuquerque, NM 87103, (505) 248-7882.

Thank you for the opportunity to review and provide information on the proposed project. If you have any questions, please contact Melissa Althouse of my staff at melissa_althouse@fws.gov.

Sincerely,

ERIK ORSAK Digitally signed by ERIK ORSAK Date: 2023.05.08 18:36:35 -05'00'

Erik Orsak
Acting Field Supervisor

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Appendix F

Government-to-Government Consultation with Federally Recognized Tribes

U.S. Department of Transportation
Federal Aviation Administration

Office of Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Chairman Durell Cooper
Apache Tribe of Oklahoma
P.O. Box 1330
Anadarko, OK 73005

Dear Chairman Cooper:

The Federal Aviation Administration (FAA) is currently evaluating Wing Aviation LLC's (Wing) proposal to conduct expanded Unmanned Aircraft System (UAS) operations in the Dallas-Fort Worth (DFW), TX metro area. Wing must obtain approval from the FAA prior to expanding operations of its Hummingbird UAS in DFW. The FAA has determined that its proposed action, which would encompass all FAA approvals necessary to enable expanded 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 initiate Section 106 consultation with the Apache Tribe of Oklahoma and to solicit your views regarding potential effects on tribal interests in the area.

Project Description

Wing is proposing to continue transporting pharmaceutical and consumer goods via its Hummingbird UAS in partnership with merchants in the communities they already serve and expand these services to the larger operation area (see attached). The Hummingbird aircraft would takeoff from one of Wing's "nests" located in a parking lot at an existing merchant in the DFW metro area and quickly rise to a cruising altitude of 65–300 feet above ground level. Each aircraft weighs approximately 12 pounds and can transport a small package up to about 2.3 pounds. Once at the delivery site, the Hummingbird hovers in place while a retractable cord lowers the package to the ground. The cord then retracts back to the aircraft, and the aircraft flies back to the nest.

Each nest would house a number of aircraft on charging pads and one or more merchants may use each nest for drone deliveries. The estimated total distance flown would vary depending upon the pickup and dropoff locations in the operating area. Wing is proposing up to 400 flights per day from each nest, with each flight taking a package to a customer delivery address before returning to the nest. There is 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 the proposed level as consumer demand increases

While each site has an approximate 6 mile service radius, Wing is seeking flexibility to provide delivery operations from sites based on partner and customer service demands. Sites are envisioned to be located at large retailers or shopping centers and placed to best supplement existing delivery methods and minimize potential effects on local housing. Wing anticipates minimal overlap in service areas.

Area of Potential Effects

In accordance with 36 CFR § 800.4(a)(1), the FAA has defined the Area of Potential Effects (APE) in consideration of the undertaking's potential direct and indirect effects. The current operation that was coordinated with the TX SHPO showed the APE would be limited to areas near Frisco and Allen, TX with a follow-on assessment for two larger areas on either side of Lewisville Lake. This expansion extends through the more densely populated or congested regions of the DFW metro area remaining within a 30 nautical mile (nm) radius of the DFW airport. An enclosed map shows the larger APE in greater detail.

Identification of Historic Properties

The proposed undertaking does not have the potential to affect below-ground or archeological resources because the undertaking does not include ground disturbance. Therefore, the FAA focused its identification efforts on above-ground historic properties.

Consultation

The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. If you have any questions or need additional information, please contact Mr. Mike Millard at (202) 267-7906 or via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

DAVID M MENZIMER
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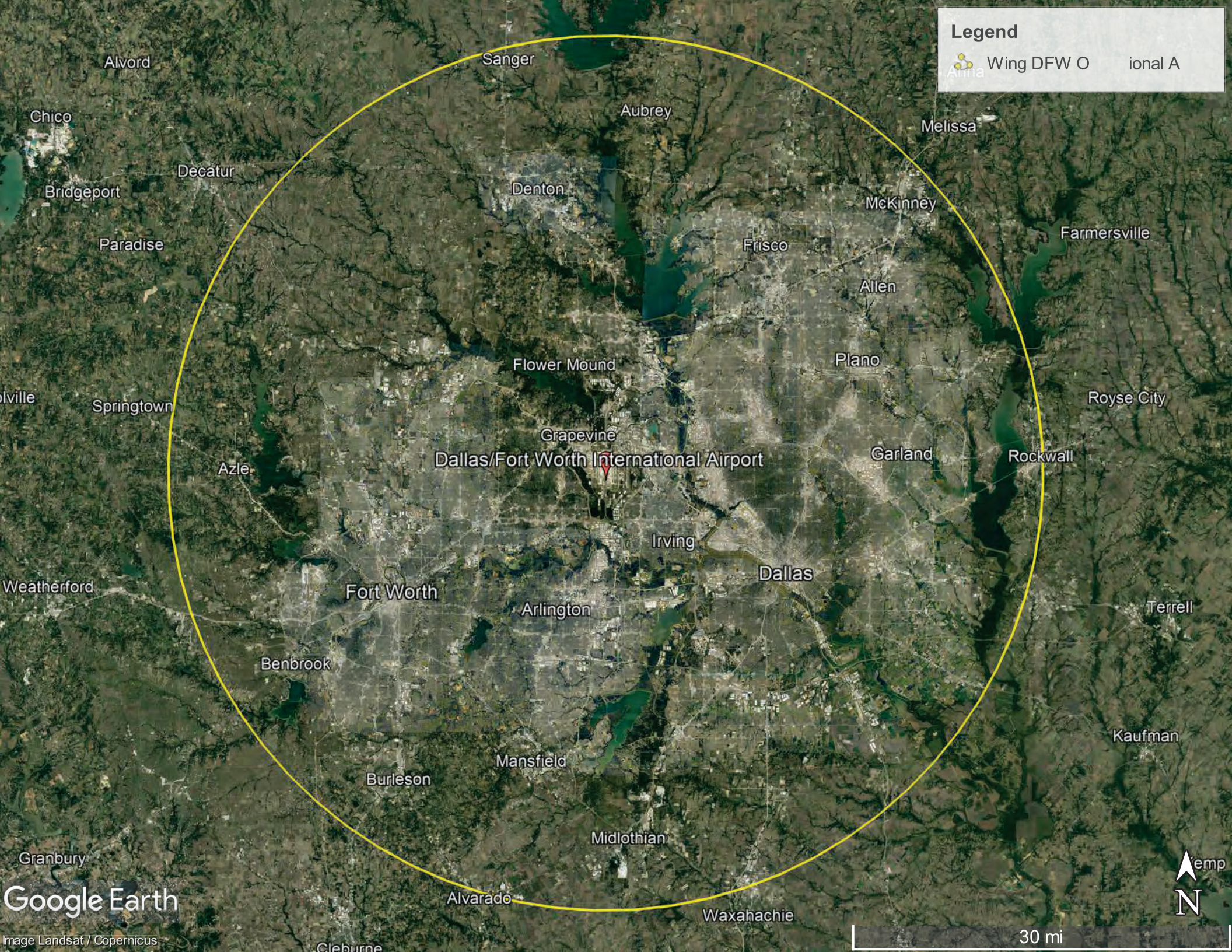
Date: 2023.04.20 07:22:54 -07'00'

David Menzimer
Aviation Safety
Manager, General Aviation Operations Branch
Flight Standards Service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U.S. Department of Transportation
Federal Aviation Administration

Office of Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Chairperson Bobby Gonzalez
Caddo Nation of Oklahoma
P.O. Box 487
Binger, OK 73009

Dear Chairperson Gonzalez

The Federal Aviation Administration (FAA) is currently evaluating Wing Aviation LLC's (Wing) proposal to conduct expanded Unmanned Aircraft System (UAS) operations in the Dallas-Fort Worth (DFW), TX metro area. Wing must obtain approval from the FAA prior to expanding operations of its Hummingbird UAS in DFW. The FAA has determined that its proposed action, which would encompass all FAA approvals necessary to enable expanded 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 initiate Section 106 consultation with the Caddo Nation of Oklahoma and to solicit your views regarding potential effects on tribal interests in the area.

Project Description

Wing is proposing to continue transporting pharmaceutical and consumer goods via its Hummingbird UAS in partnership with merchants in the communities they already serve and expand these services to the larger operation area (see attached). The Hummingbird aircraft would takeoff from one of Wing's "nests" located in a parking lot at an existing merchant in the DFW metro area and quickly rise to a cruising altitude of 65–300 feet above ground level. Each aircraft weighs approximately 12 pounds and can transport a small package up to about 2.3 pounds. Once at the delivery site, the Hummingbird hovers in place while a retractable cord lowers the package to the ground. The cord then retracts back to the aircraft, and the aircraft flies back to the nest.

Each nest would house a number of aircraft on charging pads and one or more merchants may use each nest for drone deliveries. The estimated total distance flown would vary depending upon the pickup and dropoff locations in the operating area. Wing is proposing up to 400 flights per day from each nest, with each flight taking a package to a customer delivery address before returning to the nest. There is 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 the proposed level as consumer demand increases.

While each site has an approximate 6 mile service radius, Wing is seeking flexibility to provide delivery operations from sites based on partner and customer service demands. Sites are envisioned to be located at large retailers or shopping centers and placed to best supplement existing delivery methods and minimize potential effects on local housing. Wing anticipates minimal overlap in service areas.

Area of Potential Effects

In accordance with 36 CFR § 800.4(a)(1), the FAA has defined the Area of Potential Effects (APE) in consideration of the undertaking's potential direct and indirect effects. The current operation that was coordinated with the TX SHPO showed the APE would be limited to areas near Frisco and Allen, TX with a follow-on assessment for two larger areas on either side of Lewisville Lake. This expansion extends through the more densely populated or congested regions of the DFW metro area remaining within a 30 nautical mile (nm) radius of the DFW airport. An enclosed map shows the larger APE in greater detail.

Identification of Historic Properties

The proposed undertaking does not have the potential to affect below-ground or archeological resources because the undertaking does not include ground disturbance. Therefore, the FAA focused its identification efforts on above-ground historic properties.

Consultation

The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. If you have any questions or need additional information, please contact Mr. Mike Millard at (202) 267-7906 or via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

DAVID M MENZIMER

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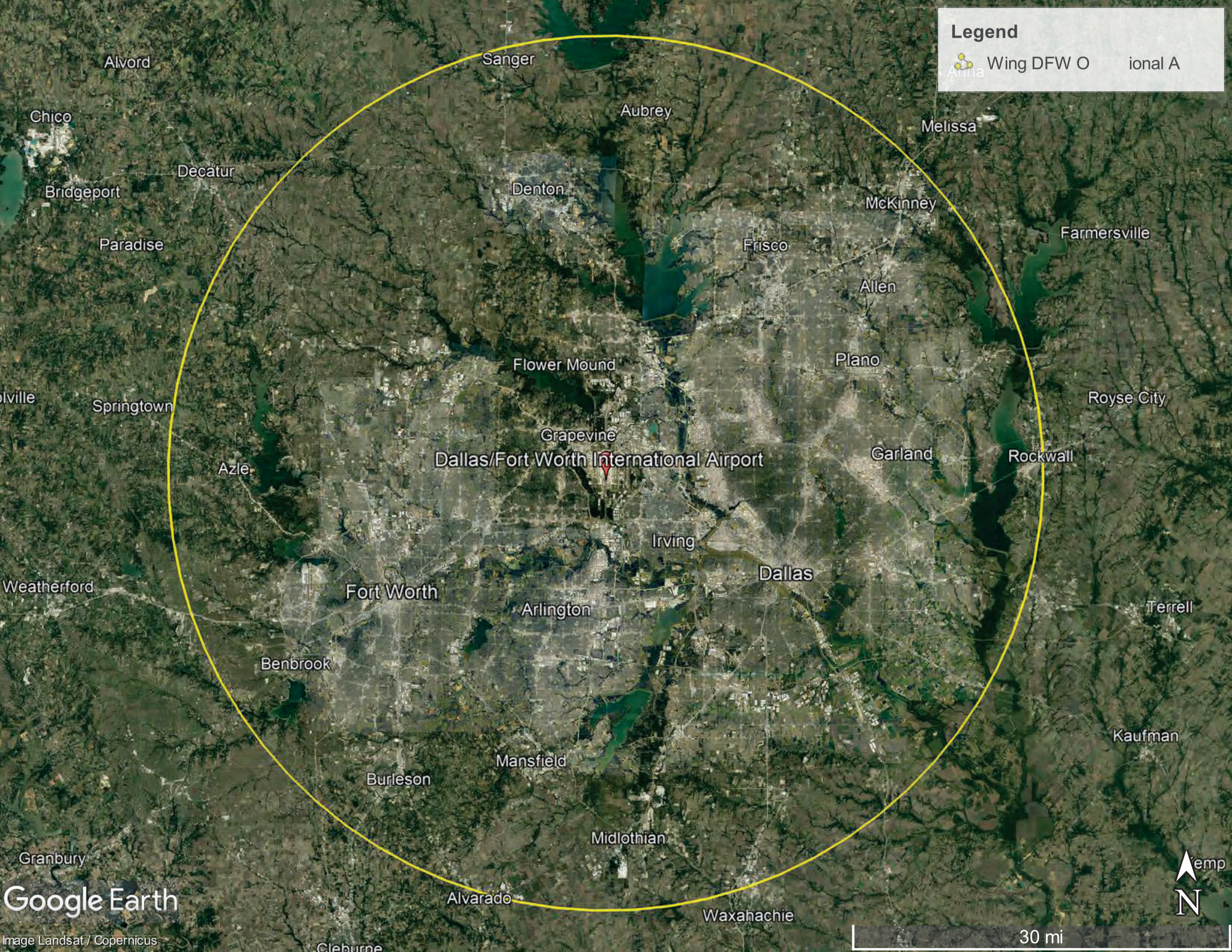
David Menzimer
Aviation Safety
Manager, General Aviation Operations Branch
Flight Standards Service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U.S. Department of Transportation
Federal Aviation Administration

Office of Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Principal Chief Chuck Hoskin
Cherokee Nation
P.O. Box 948
Tahlequah, OK 74465

Dear Principal Chief Hoskin:

The Federal Aviation Administration (FAA) is currently evaluating Wing Aviation LLC's (Wing) proposal to conduct expanded Unmanned Aircraft System (UAS) operations in the Dallas-Fort Worth (DFW), TX metro area. Wing must obtain approval from the FAA prior to expanding operations of its Hummingbird UAS in DFW. The FAA has determined that its proposed action, which would encompass all FAA approvals necessary to enable expanded 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 initiate Section 106 consultation with the Cherokee Nation and to solicit your views regarding potential effects on tribal interests in the area.

Project Description

Wing is proposing to continue transporting pharmaceutical and consumer goods via its Hummingbird UAS in partnership with merchants in the communities they already serve and expand these services to the larger operation area (see attached). The Hummingbird aircraft would takeoff from one of Wing's "nests" located in a parking lot at an existing merchant in the DFW metro area and quickly rise to a cruising altitude of 65–300 feet above ground level. Each aircraft weighs approximately 12 pounds and can transport a small package up to about 2.3 pounds. Once at the delivery site, the Hummingbird hovers in place while a retractable cord lowers the package to the ground. The cord then retracts back to the aircraft, and the aircraft flies back to the nest.

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While each site has an approximate 6 mile service radius, Wing is seeking flexibility to provide delivery operations from sites based on partner and customer service demands. Sites are envisioned to be located at large retailers or shopping centers and placed to best supplement existing delivery methods and minimize potential effects on local housing. Wing anticipates minimal overlap in service areas.

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Consultation

The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. If you have any questions or need additional information, please contact Mr. Mike Millard at (202) 267-7906 or via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

DAVID M MENZIMER

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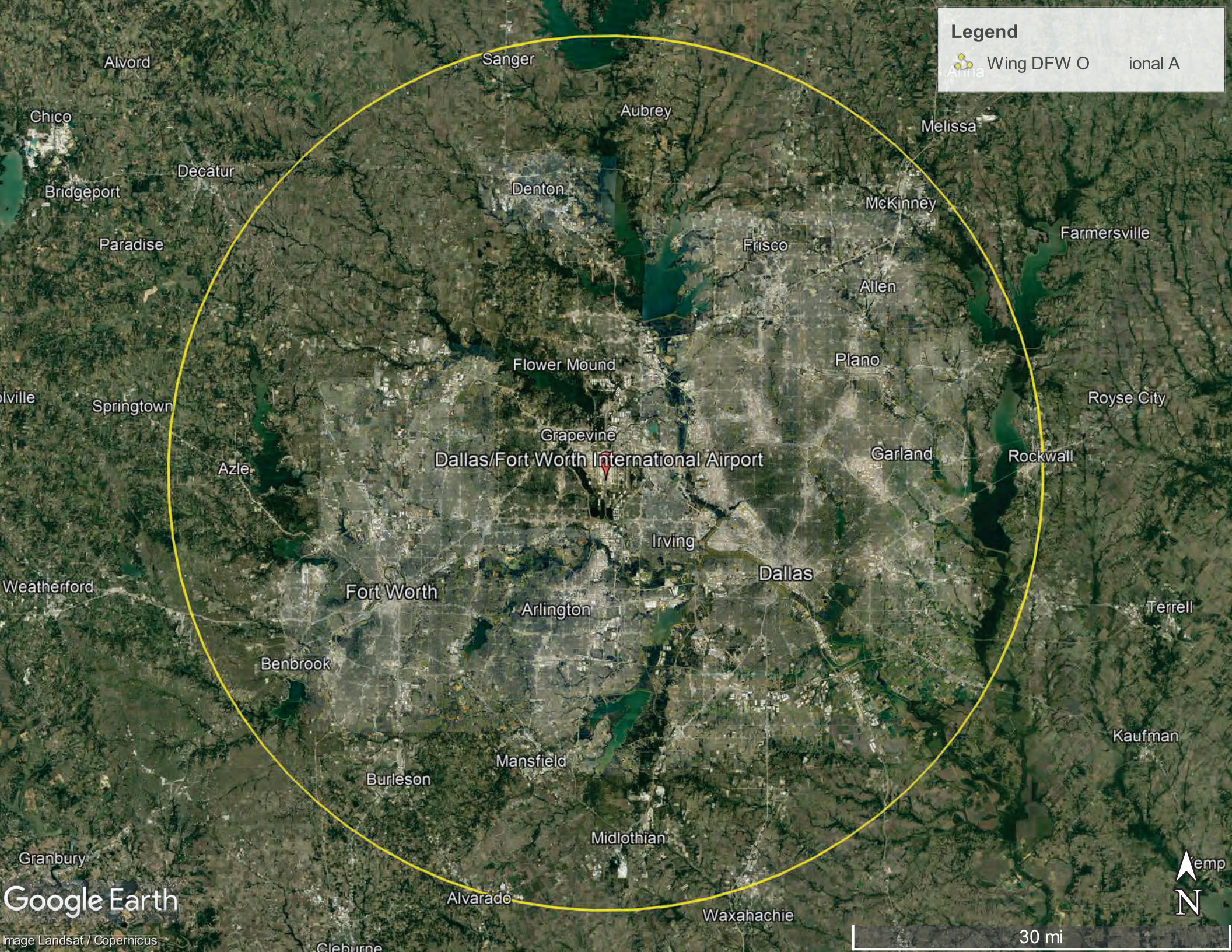
David Menzimer
Aviation Safety
Manager, General Aviation Operations Branch
Flight Standards Service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U.S. Department of Transportation
Federal Aviation Administration

Office of Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Chairman Mark Woommavovah
Comanche Nation, Oklahoma
P.O. Box 908
Lawton, OK 73502

Dear Chairman Woommavovah:

The Federal Aviation Administration (FAA) is currently evaluating Wing Aviation LLC's (Wing) proposal to conduct expanded Unmanned Aircraft System (UAS) operations in the Dallas-Fort Worth (DFW), TX metro area. Wing must obtain approval from the FAA prior to expanding operations of its Hummingbird UAS in DFW. The FAA has determined that its proposed action, which would encompass all FAA approvals necessary to enable expanded 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 initiate Section 106 consultation with the Comanche Nation and to solicit your views regarding potential effects on tribal interests in the area.

Project Description

Wing is proposing to continue transporting pharmaceutical and consumer goods via its Hummingbird UAS in partnership with merchants in the communities they already serve and expand these services to the larger operation area (see attached). The Hummingbird aircraft would takeoff from one of Wing's "nests" located in a parking lot at an existing merchant in the DFW metro area and quickly rise to a cruising altitude of 65–300 feet above ground level. Each aircraft weighs approximately 12 pounds and can transport a small package up to about 2.3 pounds. Once at the delivery site, the Hummingbird hovers in place while a retractable cord lowers the package to the ground. The cord then retracts back to the aircraft, and the aircraft flies back to the nest.

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Area of Potential Effects

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Identification of Historic Properties

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Consultation

The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. If you have any questions or need additional information, please contact Mr. Mike Millard at (202) 267-7906 or via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

DAVID M MENZIMER
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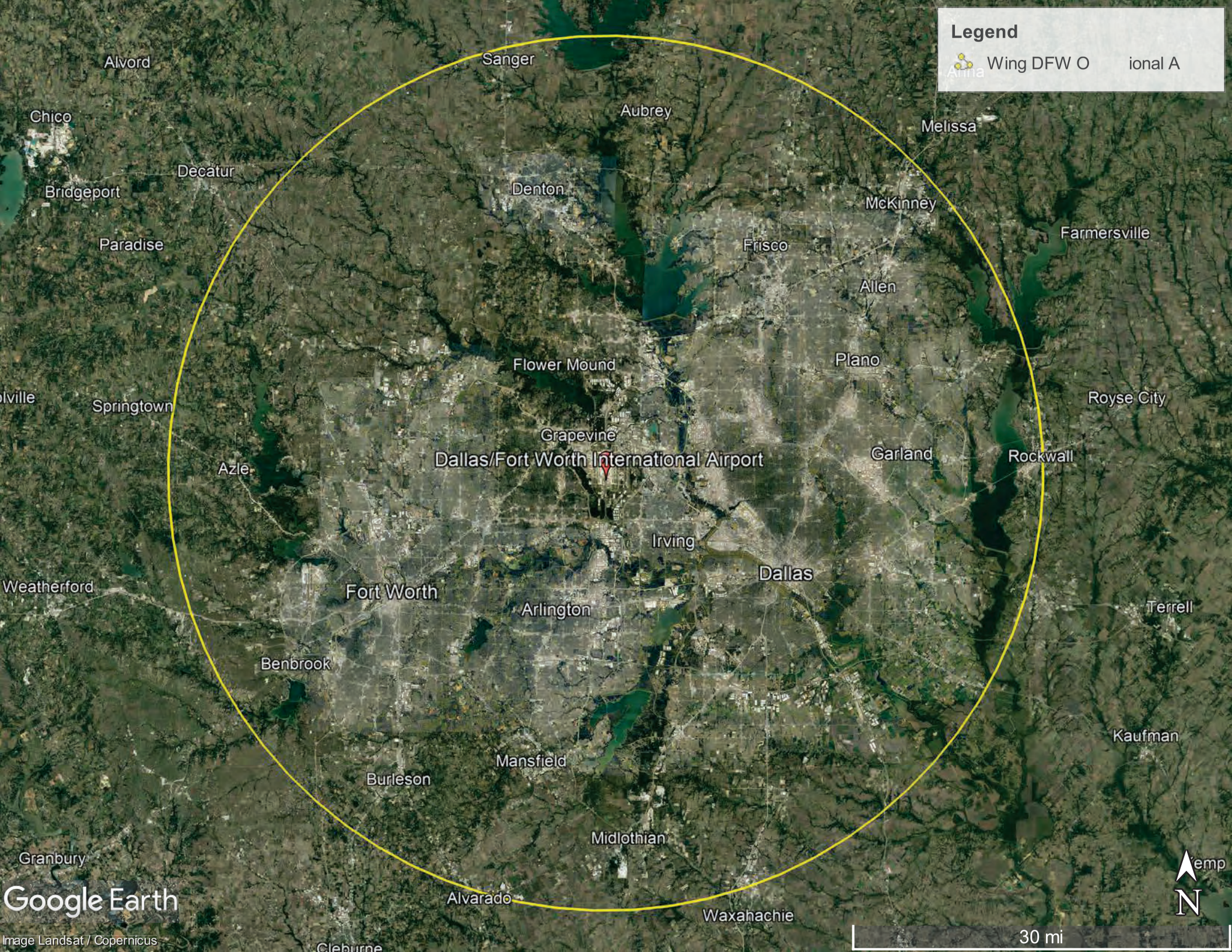
David Menzimer
Aviation Safety
Manager, General Aviation Operations Branch
Flight Standards Service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U.S. Department of Transportation
Federal Aviation Administration

Office of Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Chairman Jonathan Cernek
Coushatta Tribe of Louisiana
P.O. Box 818
Elton, LA 70532

Dear Chairman Cernek,

The Federal Aviation Administration (FAA) is currently evaluating Wing Aviation LLC's (Wing) proposal to conduct expanded Unmanned Aircraft System (UAS) operations in the Dallas-Fort Worth (DFW), TX metro area. Wing must obtain approval from the FAA prior to expanding operations of its Hummingbird UAS in DFW. The FAA has determined that its proposed action, which would encompass all FAA approvals necessary to enable expanded 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 initiate Section 106 consultation with the Coushatta Tribe of Louisiana and to solicit your views regarding potential effects on tribal interests in the area.

Project Description

Wing is proposing to continue transporting pharmaceutical and consumer goods via its Hummingbird UAS in partnership with merchants in the communities they already serve and expand these services to the larger operation area (see attached). The Hummingbird aircraft would takeoff from one of Wing's "nests" located in a parking lot at an existing merchant in the DFW metro area and quickly rise to a cruising altitude of 65–300 feet above ground level. Each aircraft weighs approximately 12 pounds and can transport a small package up to about 2.3 pounds. Once at the delivery site, the Hummingbird hovers in place while a retractable cord lowers the package to the ground. The cord then retracts back to the aircraft, and the aircraft flies back to the nest.

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Consultation

The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. If you have any questions or need additional information, please contact Mr. Mike Millard at (202) 267-7906 or via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

DAVID M MENZIMER

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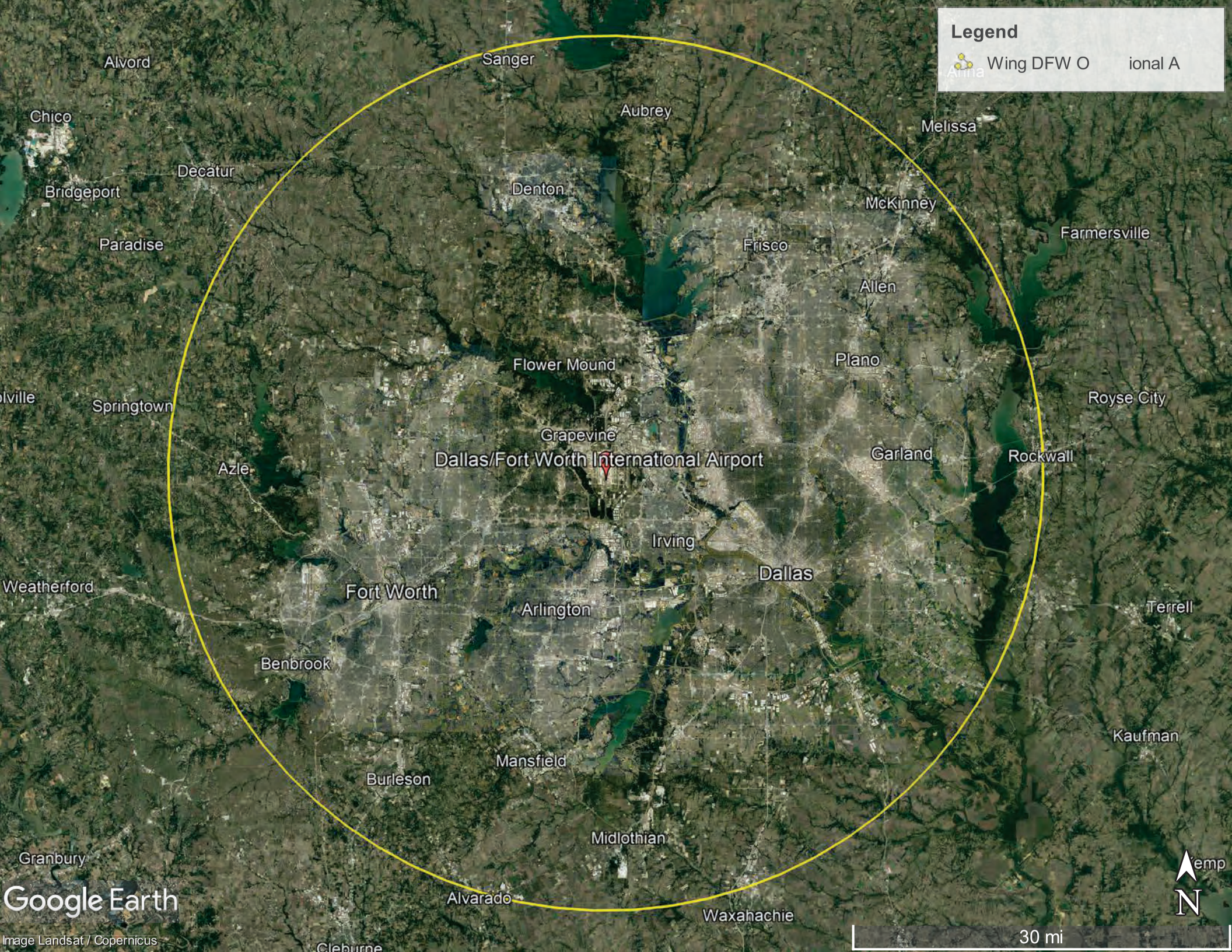
David Menzimer
Aviation Safety
Manager, General Aviation Operations Branch
Flight Standards Service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U.S. Department of Transportation
Federal Aviation Administration

Office of Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

President Deborah Dotson
Delaware Nation, Oklahoma
P.O. Box 825
Anadarko, OK 73005

Dear President Dotson,

The Federal Aviation Administration (FAA) is currently evaluating Wing Aviation LLC's (Wing) proposal to conduct expanded Unmanned Aircraft System (UAS) operations in the Dallas-Fort Worth (DFW), TX metro area. Wing must obtain approval from the FAA prior to expanding operations of its Hummingbird UAS in DFW. The FAA has determined that its proposed action, which would encompass all FAA approvals necessary to enable expanded 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 initiate Section 106 consultation with the Delaware Nation and to solicit your views regarding potential effects on tribal interests in the area.

Project Description

Wing is proposing to continue transporting pharmaceutical and consumer goods via its Hummingbird UAS in partnership with merchants in the communities they already serve and expand these services to the larger operation area (see attached). The Hummingbird aircraft would takeoff from one of Wing's "nests" located in a parking lot at an existing merchant in the DFW metro area and quickly rise to a cruising altitude of 65–300 feet above ground level. Each aircraft weighs approximately 12 pounds and can transport a small package up to about 2.3 pounds. Once at the delivery site, the Hummingbird hovers in place while a retractable cord lowers the package to the ground. The cord then retracts back to the aircraft, and the aircraft flies back to the nest.

Each nest would house a number of aircraft on charging pads and one or more merchants may use each nest for drone deliveries. The estimated total distance flown would vary depending upon the pickup and dropoff locations in the operating area. Wing is proposing up to 400 flights per day from each nest, with each flight taking a package to a customer delivery address before returning to the nest. There is 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 the proposed level as consumer demand increases.

While each site has an approximate 6 mile service radius, Wing is seeking flexibility to provide delivery operations from sites based on partner and customer service demands. Sites are envisioned to be located at large retailers or shopping centers and placed to best supplement existing delivery methods and minimize potential effects on local housing. Wing anticipates minimal overlap in service areas.

Area of Potential Effects

In accordance with 36 CFR § 800.4(a)(1), the FAA has defined the Area of Potential Effects (APE) in consideration of the undertaking's potential direct and indirect effects. The current operation that was coordinated with the TX SHPO showed the APE would be limited to areas near Frisco and Allen, TX with a follow-on assessment for two larger areas on either side of Lewisville Lake. This expansion extends through the more densely populated or congested regions of the DFW metro area remaining within a 30 nautical mile (nm) radius of the DFW airport. An enclosed map shows the larger APE in greater detail.

Identification of Historic Properties

The proposed undertaking does not have the potential to affect below-ground or archeological resources because the undertaking does not include ground disturbance. Therefore, the FAA focused its identification efforts on above-ground historic properties.

Consultation

The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. If you have any questions or need additional information, please contact Mr. Mike Millard at (202) 267-7906 or via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

DAVID M MENZIMER

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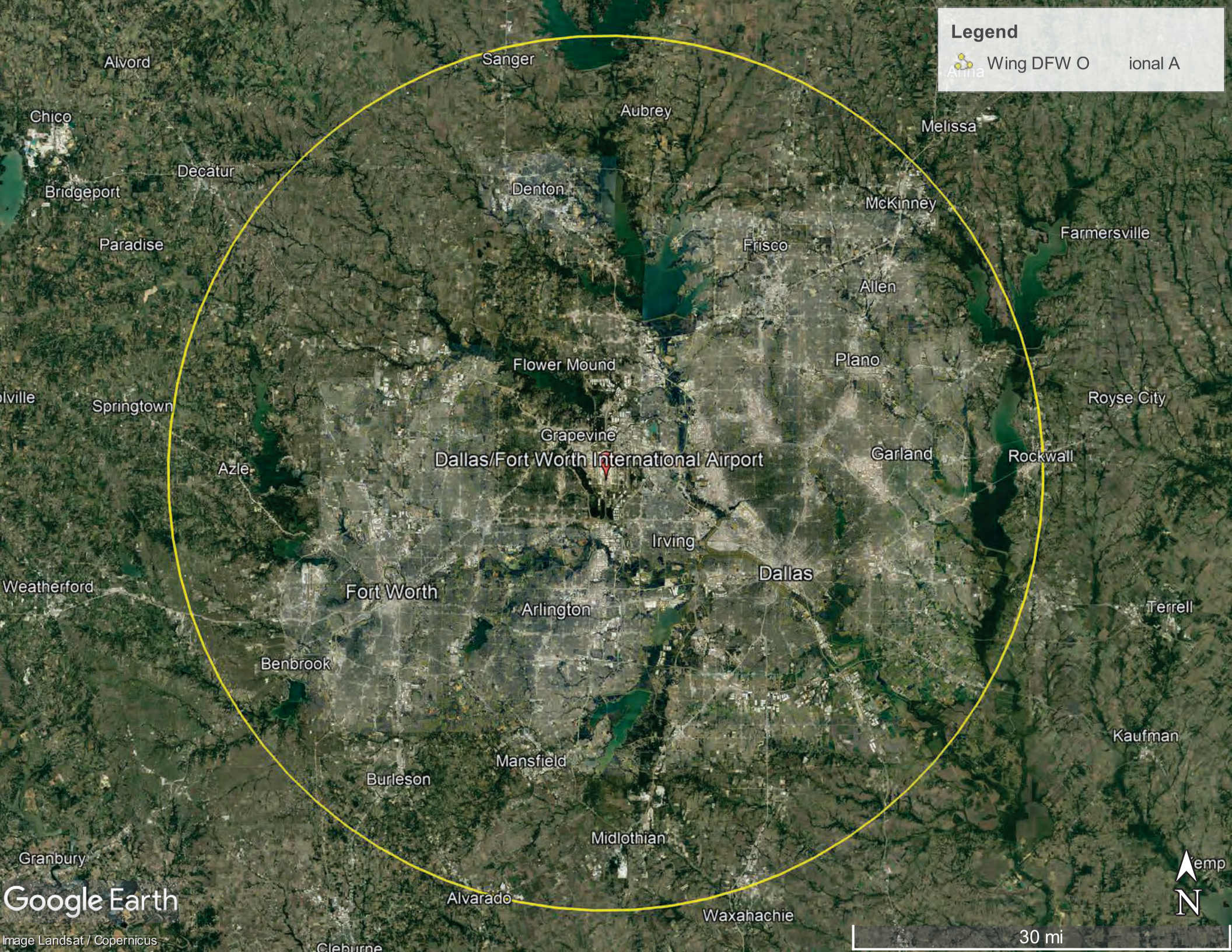
Date: 2023.04.20 07:24:23 -07'00'

David Menzimer
Aviation Safety
Manager, General Aviation Operations Branch
Flight Standards Service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U.S. Department of Transportation
Federal Aviation Administration

Office of Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Principal Chief David Hill
Muscogee Nation
P.O. Box 580
Okmulgee, OK 74447

Dear Chief Hill,

The Federal Aviation Administration (FAA) is currently evaluating Wing Aviation LLC's (Wing) proposal to conduct expanded Unmanned Aircraft System (UAS) operations in the Dallas-Fort Worth (DFW), TX metro area. Wing must obtain approval from the FAA prior to expanding operations of its Hummingbird UAS in DFW. The FAA has determined that its proposed action, which would encompass all FAA approvals necessary to enable expanded 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 initiate Section 106 consultation with the Muscogee Nation and to solicit your views regarding potential effects on tribal interests in the area.

Project Description

Wing is proposing to continue transporting pharmaceutical and consumer goods via its Hummingbird UAS in partnership with merchants in the communities they already serve and expand these services to the larger operation area (see attached). The Hummingbird aircraft would takeoff from one of Wing's "nests" located in a parking lot at an existing merchant in the DFW metro area and quickly rise to a cruising altitude of 65–300 feet above ground level. Each aircraft weighs approximately 12 pounds and can transport a small package up to about 2.3 pounds. Once at the delivery site, the Hummingbird hovers in place while a retractable cord lowers the package to the ground. The cord then retracts back to the aircraft, and the aircraft flies back to the nest.

Each nest would house a number of aircraft on charging pads and one or more merchants may use each nest for drone deliveries. The estimated total distance flown would vary depending upon the pickup and dropoff locations in the operating area. Wing is proposing up to 400 flights per day from each nest, with each flight taking a package to a customer delivery address before returning to the nest. There is 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 the proposed level as consumer demand increases.

While each site has an approximate 6 mile service radius, Wing is seeking flexibility to provide delivery operations from sites based on partner and customer service demands. Sites are envisioned to be located at large retailers or shopping centers and placed to best supplement existing delivery methods and minimize potential effects on local housing. Wing anticipates minimal overlap in service areas.

Area of Potential Effects

In accordance with 36 CFR § 800.4(a)(1), the FAA has defined the Area of Potential Effects (APE) in consideration of the undertaking's potential direct and indirect effects. The current operation that was coordinated with the TX SHPO showed the APE would be limited to areas near Frisco and Allen, TX with a follow-on assessment for two larger areas on either side of Lewisville Lake. This expansion extends through the more densely populated or congested regions of the DFW metro area remaining within a 30 nautical mile (nm) radius of the DFW airport. An enclosed map shows the larger APE in greater detail.

Identification of Historic Properties

The proposed undertaking does not have the potential to affect below-ground or archeological resources because the undertaking does not include ground disturbance. Therefore, the FAA focused its identification efforts on above-ground historic properties.

Consultation

The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. If you have any questions or need additional information, please contact Mr. Mike Millard at (202) 267-7906 or via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

DAVID M MENZIMER
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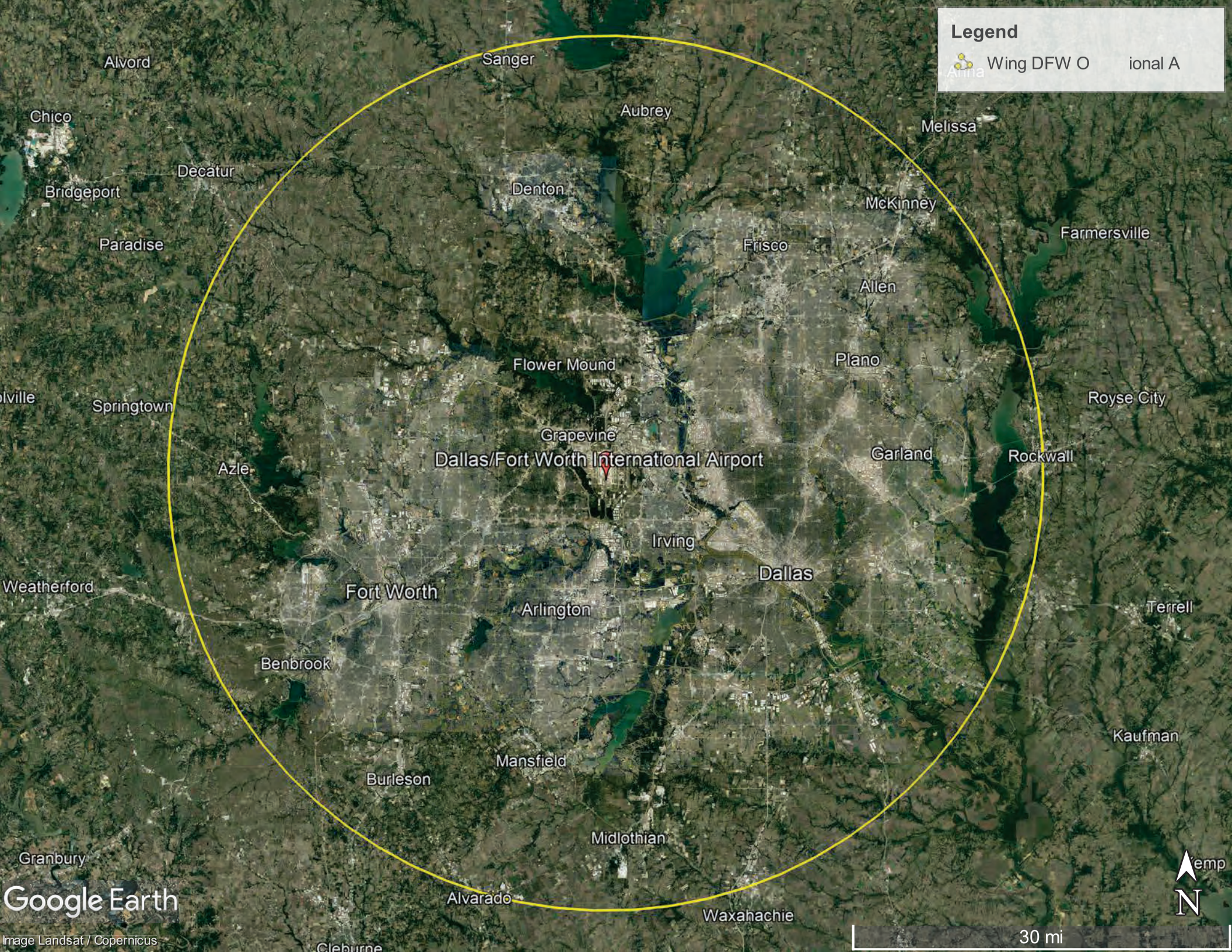
Date: 2023.04.20 07:22:21 -07'00'

David Menzimer
Aviation Safety
Manager, General Aviation Operations Branch
Flight Standards Service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U.S. Department of Transportation
Federal Aviation Administration

Office of Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

President Russell Martin
Tonkawa Tribe of Indians of Oklahoma
1 Rush Buffalo Road
Tonkawa, OK 74653

Dear President Martin:

The Federal Aviation Administration (FAA) is currently evaluating Wing Aviation LLC's (Wing) proposal to conduct expanded Unmanned Aircraft System (UAS) operations in the Dallas-Fort Worth (DFW), TX metro area. Wing must obtain approval from the FAA prior to expanding operations of its Hummingbird UAS in DFW. The FAA has determined that its proposed action, which would encompass all FAA approvals necessary to enable expanded 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 initiate Section 106 consultation with the Tonkawa Tribe of Indians of Oklahoma and to solicit your views regarding potential effects on tribal interests in the area.

Project Description

Wing is proposing to continue transporting pharmaceutical and consumer goods via its Hummingbird UAS in partnership with merchants in the communities they already serve and expand these services to the larger operation area (see attached). The Hummingbird aircraft would takeoff from one of Wing's "nests" located in a parking lot at an existing merchant in the DFW metro area and quickly rise to a cruising altitude of 65–300 feet above ground level. Each aircraft weighs approximately 12 pounds and can transport a small package up to about 2.3 pounds. Once at the delivery site, the Hummingbird hovers in place while a retractable cord lowers the package to the ground. The cord then retracts back to the aircraft, and the aircraft flies back to the nest.

Each nest would house a number of aircraft on charging pads and one or more merchants may use each nest for drone deliveries. The estimated total distance flown would vary depending upon the pickup and dropoff locations in the operating area. Wing is proposing up to 400 flights per day from each nest, with each flight taking a package to a customer delivery address before returning to the nest. There is 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 the proposed level as consumer demand increases.

While each site has an approximate 6 mile service radius, Wing is seeking flexibility to provide delivery operations from sites based on partner and customer service demands. Sites are envisioned to be located at large retailers or shopping centers and placed to best supplement existing delivery methods and minimize potential effects on local housing. Wing anticipates minimal overlap in service areas.

Area of Potential Effects

In accordance with 36 CFR § 800.4(a)(1), the FAA has defined the Area of Potential Effects (APE) in consideration of the undertaking's potential direct and indirect effects. The current operation that was coordinated with the TX SHPO showed the APE would be limited to areas near Frisco and Allen, TX with a follow-on assessment for two larger areas on either side of Lewisville Lake. This expansion extends through the more densely populated or congested regions of the DFW metro area remaining within a 30 nautical mile (nm) radius of the DFW airport. An enclosed map shows the larger APE in greater detail.

Identification of Historic Properties

The proposed undertaking does not have the potential to affect below-ground or archeological resources because the undertaking does not include ground disturbance. Therefore, the FAA focused its identification efforts on above-ground historic properties.

Consultation

The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. If you have any questions or need additional information, please contact Mr. Mike Millard at (202) 267-7906 or via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

DAVID M MENZIMER
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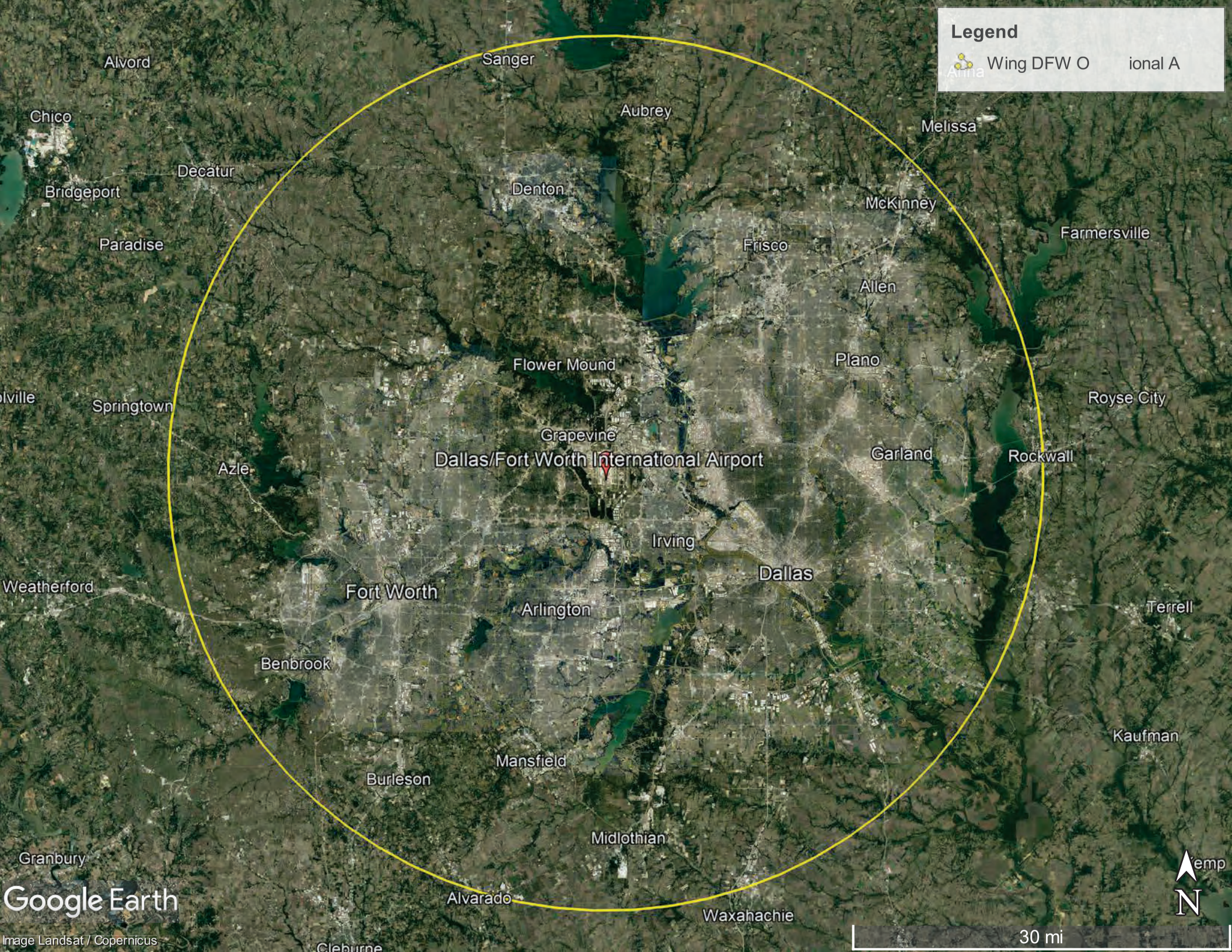
Date: 2023.04.20 07:23:52 -07'00'

David Menzimer
Aviation Safety
Manager, General Aviation Operations Branch
Flight Standards Service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U.S. Department
of Transportation
Federal Aviation
Administration

Office of Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

President Terri Parton
Wichita and Affiliated Tribes, Oklahoma
P.O. Box 729
Anadarko, OK 73005

Dear President Parton:

The Federal Aviation Administration (FAA) is currently evaluating Wing Aviation LLC's (Wing) proposal to conduct expanded Unmanned Aircraft System (UAS) operations in the Dallas-Fort Worth (DFW), TX metro area. Wing must obtain approval from the FAA prior to expanding operations of its Hummingbird UAS in DFW. The FAA has determined that its proposed action, which would encompass all FAA approvals necessary to enable expanded 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 initiate Section 106 consultation with the Wichita and Affiliated Tribes of Oklahoma and to solicit your views regarding potential effects on tribal interests in the area.

Project Description

Wing is proposing to continue transporting pharmaceutical and consumer goods via its Hummingbird UAS in partnership with merchants in the communities they already serve and expand these services to the larger operation area (see attached). The Hummingbird aircraft would takeoff from one of Wing's "nests" located in a parking lot at an existing merchant in the DFW metro area and quickly rise to a cruising altitude of 65–300 feet above ground level. Each aircraft weighs approximately 12 pounds and can transport a small package up to about 2.3 pounds. Once at the delivery site, the Hummingbird hovers in place while a retractable cord lowers the package to the ground. The cord then retracts back to the aircraft, and the aircraft flies back to the nest.

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While each site has an approximate 6 mile service radius, Wing is seeking flexibility to provide delivery operations from sites based on partner and customer service demands. Sites are envisioned to be located at large retailers or shopping centers and placed to best supplement existing delivery methods and minimize potential effects on local housing. Wing anticipates minimal overlap in service areas.

Area of Potential Effects

In accordance with 36 CFR § 800.4(a)(1), the FAA has defined the Area of Potential Effects (APE) in consideration of the undertaking's potential direct and indirect effects. The current operation that was coordinated with the TX SHPO showed the APE would be limited to areas near Frisco and Allen, TX with a follow-on assessment for two larger areas on either side of Lewisville Lake. This expansion extends through the more densely populated or congested regions of the DFW metro area remaining within a 30 nautical mile (nm) radius of the DFW airport. An enclosed map shows the larger APE in greater detail.

Identification of Historic Properties

The proposed undertaking does not have the potential to affect below-ground or archeological resources because the undertaking does not include ground disturbance. Therefore, the FAA focused its identification efforts on above-ground historic properties.

Consultation

The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. If you have any questions or need additional information, please contact Mr. Mike Millard at (202) 267-7906 or via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

DAVID M MENZIMER

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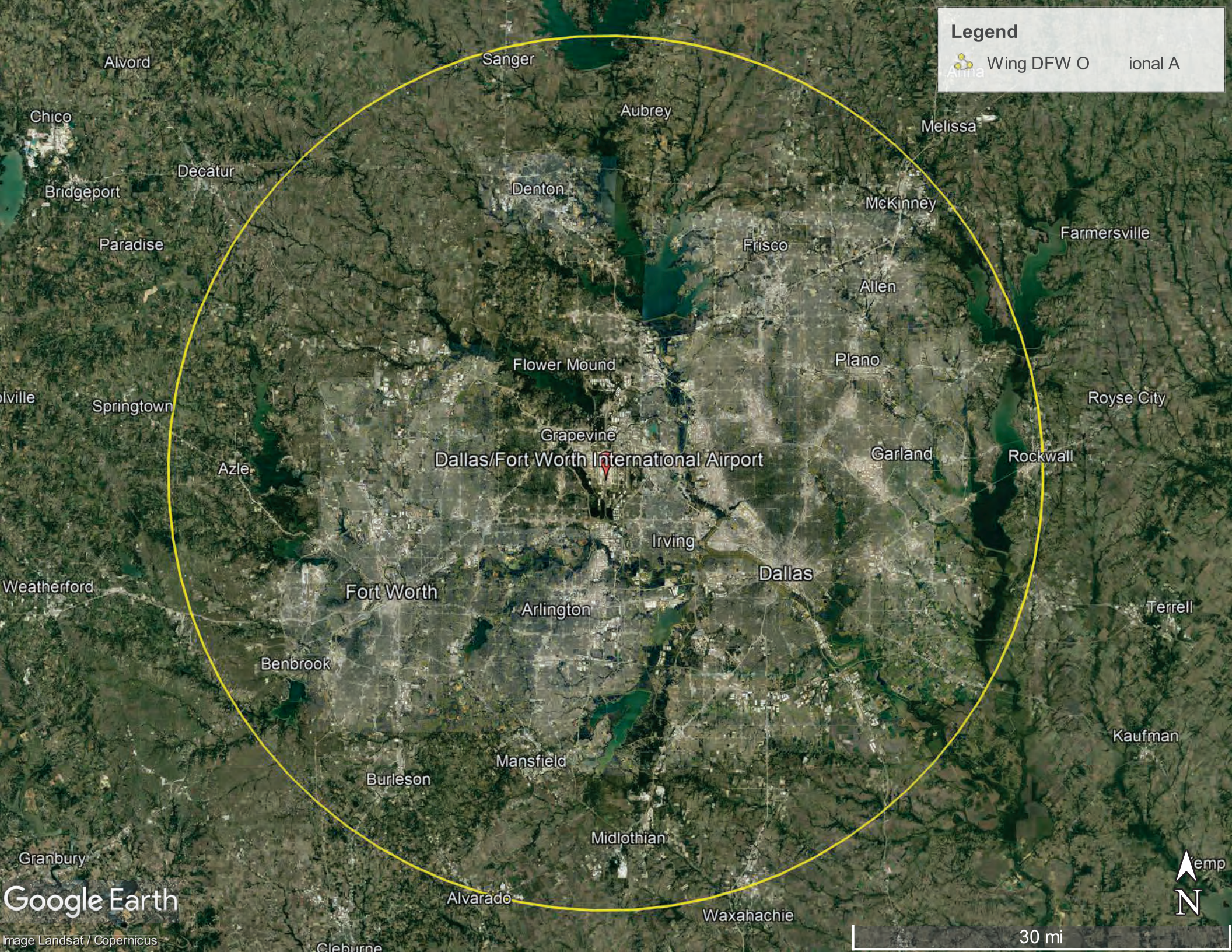
Date: 2023.04.20 07:25:23 -07'00'

David Menzimer
Aviation Safety
Manager, General Aviation Operations Branch
Flight Standards Service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Royse City
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Appendix G
SHPO Consultation

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Mr. Mark Wolfe
State Historic Preservation Officer
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711-2276

Via electronic submission to https://xapps.thc.state.tx.us/106Review/

Dear Mr. Wolfe:

The Federal Aviation Administration (FAA) is currently evaluating a proposal from Wing Aviation LLC (Wing) to expand its unmanned aircraft (UA; also referred to as a drone) small package delivery operations in the Dallas-Fort Worth (DFW) metropolitan area. Wing must obtain approval from the FAA prior to expanding operations in DFW, where it is already conducting drone deliveries in the communities of Frisco and Little Elm, Texas using its Hummingbird UA. The FAA has determined the proposed action, which would encompass all FAA approvals necessary to enable expanded 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 initiate Section 106 consultation with the State Historic Preservation Officer (SHPO) and request concurrence on the definition of the Area of Potential Effects (APE) and assessment of effects.

The FAA conducted Section 106 consultation with the SHPO for a similar undertaking in early 2021 when evaluating Wing's initial proposed operations in Frisco and Little Elm (**THC Tracking #202105336**). The SHPO concurred with the FAA's finding of *no historic properties affected* on February 2, 2021.

Project Description

Wing currently operates under 14 Code of Federal Regulations (CFR) Part 135 in Frisco and Little Elm, 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) in those areas of Texas. 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 the DFW metropolitan area to the operating area included in its OpSpecs for Texas.

Wing projects operating 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. Wing projects establishing

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

up to 25 nests in the DFW operating area. 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.

Wing is proposing to disperse nests throughout the operating area (see **Attachment A**), each located in a commercial area such as a shopping center, large retailer, or shopping mall. 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 the DFW metro area 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 during daytime hours (7am to 7pm), typically five days of the week (including weekends), and generally exclude holidays unless related to a community event or holiday-related promotion. Wing is not proposing to conduct nighttime operations.

Unmanned Aircraft

The primary UA used for the proposed operations is Wing's Hummingbird 7000W-B, which features a multi-rotor design with sixteen round diameter propellers (see **Attachment B**). The 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 7000W-B is a derivative design from the 7000W-A previously assessed for Frisco and Little Elm and was updated for noise reductions in cruise flight. All wing aircraft use electric power from rechargeable lithium-ion batteries.

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 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 en route 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.

Predicted Sound Levels

The FAA conducted a noise analysis using sound level measurement data for a prior version of the UA—the Hummingbird 7000W-A. Wing reports that improvements made to the 7000W-B model have reduced the overall operating sound level of the UA, and as such, use of the 7000W-A as a surrogate in the noise analysis is conservative for noise estimation. The estimated maximum sound exposure level (SEL)[2] for the takeoff, delivery, and landing phases of flight is approximately 86.5 decibels (dB) at about 28 feet from the drone. Predicted sound levels decrease as distances from the drone increase. The average maximum SEL for the en route phase is approximately 64 dB when the drone is flying 56 knots at 200 feet AGL.

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 APE is the operating area outlined in red in **Attachment A**. This area encompasses much of the DFW metro area within a 30-nautical mile radius around the DFW international airport. This area captures all potential noise and visual effects.

Identification of Historic Properties

The proposed undertaking does not have the potential to affect below-ground or archaeological resources because the undertaking does not include ground disturbance. Therefore, the FAA focused its identification efforts on above-ground historic properties.

According to the National Park Service's online database of the National Register of Historic Places (NRHP), a total of 224 historic properties and 145 historic districts are located in the APE (see **Attachments C and D**). Additional properties in the APE may be otherwise recognized for historical significance by the SHPO.

Most of the historic properties in the APE are residences and businesses, but also include churches, government buildings, schools, and courthouses. Additional historic properties include a steam locomotive, railway, two bridges, and a pump station. Most of the historic properties in the APE are included on the NRHP because of their historic architectural features.

[2] Sound exposure level (SEL) is a single event metric that considers both the noise level and duration of the event, referenced to a standard duration of one second.

Assessment of Effects

Given the small size of the UA and predicted sound levels, UA operations would not produce vibrations that could impact the architectural structure or contents of any structure in the APE. While the UA is not expected to generate significant noise levels at or within any historic property, the FAA considered drone delivery noise and potential visual effects on historic properties where a quiet setting or visually unimpaired sky might be a key attribute of the property's significance. The FAA has not identified any properties in the APE that would be affected by the UA's sound levels or visual effects, which are not anticipated to be significant at any locations along the drone's flight path, including delivery locations. Therefore, the FAA has made a finding of ***no historic properties affected***.

Conclusion

The FAA requests your concurrence on the definition of the APE and finding of *no historic properties affected*. 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 Mr. Mike Millard at (202) 267-7906 or via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

DAVID M MENZIMER

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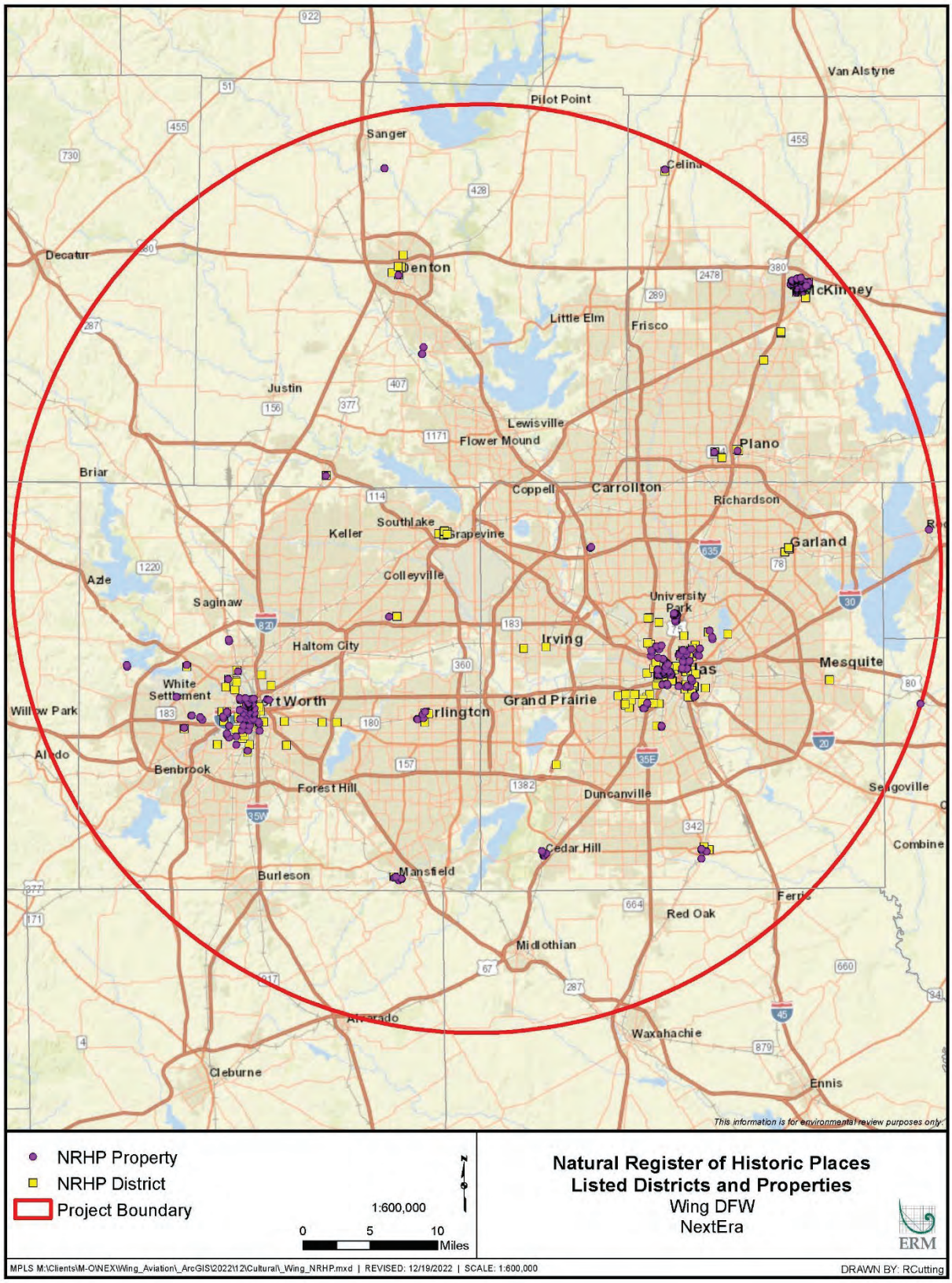
Date: 2023.04.14 06:43:47 -07'00'

David Menzimer
Aviation Safety
Manager, General Aviation Operations Branch
Flight Standards Service

Attachment A. Area of Potential Effects



Attachment B. Wing Hummingbird Unmanned Aircraft with Package Attached

Attachment C. Historic Properties

Reference Number	Name	Address	City	County
100001378	Fountain G. and Mary Oxsheer House	1119 Pennsylvania Avenue	Fort Worth	Tarrant
99001624	Riverside Public School	2629 LaSalle St.	Fort Worth	Tarrant
99001499	Texas Farm and Ranch Building	3300 Main St.	Dallas	Dallas
99001451	Tabernacle Baptist Church	1801 Evans Ave.	Fort Worth	Tarrant
99001292	Dallas Tent and Awning Building	3401 Commerce St.	Dallas	Dallas
99001049	Morning Chapel Colored Methodist Episcopal Church	901 E. 3rd St.	Fort Worth	Tarrant
99000883	Saint James Second Street Baptist Church	210 Harding St.	Fort Worth	Tarrant
99000882	Our Mother of Mercy Catholic Church and Parsonage	1100 and 1104 Evans Ave.	Fort Worth	Tarrant
99000723	Botts--Fowler House	115 N. Fourth Ave.	Mansfield	Tarrant
98001415	Montgomery Ward and Company Building	801 Grove St.	Fort Worth	Tarrant
98000102	Fort Worth Club Building - 1916	608-610 Main St.	Fort Worth	Tarrant
97001187	Stanard-Tilton Flour Mill	2400 S. Ervay St.	Dallas	Dallas
97000851	Bedford School	2400 School Ln.	Bedford	Tarrant
97000478	Santa Fe Terminal Building No. 1 and No. 2	1114 Commerce St. and 1118 Jackson St.	Dallas	Dallas
97000363	Dallas Fire Station No. 16	5501 Columbia Ave.	Dallas	Dallas
96001563	Greer, George C. House	5439 Swiss Ave.	Dallas	Dallas
96001015	Busch--Kirby Building (Boundary Increase)	1501--1509 Main St.	Dallas	Dallas
96000586	Titche--Goettinger Department Store	1901 Main St.	Dallas	Dallas
95001365	Estes House	903 N. College St.	McKinney	Collin
95001029	Shaw, Thomas and Marjorie, House	2404 Medford Ct. E.	Fort Worth	Tarrant
95000325	Silberstein, Ascher, School	2425 Pine St.	Dallas	Dallas
95000323	Ellis, James H. and Molly, House	2426 Pine	Dallas	Dallas
95000321	Rush--Crabb House	2718 Pennsylvania	Dallas	Dallas
95000319	Trinity English Lutheran Church	3100 Martin Luther King, Jr. Blvd.	Dallas	Dallas
95000318	Forest Avenue High school, Old	3000 Martin Luther King, Jr. Blvd.	Dallas	Dallas
95000317	Levi-Topletz House	2603 Martin Luther King, Jr. Blvd.	Dallas	Dallas
95000316	Levi-Moses House	2433 Martin Luther King, Jr. Blvd.	Dallas	Dallas
95000315	Emanuel Lutheran Church	4301 San Jacinto	Dallas	Dallas
95000314	Fannin, James W. Elementary School	4800 Ross Ave.	Dallas	Dallas
95000312	Shiels, Thomas, House	4602 Reiger Ave.	Dallas	Dallas
95000311	Bianchi, Didaco and Ida, House	4503 Reiger Ave.	Dallas	Dallas

Reference Number	Name	Address	City	County
95000310	Mary Apartments	4524 Live Oak	Dallas	Dallas
95000309	Mrs. Baird's Bread Company Building	1401 N. Carroll	Dallas	Dallas
95000307	Central Congregational Church	1530 N. Carroll	Dallas	Dallas
95000048	Electric Building	410 W. 7th St.	Fort Worth	Tarrant
94001627	North Fort Worth High School	600 Park St.	Fort Worth	Tarrant
94001359	Woolworth, F. W., Building	501 Houston St.	Fort Worth	Tarrant
94000542	Sanger Brothers Building	410--412 Houston St.	Fort Worth	Tarrant
93000566	Brooks, William and Blanche, House	500 S. Center St.	Forney	Kaufman
92000021	Interstate Forwarding Company Warehouse	3200 Main St.	Dallas	Dallas
91001913	Sinclair Building	512 Main St.	Fort Worth	Tarrant
91000118	Mitchell, John E., Company Plant	3800 Commerce St.	Dallas	Dallas
88002709	Westover Manor	8 Westover Rd.	Westover Hills	Tarrant
88002063	Gilbert, Samuel and Julia, House	2540 Farmers Branch Ln.	Farmers Branch	Dallas
88000979	Old Alton Bridge	Copper Canyon Rd.	Copper Canyon	Denton
88000176	Oak Lawn Methodist Episcopal Church, South	3014 Oak Lawn Ave.	Dallas	Dallas
87001757	Wilson, A. G., House	417 N. Waddill	McKinney	Collin
87001756	Wiley, Thomas W., House	105 S. Church	McKinney	Collin
87001755	Waddill, R. L., House	302 W. Lamar	McKinney	Collin
87001754	Thompson House	1207 W. Louisiana	McKinney	Collin
87001753	Taylor, J. H., House	211 N. Waddill	McKinney	Collin
87001752	Smith, W. D., House	703 N. College	McKinney	Collin
87001751	Scott, L. A., House	513 W. Louisiana	McKinney	Collin
87001750	Scott, A. M., House	1109 W. Louisiana	McKinney	Collin
87001749	Rhea, John C., House	801 N. College	McKinney	Collin
87001748	Newsome--King House	401 W. Louisiana	McKinney	Collin
87001747	Newsome, R. F., House	609 Tucker	McKinney	Collin
87001746	Nenney, J. P., House	601 N. Church	McKinney	Collin
87001745	Neathery, Sam, House	215 N. Waddill	McKinney	Collin
87001743	McKinney Hospital, Old	700-800 S. College	McKinney	Collin
87001739	McKinney Cotton Compress Plant	300 blk. Throckmorton	McKinney	Collin
87001738	Kirkpatrick, E. W. House and Barn	903 Parker	McKinney	Collin
87001737	King, Mrs. J. C., House	405 W. Louisiana	McKinney	Collin
87001724	Johnson, Thomas, House	312 S. Tennessee	McKinney	Collin
87001723	Johnson, John, House	302 Anthony	McKinney	Collin
87001722	Houses at 406 and 408 Heard	406 & 408 Heard	McKinney	Collin

Reference Number	Name	Address	City	County
87001721	House at 704 Parker	704 Parker	McKinney	Collin
87001717	House at 1303 W. Louisiana	1303 W. Louisiana	McKinney	Collin
87001716	Hill--Webb Grain Elevator	400 E. Louisiana	McKinney	Collin
87001715	Hill, W. R., House	601 N. College	McKinney	Collin
87001714	Hill, Moran, House	203 N. Waddill	McKinney	Collin
87001713	Hill, John B., House	605 N. College	McKinney	Collin
87001712	Hill, Ben, House	509 Tucker	McKinney	Collin
87001711	Heard--Craig House	205 W. Hunt	McKinney	Collin
87001710	Gough--Hughston House	1206 W. Louisiana	McKinney	Collin
87001709	Fox, S. H., House	808 Tucker	McKinney	Collin
87001708	Foote--Crouch House	401 N. Benge	McKinney	Collin
87001707	Ferguson, John H., House	607 N. Church	McKinney	Collin
87001706	Faires--Bell House	S side Chestnut Sq.	McKinney	Collin
87001705	Faires, F. C., House	505 S. Chestnut	McKinney	Collin
87001704	Dulaney, Joe E., House	311 S. Chestnut	McKinney	Collin
87001702	Dulaney, Joseph Field, House	315 S. Chestnut	McKinney	Collin
87001699	Dowell, J. S., House	608 Parker	McKinney	Collin
87001697	Davis--Hill House	710 N. Church	McKinney	Collin
87001695	Davis, H. L., House	705 N. College	McKinney	Collin
87001691	Crouch--Perkins House	205 N. Church	McKinney	Collin
87001688	Goodner, Jim B., House	302 S. Tennessee	McKinney	Collin
87001685	Collin County Mill and Elevator Company	407 E. Louisiana	McKinney	Collin
87001682	Coggins, J. R., House	805 Howell	McKinney	Collin
87001681	Cline--Bass House	804 Tucker	McKinney	Collin
87001679	Clardy, U. P., House	315 Oak	McKinney	Collin
87001671	Burrus--Finch House	405 N. Waddill	McKinney	Collin
87001666	Brown, John R., House	509 N. Church	McKinney	Collin
87001663	Board--Everett House	507 N. Bradley	McKinney	Collin
87001662	Bingham, John H., House	800 S. Chestnut	McKinney	Collin
87001661	Beverly--Harris House	604 Parker	McKinney	Collin
86001939	Old Continental State Bank	312 Oak St.	Roanoke	Denton
85003092	Hilton Hotel	1933 Main St.	Dallas	Dallas
85002912	Spake, Jacob and Eliza, House	2600 State St.	Dallas	Dallas
85001495	Straus House	400 Cedar	Cedar Hill	Dallas
85001484	Rogers-O'Daniel House	2230 Warner Rd.	Fort Worth	Tarrant
85000855	US Post Office	Lancaster and Jennings Ave.	Fort Worth	Tarrant
85000713	Roberts, Dr. Rufus A., House	210 S. Broad St.	Cedar Hill	Dallas
85000712	Hawkes, Z. T. (Tip), House	132 N. Potter St.	Cedar Hill	Dallas
85000711	Bryant, William, Jr., House	S. Broad and Cooper	Cedar Hill	Dallas
85000710	Angle, D. M., House	800 Beltline	Cedar Hill	Dallas
85000074	St. Patrick Cathedral Complex	1206 Throckmorton St.	Fort Worth	Tarrant

Reference Number	Name	Address	City	County
84001998	St. Mary of the Assumption Church	501 W. Magnolia Ave.	Fort Worth	Tarrant
84001996	Johnson-Elliott House	3 Chase Ct.	Fort Worth	Tarrant
84001993	Hutcheson-Smith House	312 N. Oak St.	Arlington	Tarrant
84001981	Fort Worth Public Market	1400 Henderson St.	Fort Worth	Tarrant
84001969	Fort Worth Elks Lodge 124	512 W. 4th St.	Fort Worth	Tarrant
84001965	Bryce, William J., House	4900 Bryce Ave.	Fort Worth	Tarrant
84001963	Bryce Building	909 Throckmorton St.	Fort Worth	Tarrant
84001961	Blackstone Hotel	601 Main St.	Fort Worth	Tarrant
84001643	Viola Courts Apartments	4845 Swiss Ave.	Dallas	Dallas
84000169	Allen Chapel AME Church	116 Elm St.	Fort Worth	Tarrant
83003812	First Christian Church	612 Throckorton St.	Fort Worth	Tarrant
83003162	Sanguinet, Marshall R., House	4729 Collinwood Ave.	Fort Worth	Tarrant
83003160	Austin, Stephen F., Elementary School	319 Lipscomb St.	Fort Worth	Tarrant
83003135	McIntosh, Roger D., House	1518 Abrams Rd.	Dallas	Dallas
83003134	Continental Gin Company	3301-3333 Elm St., 212 and 232 Trunk Ave.	Dallas	Dallas
83003133	Hotel Adolphus	1315 Commerce St.	Dallas	Dallas
82001736	Grace Methodist Episcopal Church	4105 Junius St.	Dallas	Dallas
81000627	Number 4 Hook and Ladder Company	Cedar Springs Rd. and Reagan St.	Dallas	Dallas
80004489	Busch Building	1501--1509 Main St.	Dallas	Dallas
80004151	Burnett, Burk, Building	500--502 Main St.	Fort Worth	Tarrant
80004097	Virginia Hall	3325 Dyer St.	Dallas	Dallas
80004096	Snider Hall	3305 Dyer St.	Dallas	Dallas
80004095	Perkins Hall of Administration	6425 Hillcrest Rd.	Dallas	Dallas
80004094	Patterson, Stanley, Hall	3128 Dyer St.	Dallas	Dallas
80004092	Miller, John Hickman, House	3506 Cedar Springs	Dallas	Dallas
80004091	McFarlin Memorial Auditorium	6405 Hillcrest Rd.	Dallas	Dallas
80004090	Hyer Hall	6424 Hill Lane	Dallas	Dallas
80004089	Florence, Fred, Hall	3330 University Blvd.	Dallas	Dallas
80004088	Dallas Scottish Rite Temple	Harwood and Young Sts.	Dallas	Dallas
80004087	Clements Hall	3200 Dyer St.	Dallas	Dallas
79003012	Waggoner, W. T. Building	810 Houston St.	Fort Worth	Tarrant
79003011	Hotel Texas	815 Main St.	Fort Worth	Tarrant
79003009	Eddleman-McFarland House	1110 Penn St.	Fort Worth	Tarrant
79002931	Wilson Building	1621-1623 Main St.	Dallas	Dallas
78002982	Benton, M. A., House	1730 6th Ave.	Fort Worth	Tarrant
78002981	Anderson, Neil P., Building	411 W. 7th St.	Fort Worth	Tarrant
78002922	Strain, W. A., House	400 E. Pecan St.	Lancaster	Dallas
78002921	Rawlins, Capt. R. A., House	2219 Dowling St.	Lancaster	Dallas

Reference Number	Name	Address	City	County
78002920	Randlett House	401 S. Centre St.	Lancaster	Dallas
78002917	Waples-Platter Buildings	2200--2211 N. Lamar St.	Dallas	Dallas
78002915	Magnolia Building	108 S. Akard St.	Dallas	Dallas
78002913	Dallas Hall	Southern Methodist University campus	Dallas	Dallas
78002906	Wilson, Ammie House	1900 W. 15th St.	Plano	Collin
77001477	Texas & Pacific Steam Locomotive No. 610	Now at Texas State Railroad, Palestine	Fort Worth	Tarrant
77001438	Denton County Courthouse	Public Sq.	Denton	Denton
77001437	Majestic Theatre	1925 Elm St.	Dallas	Dallas
76002068	Paddock Viaduct	Main St.	Fort Worth	Tarrant
76002019	Dallas County Courthouse	Houston and Commerce Sts.	Dallas	Dallas
75002003	Wharton-Scott House	1509 Pennsylvania Ave.	Fort Worth	Tarrant
75001967	Sanger Brothers Complex	Block 32, bounded by Elm, Lamar, Main and Austin Sts.	Dallas	Dallas
75001965	Belo, Alfred Horatio, House	2115 Ross Ave.	Dallas	Dallas
72001372	Pollock-Capps House	1120 Penn St.	Fort Worth	Tarrant
71000964	Flatiron Building	1000 Houston St.	Fort Worth	Tarrant
70000762	Tarrant County Courthouse	Bounded by Houston, Belknap, Weatherford, and Commerce Sts.	Fort Worth	Tarrant
70000761	Knights of Pythias Building	315 Main St.	Fort Worth	Tarrant
70000760	Gulf, Colorado and Sante Fe Railroad Passenger Station	1601 Jones St.	Fort Worth	Tarrant
16000916	St. Paul Methodist Episcopal Church	1816 Routh Street	Dallas	Dallas
14000105	Inspiration Point Shelter House	Roughly 250 yds S. of 2400 blk. Of Roberts Cut Off Rd.	Fort Worth	Tarrant
14000103	511 Akard Building	511 N. Akard St.	Dallas	Dallas
13000612	J. L. Sealy Building	801 South Main Street	Fort Worth	Tarrant
13000126	Fort Worth Warehouse and Transfer Company Building	201 S. Calhoun St.	Fort Worth	Tarrant
12001005	Van Zandt Cottage	2900 Crestline Road	Fort Worth	Tarrant
12001004	Farmers and Mechanics National Bank	714 Main Street	Fort Worth	Tarrant
12000589	Eldred W. Foster House	9608 Heron Drive	Fort Worth	Tarrant
12000350	Dallas Coffin Company	1325 S. Lamar	Dallas	Dallas
11000982	Ridglea Theatre Building	6025-6033 Camp Bowie Blvd. & 3309 Winthrop Ave.	Fort Worth	Tarrant
11000344	Santa Fe Terminal Building No. 4	1033 Young St.	Dallas	Dallas
11000343	Adamson High School	201 East Ninth Street	Dallas	Dallas
11000136	Texas Garden Clubs, Inc., Headquarters	3111 Old Garden Road	Fort Worth	Tarrant
11000128	Henderson Street Bridge	Henderson Street at the Clear Fork of the Trinity River	Fort Worth	Tarrant

Reference Number	Name	Address	City	County
10000865	Miller Manufacturing Company Building	311 Bryan Avenue	Fort Worth	Tarrant
10000500	Vandergriff Building	100 E. Division St.	Arlington	Tarrant
10000249	Parkland Hospital	3819 Maple Avenue	Dallas	Dallas
9000982	Petroleum Building	210 West Sixth Street	Fort Worth	Tarrant
9000981	First National Bank Building	711 Houston Street	Fort Worth	Tarrant
9000839	Celina Public School	205 S. Colorado St.	Celina	Collin
9000306	Fidelity Union Life Insurance Building	1511 Bryan/1507 Pacific Ave.	Dallas	Dallas
8001300	Roy A. and Glady's Westbrook House	2232 Winton Terrace West	Fort Worth	Tarrant
8000658	Alfred and Juanita Bromberg House			
8000539	4928 Bryan Street Apartments	4928 Bryan Street	Dallas	Dallas
8000475	Building @ 3525 Turtle Creek Boulevard	3525 Turtle Creek Boulevard	Dallas	Dallas
8000317	American Airways Hangar and Administration Building	Meacham Airport, 201 Aviation Way, Hangar 11N	Fort Worth	Tarrant
7000989	Stoneleigh Court Hotel	2927 Maple Avenue	Dallas	Dallas
7000691	First Methodist Church of Rockwall	303 East Rusk	Rockwall	Rockwall
7000266	Kress Building	604 Main Street	Fort Worth	Tarrant
7000130	Monroe Shops	2111 South Corinth Street	Dallas	Dallas
6001085	Dr. Arvel and Faye Ponton House	1208 Mistletoe Drive	Fort Worth	Tarrant
6000819	Dallas Times Herald Pasadena Perfect Home	6938 Wildgrove Avenue	Dallas	Dallas
6000651	Bluitt Sanitarium	2036 Commerce Street	Dallas	Dallas
6000513	Mark & Maybelle Lemmon House	3211 Mockingbird Lane	Highland Park	Dallas
6000510	Our Mother of Mercy School	801 Verbena Street	Fort Worth	Tarrant
5001543	1926 Republic National Bank	1309 Main Street1309 Main Street	Dallas	Dallas
5001541	Purvin-Hexter Building	2038 Commerce Street	Dallas	Dallas
5000864	Vaught House	718 West Abram Street	Arlington	Tarrant
5000856	Plano Station/Texas Electric Railway	901 E. 15th Street	Plano	Collin
5000419	Dallas National Bank	1530 Main and 1511 Commerce St.	Dallas	Dallas
5000243	Republic National Bank	300 N. Ervay/325 N. St. Paul St.	Dallas	Dallas
4000886	Our Lady of Victory Academy	801 W. Shaw St.	Fort Worth	Tarrant
4000102	Harlan Building	2018 Cadiz St.	Dallas	Dallas
3001418	Rector Road Bridge at Clear Creek	Moved to Guyer HS from approx. 2.5 mi SE of Sanger	Sangar	Denton
3000436	Wallace-Hall House	210 S. Main St.	Mansfield	Tarrant

Reference Number	Name	Address	City	County
3000435	Ralph Sandiford and Julia Boisseau Man House	604 West Broad Street	Mansfield	Tarrant
3000434	Chorn, Lester H. and Maybel Bryant, House	303 E. Broad St.	Mansfield	Tarrant
3000433	Buchanan-Hayter-Witherspoon House	306 E. Broad St.	Mansfield	Tarrant
3000432	Bratton, Andrew "Cap" and Emma Doughty, House	310 E. Broad St.	Mansfield	Tarrant
3000277	Chevrolet Motor Company Building	3221 Commerce	Dallas	Dallas
3000187	Texas Theatre	231 W. Jefferson Blvd.	Dallas	Dallas
2001515	Fort Worth High School	1015 S. Jennings Ave.	Fort Worth	Tarrant
2001512	Hogg, Alexander, School	900 St. Louis Ave.	Fort Worth	Tarrant
2000992	G & J Manufacturing	3912 Willow St.	Dallas	Dallas
2000730	Lincoln Paint and Color Company Building	3210 Main	Dallas	Dallas
2000009	Goodyear Tire and Rubber Company Building and B.F. Goodrich Building	3809 Parry Ave. & 4140 Commerce St.	Dallas	Dallas
1000470	Markeen Apartments	210--14 St. Louis Ave. and 406--10 W. Daggett Ave.	Fort Worth	Tarrant
1000437	Fort Worth US Courthouse	501 W. 10th St.	Fort Worth	Tarrant
1000103	Turtle Creek Pump Station	3630 Harry Hines Blvd.	Dallas	Dallas
1537	Medical Dental Building	300 Blk. of West Jefferson Blvd.	Dallas	Dallas
188	Arlington Post Office	200 W. Main St.	Arlington	Tarrant

Attachment D. Historic Districts

Reference Number	Name	Address	City	County
100008197	Fort Worth National Bank	115 West 7th Street	Fort Worth	Tarrant
100007423	Gospel Lighthouse Church	1900 South Ewing Avenue	Dallas	Dallas
100007403	Farrington Field and Public Schools Gymnasium	1501 University Drive and 1400 Foch Street	Fort Worth	Tarrant
100006549	Wedgwood Apartments	2511 Wedglea Drive	Dallas	Dallas
100006521	Elizabeth and Jack Knight House	2811 Simondale Drive	Fort Worth	Tarrant
100006219	Braniff International Hostess College	2801 Wycliff Avenue	Dallas	Dallas
100005603	Riverside Baptist Church	3111 Race Street	Fort Worth	Tarrant
100005459	West Denton Residential Historic District	Roughly bounded by West Hickory Street, Panhandle Street, Carroll Boulevard and Ponder Avenue	Denton	Denton
100005350	Fair Building	307 West 7th Street	Fort Worth	Tarrant
100004969	Katy Freight Depot	100 South Jones Street	Fort Worth	Tarrant
100004752	Forest Theatre	1904 Martin Luther King Jr. Boulevard	Dallas	Dallas
100004431	Fairhaven Retirement Home	2400 North Bell Avenue	Denton	Denton
100004371	Bella Villa Apartments	5506 Miller Avenue	Dallas	Dallas
100004249	McGaugh Hosiery Mills / Airmaid Hosiery Mills Building	4408 2nd Avenue	Dallas	Dallas
100003923	Cabana Motel Hotel	899 North Stemmons Freeway	Dallas	Dallas
100003599	Ambassador Hotel	1312 South Ervay	Dallas	Dallas
100003598	Texas Pool	901 Springbrook Drive	Plano	Collin
100002850	Hamilton Apartments	2837 Hemphill Street	Fort Worth	Tarrant
100002699	Shannon's Funeral Home	2717 Avenue B	Fort Worth	Tarrant
100002473	Oakwood Cemetery Historic District	701 Grand Ave.	Fort Worth	Tarrant
100002434	Saigling House	902 East 16th Street	Plano	Collin
100002347	Pioneer Woman Monument	Pioneer Circle, Texas Women's University	Denton	Denton
100001764	First National Bank Tower	1401 Elm Street	Dallas	Dallas
100001373	Garland Downtown Historic District (Boundary Increase for Alston House)	212 North 7th Street	Garland	Dallas
100001372	Plano Downtown Historic District	1000 block & 1112 East 15th Street, 1020 East 15th Place, 1410-1416 J Avenue, & 1416-1430 K Avenue	Plano	Collin
100001227	Masonic Temple	1100 Henderson Street	Fort Worth	Tarrant
100000862	The Woman's Club of Fort Worth	North side 1300 block of Pennsylvania Avenue	Fort Worth	Tarrant

Reference Number	Name	Address	City	County
100000861	Garland Downtown Historic District	Roughly bounded by W. State Street on the north, Santa Fe Rail Line on the east, West Avenue A on the south and Glenbroo	Garland	Dallas
100000674	Jennings-Vickery Historic District	W. Vickery Boulevard, St. Louis Avenue, West Daggett Avenue and Hemphill Street, plus Jennings Avenue Underpass	Fort Worth	Tarrant
100000672	Travis College Hill Historic District	300-400 blocks of South 11th Street	Garland	Dallas
100000671	Grand Lodge of the Colored Knights of Pythias, Texas	2551 Elm Street	Dallas	Dallas
100000504	Lily B. Clayton Elementary School	2000 Park Place Avenue	Fort Worth	Tarrant
99001139	Lawrence, Stephen Decatur, Farmstead	701 E. Kearney St.	Mesquite	Dallas
99000882	Our Mother of Mercy Catholic Church and Parsonage	1100 and 1104 Evans Ave.	Fort Worth	Tarrant
99000565	Fairmount--Southside Historic District (Boundary Increase)	Roughly bounded by Magnolia, Hemphill, Allen, Travis and Morphy St.	Fort Worth	Tarrant
99000565	Fairmount--Southside Historic District (Boundary Increase)	Roughly bounded by Magnolia, Hemphill, Allen, Travis and Morphy St.	Fort Worth	Tarrant
98000736	Original Town Residential Historic District	Roughly bounded by Texas, Austin, Hudgins and Jenkins Sts.	Grapevine	Tarrant
98000429	Guinn, James E., School	1200 South Freeway	Fort Worth	Tarrant
97001393	Highland Park Shopping Village	Jct. of Preston Rd. and Mockingbird Ln.	Highpark	Dallas
97001109	Cotton Belt Railroad Industrial Historic District	Along RR tracks, roughly bounded by Hudgins, Dooley, and Dallas Sts.	Grapevine	Tarrant
97000851	Bedford School	2400 School Ln	Bedford	Tarrant
97000478	Santa Fe Terminal Buildings No.1 and No. 2	1114 Commerce St. and 1118 Jackson St.	Dallas	Dallas
97000444	Grapevine Commercial Historic District (Boundary Increase)	300 and 400 blocks of S. Main St.	Grapevine	Tarrant
96000035	Dallas High School Historic District	2218 Bryan St.	Dallas	Dallas
95001087	Kessler Park Historic District (Boundary Increase)	Bounded by Turner, Colorado, Sylvan and Salmon	Dallas	Dallas
95000334	Colonial Hill Historic District	Bounded by Pennsylvania Ave., I-45, US 75 and Hatcher	Dallas	Dallas
95000333	Romine Avenue Historic District	2300--2400 blocks of Romine Ave., N side	Dallas	Dallas

Reference Number	Name	Address	City	County
95000332	Queen City Heights Historic District	Roughly bounded by Eugene, Cooper, Latimer, Kynard and Dildock	Dallas	Dallas
95000331	Wheatley Place Historic District	Bounded by Warren, Atlanta, McDermott, Meadow, Oakland and Dathe	Dallas	Dallas
95000330	Alcalde Street--Crockett School Historic District	200--500 Alcalde, 421--421A N. Carroll and 4315 Victor	Dallas	Dallas
95000328	Peak's Suburban Addition Historic District	Roughly bounded by Sycamore, Peak, Worth and Fitzhugh	Dallas	Dallas
95000327	Bryan--Peak Commercial Historic District	4214--4311 Bryan Ave. and 1325--1408 N. Peak	Dallas	Dallas
95000314	Fannin, James W., Elementary School	4800 Ross Ave.	Dallas	Dallas
94001627	North Fort Worth High School	600 Park St.	Fort Worth	Tarrant
94001473	Magnolia Petroleum Company City Sales and Warehouse	1607 Lyte St.	Dallas	Dallas
94000611	Miller and Stemmons Historic District	Roughly bounded by W. Davis St., Woodlawn Ave., Neches and Elsbeth	Dallas	Dallas
94000610	Rosemont Crest Historic District	Roughly bounded by 10th St., Oak Cliff Blvd., W. Davis St., N. Brighton Ave., W. 8th St. and Rosemont Ave.	Dallas	Dallas
94000609	Lake Cliff Historic District	Roughly bounded by E. 6th St., Beckley Ave., Zangs Blvd. and Marsalis Ave.	Dallas	Dallas
94000608	North Bishop Avenue Commercial Historic District	Roughly bounded by 9th St., Davis St., Adams and Madison	Dallas	Dallas
94000607	Kessler Park Historic District	Roughly bounded by Kidd Springs, Stewart, Oak Cliff, Plymouth, I-30, Turner, Colorado and Sylvan	Dallas	Dallas
94000606	King's Highway Historic District	900--1500 Blocks of King's Highway between W. Davis St. and Montclair Ave.	Dallas	Dallas
94000605	Lancaster Avenue Commercial Historic District	Roughly bounded by E. Jefferson Blvd., S. Marsalis, E. 10th St., E. 9th St. and N. Lancaster Ave.	Dallas	Dallas
94000604	Tenth Street Historic District	Roughly bounded by E. Clarendon Dr., S. Fleming Ave., I-35E, E. 8th St. and the E end of Church, E. 9th and Plum Sts.	Dallas	Dallas
93001607	Dealey Plaza Historic District	Roughly bounded by Pacific Ave., Market St., Jackson St. and right of way of Dallas Right of Way Management Company	Dallas	Dallas

Reference Number	Name	Address	City	County
93001607	Dealey Plaza Historic District	Roughly bounded by Pacific Ave., Market St., Jackson St. and right of way of Dallas Right of Way Management Company	Dallas	Dallas
92000097	Grapevine Commercial Historic District	404--432 S. Main St.	Grapevine	Tarrant
91002022	Masonic Widows and Orphans Home Historic District	Roughly bounded by E. Berry St., Mitchell Blvd., Vaughn St., Wichita St. and Glen Garden Dr.	Fort Worth	Tarrant
91001901	Cedar Springs Place	2531 Lucas Dr.	Dallas	Dallas
90000490	Fairmount--Southside Historic District	Roughly bounded by Magnolia, Hemphill, Eighth, and Jessamine	Fort Worth	Tarrant
90000490	Fairmount--Southside Historic District	Roughly bounded by Magnolia, Hemphill, Eighth, and Jessamine	Fort Worth	Tarrant
90000337	Grand Avenue Historic District	Roughly Grand Ave. from Northside to Park	Fort Worth	Tarrant
87001744	McKinney Residential Historic District	Roughly bounded by W. Lamar, N. Benge, W. Louisiana, & N. Oak	McKinney	Collin
87001743	McKinney Hospital, Old	700--800 S. College	McKinney	Collin
87001740	McKinney Cotton Mill Historic District	Roughly bounded by Elm, RR tracks, Burrus, Fowler, & Amscott	McKinney	Collin
87001739	McKinney Cotton Compress Plant	300 blk. Throckmorton	McKinney	Collin
87001738	Kirkpatrick, E. W., House and Barn	903 Parker	McKinney	Collin
87001716	Hill--Webb Grain Elevator	400 E. Louisiana	McKinney	Collin
87001685	Collin County Mill and Elevator Company	407 E. Louisiana	McKinney	Collin
86003488	Texas Centennial Exposition Buildings (1936--1937)	Bounded by Texas and Pacific RR, Pennsylvania, Second, and Parry Aves.	Dallas	Dallas
85000074	St. Patrick Cathedral Complex	1206 Throckmorton	Fort Worth	Tarrant
84001641	Houston Street Viaduct	Houston St. roughly between Arlington St. and Lancaster Ave.	Dallas	Dallas
83003758	Winnetka Heights Historic District	Roughly bounded by Davis and 12th Sts., and Rosemont and Willomet Aves.	Dallas	Dallas
83003134	Continental Gin Company	3301-3333 Elm St., 212 and 232 Trunk Ave.	Dallas	Dallas
83003132	McKinney Commercial Historic District	Roughly bounded by Herndon, Wood, Cloyd, Davis, Louisiana, MacDonald, and Virginia Sts.	McKinney	Collin
79003010	Elizabeth Boulevard Historic District	1001--1616 Elizabeth Blvd.	Fort Worth	Tarrant
79002930	South Boulevard-Park Row Historic District	South Blvd. and Park Row from Central	Dallas	Dallas

Reference Number	Name	Address	City	County
78002983	Texas and Pacific Terminal Complex	Lancaster and Throckmorton Sts.	Fort Worth	Tarrant
78002919	Wilson Block	2902, 2906, 2910 and 2922 Swiss Ave.	Dallas	Dallas
78002918	Westend Historic District	Bounded by Lamar, Griffin, Wood, Market, and Commerce Sts.	Dallas	Dallas
78002918	Westend Historic District	Bounded by Lamar, Griffin, Wood, Market, and Commerce Sts.	Dallas	Dallas
78002916	Munger Place Historic District	Roughly bounded by Henderson, Junius, Prairie, and Reiger Sts.	Dallas	Dallas
78002914	DeGolyer Estate	8525 Garland Rd.	Dallas	Dallas
78002906	Wilson, Ammie, House	1900 W. 15th St.	Plano	Collin
76002067	Fort Worth Stockyards Historic District	Roughly bounded by 23rd, Houston, and 28th Sts., and railroad	Fort Worth	Tarrant
75001966	Dallas Union Terminal	400 S. Houston St.	Dallas	Dallas
74002068	Swiss Avenue Historic District	Swiss Ave. between Fitzhugh and LaVista	Dallas	Dallas
16000915	Hughes Brother's Manufacturing Company Building	1401 South Ervay Street	Dallas	Dallas
16000353	Fortune Arms Apartments	601 West 1st Street	Fort Worth	Tarrant
16000122	Will Rogers Memorial Center	3401 West Lancaster Avenue	Fort Worth	Tarrant
15000877	Everard-Sharrock Jr. Farmstead	6900 Grady Niblo Road	Dallas	Dallas
15000708	Lamar-McKinney Bridge	Spanning the Trinity River at Continental Avenue	Dallas	Dallas
15000337	Parker-Browne Company Building	1212 East Lancaster Avenue	Fort Worth	Tarrant
15000245	One Main Place	1201 Main Street	Dallas	Dallas
14001227	Mayflower Building	411 North Akard Street	Dallas	Dallas
14001035	Sanger Brothers Building (1925)	515 Houston Street	Fort Worth	Tarrant
14000966	Hotel Texas (Boundary Increase)	815 Main Street/815 Commerce Street	Fort Worth	Tarrant
14000963	Paine House	2515 West 5th Street	Irving	Dallas
14000962	Johnson Rooming House	1026 North Beckley Avenue	Dallas	Dallas
14000473	Joffre-Gilbert House	309 S. O'Connor Road	Irving	Dallas
14000343	Fort Worth Recreation Building	215 West Vickery Boulevard	Fort Worth	Tarrant
14000105	Inspiration Point	Roughly 250 yards south of 2400 block of Roberts Cut off Road in Marion Sansom Park	Fort Worth	Tarrant
14000103	511 Akard Building	511 North Akard	Dallas	Dallas
13000126	Fort Worth Warehouse & Transfer Company Building	201 South Calhoun Street	Fort Worth	Tarrant

Reference Number	Name	Address	City	County
11000982	Ridglea Theatre and Annex Building	6025-6033 Camp Bowie Boulevard and 3309 Winthrop Avenue	Fort Worth	Tarrant
11000514	Butler Place Historic District	Roughly bounded by Luella St., I.M. Terrell Way Cir. M., 19th St. & I 35W	Fort Worth	Tarrant
11000344	Santa Fe Terminal Building No. 4	1033 Young Street	Dallas	Dallas
10000866	Thomas J. & Elizabeth Nash Farm	626 Ball Street	Grapevine	Tarrant
10000500	Vandergriff Building	100 East Division Street	Arlington	Tarrant
10000253	Heritage Plaza	West Bluff Street at Main Street	Fort Worth	Tarrant
10000247	Fairview H&TC Railroad Historic District	About 1/4 mile west of State Highway 5 on Sloan Creek & the old Houston & Texas Central Railroad tracks	Fairview	Collin
10000144	Gulf Oil Distribution Facility	501 Second Avenue	Dallas	Dallas
10000051	Oakhurst Historic District	Roughly bounded by Yucca Avenue, Sylvania Avenue, Watauga Avenue and Oakhurst Scenic Drive	Fort Worth	Tarrant
9000984	South Main Street Historic District	104, 108, 126 7 200 blocks of South Main Street	Fort Worth	Tarrant
9000980	Allen Water Station	North of Exchange Parkway on Cottonwood Creek	Allen	Collin
9000839	Celina Public School	205 South Colorado Street	Celina	Collin
9000306	Fidelity Union Life Insurance Building	1511 Bryan / 1507 Pacific Avenue	Dallas	Dallas
8001400	Fort Worth Botanic Garden	3220 Botanic Garden Boulevard	Fort Worth	Tarrant
8001299	Dallas Downtown Historic District (Boundary Increase)	Roughly bounded by Jackson, North Harwood, Commerce, north-south line between South Pearl Expressway and South Harwood,	Dallas	Dallas
8000658	Alfred and Juanita Bromberg House	3201 Wendover Road	Dallas	Dallas
8000476	Central Roanoke Historic District	100 and 200 blocks of North Oak Street	Roanoke	Denton
7001383	Greenway Parks Historic District	Bounded by W. Mockingbird Lane, West University Boulevard, Inwood, North Dallas Tollway	Dallas	Dallas
6001065	Eighth Avenue Historic District	Bounded by 8th Ave., Pennsylvania Ave., 9th Ave., and Pruitt St.	Fort Worth	Tarrant
5000240	Leuda-May Historic District	301-311 W. Leuda and 805-807 May Sts.	Fort Worth	Tarrant

Reference Number	Name	Address	City	County
4000894	Dallas Downtown Historic District	Roughly bounded by Federal, N. St. Paul, Pacific, Harwood, S. Pearl, Commerce, S Ervay, Akard, Commerce and Field	Dallas	Dallas
4000886	Our Lady of Victory Academy	801 W. Shaw St.	Fort Worth	Tarrant
3000435	Man, Ralpd Sandiford and Julia Boisseau, House	604 W. Broad St.	Mansfield	Tarrant
3000334	South Center Street Historic District	500-600 blks of S. Center St.	Arlington	Tarrant
2001569	Grapevine Commercial Historic District (Boundary Increase II)	500-530 S. Main St.	Grapevine	Tarrant
2000405	Near Southeast Historic District	Roughly bounded by New York Ave., E. Terrell Ave., former I&GN Railway, Verbena St., and N side of E. Terrell Ave,	Fort Worth	Tarrant
2000009	Goodyear Tire and Rubber Company Building and B.F. Goodrich Building	2809 Parry Ave. and 4136-40 Commerce St.	Dallas	Dallas
1001472	Central Handley Historic District	Roughly bounded by E. Lancaster Ave., Forest Ave., Kerr St., and Handley Dr.	Fort Worth	Tarrant
1001002	Strain Farm--Strain, W.A., House (Boundary Increase)	400 Lancaster-Hutchins Rd.	Lancaster	Dallas
1000102	Marine Commercial Historic District	Roughly defined by N. Main St., bet. N. Side Dr. and N. 14th St.	Fort Worth	Tarrant
1582	Denton County Courthouse Square Historic District	Area bounded by Pecan, Austin, Walnut, and Cedar Sts.	Denton	Denton
247	Old Town Historic District	Roughly bounded by Sanford, Elm, North, Prairie and Oak Sts.	Arlington	Tarrant

From:	Millard, Mike (FAA)
To:	Couture, Christopher A (FAA); Baker, Nicholas M (FAA); Hurst, Christopher A (FAA); Neumann, Shelia S (FAA)
Subject:	FW: Small Package Delivery in Dallas-Fort Worth Metropolitan Area
Date:	Tuesday, May 2, 2023 8:58:24 AM
Attachments:	~WRD000.jpg

All,

This came in from the TX SHPO for the Wing Dallas Fort Worth delivery area.

From: noreply@thc.state.tx.us <noreply@thc.state.tx.us>
Sent: Monday, May 1, 2023 2:12 PM
To: 9-AWA-AVS-AFS-ENVIRONMENTAL (FAA) <9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov>; reviews@thc.state.tx.us
Subject: Small Package Delivery in Dallas-Fort Worth Metropolitan Area

Re: Project Review under Section 106 of the National Historic Preservation Act
THC Tracking #202307198
Date: 05/01/2023
Small Package Delivery in Dallas-Fort Worth Metropolitan Area
Dallas Fort Worth Metro Area
Dallas,TX

Description: The FAA is currently evaluating a proposal from Wing Aviation LLC to expand its unmanned aircraft small package delivery operations in the Dallas-Fort Worth metropolitan area.

Dear Mike Millard:
Thank you for your submittal regarding the above-referenced project. This response represents the comments of the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission (THC), pursuant to review under Section 106 of the National Historic Preservation Act.

The review staff, led by Justin Kockritz and Rebecca Shelton, has completed its review and has made the following determinations based on the information submitted for review:

Above-Ground Resources

- No historic properties are present or affected by the project as proposed. However, if historic properties are discovered or unanticipated effects on historic properties are found, work should cease in the immediate area; work can continue where no historic properties are present. Please contact the THC's History Programs Division at 512-

463-5853 to consult on further actions that may be necessary to protect historic properties.

We have the following comments: THC has no concerns about the proposed operation of the unmanned aircraft if the nests are located on existing developed sites and no new ground disturbance is proposed. If specific nest sites do propose new ground disturbance, additional review and consultation will be required for those sites.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this review process, and for your efforts to preserve the irreplaceable heritage of Texas. If the project changes, or if new historic properties are found, please contact the review staff. If you have any questions concerning our review or if we can be of further assistance, please email the following reviewers: justin.kockritz@thc.texas.gov, rebecca.shelton@thc.texas.gov.

This response has been sent through the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit http://thc.texas.gov/etrac-system.

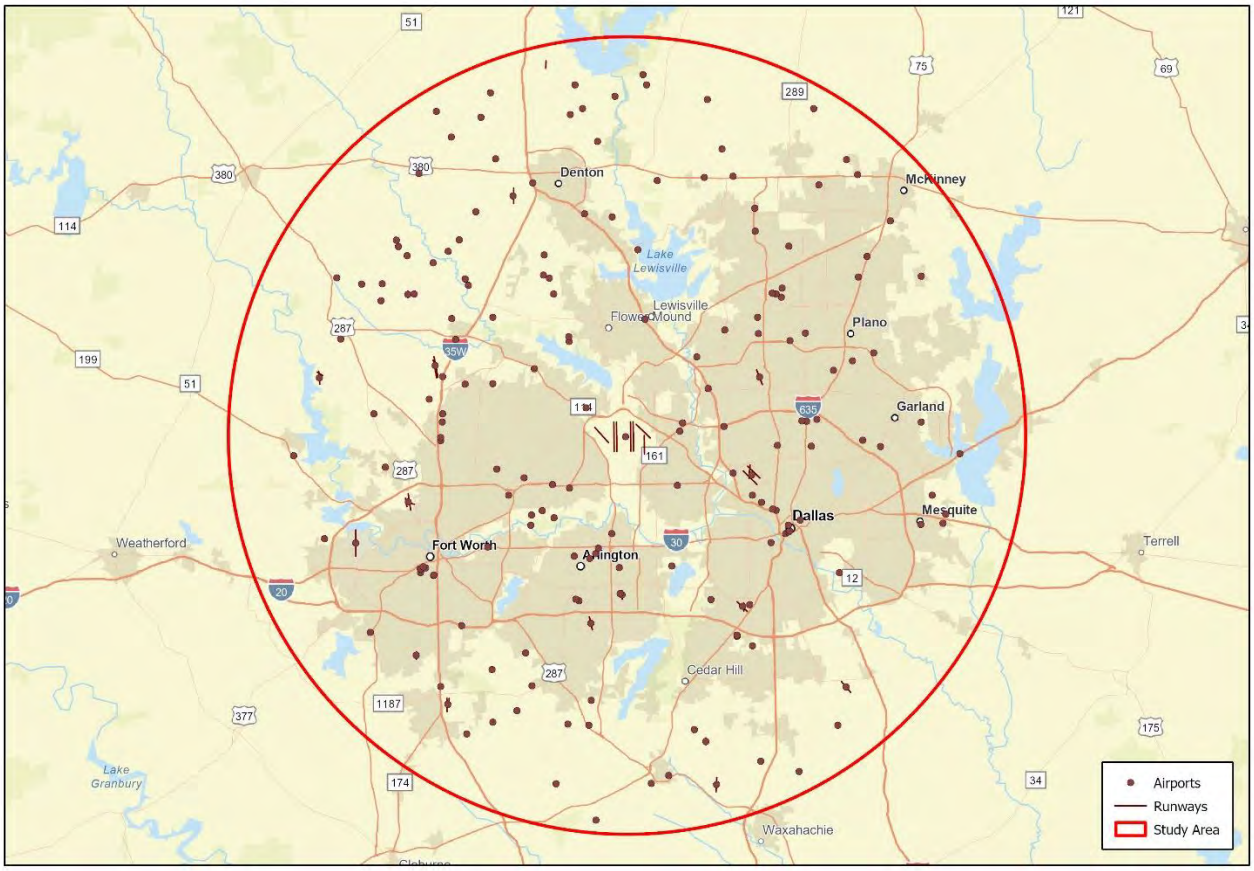
Sincerely,

for Mark Wolfe, State Historic Preservation Officer
Executive Director, Texas Historical Commission

Please do not respond to this email.

Mike Millard
Aviation Safety Inspector
Flight Standards Environmental Specialist
Parachute, Balloon, Glider, Ultralight, Banner Towing Operations Specialist
General Aviation Operations Branch, AFS-830
202-267-7906

Appendix H
Dallas–Fort Worth Area Airports



Appendix I
Existing Nest Locations