FINAL ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT/ RECORD OF DECISION

Causey Aviation Unmanned (CAU), Inc.
Drone Package Delivery Operations in the
Dallas-Fort Worth Area,
including Granbury and Rowlett, Texas

Prepared by:

United States Department of Transportation
Federal Aviation Administration
Washington, D.C.

December 2024

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration
Finding of No Significant Impact and Record of Decision
for
Environmental Assessment for Causey Aviation Unmanned (CAU), Inc. LLC Proposed Drone Package Delivery Operations in Dallas–Fort Worth and Granbury, Texas

Summary

The Federal Aviation Administration (FAA) prepared the attached final Environmental Assessment (EA) to analyze the potential environmental impacts of issuing a Part 135 certificate, Operations Specifications (OpSpec), and 49 United States Code (U.S.C.) Section 44807 exemption to Causey Aviation Unmanned (CAU), Inc. that allows CAU to carry the property of another for compensation or hire beyond visual line of sight (BVLOS) using its Flytrex FTX-M600P and the Flytrex Sky II Unmanned Aircraft System (UAS). Causey Aviation Unmanned (CAU), Inc. is seeking an OpSpec to allow unmanned aircraft (UA; also referred to as a drone) commercial package delivery operations in the Dallas Fort Worth (DFW) metropolitan and surrounding area. The EA was prepared in accordance with the National Environmental Policy Act of 1969, as amended (NEPA; 42 U.S.C. § 4321 et seq.); Council on Environmental Quality (CEQ) NEPA-implementing regulations (40 Code of Federal Regulations [CFR] parts 1500 to 1508); and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.

After reviewing and analyzing available data and information on existing conditions and potential impacts, the FAA has determined that the Proposed Action would not significantly affect the quality of the human environment. Therefore, the preparation of an Environmental Impact Statement is not required, and the FAA is issuing this Finding of No Significant Impact (FONSI) and Record of Decision (ROD). The FAA has made this determination in accordance with applicable environmental laws and FAA regulations. The EA is incorporated by reference into this FONSI/ROD.

Purpose and Need

The purpose of Causey Aviation Unmanned (CAU), Inc.'s request is to expand commercial drone package delivery operations in DFW and Granbury, TX. Causey Aviation Unmanned (CAU), Inc. has determined there is an increase in consumer demand for drone delivery services and the proposed action is needed, necessitating expanded operations.

Proposed Action

Causey Aviation Unmanned (CAU), Inc.'s request to obtain a Part 135 Certificate, OpSpec, and 44807 exemption to enable beyond visual line of sight drone delivery operations under Part 135 using the FLYTREX FTX-M600P AND THE FLYTREX SKY II in the DFW and Granbury area requires FAA review and approval. The Flytrex FTX-M600P UA has a maximum takeoff weight of 33.1 pounds, and the maximum allowable package weight is 5.73 pounds. The UA features a multi-rotor design with six propellers mounted on equally-spaced arms extending horizontally from a center frame. The system's computers and package containers are mounted on the underside of the airframe. The Flytrex Sky II UA has a maximum takeoff weight of 34.2 pounds, and the maximum allowable package weight is 8.8 pounds. The UA features a multi-rotor design with eight propellers mounted on a hash-shaped carbon fiber airframe. The system's computers, power system and winch mechanism are mounted on the center of the airframe. The Sky II model carries the packages without a delivery box.

The major federal action includes the FAA approval of Causey Aviation Unmanned (CAU), Inc.'s B050 OpSpec*, Authorized Areas of En Route Operations, Limitations, and Provisions*. Once approved, a reference section titled *Limitations, Provisions, and Special Requirements* will be created in the OpSpec. This would allow Causey Aviation Unmanned (CAU), Inc. to expand the geographic scope of new DC locations as well as increase their number of daily operations to 500 deliveries per day from each DC. Causey Aviation Unmanned (CAU), Inc. is projecting to establish up to an additional 30 Distribution Centers (DCs) in the DFW and Granbury operating area under the scope of the proposed action.

DCs would be distributed throughout the DFW metro area following a measured rollout plan to be developed with Causey Aviation Unmanned (CAU), Inc.'s partners and continuing best practices from Causey Aviation Unmanned (CAU), Inc.'s established community outreach program. Causey Aviation Unmanned (CAU), Inc.'s DCs 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, Causey Aviation Unmanned (CAU), Inc. would site its DCs at least 150 feet away from noise-sensitive areas, based on the extent of the 55 dB DNL, when the DC is located within the controlled surface area of Class B or Class D airspace and at least 83 feet away from noise-sensitive areas, based on the extent of the 60 dB DNL, in all other locations within the study area, which is defined as the proposed operating areas. Each DC would contain multiple aircraft takeoff and landing pads. The estimated total distance flown for deliveries would vary depending upon the DC and drop-off locations in the operating area.

Causey Aviation Unmanned (CAU), Inc. will typically operate seven (7) days per week to include holidays. The total distance flown for deliveries would vary depending on the DC and delivery locations with a maximum distance of 8.5 miles (round trip) for the Flytrex M600P UA model and a maximum distance of 8 miles (round trip) for the Flytrex Sky II UA model. Operations are to be conducted from 7 AM to 10 PM local time. Each flight would take a package to a customer delivery address before returning to the DC. There would be variability in the number of flights per day based on customer demand and weather conditions. Deliveries would be conducted at the time of the customer's choosing and directly to the customer's home in the operating area.

See Sections 1.2 and 1.3 of the EA for detailed discussion.

See Section 2.2 of the EA for further information.

Alternatives

Council on Environmental Quality (CEQ) regulations at 40 CFR § 1502.14(c) require agencies to consider a no action alternative in their NEPA analyses. Thus, the no action alternative serves as a baseline to compare the impacts of the proposed action. As described briefly in Section 1.2, Under the no action alternative, the FAA would not approve an OpSpec under Part 135 to expand Causey Aviation Unmanned (CAU), Inc. package delivery operations in the DFW area. There would be no change to current Causey Aviation Unmanned (CAU), Inc. package delivery operations in the Granbury and Rowlett area. Under the No Action Alternative, CAU would not expand its UA commercial package deliveries in the DFW metro area and would not extend its delivery ranges in Granbury and Rowlett. CAU would still be authorized to conduct package delivery flights in Granbury and Rowlett under its existing Part 135 approval using the Flytrex FTX-M600P UA, which includes up to 77 average annual daily (AAD) deliveries from the Granbury DC and up to 71 AAD deliveries from the Rowlett DC.

In addition, CAU could continue to operate under 14 CFR Part 107, although these existing operations are limited to UA weighing less than 55 pounds and within visual line of sight. Visual observers placed in vehicles along the delivery route to maintain line of sight would still be required. The No Action Alternative does not meet the stated purpose and need. Consumers in the areas not served by UA would be expected to continue to use personal ground transportation to retrieve small goods using their automobiles or in some cases with public transportation, if available. This alternative does not support the stated purpose and need.

See Section 2.1 of the EA for further information.

Environmental Impacts

The potential environmental impacts of the Proposed Action and no action alternative were evaluated in the EA for each environmental impact category identified in FAA Order 1050.1F. Chapter 3 of the EA describes the affected environment within the project study area and identifies the following environmental impact categories that are not analyzed in detail: Air Quality and Climate; Coastal Resources; Farmlands; Hazardous Materials, Solid Waste, and Pollution Prevention; Land Use; Natural Resources and Energy Supply; Socioeconomics; Children's Environmental Health and Safety Risks; Visual Effects (Light Emission Only); and Water Resources (Wetlands, Floodplains, Surface Water, Groundwater, and Wild and Scenic Rivers).

Chapter 3 also provides the potential environmental consequences of the Proposed Action for each of the remaining environmental impact categories and documents the finding that no significant environmental impacts would result from the Proposed Action. A summary of the documented findings for each impact category, including requisite findings with respect to relevant special purpose laws, regulations, and executive orders, is presented below.

Biological Resources, EA Section 3.2 and Appendix B. The Proposed Action is not anticipated to significantly impact wildlife within the affected area. Operations would occur mostly in an urban environment, typically well above the tree line and away from sensitive habitats. Individual areas would only briefly experience increased ambient sound levels during transit and delivery operations. Potential impacts on biological resources associated with the proposed action were considered in the area where drones may operate (launch, fly, and drop packages). Causey Aviation Unmanned (CAU), Inc.'s DCs would be located in retail store parking lots; therefore, there would be no ground disturbance or habitat modification associated with the proposed action. Packages are loaded into the UA at the DC. The UA then launches to perform aerial deliveries. With a multi-rotor design, the UA can take off and descend vertically, as well as hover. Normal cruising speeds are expected to be approximately 29 knots (33 miles per hour [mph]) for both Flytrex models. Typical flights begin with the UA departing from a DC and ascending vertically to 230 feet above ground level (AGL). The UA then flies a pre-determined route at 230 feet AGL to the delivery point. Upon arrival at the delivery point, the UA descends vertically to the delivery hover altitude of 75 to 82 feet AGL, lowers the package to the ground using a tethered mechanism, ascends to cruising altitude and speed, and returns to the DC. Upon arrival at the DC, the UA descends vertically from 230 feet AGL to the ground for landing. CAU's aircraft does not touch the ground in any place other than the DC (except during emergency landings) since it remains airborne while conducting deliveries. In addition, Causey Aviation Unmanned (CAU), Inc. would also specifically coordinate with the managing entities of state parks and natural areas within the action area on the thoughtful placement and use of delivery sites within these areas as necessary.

To avoid impacts on nesting Bald Eagles, Causey Aviation Unmanned (CAU), Inc. 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 to identify eagle nests that may occur in the operating area, as well as communication with the bird watching community to identify nests. Causey Aviation Unmanned (CAU), Inc. personnel will also be educated in the visual identification of Bald Eagle nests, which are typically very conspicuous. If Causey Aviation Unmanned (CAU), Inc. identifies a Bald Eagle nest or is notified of the presence of a nest, Causey Aviation Unmanned (CAU), Inc. 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. Causey Aviation Unmanned (CAU), Inc. will maintain this avoidance area until the end of the breeding season or until a qualified biologist indicates the nest has been vacated. Causey Aviation Unmanned (CAU), Inc. will regularly report monitoring and avoidance measures to Texas Parks & Wildlife and the USFWS Region 2 Migratory Bird Permit Office. Causey Aviation Unmanned (CAU), Inc. has not had any bird strikes related to their operations.

The FAA determined the proposed action would have no effect on the alligator snapping turtle (*Macrochelys temminckii*), Texas fawnsfoot (*Truncilla macrodon*), Texas heelsplitter (*Potamilus amphichaenus),* and monarch butterfly (*Danaus plexippus*), and may affect, but is not likely to adversely affect the tricolored bat (*Perimyotis subflavus*), golden-cheeked warbler (*Setophaga chrysoparia*), and whooping crane (*Grus americana*). On September 23, 2024, the USFWS issued its concurrence on these findings.

The tri-colored bat is proposed to be listed. 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. Should the tricolored bat be listed, the FAA will re-evaluate the project to determine the extent of effects on the species. If that evaluation indicates adverse effects would or are occurring on the species, measures should be implemented to avoid incidental take until consultation can be completed. Additionally, the FAA would then need to develop and implement long term procedures for monitoring and reporting potential effects of drone activity on tricolored bats. This would include a process for reporting survey data, detection of collisions, and contingency planning in the event that adverse effects are reported.

This concluded the FAA's obligations under Section 7 of the Endangered Species Act. In addition, the Proposed Action 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 of any species. Therefore, no significant impacts on biological resources are expected under the Proposed Action.

Department of Transportation Act Section 4(f), EA Section 3.5 and Appendix F. The FAA has determined that drone operations would not cause substantial impairment to Section 4(f) resources that could occur in the study area and would not be considered a *constructive use* of any Section 4(f) resource. Noise and visual effects from CAU's occasional overflights are not expected to diminish the activities, features, or attributes of the resources that contribute to their significance or enjoyment. There would be no physical use of Section 4(f) resources because the Proposed Action has no direct interaction with any resources on the ground. Constructive use could occur when a project would produce an effect, such as excessive noise, that would result in substantial impairment to a property where the features of that property are substantially diminished. However, as discussed in Section 3.3, the Proposed Action would not result in a significant increase in noise levels at any location within the study area. As further described in Section 3.7, the short duration of en route flights would minimize any potential for significant visual impacts.

FAA distributed the Notice of Availability (NOA) of the published draft EA for the public comment period to all identified appropriate official(s) with jurisdiction over the Section 4(f) properties.

The FAA has determined that the Proposed Action would not cause substantial impairment, or direct or constructive use, as defined in Section 3.5.1, to any of the Section 4(f) resources in the study area. Therefore, the Proposed Action would not result in significant impacts on Section 4(f) resources.

Historical, Architectural, Archaeological, and Cultural Resources; EA Section 3.4, Appendices D and E. The Proposed Action would not significantly impact historical, architectural, archaeological, and cultural resources. Drone effects on historic properties are limited to non-physical, reversible impacts (i.e., the introduction of audible and/or visual elements).

The FAA invited several Tribal governments for government-to-government consultation concerning the proposed action and initiated consultation under Section 106 concerning any potential resources of religious or cultural significance in the APE, which included the following tribes (section 6.0): Apache Tribe of Oklahoma, Caddo Nation of Oklahoma, Comanche Nation, Oklahoma, Cherokee Nation, Oklahoma, Delaware Nation, Oklahoma, The Muscogee (Creek) Nation, Oklahoma, Coushatta Tribe of Louisiana, Tonkawa Tribe of Indians of Oklahoma, Wichita and Affiliated Tribes, Oklahoma. No responses from tribal governments have been received as of the issuance date of the FONSI-ROD.

FAA conducted a noise exposure analysis for the Proposed Action and concluded that noise levels would be below the FAA's threshold for significance. Based on the information available, the FAA made a finding of *no adverse effect on historic properties* in accordance with 36 CFR Part 800. The FAA received concurrence from the State Historic Preservation Office (SHPO) on September 6, 2024, that the Proposed Action would have "n*o adverse effects on historic properties.*" Therefore, the Proposed Action would not result in significant impacts on historical, architectural, archaeological, or cultural resources.

Noise and Noise-Compatible Land Use, EA Section 3.3 and Appendix C. The Proposed Action is not anticipated to result in any significant changes in the overall noise environment within the affected area. Noise impacts would be significant if the action would increase noise by day-night average sound level (DNL) 1.5 decibel (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.

FAA has an established noise significance threshold, defined in FAA Order 1050.1F, which is used when assessing noise impacts in a particular project area. A significant noise impact is defined 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 65 dB level due to a DNL 1.5 dB or greater increase.

The noise generated by the DFW including Granbury operations is not expected to be incompatible with noise sensitive resources within the action area. The maximum noise exposure levels are associated with DC operations, where the maximum noise exposure levels within the operating areas with noise levels ranging from 52 dB to 70 dB DNL could occur from approximately 277 feet to 26 feet. As described in Section 2.2, *Proposed Action*, DCs would be located at least 83 feet away from noise-sensitive areas based on the 60 dB DNL. In addition, when DCs are planned to be within the controlled surface areas of Class B, C, and D airspace, the setback distance from noise-sensitive land uses is 150 feet based on the 55 dB DNL extent.

Based on this approach, any noise increases associated with activity at DCs should not exceed the significance impacts threshold for noise. Therefore, no significant impacts on noise and noise-compatible land use are expected under the Proposed Action.

Environmental Justice, EA Section 3.6. The Proposed Action would not result in disproportionately high or adverse effects on minority or low-income populations. Drone 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, Causey's service is meant to provide additional and on-demand access to small goods and groceries without making use of roads and provides a greater benefit in more congested areas. Commercial drone delivery services may therefore result in a positive effect on low-income and minority communities who experience greater traffic congestion and have no other mode of transportation. As such, the Proposed Action would not result in significant environmental justice impacts or disproportionately high and adverse effects on minority and low-income populations.

Visual Effects (Visual Resources and Visual Character), EA Section 3.7. Impacts on visual resources are expected to be less than significant. 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. Drone operations would not introduce new light emissions, and the short duration of overflights as well as the low number of overflights within any given location would minimize the potential for substantial visual impacts. Therefore, no significant impacts on visual effects are expected under the Proposed Action.

Please refer to Chapter 3 of the EA for a full discussion of the analysis for each environmental impact category.

Chapter 4 of the EA provides an analysis of the potential cumulative impacts of the Proposed Action when added to other past, present, and reasonably foreseeable actions. An additional cumulative effects analysis for multiple operators expected to provide package delivery operations within the DFW area within the next two years is provided in Appendix I. The FAA has determined that the Proposed Action would not result in significant cumulative impacts in any environmental impact category.

Public Involvement and Coordination

On October 28, 2024, the FAA published the draft EA for a 30-day public comment period which concluded on November 29, 2024. The FAA received comments during the comment period for this EA, which are documented in Appendix H. The FAA considered all public comments when preparing the EA. Comments were received in writing at 9-FAA-Drone-Environmental@faa.gov.

See Section 1.4 and Appendix H of the EA for further information.

Finding of No Significant Impact

The FAA finding is based on a comparative examination of environmental impacts for each of the alternatives studied during the environmental review process. The EA discloses the potential environmental impacts for each of the alternatives and provides a full and fair discussion of those impacts. Based on the FAA's review and analysis and consideration of comments, it has determined that there would be no significant impacts on the natural environment or surrounding population as a result of the Proposed Action.

The FAA believes the Proposed Action best fulfills the purpose and need identified in the EA. In contrast, the no action alternative fails to meet the purpose and need identified in the EA. An FAA decision to take the required actions and approvals is consistent with its statutory mission and policies supported by the findings and conclusions reflected in the environmental documentation and this FONSI/ROD.

After careful and thorough consideration of the facts contained herein and following consideration of the environmental impacts described, the undersigned finds that the proposed Federal action is consistent with existing national environmental policies and objectives as set forth in Section 101(a) of the National Environmental Policy Act of 1969 and other applicable environmental requirements, and will not significantly affect the quality of the human environment or otherwise include any condition requiring consultation pursuant to Section 102(2)(C) of NEPA. As a result, an Environmental Impact Statement will not be prepared by the FAA.

Decision and Order

The FAA recognizes its responsibilities under NEPA, CEQ regulations, and its own directives. Recognizing these responsibilities, the undersigned has carefully considered the FAA's goals and objectives in reviewing the environmental aspects of the Proposed Action to approve Causey Aviation Unmanned (CAU), Inc.'s request to expand drone delivery services in the DFW and Granbury Texas area. Based upon the above analysis, the FAA has determined that the Proposed Action meets the purpose and need.

The environmental review included the purpose and need to be served by the Proposed Action, alternatives to achieving them, the environmental impacts of these alternatives, and conditions to preserve and enhance the human environment. This decision is based on a comparative examination of the environmental impacts for each of these alternatives. The EA provides a fair and full discussion of the impacts of the Proposed Action. The NEPA process included appropriate consideration for avoidance and minimization of impacts, as required by NEPA, the CEQ regulations, and other special-purpose environmental laws, and appropriate FAA environmental orders and guidance.

The FAA has determined that environmental concerns presented by interested agencies and the public have been addressed in the EA. The FAA believes that, with respect to the Proposed Action, the NEPA requirements have been met. FAA approval of this environmental review document indicates that applicable Federal requirements for environmental review of the Proposed Action have been met.

Accordingly, under the authority delegated to me by the Administrator of the FAA, I approve and direct that agency action be taken to carry out implementation of the Proposed Action.

DEREK W HUFTY Digitally signed by DEREK W HUFTY Date: 2024.12.05 13:36:31 -05'00'

Derek Hufty
Manager, General Aviation and Commercial Operations Branch
Emerging Technologies Division
Office of Safety Standards, Flight Standards Service

Right of Appeal

This FONSI/ROD constitutes a final agency action and a final order taken pursuant to 49 U.S.C. §§ 40101 et seq., and constitutes a final order of the FAA Administrator, which is subject to exclusive judicial review by the Courts of Appeals of the United States in accordance with the provisions of 49 U.S.C. § 46110. Any party having substantial interest in this order may apply for a review of the decision by filing a petition for review in the appropriate U.S. Court of Appeals no later than 60 days after the order is issued in accordance with the provisions of 49 U.S.C. § 46110.

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Washington, D.C.

Notice of Availability of the Final Environmental Assessment and Finding of No Significant Impact/Record of Decision for Causey Aviation Unmanned, Inc.'s Drone Package Delivery Operations in the Dallas-Fort Worth Area, including Granbury and Rowlett, Texas

The Federal Aviation Administration (FAA) hereby gives notice that a Final Environmental Assessment (EA) and a Finding of No Significant Impact/Record of Decision (FONSI/ROD) prepared pursuant to the National Environmental Policy Act (NEPA) (42 United States Code §§ 4321 – 4355), to assess the potential environmental effects of the FAA decision to authorize Causey Aviation Unmanned, Inc. (CAU), to conduct unmanned aircraft (UA) commercial package delivery operations from distribution centers located in the Dallas-Fort Worth area, including Granbury and Rowlett, Texas, are available.

CAU seeks to amend its air carrier Operations Specifications (OpSpec) and other FAA approvals necessary to begin UA commercial package delivery operations in the Dallas-Fort Worth, Texas, area and to expand its operations in Granbury and Rowlett, Texas. The federal action subject to this EA is the requested FAA approval of CAU's OpSpec to include a paragraph with descriptive language about the operating area boundaries, which includes the specific locations and operational profiles in CAU's request.

This Final EA has been prepared in accordance with the requirements set forth in the Council on Environmental Quality (CEQ) regulations at Title 40, Code of Federal Regulations (CFR), parts 1500-1508, *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures.* This Final EA reflects the consideration of comments received during the public comment period for this EA from October 29, 2024, through November 29, 2024. Based on the analysis described in this EA, the FAA has determined there will not be a significant impact to the human environment. As a result, an Environmental Impact Statement (EIS) has not been initiated (40 CFR 1501.6).

The Final EA and FONSI/ROD are available to view/download electronically at: https://www.faa.gov/uas/advanced_operations/nepa_and_drones **CONTACT INFORMATION:** For any questions or to request a copy of the EA, please email 9-FAA-DRONE-Environmental@FAA.gov.

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

Responsible FAA Official:

DEREK W HUFTY Digitally signed by DEREK W HUFTY
Date: 2024.12.10 16:25:25 -05'00'

Derek W. Hufty
Manager, General Aviation and Commercial Operations Branch
Emerging Technologies Division
Office of Safety Standards, Flight Standards Service

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List of Acronyms and Abbreviations

ACS	American Community Survey
AGL	above ground level
APE	area of potential effects
BCC	Birds of Conservation Concern
BVLOS	Beyond Visual Line of Sight
CAU	Causey Aviation Unmanned, Inc.
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COA	Certificate of Waiver or Authorization
CWA	Clean Water Act
dB	decibel
DC	distribution center
DNL	day-night average sound level
DNR	Department of Natural Resources
DOT	Department of Transportation
EA	Environmental Assessment
EJ	Environmental Justice
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
IPaC	Information for Planning and Consultation
IPP	UAS Integration Pilot Program
NAS	National Airspace System
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act

NM	nautical miles
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NTSB	National Transportation Safety Board
OpSpec	Operations Specifications
PSP	Partnership for Safety Program
RPIC	Remote Pilot in Command
SEL	Sound Exposure Level
SHPO	State Historic Preservation Office(r)
THPO	Tribal Historic Preservation Office(r)
U.S.C.	United States Code
UA	Unmanned Aircraft
UAS	Unmanned Aircraft Systems
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WSRS	National Wild and Scenic Rivers System

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1.0 PURPOSE AND NEED

1.1 Introduction

In 2012, Congress first charged the Federal Aviation Administration (FAA) with integrating unmanned aircraft systems (UAS) into the National Airspace System (NAS).[1] The FAA has engaged in a phased, incremental approach to integrating UAS into the NAS and continues to work toward full integration of UAS into the NAS. Part of that approach involves providing safety review and oversight of proposed operations to begin commercial unmanned aircraft (UA), or drone, delivery in the NAS.[2]

Over the past several years, Causey Aviation Unmanned, Inc. (CAU) has partnered with Flytrex under FAA programs, including the UAS Integration Pilot Program (IPP)[3] and the BEYOND program,[4] 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, under the current regulations and through exemptions and waivers for some of these regulatory requirements.

CAU received a standard air carrier certificate under 14 Code of Federal Regulations (CFR) Part 135 (Part 135)[5] from the FAA in January 2023, which allows CAU to conduct on-demand operations, and a 49 United States Code (U.S.C.) Section 44807 exemption,[6] which allows CAU to carry the property of another for compensation or hire beyond visual line of sight (BVLOS) using the Flytrex FTX-M600P UA. CAU's Part 135 certificate contains a stipulation that operations must be conducted in accordance with the provisions and limitations set forth in its air carrier Operations Specifications (OpSpec). The OpSpec defines the scope of aircraft operations that the FAA has authorized.[7] CAU currently operates from a distribution center (DC) in Granbury, southwest of the Dallas-Fort Worth (DFW) metropolitan (metro) area, and a DC in Rowlett in the eastern part of the DFW metro area. The FAA prepared an Environmental Assessment (EA) for CAU's operations in Granbury and Rowlett and issued a Finding of No Significant Impact (FONSI) and a Record of Decision (ROD) on August 9, 2023 (FAA 2023 EA). The previous EA considered up to 77 daily delivery operations from the Granbury DC and up to 71 daily operations from the Rowlett DC, and the delivery area radius extended up to 2 nautical miles (NM) from each DC.[8] CAU also seeks to use the Flytrex Sky II model for drone package deliveries. Operational approvals for the Flytrex Sky II model are anticipated to be received from the FAA in 2024. CAU seeks to amend its OpSpec and other FAA approvals necessary to expand its UA commercial package delivery operations in the DFW metro area, Granbury, and Rowlett, Texas.

As part of their current OpSpec amendment request, CAU seeks to:

- Expand its commercial package delivery to new locations within the DFW metro area;
- Extend its delivery area radius from 2 NM to 3.5 NM from the Granbury and Rowlett DCs;
- Continue operating from the Granbury and Rowlett DCs;

1 49 U.S.C. 44802; FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, Sec. 332. 126 Stat. 11, 73 (2012).
2 The terms UA and drone may be used interchangeably.
3 The UAS IPP was announced on October 25, 2017, via a Presidential Memorandum, which has the force and effect of law on executive agencies. https://www.faa.gov/uas/programs_partnerships/completed/integration_pilot_program/
4 https://www.faa.gov/uas/programs_partnerships/beyond/
5 https://www.faa.gov/uas/advanced_operations/package_delivery_drone
6 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.
7 Paragraph B050 – Authorized Areas of En Route Operations, Limitations, and Provisions specifies the areas of operations whereby CAU is authorized to conduct operations under its Part 135 Certificate.
8 To date, less than 80 operations per day have operated from the Granbury and Rowlett DCs.

- Add up to 30 additional DCs (TBD) within the DFW metro area, including locations such as Frisco/Little Elm and North Richland Hills.

Figure 1 depicts the operating area, with cities denoted by black squares and known DC locations in Granbury and Rowlett denoted by red triangles. The actual locations of the 30 proposed additional DCs are to be determined and not depicted on **Figure 1**.

The Flytrex FTX-M600P UA has a delivery range of approximately 8.5 statute miles (round trip), and the newer Flytrex Sky II UA has a delivery range of approximately 8 statute miles (round trip). CAU proposes to situate DCs in locations throughout the DFW, Granbury, and Rowlett operating areas that will have unique delivery zones within 3.5 NM of each DC, with minimal overlap in the operating areas. The DCs would be located in commercial areas, such as shopping centers, movie theaters, large retail stores, and/or other non-residential areas. For example, the Granbury DC is located at Cinergy Cinemas, and the Rowlett DC is located near the Timberlake Shopping Center. CAU must submit additional DC locations to the FAA for additional National Environmental Policy Act (NEPA) review prior to beginning operations.

CAU plans to fly seven days per week, including holidays, between the hours of 8 a.m. and 10 p.m. Based upon the scope of the Proposed Action, which is described in **Section 2.1**, CAU projects that it would fly up to 500 deliveries per day per DC on average. A "delivery flight" is considered a round-trip flight that includes delivery to the recipient and return to the DC.

The FAA's approval of CAU's amended OpSpec would be considered a major federal action that is subject to environmental review requirements in accordance with NEPA[9] and the Council on Environmental Quality (CEQ) NEPA implementing regulations.[10] CAU prepared this EA under the supervision of the FAA to evaluate the potential environmental impacts that may result from the FAA's approval of the Proposed Action. Under NEPA, federal agencies are required to consider the potential 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, 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).

[9] 42 U.S.C. § 4321 et seq.
[10] See 40 CFR § 1506.5(a)

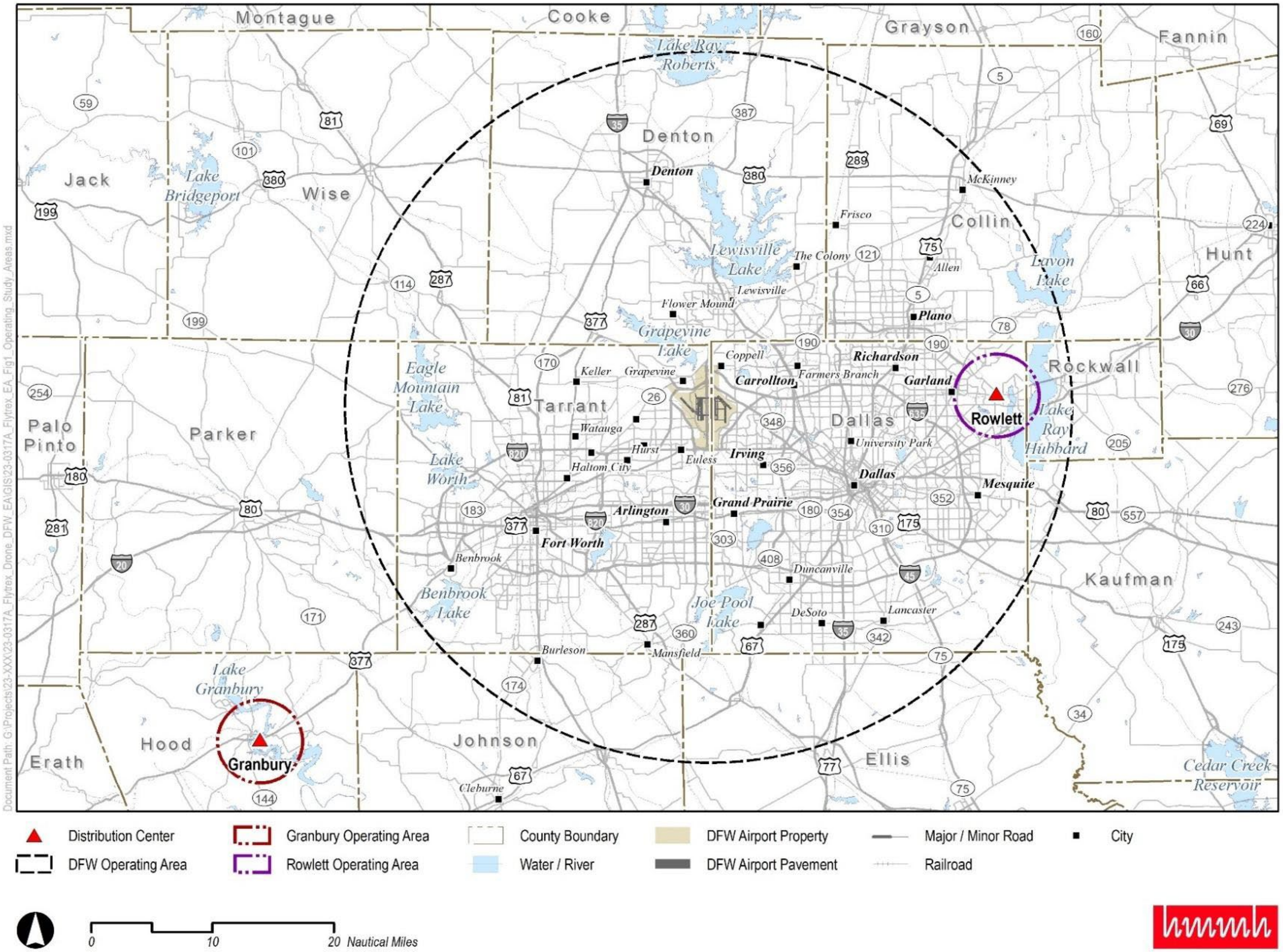

Figure 1. Operating Areas/Study Area

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1.2 FAA Role for Proposed Action

In general, Congress has charged the FAA with the safety of air commerce in the United States. The FAA provides multiple approvals associated with package delivery proposals, such as a waiver of 14 CFR § 91.113(b) to enable BVLOS operations, and a Certificate of Waiver or Authorization; however, the FAA's issuance of an OpSpec (or amended OpSpec) to include package delivery flights in a specified operating area is the approval that ultimately enables UA operations.

In addition, the FAA has specific statutory and regulatory obligations related to its issuance of a Part 135 certificate and the related OpSpec. The FAA is required to issue an operating certificate 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." An operating certificate also specifies "terms necessary to ensure safety in air transportation; and (2)…the places to and from which, and the airways of the United States over which, a person may operate as an air carrier." 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 the OpSpec. 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. The regulations implementing 49 U.S.C. Section 44705 specify that an air carrier's approved OpSpec must include, among other things, "authorization and limitations for routes and areas of operations." 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." After making this determination, the FAA must take an action on the OpSpec amendment.

1.3 Purpose and Need

The "Purpose and Need" section of an EA briefly describes the underlying purpose and need for the proposed action. It presents the problem that would be addressed and describes what the project proponent is trying to achieve with the proposed action.

The ***purpose*** of CAU's request is to amend its OpSpec and other FAA approvals necessary to expand UA BVLOS commercial package delivery operations in the DFW metro area, Granbury,[11] and Rowlett, which, in its business judgment, CAU has determined are appropriate markets for operations. The proposed action is ***needed*** to allow CAU to expand its operations in response to consumer demand for commercial package deliveries in the DFW metro area, Granbury, and Rowlett. CAU's experience in Granbury and Rowlett has helped CAU gauge public demand for UA commercial delivery services and evaluate whether scalable and cost-effective UA BVLOS delivery expansion in the larger DFW metro area is feasible.

1.4 Public Involvement

The FAA created a Notice of Availability (NOA) with information about the Draft EA and provided it to federal, state, and local officials, interest groups, and federally recognized tribes. The NOA was provided in English and Spanish, included information about the Proposed Action, and requested review and comments on this Draft EA. The NOA was published on the FAA's website[12] for a 30-day comment period. The FAA also announced the availability of this Draft EA in the *Dallas Observer*, *AlDia*, and *Fort Worth Star-Telegram* newspapers which serve the operating areas. All Section 4(f) property owners

[11] Permissions for BVLOS commercial package delivery operations for the Granbury site will be pursued at a later stage.
[12] See https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

were notified of the proposed action via the NOA process. Interested parties were invited to submit comments on any environmental concerns related to the Proposed Action.

Four comments were received. Copies of these comments and responses to them are contained in **Appendix H**.

2.0 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 CAU'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 federal 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).[13] The No Action Alternative serves as the baseline for comparing the impacts of the Proposed Action.

Under the No Action Alternative, CAU would not expand its UA commercial package deliveries in the DFW metro area and would not extend its delivery ranges in Granbury and Rowlett. CAU would still be authorized to conduct package delivery flights in Granbury and Rowlett under its existing Part 135 approval using the Flytrex FTX-M600P UA, which includes up to 77 average annual daily (AAD) deliveries from the Granbury DC and up to 71 AAD deliveries from the Rowlett DC.

In addition, CAU could continue to operate under 14 CFR Part 107, although these existing operations are limited to UA weighing less than 55 pounds and within visual line of sight.[14] Visual observers placed in vehicles along the delivery route to maintain line of sight would still be required. Consumers in the areas not served by UA would continue to use personal ground transportation to retrieve small goods or have them delivered by services using ground transportation. The No Action Alternative does not meet the stated purpose and need.

2.2 Proposed Action

The proposed action is the expansion of the geographic scope of CAU's UA commercial package deliveries in the DFW metro area to include new DC locations, to extend its delivery radius from the Granbury DC and the Rowlett DC from 2 NM to 3.5 NM, to expand its number of average annual daily operations to an AAD maximum of 500 deliveries per DC, and to incorporate the Sky II platform into its operations.

CAU expects to establish up to 30 new DC locations within the operating areas under the scope of the Proposed Action within the next three (3) years. If CAU wants to establish more than 30 new DCs in the operating areas, additional safety and NEPA reviews would be required. Operations, including the placement of DCs and all UA flights, would be confined to the operating areas depicted in **Figure 1**.[15]

At the time of this EA, CAU has identified five (5) DC locations within the DFW operating area. These DC locations are in Cedar Hill, Frisco/Little Elm,[16] Murphy, North Richland Hills, and Wylie (**Figure 2**).

[13] 40 CFR § 1502.14

[14] 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.

[15] Amendments to Causey's OpSpec would require approval in accordance with 14 CFR Part 135.

[16] The proposed DC for Frisco/Little Elm is located on the border between the two municipalities. The DC Will serve both Frisco and Little Elm; therefore, the DC is referred to as Frisco/Little Elm.

The geocoordinates of each proposed DC are listed in **Table 1**.

Table 1. Geocoordinates of Proposed DCs within DFW Operating Area

DC	Latitude	Longitude
Cedar Hill	32.59428	-96.9372
Frisco/Little Elm	33.15611	-96.8926
Murphy	33.01417	-96.6137
North Richland Hills	32.90247	-97.1961
Wylie	33.00902	-96.553

Source: Flytrex 2024

While the exact timing of DC establishment is not currently known, CAU anticipates that it would site DCs in Cedar Hill, Frisco/Little Elm, Murphy, North Richland Hills, and Wylie by 2025, depending on market conditions. The other 25 locations for the other DCs have not yet been determined, but CAU would distribute DCs throughout the operating areas using a planned approach that incorporates best practices and community outreach and is developed in consultation with its commercial partners.

CAU typically partners with established businesses and identifies locations for DCs at the partner's parking lot, rooftop, or other area where it is not disruptive to the business, does not present a safety hazard, and is consistent with local land use and zoning regulations. This approach allows the drone operator to conduct operations with minimal infrastructure requirements and no ground disturbance activities. Each DC would contain charging pads for up to 20 drones.

Initially, CAU would likely fly less than the maximum of 500 deliveries per day from each DC. Over time, deliveries from each DC would increase as demand from consumers increases. Proposed operations would occur seven days per week, including holidays, between the hours of 8 a.m. and 10 p.m.

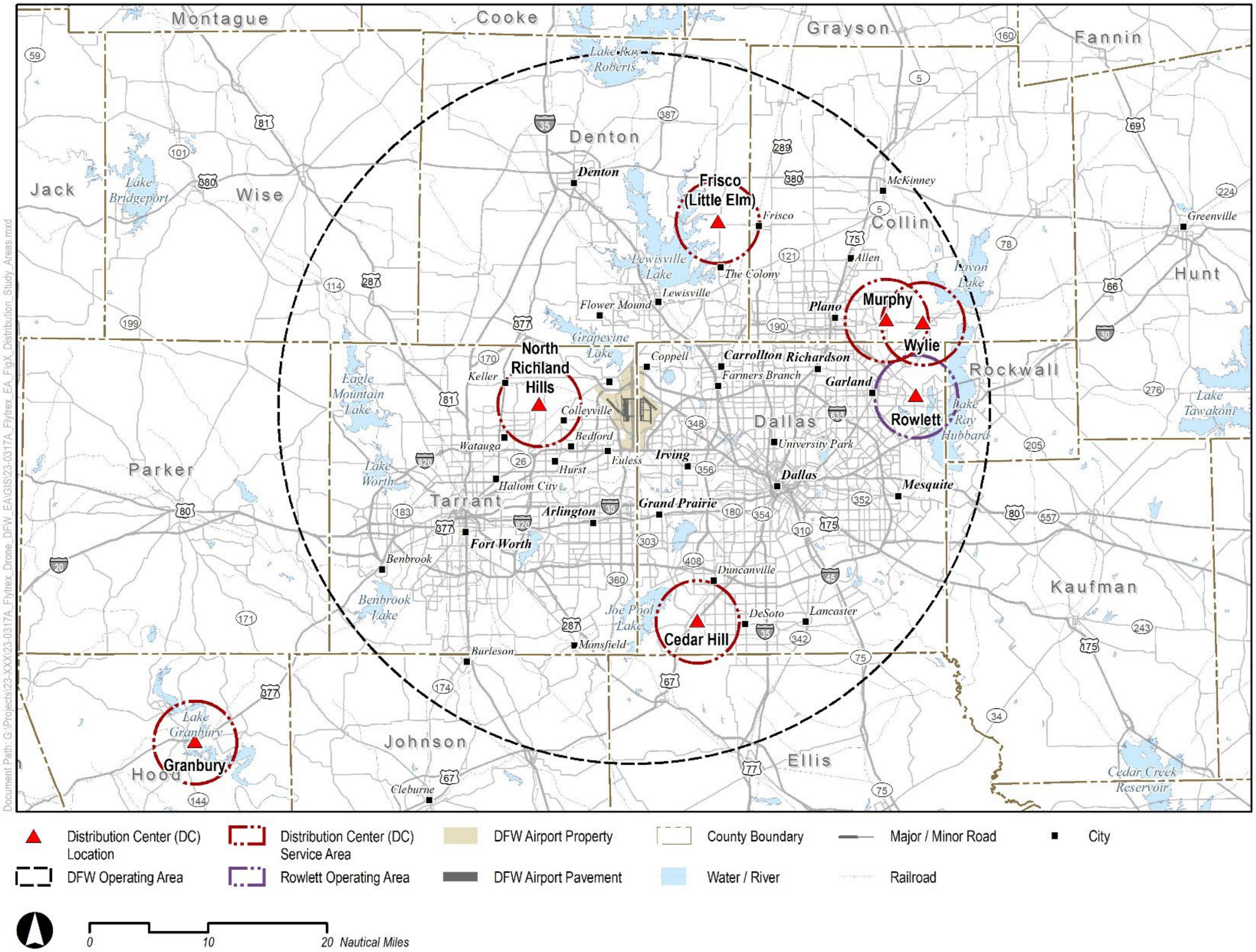

Figure 2. Proposed Distribution Center Locations in Operating Areas/Study Area

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2.2.1 Unmanned Aircraft Specifications

CAU plans to use two UA platforms for the proposed operations— the Flytrex FTX-M600P and the Flytrex Sky II (see **Figures 3 and 4**). CAU intends to phase out the Flytrex FTX-M600P UA and replace it with the Flytrex Sky II in the first half of 2025.

The Flytrex FTX-M600P UA has a maximum takeoff weight of 33.1 pounds, and the maximum allowable package weight is 5.73 pounds (**Figure 3**). The UA features a multi-rotor design with six propellers mounted on equally-spaced arms extending horizontally from a center frame. The system's computers and package containers are mounted on the underside of the airframe.

Figure 3. Flytrex FTX-M600P UA

The Flytrex Sky II UA (**Figure 4**) has a maximum takeoff weight of 34.2 pounds, and the maximum allowable package weight is 8.8 pounds. The UA features a multi-rotor design with eight propellers mounted on a hash-shaped carbon fiber airframe. The system's computers, power system and winch mechanism are mounted on the center of the airframe. The Sky II model carries the packages without a delivery box.

Both drone models use electric power from rechargeable lithium-ion batteries and include a parachute safety system that can be deployed in cases of emergency.

Figure 4. Flytrex Sky II UA

2.2.2 Flight Operations

Packages are loaded into the UA at the DC. The UA then launches to perform aerial deliveries. With a multi-rotor design, the UA can take off and descend vertically, as well as hover. Normal cruising speeds are expected to be approximately 29 knots (33 miles per hour [mph]) for both Flytrex models. Typical flights begin with the UA departing from a DC and ascending vertically to 230 feet above ground level (AGL). The UA then flies a pre-determined route at 230 feet AGL to the delivery point. Upon arrival at the delivery point, the UA descends vertically to the delivery hover altitude of 75 to 82 feet AGL, lowers the package to the ground using a tethered mechanism, ascends to cruising altitude and speed, and returns to the DC. Upon arrival at the DC, the UA descends vertically from 230 feet AGL to the ground for landing. CAU's aircraft does not touch the ground in any place other than the DC (except during emergency landings) since it remains airborne while conducting deliveries.

The total distance flown for deliveries would vary depending on the DC and delivery locations with a maximum distance of 8.5 miles (round trip) for the Flytrex M600P UA model and a maximum distance of 8 miles (round trip) for the Flytrex Sky II UA model. The package would be delivered directly to the customer's requested location using the Flytrex automated route planning algorithm that is designed to optimize route planning while minimizing overflights over the same resource and minimizing repeated flight patterns. The delivery cycle can generally be divided into the following five phases: (1) takeoff and climb, (2) en route outbound, (3) delivery, (4) en route inbound, and (5) descent and landing. Prior to takeoff, packages are manually loaded onto the UA by a ground crew at the DC. **Figure 5** shows a typical flight profile.

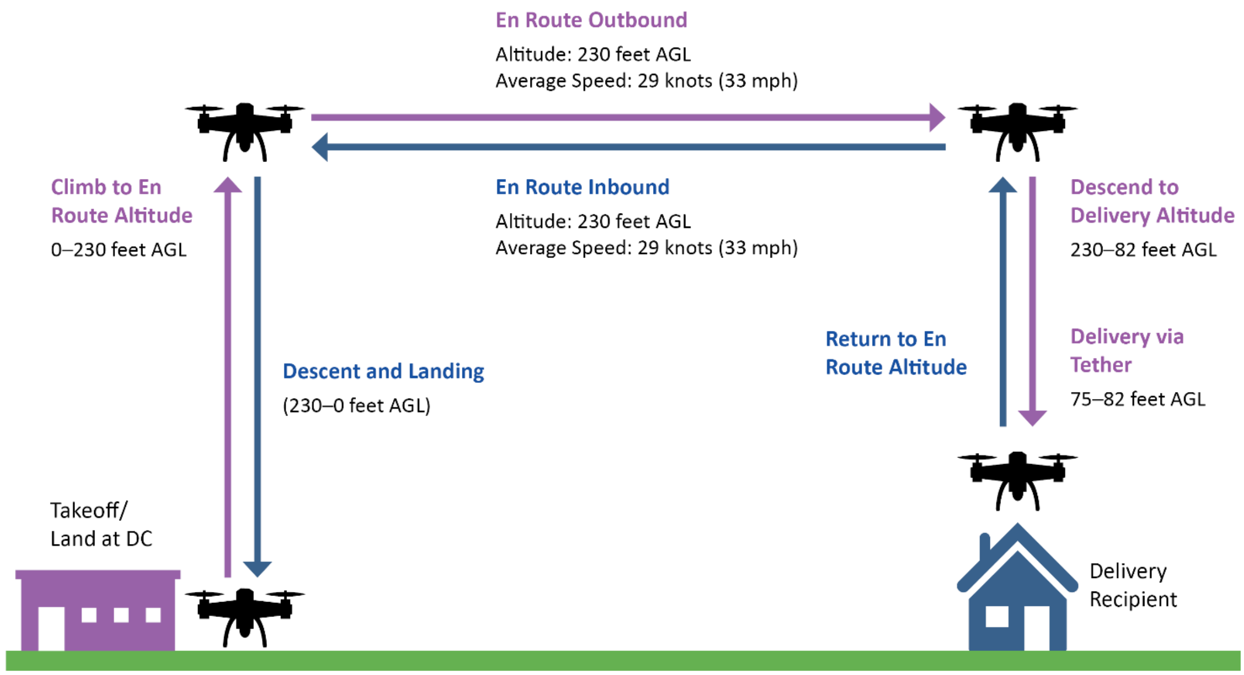

Figure 5. Typical Flight Profile

Takeoff and Climb

The takeoff and climb phase is described as the portion of the flight in which a fully loaded UA takes off from the DC and climbs vertically. Packages are loaded into the UA at the DC. The UA then launches to perform aerial deliveries. The UA climbs from 0 to 33 feet AGL and then hovers briefly as various systems checks are conducted to ensure it is functioning properly. Upon completion of systems checks, the UA ascends from 33 feet AGL to its cruising altitude of approximately 230 feet AGL. The takeoff and climb phase lasts up to 23 seconds.

En Route Outbound

The en route outbound phase is defined as the part of the flight in which the fully loaded UA flies the assigned route from its hub to a delivery point. During this flight phase, en route cruising speeds average around 29 knots (33 miles per hour) at a cruising altitude of 230 feet AGL. This phase lasts from 1 to 8 minutes.

Delivery

The delivery phase is defined by descent from the en route outbound phase to a delivery point to deliver a package. Upon arrival at the delivery point, the UA descends vertically to the delivery hover altitude of 75 to 82 feet AGL and lowers the package to the ground using a tethered mechanism. CAU’s aircraft does not touch the ground in any place other than the DC (except during emergency landings). Upon completing the delivery, the UA ascends vertically to reach its en route cruising altitude of 230 feet AGL. The delivery phase takes approximately 1 minute from arrival at the delivery location to the UA’s return to cruising altitude.

En Route Inbound

Once the UA reaches its cruising altitude of 230 feet AGL, it returns from the delivery point back to the DC via the same assigned route. It travels at approximately 29 knots (33 miles per hour) for approximately 1 to 8 minutes.

Descent and Landing

Upon arrival at the DC, the UA descends vertically from 230 feet AGL to 33 feet AGL where it hovers before lowering to the ground and shutting down. The descent and landing phase lasts up to 40 seconds.

2.2.3 Best Practices

CAU proposes several best practices to avoid the potential for significant impacts to various types of resources. These practices are listed in the following paragraphs by type of resource.

Children's Health and Safety: CAU will avoid operations near schools (e.g., elementary, middle, high, preschool, and daycare facilities) during time of operation.[17]

Biological Resources: To avoid impacts on nesting bald eagles, CAU implements typical best management practices related to monitoring for bald eagle nests, integrating multiple strategies and resources. These best management practices include periodically checking online tools, such as iNaturalist[18] to identify eagle nests that may occur in the operating areas, as well as communicating with the bird watching community to identify nests. CAU personnel will also be educated in the visual identification of bald eagle nests, which are conspicuous. If CAU identifies a bald eagle nest or is notified of the presence of a nest, CAU will establish an avoidance area to provide a 1,000-foot vertical and horizontal separation distance between the drone's flight path and the nest. CAU will maintain this avoidance area until the end of the breeding season (December 1 through August 31 in the study area) or until a qualified biologist indicates the nest has been vacated. For each new site being considered for a DC, CAU requires the identification of bald eagle nesting sites so that the sites and appropriate buffers can be added as no-fly zones. CAU will regularly report monitoring and avoidance measures to Texas Parks & Wildlife and the U.S. Fish and Wildlife Service (USFWS) Region 2 Migratory Bird Permit Office.

Noise and Noise-Compatible Land Use: To avoid the potential for significant noise impacts, CAU would locate its DCs at least 150 feet away from noise-sensitive areas, based on the extent of the 55 dB DNL, when the DC is located within the controlled surface area of Class B or Class D airspace and at least 83 feet away from noise-sensitive areas, based on the extent of the 60 dB DNL, in all other locations within the study area, which is defined as the proposed operating areas (see **Figure 1**).[19]

Section 4(f) Resources: CAU identifies areas where open air gatherings of people typically occur, such as open-air concert venues and school yards, and avoids these properties through the creation of static keep-out areas via CAU's route planning processes. The Flytrex automated route planning algorithm prepares an optimized flight path from the DC to each designated delivery site and ensures that each route integrates and respects all of the restrictions identified as best practices, including Section 4(f) properties, which can be avoided based on the time of day and other factors.

[17] FAA Exemption No. 19508A, Regulatory Docket No. FAA-2020-0532, Condition & Limitation No. 27
[18] https://www.inaturalist.org
[19] Distances are based on the extent of the 55 dB and 60 dB DNL from the drone takeoff and landing position at a hub for noise generated by the Sky II, which generates higher noise levels than the FTX-M600P.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section provides a description of the environmental resources that would be affected by the Proposed Action, as required by the CEQ regulations and FAA Order 1050.1F. The level of detail provided in this section is commensurate with the importance of the impact on these resources (40 CFR § 1502.15). The study areas for each resource are the entire areas within the black, red, and purple dashed lines shown on **Figure 1**. The black dashed line encompasses the DFW metro area, which includes the Rowlett operating area that was initially studied in the 2023 EA and is being expanded as part of this EA. Additionally, the Granbury study area, delineated by the red dashed line, was originally studied in the 2023 EA and is being expanded as part of this EA.[20]

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) Resources
- 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
- Socioeconomic, Environmental Justice, and Children's Environmental Health and Safety Risks
- Visual Effects (Light Emissions)
- Water Resources (including Wetlands, Floodplains, Surface Waters, Groundwater, and Wild and Scenic Rivers)

For each of the resources covered in this section, the following information is provided:

- Regulatory Setting
- Affected Environment
- Environmental Consequences

3.1 Resources Not Analyzed in Detail

This EA does not analyze potential impacts on the following environmental impact categories in detail, for the reasons explained below:

- **Air Quality and Climate** – The drone is battery-powered and would not generate emissions that could result in air quality impacts or climate impacts. Electricity consumed for battery charging at the DC and for overall DC operation would be minimal, especially for the limited scope of these operations. Electricity consumed for the No Action Alternative and the Proposed Action would come from the power grid. On-site backup generators would be used only in the event of an emergency. Because generator use is expected to be extremely

[20] The Granbury and Rowlett study areas are shown in different colors from the DFW metro area to highlight that they were originally studied in the 2023 EA for Part 135 drone package deliveries and are being expanded as part of this EA.

limited, a full analysis of these generators is not required. CAU would be required to comply with any state or local permitting requirements associated with generator use. . It should be noted that the No Action Alternative would generate higher vehicle emissions because visual observers placed in vehicles would be required along the flight path to maintain line of sight. These emissions would be minimal and are not expected to contribute to any exceedance of National Ambient Air Quality Standards. Visual observers would not be required under the Proposed Action.

- **Coastal Resources** – The No Action Alternative and the Proposed Action would not directly affect any shorelines, change the use of shoreline zones, or be inconsistent with any National Oceanic and Atmospheric Administration (NOAA)-approved state Coastal Zone Management Plan since there are no coastal zones or shorelines in the operating areas.
- **Farmlands** – The No Action Alternative and the Proposed Action would not involve development on or disturbance of any land regardless of use, nor would they have the potential to convert any farmland to non-agricultural uses or affect designated prime or unique farmlands.
- **Hazardous Materials, Solid Waste, and Pollution Prevention** – The No Action Alternative and the Proposed Action would not result in any construction or development or any physical disturbances of the ground. Additionally, each Flytrex UA is made from recoverable materials and would be properly managed at the end of its operating life in accordance with 14 CFR Part 43.
- **Land Use** – The No Action Alternative and the Proposed Action would not involve any changes to existing, planned, or future land uses within the area of operations. CAU would use current infrastructure, including parking lots and buildings, to site its operations. Local and state laws typically govern land use and zoning. CAU is responsible for complying with any such applicable laws relevant to establishing its operations (e.g., siting DCs and related infrastructure). Local jurisdictions in the DFW metro area may vary in the scope of their review and approval of commercial drone package delivery operations. Additionally, **Section 2.2.3** identifies the standoff distances for noise-sensitive areas.
- **Natural Resources and Energy Supply –** The No Action Alternative and the Proposed Action would not require the need for unusual natural resources and materials, or those in short supply. CAU's UA would be battery powered and would not directly consume fuel resources.
- **Socioeconomic Impacts and Children's Environmental Health and Safety Risks** – The No Action Alternative and 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. Neither alternative would affect products or substances that 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. Additionally, CAU's proposal includes avoiding operations near schools (Monday through Friday), which would help reduce the potential for environmental health or safety impacts to children.
- **Visual Effects (Light Emissions Only)** – The No Action Alternative and the Proposed Action would not result in significant light emission impacts because most flights would be conducted during the daytime. Because of the overall small average of daily operations within an operating area and the even smaller number of operations likely to be conducted

between twilight and 10:00 p.m., neither alternative would result in substantial visual impacts due to light emissions.

- **Water Resources (Wetlands, Floodplains, Groundwater, and Wild and Scenic Rivers)** – The No Action Alternative and the Proposed Action would not result in the construction of facilities and would therefore not encroach upon areas designated as navigable waters or directly impact wetlands. Neither alternative would encroach upon areas designated as a 100-year flood event area as described by the Federal Emergency Management Agency (FEMA). Neither alternative would result in any changes to existing discharges to water bodies, create a new discharge that would result in impacts to surface waters, or modify a water body. The No Action Alternative and the Proposed Action would not involve land acquisition or ground-disturbing activities that would withdraw groundwater from underground aquifers or reduce infiltration or recharge to ground water resources through the introduction of new impervious surfaces. No National River Inventory (NRI) river segments exist within the operating areas.[21] No Wild and Scenic River segments occur within the operating areas.[22] Therefore, neither alternative would impact any Wild and Scenic Rivers or NRI river segments.

3.2 Biological Resources (including Fish, Wildlife, and Plants)

3.2.1 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. In addition to their intrinsic values, biological resources provide aesthetic, recreational, and economic benefits to society.

Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973 (16 U.S.C. § 1531 et seq.) requires the evaluation of all federal actions to determine whether an action is likely to jeopardize any proposed, threatened, or endangered species or proposed or designated critical habitat. Critical habitat includes areas that will contribute to the recovery or survival of a listed species. Federal agencies are responsible for determining if an action "may affect" listed species, which determines whether formal or informal consultation with the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) is needed. If the FAA determines that the action will have no effect on listed species, consultation is not required. If the FAA determines that the action may affect listed species, consultation with the USFWS must be initiated. A significant impact to federally-listed threatened and endangered species would occur when the USFWS or NMFS determines that an 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.

Migratory Birds

The Migratory Bird Treaty Act (16 U.S.C. §§ 703-712) protects migratory birds, including their nests, eggs, and parts, from possession, sale, purchase, barter, transport, import, export, and take. The USFWS

[21] National Park Service Nationwide Rivers Inventory (NRI) Interactive Map. Available: https://www.nps.gov/maps/full.html?mapId=8adbe798-0d7e-40fb-bd48-225513d64977. Accessed: June 30, 2024.

[22] National Wild and Scenic Rivers System. Available: https://www.nps.gov/subjects/rivers/texas.htm. Accessed: June 30, 2024.

is the federal agency responsible for the management of migratory birds as they spend time in habitats of the U.S. For purposes of the Migratory Bird Treaty Act, "take" is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 CFR § 10.12). The Migratory Bird Treaty Act applies to migratory birds identified in 50 CFR § 10.13 (defined hereafter as "migratory birds").

Bald and Golden Eagles

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. The USFWS has issued regulations for the permitting process in 50 CFR Part 22, which include permits for the incidental take of bald eagles. Such permits are only needed when avoidance of incidental take is not possible. According to federal guidelines, if conservation measures can be implemented such that no aircraft are flown within 1,000 feet of a nest, incidental take of bald eagles is unlikely to occur, and no permit is needed.[23]

3.2.2 Affected Environment

This section describes the existing biological environment of the operating areas. As shown on **Figure 1**, CAU's proposed operating areas capture 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 operating areas overlap 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 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. Forest patches are interspersed throughout the operating areas, particularly along drainages and near water bodies.
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 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).

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[23] U.S. Fish and Wildlife Service. 2007. National Bald Eagle Management guidelines. Available: https://www.fws.gov/media/national-bald-eagle-management-guidelines. Accessed: July 1, 2024.

The developed land uses, upland habitats, and wetland or waterway habitats in the operating area support a variety of insects, reptiles, amphibians, mammals, and birds. Several aquatic habitats and natural areas occur. Lake Granbury is a dammed portion of the Brazos River which runs through the Granbury operating area flowing from the north to south with an oxbow (curvature) in the center of the operating area. The operating area overlaps approximately 1,700 acres of open water habitat within Lake Granbury.

The Rowlett operating area includes Lake Ray Hubbard, a dammed reservoir that contains approximately 24,000 acres of open water habitat. The lake is heavily used by recreational boaters and fisherman. The Rowlett Creek-Dallas County Nature Preserve is located west of the Rowlett DC. This 97-acre preserve is located along Rowlett Creek and is a multi-use, public access county park. The preserve is mainly wooded riparian and upland habitat along Rowlett Creek which is a tributary to Lake Ray Hubbard. The entirety of the preserve is located within the Rowlett operating area, approximately 1.6 miles southwest of the DC.[24, 25] Additional Lake Ray Hubbard tributaries within the operating area include Muddy Creek and Lang Branch Creek. Both are primarily wooded waterways surrounded by residential and other urban development.

The operating areas consist of urban and rural residential areas, agricultural land uses, natural areas, commercial land uses, and industrial land uses. Urban areas provide habitat for species such as great-tailed grackle, house finches, rodents, songbirds, and waterfowl. Non-urban land uses provide habitat for many common wildlife species in the region, including mammals such as Virginia opossums, squirrels, rabbits, raccoons, bats, mice, voles, coyote, foxes, American beaver, Northern American river otters, skunks, bobcat, white-tailed deer, and birds (including songbirds, waterfowl, raptors, wading birds, and shorebirds), reptiles (including green anoles, Texas spiny lizards, common snapping turtle, and common garter snakes), amphibians (including numerous species of frogs, toads, newts, and salamanders), and insects (including honey bees, butterflies, dragonflies, beetles, and skippers).[26]

Special Status Species

Federally-Listed Species

For the purpose of Section 7 consultation, the action area is defined as Causey's proposed operating areas which are shown on **Figure 1**. The FAA obtained the Official Species List from the USFWS Information for Planning and Consultation (IPaC) online system to identify ESA-listed species and designated critical habitat in the action area (see **Appendix B**). **Table 2** provides the list of ESA-listed and candidate species that may be present in the action area. The action area contains designated critical habitat for the Texas fawnsfoot (*Truncilla macrodon*).

Table 2. 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

[24] Dallas County Texas. Rowlett Creek Preserve. Available: https://www.dallascounty.org/departments/plandev/openspaces/locations/05-rowlett-creek.php. Accessed July 1, 2024.
[25] CAU will try to avoid flight paths that fly over nature preserves, parklands, and recreation areas.
[26] iNaturalist. Dallas County, US, TX. Available: https://www.inaturalist.org/places/dallas-county#taxon=47158. Accessed July 1, 2024.

Common Name	Scientific Name	ESA Status
Rufa red knot	*Calidris canutus rufa*	Threatened
Whooping crane	*Grus americana*	Endangered
Clams		
Texas fawnsfoot	*Truncilla macrodon*	Proposed Threatened
Texas heelsplitter	*Potamilus amphichaenus*	Proposed Endangered
Reptiles		
Alligator snapping turtle	*Macrochelys temminckii*	Proposed Threatened
Insects		
Monarch butterfly	*Danaus lexippus*	Candidate

Source: USFWS Official Species List dated August 6, 2024

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

Additional information on each of the other species listed in **Table 2** is provided in the USFWS Section 7 Consultation Letter dated August 21, 2024, which is included in **Appendix B**.

State Species of Concern

The State of Texas maintains a list of fish and wildlife that are protected under the Texas Parks and Wildlife Code. This list includes all species that the director of the TPWD deems threatened with statewide extinction (Title 31, Part 2, Chapter 65, Subchapter G RULE, § 65.176).[27] In addition, a species that is indigenous to the State of Texas and listed by the federal government as endangered automatically receives state protection as an endangered species. Species on this list are protected under state law. The Texas Parks and Wildlife Code (§ 68.015, Prohibited Acts) states that "no person may capture, trap, take, or kill, or attempt to capture, trap, take, or kill, endangered fish or wildlife."[28] Additionally, the Texas Administrative Code (Title 31, Part 2, Chapter 65, Subchapter G RULE, § 65.171 states that "no person may: (1) take, possess, propagate, transport, export, sell or offer for sale, or ship any species of fish or wildlife listed by the department as endangered; or (2) take, possess, propagate, transport, import, export, sell, or offer for sale any species of fish or wildlife listed in this subchapter as threatened."[29]

The state-protected species that may occur in the operating areas are displayed in **Table 3**. These species are listed as Species of Greatest Conservation Need as defined in the 2015 Texas Conservation Action Plan.[30] While these species are listed for counties within the operating areas, it does not automatically mean that they have the potential to occur in the operating areas. Federally-listed species are not included in **Table 3** because they are addressed in **Table 2** above, and state regulations do not provide increased protection beyond the ESA regulations for federally-listed species.

[27] Texas Endangered Species List. Available: https://texreg.sos.state.tx.us/fids/202001043-2.pdf. Accessed June 30, 2024.
[28] Texas Parks and Wildlife Code, § 68.015 Prohibited Acts. Under the Federal ESA, the term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect. Available: https://texas.public.law/statutes/tex._parks_and_wild._code_section_68.015. Accessed July 1, 2024.
[29] Texas Administrative Code Title 31 Part 2 Chapter 65 Subchapter G RULE § 65.171. Available: https://texreg.sos.state.tx.us/public/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=31&pt=2&ch=65&rl=171. Accessed July 1, 2024.
[30] Texas Parks and Wildlife Department, Wildlife Division, Diversity and Habitat Assessment Programs. TPWD County Lists of Protected Species and Species of Greatest Conservation Need. Available: https://tpwd.texas.gov/gis/rtest/. Accessed July 1, 2024.

Table 3. State-Listed Wildlife Species within Study Area

Common Name	Scientific Name	State Listing Status*
Birds		
White-faced ibis	*Plegadis chihi*	ST
Black rail	*Laterallus jamaicensis*	ST
Wood stork	*Mycteria americana*	ST
Reptiles		
Texas horned lizard	*Phrynosoma cornutum*	ST
Brazos water snake	*Nerodia harteri*	ST
Alligator snapping turtle	*Macrochelys temminckii*	ST
Mollusks		
Brazos heelsplitter	*Potamilus streckersoni*	ST
Sandbank pocketbook	*Lampsilis satura*	ST
Louisiana pigtoe	*Pleurobema riddellii*	ST
Trinity pigtoe	*Fusconaia chunii*	ST
Texas heelsplitter	*Potamilus amphichaenus*	ST
Texas fawnsfoot	*Truncilla macrodon*	ST
Mammals		
Black bear	*Ursus americanus*	ST

* ST= State Threatened
Source: Texas Parks & Wildlife. Rare, Threatened, and Endangered Species of Texas by County. Available: https://tpwd.texas.gov/gis/rtest/. Accessed July 12, 2024.

Migratory Birds

Migratory bird species found within the operating areas vary throughout the year. During certain weeks in the spring and fall, hundreds of species of songbirds, raptors, and waterfowl may potentially pass through the study areas. The operating areas are part of the Central Migratory Flyway where millions of birds, including songbirds, grassland birds, waterfowl, shorebirds, and raptors, move north and south during spring and fall migration. Some of these species migrate overland while others fly across the Gulf of Mexico. Migratory birds use rivers, mountain ranges, and other major landscape navigation points to aid their navigation when migrating and use a variety of habitat types for resting and feeding during migration.[31]

The Birds of Conservation Concern (BCC) list identifies migratory and non-migratory bird species that represent the USFWS' highest conservation priority. Established through the 1988 amendment to the Fish and Wildlife Conservation Act (16 U.S.C. §§ 661-667d), the USFWS maintains this list "to stimulate coordinated, collaborative and proactive conservation actions among international, federal, state, tribal and private partners."[32] The Official Species List identifies species on the BCC that could occur in the operating areas, along with information on the likelihood that they may be nesting in the operating areas (see **Appendix B**). Habitat used by BCC species listed in the operating areas occurs in aquatic, wetland, forested, agricultural, and urban environments. No regulations or protections are associated

[31] Texas Parks & Wildlife. Migratory Flyways of North America. Available at: https://tpwd.texas.gov/huntwild/wild/birding/migration/flyways/central/. Accessed June 30, 2024.
[32] U.S. Fish and Wildlife Service. 2021. Birds of Conservation Concern 2021. Migratory Bird Program. Available: https://www.fws.gov/sites/default/files/documents/birds-of-conservation-concern-2021.pdf. Accessed: June 30, 2024.

with species listed on the BCC unless they are protected or regulated by other federal, state, or local rules.

The bald eagle (*Haliaeetus leucocephalus)* is identified on the Official Species List as a BCC species with the potential to occur in both operating areas. While the BCC listing provides no regulatory protections, the bald eagle is protected under the Bald and Golden Eagle Protection Act. Bald eagles could nest near bodies of water such as lakes or rivers. The National Bald Eagle Management Guidelines state that aircraft should stay at least 1,000 feet from bald eagle nests during the breeding season unless the aircraft is operated by a trained wildlife biologist or where eagles have demonstrated tolerance for such activity.[33]

3.2.3 Environmental Consequences

Potential impacts to biological resources associated with the No Action Alternative and the Proposed Action were considered in the operating areas where drones may operate (launch, fly, and deliver packages). As discussed in **Section 2.0**, no ground construction or habitat modification would occur as part of the No Action Alternative or the Proposed Action. Therefore, neither alternative would result in any physical disturbance to habitat. The action does not include any ground construction or habitat modification. During nominal operations, the UA would not touch the ground except at the DCs, which would be in commercial areas, such as shopping centers. 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. The FAA evaluated the potential for Causey's operations to affect ESA-listed species. Based upon the FAA's evaluation contained in **Appendix B**, 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 USFWS concurred with these findings for the golden-cheeked warbler and whooping crane by letter dated September 23, 2024. Additionally, the USFWS noted that the tricolored bat is not afforded protection under the ESA as a candidate species; however, the USFWS stated that should the tricolored bat become listed, the FAA should re-evaluate the action to determine the extent of effects on the species and provide measures to be considered to avoid incidental take of a tricolored bat. These measures include:

- Determining the extent of tricolored bat presence in the action area through acoustic surveys and
- Restricting flight hours to daylight hours during non-hibernating season.

See **Appendix B** for more details on the analysis and for copies of the Section 7 consultation letters.

State Species of Concern

State-listed bird species may display disturbance behaviors toward drones, such as fleeing or attacking maneuvers or potential strikes; however, due to the altitude of overflights (cruising at approximately 230 feet AGL) and minimal anticipated noise and visual impacts from the action, no significant impacts to state protected bird species are expected.

[33] U.S. Fish and Wildlife Service. 2007. National Bald Eagle Management Guidelines. Available: https://www.fws.gov/media/national-bald-eagle-management-guidelines. Accessed: June 30, 2024.

Neither the No Action Alternative nor the Proposed Action would include ground disturbance or impacts to upland or wetland habitats. Therefore, no impacts are anticipated for state-listed reptile, mollusk, or mammal species.

Migratory Birds and Birds of Conservation Concern

Migratory and BBC bird species may display disturbance behaviors towards drones, such as fleeing or attacking maneuvers; however, due to the altitude of overflights (cruising at approximately 230 feet AGL) and minimal anticipated noise and visual impacts from the action, no significant impacts to migratory bird species or BCC bird species are expected under the No Action Alternative or Proposed Action.

Bald Eagles

No bald eagle nests have been documented by state or local resource agencies within the operating areas. However, bald eagles have been observed and documented in online resources such as iNaturalist.[34] Bald eagles were documented in flight and perching in the operating areas. If the drone operator identifies a bald eagle nest or is notified of the presence of a nest by a state or federal regulator or other natural resource stakeholder, CAU will establish an avoidance area to provide a 1,000-foot 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 (December 1 through August 31 in the study areas) or until a qualified biologist indicates the nest has been vacated.[35, 36]

Our analysis finds that the No Action Alternative and the Proposed Action are not expected to cause any of the following impacts:

- A long-term or permanent loss of unlisted plant or wildlife species, (i.e., extirpation of the species from a large project area);
- Adverse impacts to special status species (e.g., federally-listed species, state species of concern, species proposed for listing, migratory birds, bald and golden eagles) or their habitats;
- Substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or their populations; or
- Adverse impacts on a species' reproductive success rates, natural mortality rates, non-natural mortality (e.g., road kills and hunting), or ability to sustain the minimum population levels required.

3.3 Noise and Noise-Compatible Land Use

3.3.1 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, regulate aircraft noise.[37] The FAA regulates noise from aircraft through 14 CFR Part 36.

[34] iNaturalist. Nature in my backyard on Lake Ray Hubbard. Available: https://www.inaturalist.org/projects/nature-in-my-backyard-on-lake-ray-hubbard?tab=species. Accessed July 1, 2024.
[35] See Official Species List in Appendix B for Bald Eagle breeding dates in the study area.
[36] CAU will report any bald eagle nests and/or mitigative efforts to the USFWS Region 2 Migratory Bird Permit Office if a nest is observed.
[37] 49 U.S.C. §§ 47501–47507

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 FAA Order 1050.1F, Paragraph 11-5b, a noise sensitive area is "[a]n 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. FAA's primary noise metric for aviation noise analysis is the yearly Day-Night Average Sound Level (DNL) metric. The DNL noise metric is used to reflect a person's cumulative exposure to sound over a 24-hour period, expressed as the noise level for the average day of the year on the basis of annual aircraft operations. DNL accounts for the amount of noise from each aircraft operation as well as the total number of operations throughout the day and applies an additional 10 dB weighting for nighttime flights between 10 p.m. and 7 a.m. More information about this environmental impact category is presented in Chapter 11 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

3.3.2 Affected Environment

The operating areas cover a land area of approximately 3,765 square miles, with approximately 156 square miles of water area. According to 2020 U.S. Census Bureau estimates, the population within the counties in the operating areas is 7,537,431. Noise sensitive areas within the study area include residential, educational, health, and religious structures, along with parks, recreational areas, and cultural and historic sites.

The ambient (or background) sound level in the operating areas varies and depends on the uses in the immediate vicinity. For example, the ambient sound level in an urban center is higher than the ambient sound level within a residential neighborhood. Existing sound sources in the operating areas 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, and aircraft). Except for areas close to airports, existing aviation noise levels in the operating areas are expected to be well below the FAA's threshold for significant noise exposure (DNL 65 dB). **Figure 6** presents the surface areas of Class B and Class D airspace[38] in the vicinity of each operating area. For existing airport noise, DNLs of 60 dB and above are fully contained within these surface areas.

3.3.3 Environmental Consequences

FAA Order 1050.1F states noise impacts would be significant if 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

[38] Class B and Class D airspace are classes of controlled airspace. In this airspace, aircraft are under control by air traffic controllers. It represents airspace having the greatest density of aircraft activity and associated noise from the aircraft.

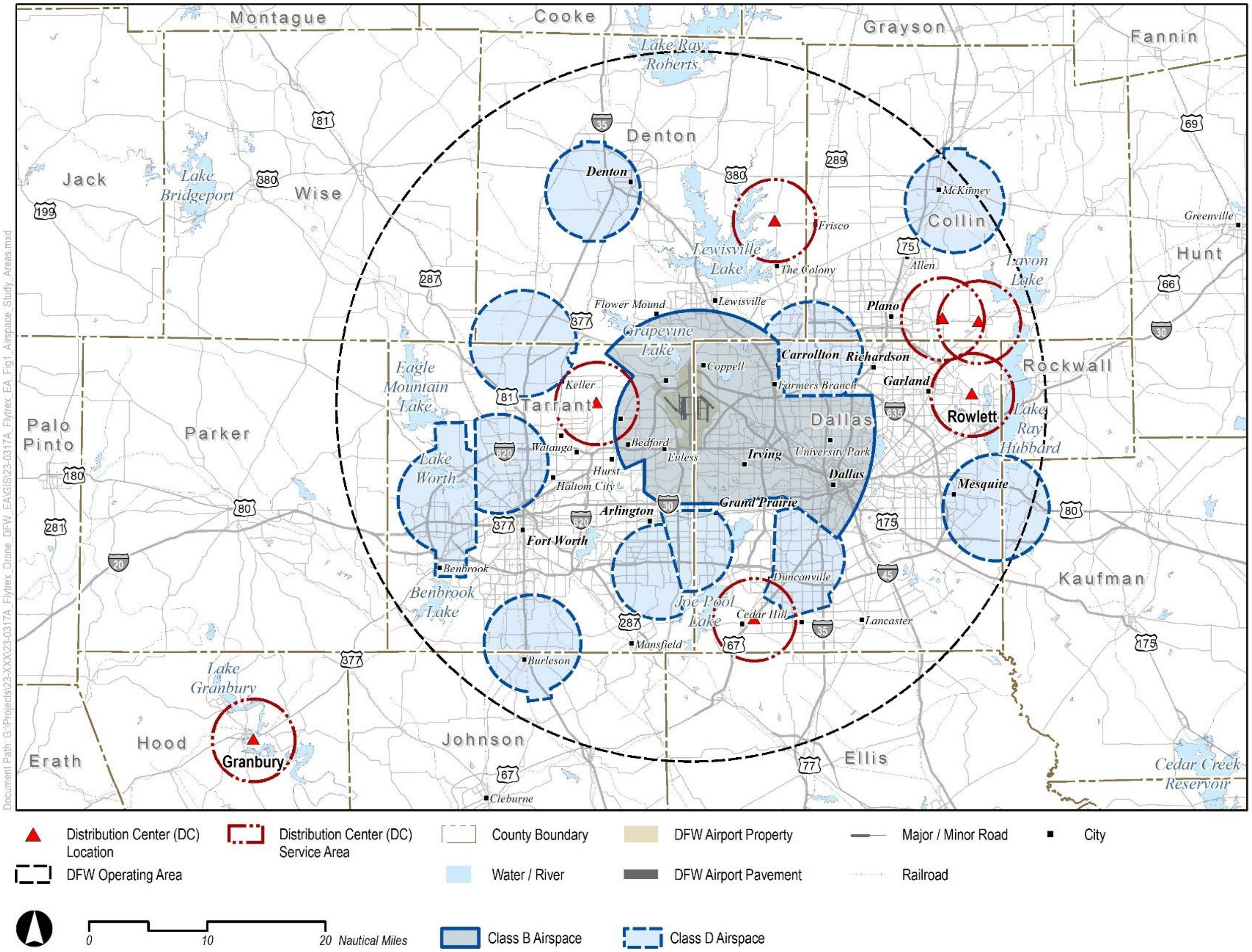

Figure 6. Class B and Class D Airspace in Vicinity of Operating Areas

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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. The FAA analyzed the Proposed Action's potential noise exposure to determine whether it would cause a significant impact to any residential land uses or noise sensitive areas within the operating areas.

Noise Exposure

As described in **Section 2.0**, the Proposed Action includes up to 500 AAD deliveries per DC location from a total of 30 new DC sites and 2 existing DC sites. Initially, both the Flytrex FTX-M600P and the Sky II UA would be used to conduct package deliveries, but all DCs would eventually transition to using only the Sky II UA. **Appendix C** contains the noise analysis reports for the Sky II and FTX-M600P, respectively. Overall, the Sky II generates higher noise levels than the FTX-M600P. Since the Sky II is the noisier UA and would eventually be the only UA operated at all DC locations, it is used as the basis for the noise exposure analysis in this EA. As presented in **Appendix C**, Sky II noise levels were calculated for each flight phase and are presented in the following three sub-sections:

- Noise Exposure for Operations at the DCs[39]
- Noise Exposure for En Route Operations
- Noise Exposure for Delivery Operations

Noise Exposure for DC Operations

The noise exposure for DCs includes all flight activity occurring at and around the DC. The flight activity includes takeoff, landing, transitions to and from en route flight, and the outbound and inbound en route flight. The estimated noise exposure values assume the UA passes directly over the receiver during all flight activity except vertical ascent and descent. The extent of DNL levels under the flight path for a single DC is provided in Table 5 of the Sky II noise report in **Appendix C** and summarized in **Table 4** for 45 dB through 75 dB for a DC with 500 AAD deliveries.

Table 4. Estimated DNL Noise Exposure for DC Locations with the Sky II UA

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	DNL 45 dB Extent Feet	DNL 50 dB Extent Feet	DNL 55 dB Extent Feet	DNL 60 dB Extent Feet	DNL 65 dB Extent Feet	DNL 70 dB Extent Feet	DNL 75 dB Extent Feet
500	182,500	>277	>277	150	83	50	26	<25

Notes:
"<25": Limit of available data, see Appendix C.
">277": Refer to en route noise DNL for distances greater than 277 feet, see in Appendix C.

Noise Exposure for En Route Operations

The estimate of en route noise exposure is conservatively based on the UA flying the same outbound flight path between the DC and the delivery point and inbound flight path back to the DC. Therefore, each location under the en route path would be overflown twice for each delivery served by the respective overhead en route path.

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[39] CAU may have generators on-site for backup power during emergency situations. Because the use of generators would be minimal and would only last for short durations during emergencies such as power outages, analysis of noise generated from generator use is not warranted at this time.

Table 5 provides the estimated DNL for a location on the ground directly under an en route path for 500 AAD DNL equivalent deliveries. The en route noise calculated for each delivery includes both the inbound and outbound traversal of the en route path at 230 feet AGL and a ground speed of 29.2 knots.

Table 5. Estimated DNL Noise Exposure for En Route Overflight of the Sky II UA

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	Estimated DNL (dB) Under 230 ft AGL Flight Path
500	182,500	51.9

Noise Exposure for Delivery Operations

For delivery locations, UA-related noises include the entire associated flight activity profile of the UA, including the noise from en route flight in both directions from a location and all vertical ascent/descent. All operations are assumed to be on the same en route flight path with inbound and outbound flights traversing it in opposite directions.

Table 6 presents the noise exposure for 1 and 5 AAD DNL equivalent deliveries and the associated estimated DNL at distances of 25 feet, 50 feet, 75 feet, 100 feet, and 125 feet from the delivery point. The distance range of 25 to 125 feet, calculated for deliveries, is representative of the closest a participant may during a delivery out to the distances from which nearby properties experience noise from a delivery (see **Appendix C**). The estimated noise exposure values assume the UA passes directly over the receiver during all flight activity except vertical ascent and descent.

Table 6. Estimated DNL Noise Exposure at Delivery Locations for the Sky II UA

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	Estimated Delivery DNL at 25 Feet (dB)	Estimated Delivery DNL at 50 Feet (dB)	Estimated Delivery DNL at 75 Feet (dB)	Estimated Delivery DNL at 100 Feet (dB)	Estimated Delivery DNL at 125 Feet (dB)
1	365	38.1	36.8	34.2	32.4	30.2
5	1,825	45.1	43.8	41.2	39.4	37.2

While there is no limit to the number of deliveries a customer may receive daily, except for the capacity of the servicing DC, it is anticipated that number would generally be much less than 5. Table 7 of the Sky II noise report in **Appendix C** presents noise levels for additional daily deliveries ranging up to 500.

Mitigation

The maximum noise exposure levels within the operating areas would occur at the DC locations, where noise levels ranging from 52 dB to 70 dB DNL could occur from approximately 277 feet to 26 feet, respectively, as shown in **Tables 4** and **5**. Noise levels in this range would extend radially from the DC out to 277 feet, beyond which en route noise would take over as the dominant noise source resulting from package delivery operations.

To avoid the potential for significant noise impacts to occur, DCs would be sited an appropriate distance from noise-sensitive land uses (**Table 7**). The setback distances depend on whether a DC location would be within or outside the surface areas of Class B, C, or D airspace, accounting for the potential presence of airport noise (see **Section 4.0**). Assuming the maximum number of daily operations from a DC (500 AAD deliveries-), if the DC is located outside the surface areas of Class B, C, or D airspace, the setback distance from noise-sensitive land uses is 83 feet based on the 60 dB DNL extent. If the hub is located within the surface areas of Class B, C, or D airspace, the setback distance from noise-sensitive land uses is 150 feet based on the 55 dB DNL extent. Based on this approach, any noise increases associated with activity at DCs should not exceed the significance impacts threshold for noise.

Table 7. DC Setback Distances (Feet) from Noise-Sensitive Land Use for 500 Deliveries Per Day with the Sky II UA

Basis for Setback Distance	Outside the Surface Area of Class B, C, or D Airspace	Within the Surface Area of Class B, C, or D Airspace
55 dB DNL Extent	-	150 feet
60 dB DNL Extent	83 feet	-

Based on the noise analysis, and the above-listed mitigation, the Proposed Action is not expected to result in a significant noise impact.

3.4 Historical, Architectural, Archaeological, and Cultural Resources

3.4.1 Definition of Resource and Regulatory Setting

Section 106 of the National Historic Preservation Act (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 State Historic Preservation Officer (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 any tribe or THPO that is identified as potentially having traditional cultural interests in the area, and determining the potential impacts to 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, archeological, and cultural resources. A factor to consider in assessing significant impact is when an action would result in a finding of adverse effect through the Section 106 process. However, under 36 CFR § 800.8(a), a finding of adverse effect on a historic property does not necessarily result in a significance finding under NEPA.

3.4.2 Affected Environment

The APE for the No Action Alternative and the Proposed Action is the entire operating area where CAU plans to conduct UA package deliveries, as shown in **Figure 1**. According to the National Park Service's online database of the National Register of Historic Places (NRHP), a total of 227 historic properties and 146 historic districts are in the APE (see **Appendix 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; however, the APE also contains 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 listed in the NRHP because of their architectural features.

3.4.3 Environmental Consequences

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 Proposed Action would not result in physical alterations to historic properties and would not directly affect the existing or continued use of any historic property. Given the small size of the UA and the predicted noise 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 visual or auditory intrusion from drone operations. The operations would not diminish the integrity of any property's significant historic features. The Proposed Action would not result in neglect of a property, would not alter the existing ownership or zoning, and is not anticipated to result in planned growth or a change in land use. Therefore, adverse effects are not anticipated.

Based on a review of the information available, and the FAA's knowledge with respect to the level of environmental impacts from UAS operations, the FAA has determined that no historic properties would be affected by the No Action Alternative or the Proposed Action. In summary, based on the assessment above and in accordance with 36 CFR 800.4(d)(1), the FAA has made a *finding of no adverse effect*. This would be the same for both the No Action and the Proposed Action Alternatives.

In accordance with 36 CFR § 800.4(a)(1), the FAA consulted with the Texas SHPO and tribes that may potentially attach religious or cultural significance to resources in the APE. By letter dated September 6, 2024, the Texas SHPO concurred with the FAA's determination that the Proposed Action would have ***no adverse effect*** on historic properties.

The FAA invited the following tribes to consult via letter dated April 22, 2024: Apache Tribe of Oklahoma, the Caddo National of Oklahoma, the Cherokee Nation, the Comanche Nation, the Coushatta Tribe of Louisiana, the Delaware Nation of Oklahoma, the Muscogee (Creek) Nation, the Tonkawa Tribe of Indians of Oklahoma, the Wichita and Affiliated Tribes of Oklahoma. As of the date this EA was made available for public comment, no responses have been received.

The FAA's historic and tribal outreach letters are included in **Appendix E**.

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

3.5.1 Definition of Resource and Regulatory Setting

Section 4(f) of the Department of Transportation (DOT) Act [codified at 49 U.S.C. § 303(c)] protects significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites. Section 4(f) states[29] that, subject to exceptions for de minimis impacts: "The 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 to 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. A 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 attributes of the resource that contribute to its significance or enjoyment are substantially diminished. The determination of use must consider the entire property and not simply the portion of the property used for a proposed project.[30]

Section 4(f) resources where a quiet setting is a generally recognized feature or attribute receive special consideration. Parks, recreation areas, and wildlife and waterfowl refuges that are privately owned are not subject to Section 4(f) provisions.

A significant impact would occur pursuant to NEPA when a Proposed Action either involves more than a minimal physical use of a section 4(f) property or is deemed a "constructive use" based on an FAA determination that the Proposed Action would substantially impair the 4(f) property, and mitigation measures do not eliminate or reduce the effects of the use below the threshold of significance.

3.5.2 Affected Environment

The FAA identified properties that could meet the definition of a Section 4(f) resource within the operating areas, including public parks and historic sites. Most of the Section 4(f) resources are local public parks, trails, and recreational fields. Section 4(f) properties managed by the National Park Service, Intermountain Region include Dealey Plaza Historic District and National Historic Landmark, Fair Park Centennial Buildings, and Highland Park Village. A map showing the location of these NPS properties is contained in **Appendix F**.

No wildlife or waterfowl refuges exist within the operating areas.

As discussed in **Section 3.4**, numerous historic sites listed are located within the operating area; however, most of these properties are considered for architectural or other purposes that are not typically affected by UA operations. Also, the FAA consulted with the Texas SHPO for Causey's proposed operations to determine whether historic and traditional cultural properties would be affected.

3.5.3 Environmental Consequences

There would be no physical use of Section 4(f) resources because there would not be any physical occupation or alteration of a Section 4(f) property or any portion of a Section 4(f) property. The FAA has determined that infrequent UAS overflights as described in the No Action Alternative and the Proposed Action are not considered a constructive use of any Section 4(f) resource and would not cause substantial impairment to any of the Section 4(f) resources in the operating areas. As described in **Section 3.3**, the proposed operations would not result in significant noise levels at any location in the operating areas. Noise and visual effects from CAU's occasional overflights are not expected to diminish the activities, features, or attributes of the resources that contribute to their significance or enjoyment.

Additionally, CAU identifies areas where open air gatherings of people typically occur, such as open air concert venues and school yards, and minimizes overflying these properties through the creation of "limited fly zones" via CAU's route planning software, which prepares an optimized flight path from the DC to each designated delivery site. The software ensures that each route integrates and respects all of the restrictions entered into the database, including Section 4(f) properties, which can be automatically avoided based on the time of day and other factors. The FAA has determined that there would be ***no significant impacts*** to Section 4(f) resources as a result of the No Action Alternative or the Proposed Action.

3.6 Environmental Justice

3.6.1 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*, was enacted on April 21, 2023. EO 14096 on EJ does not rescind EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, which has been in effect since February 11, 1994, and is currently implemented through DOT Order 5610.2C, *U.S. Department of Transportation Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. This implementation will continue until further guidance is provided regarding the implementation of the new EO 14096 on EJ.

EO 12898 directs each federal agency to "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." Subsequent orders at the federal level—including DOT Order 5610.2C—have reinforced the directives outlined in EO 12898. CEQ also developed guidelines (CEQ 1997) to assist federal agencies in incorporating the goals of EO 12898 into the NEPA process.

DOT Order 5610.2C defines a minority person as a person who is Black, Hispanic or Latino, Asian American, American Indian or Alaska Native, or Native Hawaiian or Other Pacific Islander. The DOT Order defines a minority population as 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 will 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. It defines a low-income population as 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 would be similarly affected by a proposed DOT program, policy, or activity.

More information about this environmental impact category is presented in Chapter 14 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

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 includes whether the action would have the potential to lead to a disproportionately high and adverse impact on the environmental justice 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 low-income population and is appreciably more severe or greater in magnitude than adverse effects that will be suffered by the non-minority population and/or non-low-income population.

3.6.2 Affected Environment

The study area includes 10 counties: Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise.

DOT Order 5610.2C accounts for both race and ethnicity in addressing EJ impacts. The FAA identified minority populations, classified by both race and ethnicity,[40] using the Decennial Census down to the county level. Separate data is provided for racial minority and Hispanic populations; therefore, this analysis identifies these populations by both classifications. The FAA identified low-income populations using 2020 American Community Survey (ACS) 5-year estimates from the U.S. Census Bureau. The FAA compared the ACS 5-year estimates to the HHS Poverty Guidelines for the 48 contiguous states and the District of Columbia to calculate the percentage of households below the poverty threshold for each county.

The FAA selected a "Reference Community" to provide a benchmark by which the individual counties could be compared to identify areas of EJ concern within the study area. Due to the size and population of the study area, the FAA used the aggregate of the 10 counties in the study area as the Reference Community for this analysis.[41] This regional Reference Community allows the demographics of localized populations (i.e., counties) to be compared to the total population within the overall study area.[42]

The FAA considered communities (i.e., counties) where EJ demographics exceed those of the Reference Community by a "meaningfully greater" amount to be areas of EJ concern. The FAA selected a threshold value of zero percent or greater than the average of the Reference Community to define the "meaningfully greater" amount to ensure that any potential EJ communities were identified. As a result,

[40] As defined by the U.S. Census Bureau.

[41] Per *Promising Practices for EJ Methodologies in NEPA Reviews* (March 2016), a product of the Federal Interagency Working Group on EJ, a larger scale reference community (e.g., municipal, state, or regional) may be required under this circumstance to obtain results that accurately reflect the existence of a minority population in the geographic unit of analysis (e.g., census block) being analyzed. Available: https://www.epa.gov/environmentaljustice/ej-iwg-promising-practices-ej-methodologies-nepa-reviews.

[42] See *Community Guide to Environmental Justice and NEPA Methods* (March 2019), a product of the Federal Interagency Working Group on EJ, for more information on the importance of selecting an appropriate Reference Community and its use in meaningfully greater analyses. Available: https://www.energy.gov/sites/default/files/2019/05/f63/NEPA%20Community%20Guide%202019.pdf.

any county with a percentage of minority and/or low-income populations greater than the Reference Community are considered an area of EJ concern for the purpose of this EJ analysis.

The FAA also considered communities where EJ populations predominate (i.e., the minority population is equal to or greater than 50 percent) as areas of EJ concern.

For reference, the FAA also included data for the state of Texas as a reference to provide additional context. The FAA used the comparison between the 10-county aggregate Reference Community and the individual county to identify areas of EJ concern.

Table 8 shows the demographic information of each county within the study area and the Reference Community.

Table 8. Areas of EJ Concern

County	% All Other Races	% Hispanic	% Households Below Poverty
Reference Community	51.4%	29.4%	9.9%
Collin	X	X	**12.5%**
Dallas	**64.6%**	**40.5%**	X
Denton	X	X	X
Ellis	X	X	**10.7%**
Johnson	X	X	**10.7%**
Kaufman	X	X	X
Parker	X	X	X
Rockwall	X	X	**10.1%**
Tarrant	**50.5%**	**29.4%**	X
Wise	X	X	X

Sources: HHS 2022, U.S. Census Bureau 2020, U.S. Census Bureau 2022

Note: X = Does not meet the threshold to be considered an area of EJ concern

In summary, of the 10 counties, one county is considered an area of EJ concern with respect to race because it has a higher percentage of racial minorities compared to the Reference Community. Two counties are predominately minority (greater than 50 percent). Two counties are considered areas of EJ concern with respect to ethnicity because they have higher percentages of ethnic minorities than the Reference Community. Four counties are considered areas of EJ concern with respect to poverty because they have higher percentages of households below poverty than the Reference Community.

3.6.3 Environmental Consequences

3.6.3.1 No Action Alternative

The No Action Alternative assumes UA operators would continue to operate under the existing Part 135 approvals listed in **Section 2.1**, as well as Part 107 approvals which require operations to remain within visual line of sight. Previous EAs for Part 135 commercial drone package delivery in Texas resulted in FONSIs (see **Section 2.1**). Currently approved Part 135 package delivery operations forecast to continue under the no action alternative are those from Causey, Amazon Prime Air, and Wing Aviation. Drone operators would be able to provide on-demand access to small goods, including medicine and groceries, so that recipients would not be dependent on personal vehicles or other modes of transportation to obtain these items, which is a benefit of drone package deliveries. This additional access to small goods could result in decreased traffic congestion and greenhouse gas emissions, which would represent positive impacts to EJ communities. For these reasons, the No Action Alternative is not expected to result in significant impacts on EJ communities.

3.6.3.2 Proposed Action

As described in the sections above, the Proposed Action would not result in significant impacts in any other environmental impact category. As noted in **Section 3.3**, the UA sound levels could be perceptible in areas within the study area but would stay below the level determined to constitute a significant impact (HMMH 2024).

Drone package deliveries would provide additional access to small goods, such as groceries and medicine, which could present a positive effect on low-income and minority communities where individuals may not have reliable access to personal vehicles and/or other modes of transportation. For these reasons, the Proposed Action may result in a benefit to low-income and minority communities by providing additional and on-demand access to small goods.

The Proposed Action would not create impacts that exceed thresholds of significance in other environmental impacts, nor would it generate impacts on the physical or natural environment that affect an EJ population in a way that the FAA determines are unique to the EJ population and significant to that population. ***Therefore, the Proposed Action would not result in significant EJ impacts, including disproportionately high and adverse effects on minority and/or low-income populations.***

3.7 Visual Effects (Visual Resources and Visual Character)

3.7.1 Definition of Resource and Regulatory Setting

Visual resources and visual character impacts deal with the extent to which the No Action Alternative or the Proposed Action would result in visual impacts to resources in the operating areas. Visual impacts can be difficult to define and evaluate because the analysis is generally subjective but are normally related to the extent that the No Action Alternative or the Proposed Action would contrast with, or detract from, the visual resources and/or the visual character of the existing environment. 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 threshold of significance similar to noise impacts. Factors the FAA considers in assessing significant impacts include the degree to which the action would have the potential to: (1) affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources; (2) contrast with the visual resources and/or visual character in the study area; or (3) block or obstruct the views of visual resources, including whether these resources would still be viewable from other locations.

3.7.2 Affected Environment

Drone package delivery flights under the No Action Alternative or the Proposed Action would take place primarily over urban and suburban areas and commercially-developed properties. Nighttime lighting in the operating areas varies, depending on the land use. Existing light emissions are the highest at the DCs which are situated in commercial areas, and light emissions in areas beneath the UA's flight path are typically lower, especially in suburban and residential areas. As noted in **Section 3.5**, there are some public parks that could be valued for aesthetic attributes within the operating areas.

3.7.3 Environmental Consequences

Drone package delivery flights would occur over urban and suburban areas, as well as commercially-developed properties between the hours of 8 a.m. and 10 p.m. Visual effects could occur during all flight phases. When making a delivery, the UA would depart from a DC and travel en route at an altitude less than 400 feet AGL and therefore could be visible by someone looking for a drone in the sky for a short duration.

CAU uses flight planning software to vary flight paths to minimize overflights of any given location and to deconflict paths that might overlap with other aircraft. The highest concentrations of overflights would likely occur in proximity to each DC, which are primarily located in commercial areas, such as parking lots or commercial buildings that already have high levels of activity and ambient lighting. However, because DCs are expected to be in areas that are not visually sensitive, operations at the DC are not expected to affect the nature of the visual character of the area or contrast with visual resources in the vicinity of the DCs. Additionally, DC operations would not block or obstruct views of visual resources given the small size of the drones.

As noted in **Sections 3.4 and 3.5**, there are some historic sites, public parks, recreational facilities, and trails that could be valued for aesthetic attributes within the operating areas. CAU proposes to minimize overflights of large open-air gatherings of people, which may include properties covered under Section 4(f), under the No Action Alternative or the Proposed Action. This measure is made possible in part by CAU's flight planning system described in **Section 2.2.2**.

Based upon FAA requirements to minimize overflights of open-air gatherings of people and an expected low number of proposed flights per day spread throughout the operating areas, the No Action Alternative and the Proposed Action are not expected to affect the visual character of the area; substantially contrast with the visual resources within the operating areas; or block or obstruct the views of visual resources. Any visual effects are expected to be similar to existing air traffic in the vicinity of the operating areas. For these reasons, the Proposed Action is ***not expected to result in significant visual effects at any location in the operating areas.***

3.8 Water Resources - Surface Waters

3.8.1 Definition of Resource and Regulatory Setting

Surface water resources generally consist of oceans, wetlands, lakes, rivers, and streams. Surface water is important for its contribution to the economic, ecological, recreational, and human health of a community. The Clean Water Act (CWA) established the National Pollutant Discharge Elimination System (NPDES) program, which regulates the discharge of point sources of water pollution into Waters of the United States (U.S.) and requires a permit under Section 402 of the CWA. Waters of the U.S. are defined by the CWA and are protected by various regulations and permitting programs administered by the U.S. Environmental Protection Agency (USEPA) and the U.S. Army Corps of Engineers. An action would be considered significant to surface waters when it would: (1) exceed water quality standards established by federal, state, local, and tribal regulatory agencies; or (2) contaminate public drinking water supply such that public health may be adversely affected.

3.8.2 Affected Environment

Approximately 156 square miles of surface waters occur within the operating areas (see **Figure 1**). Notable surface waters include the Trinity River, Brazos River, Lake Granbury, Lake Ray Hubbard, Lewisville Lake, Grapevine Lake, Eagle Mountain Lake, Lake Worth, Benbrook Lake, Joe Poole Lake, and Lavon Lake. CAU's operations would not require an NPDES permit or any other authorization under the CWA.

3.8.3 Environmental Consequences

While it is highly unlikely for one of CAU's aircraft to crash, and even less likely for a crash to happen in surface waters, this EA considers the potential effects of a UA crashing into surface waters covered by the CWA.

CAU would be a certificated air carrier and must comply with all applicable regulatory requirements. This includes compliance with requirements to notify the FAA and/or National Transportation Safety Board (NTSB) in accordance with regulatory requirements in the event of an aircraft accident. CAU's FAA-accepted checklists include procedures to notify local emergency services in the event of an accident or incident. In accordance with 14 CFR § 135.23(d), CAU is required to locate and secure any downed aircraft pending guidance from the FAA or NTSB.

In the event of an in-flight malfunction or deviation, the Remote Pilot-in-Command (RPIC) can initiate three commands: initiate a hold pattern, return to the distribution center, or terminate the flight via the emergency parachute system, which may also automatically deploy if the CAU UA detects a critical failure necessitating a flight termination. In addition, the Lithium-ion battery packs are well-secured within the aircraft and are not expected to detach from the aircraft or become lost in the event of an incident.

No construction activities would be associated with the No Action Alternative or the Proposed Action. Neither the No Action Alternative nor the Proposed Action would have the potential to adversely affect natural and beneficial water resource values to a degree that substantially diminishes or destroys such values, or to adversely affect surface waters such that the beneficial uses and values of such waters are appreciably diminished or can no longer be maintained and such impairment cannot be avoided or satisfactorily mitigated. Neither alternative would cause an exceedance of water quality standards established by federal, state, local, and tribal regulatory agencies, and neither alternative would contaminate public drinking water supply such that public health may be adversely affected.

4.0 CUMULATIVE IMPACTS

Consideration of cumulative impacts applies to the impacts resulting from the implementation of the Proposed Action with other actions. CEQ regulations define a cumulative impact as "an impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions." The regulations also state that cumulative impacts can result from individually minor, but collectively significant actions that take place over a period of time.

In addition to the 1050.1F Desk Reference, the CEQ's publication entitled, Considering Cumulative Effects under the National Environmental Policy Act,[43] outlines the process for evaluating cumulative impacts associated with a proposed project.

Cumulative impacts are only evaluated for resource categories that would experience direct and/or indirect impacts resulting from a proposed action. Because the majority of impacts discussed in Chapter 3 of this EA were found to be minimal and because drone flights have limited opportunities to interact with other non-related actions due to the flights' short durations and spread over a large geographic area, the FAA anticipates the Proposed Action's potential for cumulative effects would be limited to noise. Therefore, this section focuses on the Proposed Action's potential cumulative impact on the noise environment.

The noise analysis presented in **Appendix C** and summarized in **Section 3.3** considers cumulative noise impacts associated with drone package deliveries that are forecast to occur as part of the Proposed Action. CAU currently operates drone package deliveries from a DC in Granbury and from a DC in Rowlett. CAU proposes to establish 30 additional DCs within the DFW metro area. These operations would occur in areas that are subject to other aviation noise sources. These other noise sources may include traditional aircraft as well as other drones operating in the same area as CAU's proposed operations. Therefore, it is necessary to evaluate the cumulative noise exposure that could result from the combination of drone package deliveries and other aviation noise sources in the operating areas. Scenarios where these combinations could occur include drone package delivery operations in the vicinity of an airport where the flight paths may overlap or drone package delivery operations where multiple drone companies are operating.

Thirty-five (35) active airports are located within the DFW metro area. The potential for cumulative effects associated with noise and noise compatible land use could occur when UA and manned aircraft simultaneously operate within the surface areas of Class B, C, and D airspace (see **Figure 6**). The potential for cumulative effects would be minimized because hubs would be placed at the appropriate standoff distances from noise-sensitive land uses, as discussed in **Section 3.3**, depending on whether their locations are within or outside of the controlled surface areas of Class B, C, and D airspace.

As the number of operators within a given area increases, the potential for cumulative noise impacts also increases. CAU and Wing currently conduct Part 135 operations in the DFW metro area, and DroneUp recently announced its plans to operate up to 30 hubs in the DFW metro area (DroneUp 2024).

CAU acknowledges that future operators may propose locating their operations within the same operating areas as the Proposed Action covered in this EA. If that occurs, CAU understands the potential

[43] See https://www.energy.gov/nepa/downloads/considering-cumulative-effects-under-national-environmental-policy-act-ceq-1997

for cumulative impacts may increase due to a future operator's action and agrees to work with the new operator and the FAA to mitigate potential impacts to a level that is less than significant. CAU also understands that future operators would be required to evaluate the potential for noise impacts due to their operations as part of a NEPA analysis.

Additional operators are expected to move into the DFW metro area. An independent FAA analysis of prospective hub siting areas concluded that siting 100 percent of the existing and proposed DC locations is not feasible without overlap in the land area accessible from the DC locations (i.e., the delivery ranges of the proposed UA). More information regarding the number of proposed DCs, delivery ranges, and other assumptions relative to cumulative effects that could occur from Part 135 drone package deliveries in the DFW metro area can be found in **Appendix G** of this EA.

It should be noted that overlap does not necessarily mean that there will be adverse impacts to environmental resource categories identified for environmental reviews in FAA Order 1050.1F.[44] Cumulative effects are expected to occur where DC locations and delivery routes overlap. The level of cumulative impacts would vary depending on the amount of overlap, but FAA's analysis has determined that the cumulative impacts would not exceed thresholds for significance in any environmental resource categories.

The degree to which all of the different operators would operate within areas of shared airspace is dependent on the operators, their specific business use cases, and their ability to deconflict with one another in those overlapping areas. Each operator is responsible for coordinating with other operators in the same geographic area to avoid significant cumulative impacts. CAU will communicate and coordinate with other operators to limit operations occurring concurrently in the same area to avoid any significant cumulative impacts. When considering new DC locations, CAU will confirm a new DC does not cause a significant cumulative impact due to another operator's DC by verifying approved locations through NEPA documents and by consulting with the FAA. CAU will avoid potential projects and cumulative impacts by geofencing and proactively sharing airspace.

[44] See Section 3.0 for a listing of environmental resource categories to be analyzed in NEPA documents, per FAA Order 1050.1F.

5.0 LIST OF REVIEWERS, PREPARERS, AND CONTRIBUTORS

Table 9 lists the principal reviewers of this EA.

Table 9. List of Reviewers

Reviewer	Agency	Years of Industry Experience	EA Responsibility
Shelia Neumann, Ph.D., P.E.	Federal Aviation Administration	30	Environmental Protection Specialist, NEPA Lead and Reviewer
Christopher Hurst, REM, CEA, CESCO	Federal Aviation Administration	20	Environmental Protection Specialist, NEPA Document Reviewer
Christopher Couture	Federal Aviation Administration	18	Environmental Protection Specialist, NEPA Document Reviewer
Christopher Hobbs	Federal Aviation Administration	27	Acoustician
Adam Scholten	Federal Aviation Administration	14	Environmental/Noise Analyst
Susumu Shirayama	Federal Aviation Administration	24	Environmental/Noise Analyst

Table 10 lists the principal preparers and contributors to this EA.

Table 10. List of Preparers and Contributors

Preparer/Contributor	Company	Years of Industry Experience	EA Responsibility
Jeff Causey	Causey Aviation Unmanned, Inc.	22	UAS Operation Subject Matter Expert, FAA Compliance Review
Kyle Guidry	Causey Aviation Unmanned, Inc.	12	UAS Subject Matter Expert, FAA Compliance Review
Ariel Katorza	Flytrex	8	UAS Subject Matter Expert, FAA Compliance Review
Polina Bam	Flytrex	1	UAS Subject Matter Expert, FAA Compliance Review
Missi Shumer	HMMH Inc.	24	NEPA Subject Matter Expert, Document Preparation/Review
Brandon L. Robinette	HMMH Inc.	19	Noise Analysis Subject Matter Expert
Michael Hamilton	HMMH Inc.	30	Senior GIS Specialist
Erin Greenfield	HMMH Inc.	17	Technical Editor, Section 508 compliance

Preparer/Contributor	Company	Years of Industry Experience	EA Responsibility
Christopher P. Emma	HMMH Inc.	3	Noise and Environmental Justice Analyst
Avery J. Pecci	HMMH Inc.	1	GIS Specialist

6.0 LIST OF AGENCIES CONSULTED

Federal Agencies

U.S. Fish and Wildlife Service, Arlington (Texas) Ecological Field Services Office

State Agencies

Texas Historical Commission, State Historic Preservation Office

Tribes

Apache Tribe of Oklahoma
Caddo National of Oklahoma
Cherokee Nation, the Comanche Nation
Coushatta Tribe of Louisiana
Delaware Nation of Oklahoma
Muscogee (Creek) Nation
Tonkawa Tribe of Indians of Oklahoma
Wichita and Affiliated Tribes of Oklahoma

APPENDIX A
References

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APPENDIX B
Biological Resources and USFWS Consultation

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal and Central Plains Ecological Services Field Office
Fort Worth Sub-office
3233 Curtis Drive
Fort Worth, Texas 76116
(817) 277-1100

In Reply Refer To:
2024-0126286
2023-0017513

September 23, 2024

Joseph K. Hemler, Jr.
Manager, AFS-752
800 Independence Avenue, SW.
Washington, DC 20591

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

Dear Mr. Hemler,

This responds to the Federal Aviation Administration's (FAA) August 21, 2024, 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 of the proposed action of authorizing Causey Aviation Unmanned (CAU) to begin unmanned aircraft (UA) small package delivery operations in the Dallas-Fort Worth (DFW) metropolitan area and expand its operations in Granbury and Rowlett, Texas (Consultation#: 2023-0017513). Additional information regarding the Granbury action area was received via electronic correspondence on September 18, 2024. The biological evaluation concluded that the proposed action would have no effect on the Texas fawnsfoot (*Truncilla macrodon*) and Texas heelsplitter (*Potamilus amphichaenus),* is not expected to adversely affect the monarch butterfly (*Danaus plexippus*), and may affect, but is not likely to adversely affect the tricolored bat (*Perimyotis subflavus*), golden-cheeked warbler (*Setophaga chrysoparia*), and whooping crane (*Grus americana*).

The purpose of the proposed action is to "establish up to 30 new distribution centers within the proposed operating area within the next three years, including locations in Cedar Hill, Frisco/Little Elm, Murphy, North Richland Hills, and Wylie." CAU would extend its delivery radius from the Granbury and Rowlett distribution centers from 2 nautical miles to 3.5 nautical miles (Figure 1). CAU also requests to expand its number of average annual daily operations to a maximum of 500 deliveries per distribution center. Initially, CAU would likely fly less than the maximum of 500 deliveries per day and deliveries would increase with demand. Proposed operations would occur seven days per week, including holidays, between the hours of 8 a.m. and 10 p.m. The UA would transport small consumer goods and packages in partnership with merchants in the community.

Unmanned aircraft flight operations within a network of defined flight paths between distribution centers and delivery sites, include:

- Takeoff and climb
- En route flight outbound
- Delivery
- En route flight inbound
- Descent and landing

The FAA conducted a noise analysis using sound level measurement data for the Flytrex FTX-M600P and the Flytrex Sky II UA. The Flytrex Sky II, which will replace the FTX-M600P in the first half of 2025, has higher noise levels than the FTX-M600P. For the purpose of considering potential environmental effects, the noise values for the Flytrex Sky II are used since it represents the worst-case scenario.

Based on the Flytrex Sky II noise measurement data, the maximum sound exposure level (SEL) would occur at distribution centers, where drone activity would generate an average SEL of up to 92.5 dB at 25 feet from the takeoff/landing pad. For deliveries, drone activity would generate an average SEL of up to 87.5 dB at 25 feet from the delivery drop point. Sound levels would decrease as distances from the drone increase. The maximum average measured SEL for the en route phase is 74.3 dB when the drone is flying 29.2 knots at 230 feet AGL directly overhead.

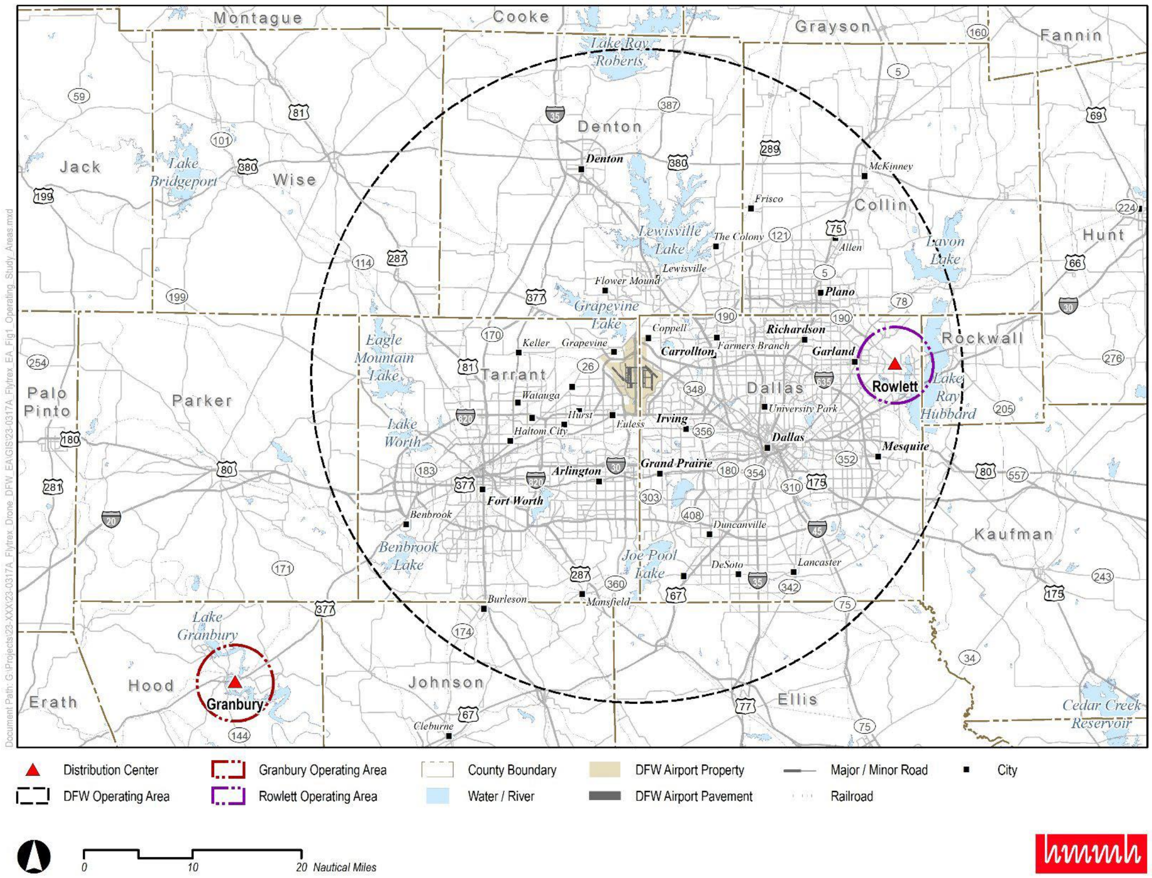

Figure 1. Action Area.

The federally-listed, proposed listed, and candidate species known to occur in Wise, Denton, Collin, Parker, Tarrant, Dallas, Kaufman, Ellis, Rockwall, Hood, and Johnson Counties are the threatened piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), and Texas fawnsfoot (*Truncilla macrodon*)(listing effective July 5, 2024), the endangered golden-cheeked warbler (*Setophaga chrysoparia*) and whooping crane (*Grus americana*), the proposed endangered tricolored bat (*Perimyotis subflavis*) and Texas heelsplitter (*Potamilus amphichaenus)*, proposed threatened alligator snapping turtle (*Macrochelys temminckii),* and the candidate monarch butterfly (*Danaus plexippus*). Currently, the Service recommends the piping plover and red knot be evaluated only for wind energy projects in these counties; therefore, no consultation is necessary regarding those species. 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 biological evaluation does not indicate the need for conference on the proposed species. We should note that there is a lack of information on the potential effects of drone flights on the tricolored bat. While the proposed action is not expected to directly affect roosting habitat for the species and the majority of flight time would occur when bats are roosting, there are times when active/feeding tricolored bats, if present in the action area, could be exposed to drone activity. Should the tricolored bat be listed, you should re-evaluate the project to determine the extent of effects on the species. If that evaluation indicates adverse effects would or are occurring on the species, measures should be implemented to avoid incidental take until consultation can be completed. The following measures should be considered to avoid incidental take:

- Determining the extent of tricolored bat presence in the action through acoustic surveys
- Restricting flight hours to daylight hours during non-hibernating season

For more information on tricolored bat acoustic surveys, please see the USFWS Range-Wide Indiana Bat & Northern Long-Eared Bat Survey Guidelines at https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

Additionally, we recommend the FAA develop and implement long term procedures for monitoring and reporting potential effects of drone activity on tricolored bats. This would include a process for reporting survey data, detection of collisions, and contingency planning in the event that adverse effects are reported.

Candidate species are not afforded protection under the Act, but we 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 35 counties in Texas, with Dallas and Johnson Counties as the only counties in the Action Area. A small number of golden-cheeked warblers have been reported during the breeding season in 2023 in Dallas County (Curtis 2023, entire). Golden-cheeked warblers breed exclusively in the mixed Ashe juniper/deciduous woodlands. These songbirds require the shredding bark produced by mature Ashe junipers (*Juniperus ashei*) 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. A recent study found no evidence that golden-cheeked warbler territory placement, productivity, song characteristics, or behavior was affected by highway construction or traffic noise in Austin, Texas (Long et al. 2017, p. 385). Based on: 1) operations occurring mostly in an urban environment, 2) the altitude at which the UA flies in the en route phase (230 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. Whooping cranes could be encountered at suitable stopover sites within the corridor during spring and fall migration. Although whooping crane migratory flights are generally at altitudes of between 1,000 and 6,000 feet, they fly at lower altitudes when seeking stop-over habitats such as reservoirs, large ponds, rivers, and wetlands. 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 (230 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).

Based on the information provided within the BE and later correspondence, we concur with the 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 Ms. Sydney Dragon-Moore of my staff at sydney_dragon-moore@fws.gov.

Sincerely,

Omar Bocanegra
Deputy Field Supervisor

Literature Cited

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August 21, 2024

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SUBJECT: **Endangered Species Act Section 7 Consultation for CAU 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 Causey Aviation Unmanned (CAU) to begin unmanned aircraft (UA; also referred to as a drone) small package delivery operations in the Dallas-Fort Worth (DFW) metropolitan area and expand its operations in Granbury and Rowlett, Texas, ***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.

The FAA conducted Section 7 consultation with the USFWS for a similar undertaking in early 2023 when evaluating CAU's initial proposed operations in Granbury and Rowlett (**Reference: USFWS #2023-0017513)**. The USFWS concurred with the FAA's finding of ***may affect, but is not likely to adversely affect***, the golden-cheeked warbler (*Setophaga chrysoparia*) and whooping crane (*Grus americana*) for Granbury and Rowlett operations by letter dated March 3, 2023.

Background

Over the past several years, CAU has worked 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.

CAU currently operates under 14 Code of Federal Regulations (CFR) Part 135 in Granbury and Rowlett, Texas. CAU 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] CAU is applying to the FAA to add the DFW metropolitan area to the operating area included in its OpSpecs for Texas and to expand its operations in Granbury and Rowlett.

Project Description

CAU plans to establish up to 30 new distribution centers within the proposed operating area within the next three years, including locations in Cedar Hill, Frisco/Little Elm, Murphy, North Richland Hills, and Wylie (see **Figure 1, Attachment A**). CAU would extend its delivery radius from the Granbury and Rowlett distribution centers from 2 nautical miles to 3.5 nautical miles (see **Figure 1, Attachment A**). CAU also requests to expand its number of average annual daily operations to a maximum of 500 deliveries per distribution center (DC).

Initially, CAU would likely fly less than the maximum of 500 deliveries per day from each DC. Over time, deliveries would increase as demand from consumers increases. Proposed operations would occur seven days per week, including holidays, between the hours of 8 a.m. and 10 p.m.

The UA would transport small consumer goods and packages in partnership with merchants in the community. CAU typically partners with established businesses and identifies locations for distribution centers at the partner's parking lot, rooftop, or other area where it is not disruptive to the business, does not present a safety hazard, and is consistent with local land use and zoning regulations. This approach allows the drone operator to conduct operations with minimal infrastructure requirements and no ground disturbance activities. Each DC would contain charging pads for up to 20 drones.

Unmanned Aircraft

CAU plans to use two UA platforms for the proposed operations— the Flytrex FTX-M600P and the Flytrex Sky II (see **Figures 2 and 3, Attachment A**). CAU intends to phase out the Flytrex FTX-M600P UA and replace it with the Flytrex Sky II in the first half of 2025.

The Flytrex FTX-M600P has a maximum takeoff weight of 33.4 pounds, and the maximum allowable package weight is 5.73 pounds. The UA features a multi-rotor design with six propellers mounted on equally-spaced arms extending horizontally from a center frame. The system's computers and package containers are mounted on the underside of the airframe.

The Flytrex Sky II has a maximum takeoff weight of 34.2 pounds, and the maximum allowable package weight is 8.8 pounds. The UA features a multi-rotor design with eight propellers mounted on a hash-shaped carbon fiber airframe. The system's computers, power system, and winch mechanism are mounted on the center of the airframe. The Sky II model carries packages without a delivery box.

Both drone models use electric power from rechargeable lithium-ion batteries and include a parachute safety system that can be deployed in cases of emergency.

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

Flight Operations

Prior to takeoff, packages are manually loaded onto the UA by a ground crew at the DC. The UA then launches to perform aerial deliveries. With a multi-rotor design, the UA can take off and descend vertically, as well as hover. Normal cruising speeds are expected to be approximately 29 knots (33 miles per hour [mph]). Typical flights begin with the UA departing from a distribution center and ascending vertically to 230 feet above ground level (AGL). The UA then flies a pre-determined route at 230 feet AGL to the delivery point. Upon arrival at the delivery point, the UA descends vertically to the delivery hover altitude of 75 to 82 feet AGL, lowers the package to the ground using a tethered mechanism, ascends to cruising altitude and speed, and returns to the DC. Upon arrival at the DC, the UA descends vertically from 230 feet AGL to the ground for landing.

Neither aircraft would touch the ground in any place other than the distribution center (except during emergency landings) since they remain airborne while conducting deliveries.

The total distance flown for deliveries would vary depending on the DC and delivery locations with a maximum distance of 8.5 miles (round trip) for the Flytrex FTX-M600P UA and 8 miles (round trip) for the newer Flytrex Sky II UA. The package would be delivered directly to the customer's requested location using the Flytrex automated route planning algorithm that is designed to optimize route planning while minimizing overflights and repeated flight patterns. The delivery cycle can generally be divided into the following five phases: (1) takeoff and climb, (2) en route outbound, (3) delivery, (4) en route inbound, and (5) descent and landing (see **Figure 4, Attachment A**).

Takeoff and Climb

The takeoff and climb phase is described as the portion of the flight in which a fully loaded UA takes off from the DC and climbs vertically. Packages are loaded into the UA at the DC. The UA then launches to perform aerial deliveries. The UA climbs from 0 to 33 feet AGL and then hovers briefly as various systems checks are conducted to ensure it is functioning properly. Upon completion of systems checks, the UA ascends from 33 feet AGL to its cruising altitude of approximately 230 feet AGL. The takeoff and climb phase lasts up to 23 seconds.

En Route Outbound

The en route outbound phase is defined as the part of the flight in which the fully loaded UA flies the assigned route from its hub to a delivery point. During this flight phase, en route cruising speeds average around 29 knots (33 miles per hour) at a cruising altitude of 230 feet AGL. This phase lasts from 1 to 8 minutes.

Delivery

The delivery phase is defined by descent from the en route outbound phase to a delivery point to deliver a package. Upon arrival at the delivery point, the UA descends vertically to the delivery hover altitude of 75 to 82 feet AGL and lowers the package to the ground using a tethered mechanism. CAU's aircraft does not touch the ground in any place other than the DC (except during emergency landings). Upon completing the delivery, the UA ascends vertically to reach its en route cruising altitude of 230 feet AGL. The delivery phase takes approximately 1 minute from arrival at the delivery location to the UA's return to cruising altitude.

En Route Inbound

Once the UA reaches its cruising altitude of 230 feet AGL, it returns from the delivery point back to the DC via the same assigned route. It travels at approximately 29 knots (33 miles per hour) for approximately 1 to 8 minutes.

Descent and Landing

Upon arrival at the DC, the UA descends vertically from 230 feet AGL to 33 feet AGL where it hovers before lowering to the ground and shutting down. The descent and landing phase lasts up to 40 seconds.

<u>Predicted Sound Levels</u>

The FAA conducted a noise analysis using sound level measurement data for the Flytrex FTX-M600P and the Flytrex Sky II (see **Attachment B**). The Flytrex Sky II, which will replace the FTX-M600P in the first half of 2025, has higher noise levels than the FTX-M600P. For the purpose of considering potential environmental effects, the noise values for the Flytrex Sky II are used since it represents the worst-case scenario.

Based on the Flytrex Sky II noise measurement data, the maximum sound exposure level (SEL) would occur at distribution centers, where drone activity would generate an average SEL of up to 92.5 dB at 25 feet from the takeoff/landing pad. For deliveries, drone activity would generate an average SEL of up to 87.5 dB at 25 feet from the delivery drop point. Sound levels would decrease as distances from the drone increase. The maximum average measured SEL for the en route phase is 74.3 dB when the drone is flying 29.2 knots at 230 feet AGL directly overhead.

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 CAU'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 water bodies.

- 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 B**) 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
Rufa red knot	*Calidris canutus rufa*	Threatened
Whooping crane	*Grus americana*	Endangered
Clams		
Texas fawnsfoot	*Truncilla macrodon*	Proposed Threatened
Texas heelsplitter	*Potamilus amphichaenus*	Proposed Endangered
Reptiles		
Alligator snapping turtle	*Macrochelys temminckii*	Proposed Threatened
Insects		
Monarch butterfly	*Danaus plexippus*	Candidate

The Official Species List states that the piping plover and rufa 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 would not touch the ground except at the DCs, 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 DC. The duration of exposure by wildlife on the ground to visual or noise impacts from the UA would be of very short duration (less than one minute).

As noted above and shown in **Attachment B**, the highest estimated SEL associated with CAU's proposed operations is SEL 92.5 dB, which would occur when the drone is taking off from or landing at a DC in a commercial area. 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 230 feet AGL is estimated to be around 74.3 dB, which is louder than 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 92.5 dB.

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

<u>Tricolored Bat</u>

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 DCs would be located and deliveries would occur (see **Figure 5, Appendix A**). DCs would be located in commercial areas and therefore not within suitable habitat for tricolored bats.

As stated above, Causey is proposing UA operations from 8:00 a.m. to 10:00 p.m. Therefore, the time period that represents the greatest potential for the action to affect a tricolored bat is from dusk until 10:00 p.m. Also, the risk is only present for 3 to 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 DCs and delivery locations, and the short period of time the UA would be in any particular location, UA noise is not expected to adversely affect tricolored bats. Any increase in ambient sound levels caused by the UA's flight would only last a few seconds during the en route phase and less than two minutes during a delivery.

Bats could also be struck by a drone, particularly from dusk until 10:00 p.m. when foraging. Given the bat's ability to avoid flying into objects and the short period of time the UA would be in any one place, the likelihood of the UA striking a bat is discountable.

Based on 1) the operations occurring mostly in an urban environment, 2) the altitude at which the UA flies in the en route phase (230 feet AGL), 3) the expected low sound levels experienced by a bat, 4) any increase in ambient sound levels would be short in duration, and 5) 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 DCs 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 (230 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 Refugein Austwell, Texas. 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, such as 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 DCs 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, CAU has reported that there has never been a bird strike with its drones.

Based on 1) operations occurring mostly in an urban environment, 2) the altitude at which the UA flies in the en route phase (230 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.

Texas Heelsplitter

The Texas heelsplitter is a freshwater mussel that is endemic to Texas restricted to the Trinity, Neches, and Sabine River systems. The action does not involve any ground-disturbing activities or activities within Texas heelsplitter habitat. As there is no plausible route of effect to this species, the FAA determined the action would have ***no effect*** on the Texas heelsplitter.

Alligator Snapping Turtle

The Alligator snapping turtle is a large species of turtle that is endemic to freshwater habitats, primarily found in freshwaters of the southeastern United States. The primary threats to this species include habitat alteration and fragmentation, water pollution, deliberate harvest for human consumption, incidental catch by recreational fishers, and drought (Reed et al. 2002, Riedle et al. 2005).

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 Dr. Shelia Neumann at 9-FAA-DRONE-Environmental@FAA.gov.

Sincerely,

Joseph K. Hemler Jr.
Manager, AFS-752
Emerging Technologies Division
Office of Safety Standards, Flight Standards Service

Attachments:
Attachment A Various Figures
- Figure 1. Action Area
- Figure 2. Flytrex FTX-M600P UA
- Figure 3. Flytrex FTX Sky II UA Diagram
- Figure 4. Typical Flight Profile
- Figure 5. Tricolored Bat Mean Occupancy Probabilities

Attachment B. USFWS Official Species List
Attachment C. Noise Assessment Report

References

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Attachment A
Various Figures

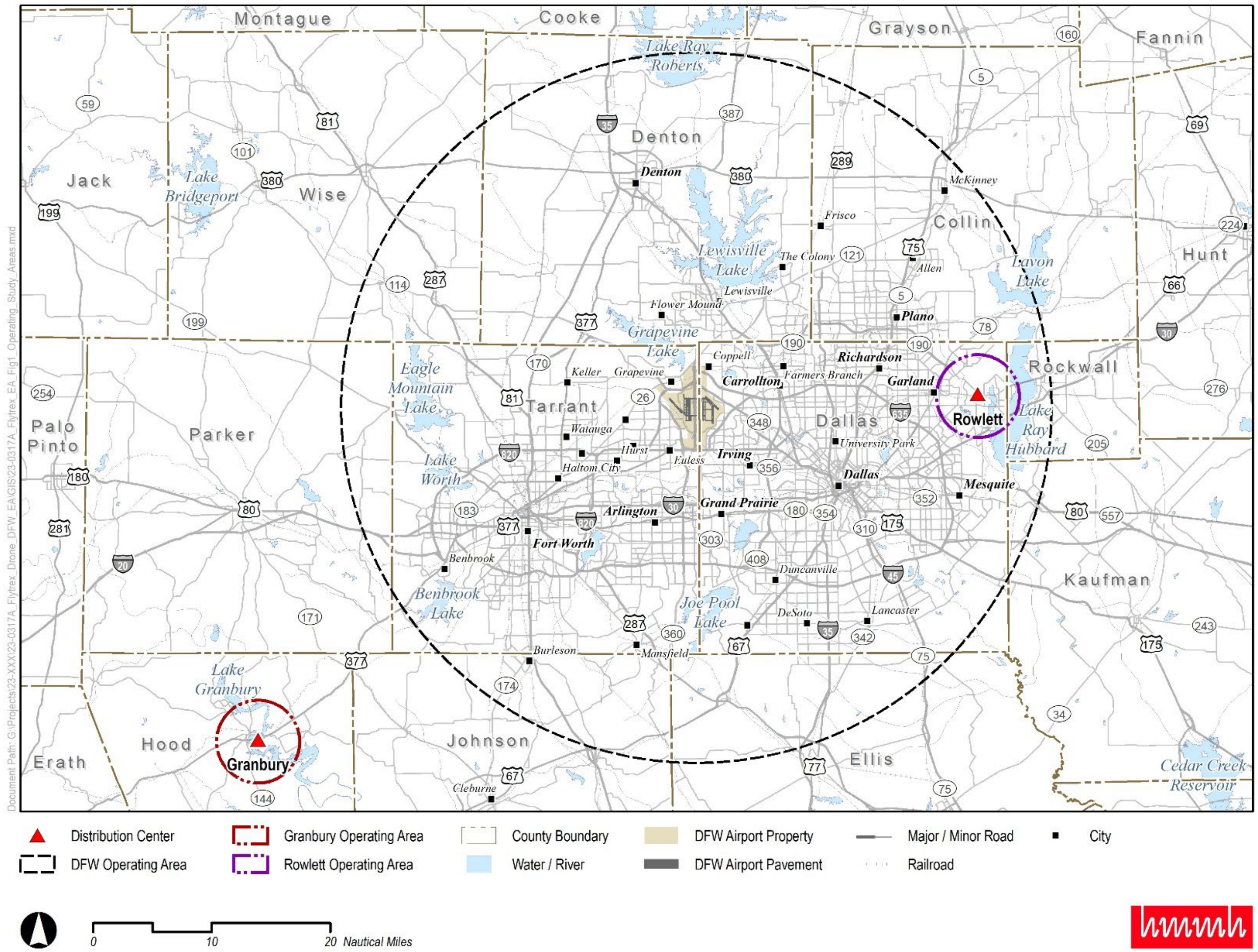


Figure 1. Action Area

Figure 2. Flytrex FTX-M600P UA

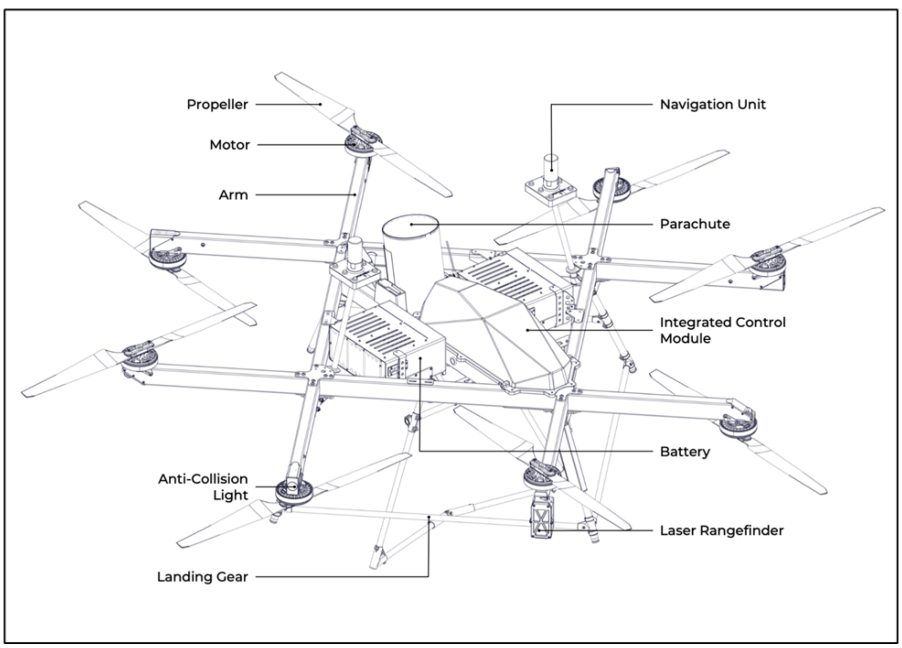


Figure 3. Flytrex FTX Sky II UA Diagram

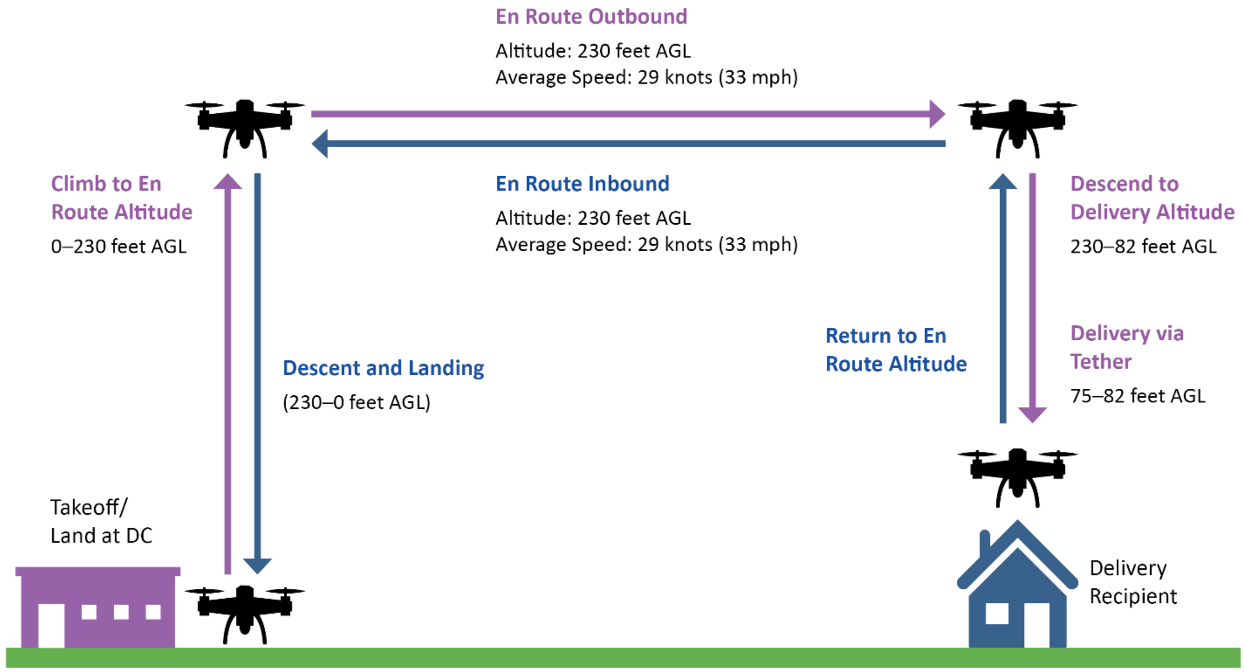
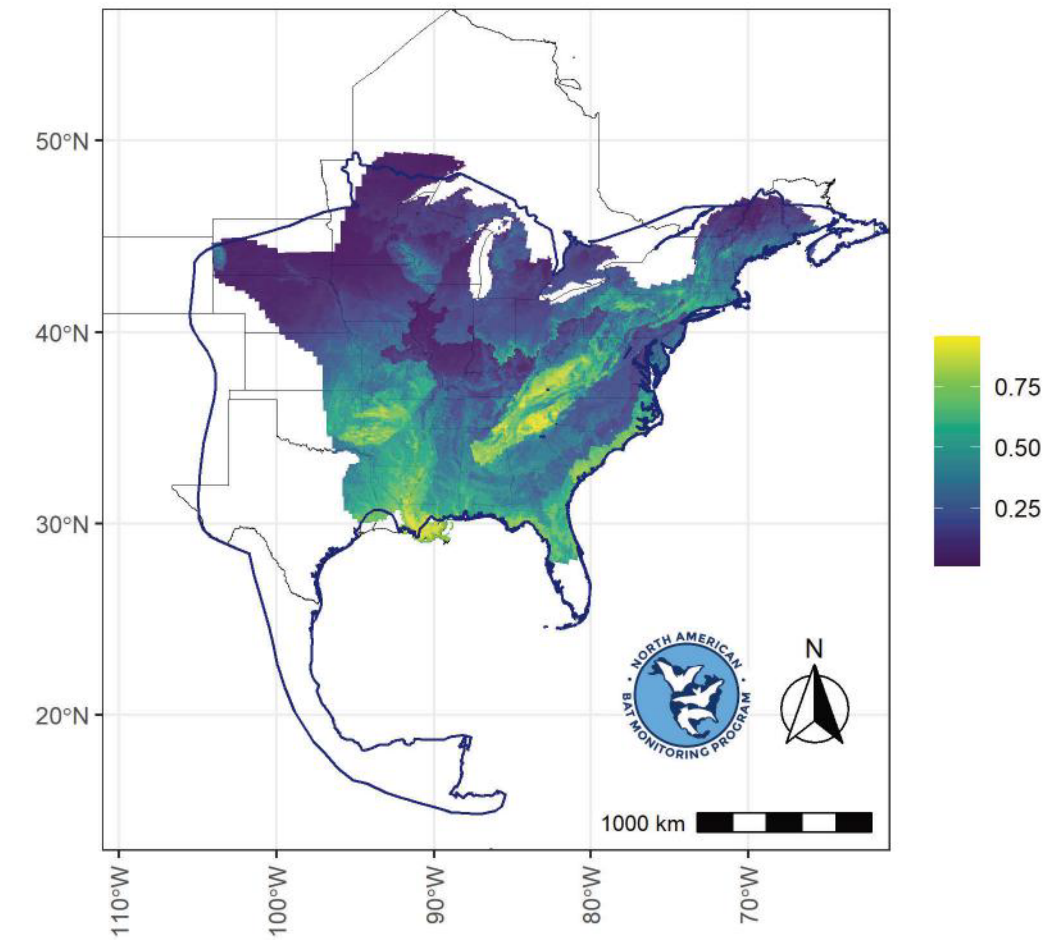


Figure 4. Typical Flight Profile



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.

USGS
science for a changing world

Figure 5. Tricolored Bat Mean Occupancy Probabilities

Attachment B
USFWS Official Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arlington Ecological Services Field Office
17629 El Camino Real, Suite 211
Houston, TX 77058-3051
Phone: (817) 277-1100 Fax: (817) 277-1129
Email Address: arles@fws.gov

In Reply Refer To: 08/06/2024 13:19:19 UTC
Project Code: 2024-0126286
Project Name: Flytrex/CAU DFW

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
- Bald & Golden Eagles
- 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
17629 El Camino Real, Suite 211
Houston, TX 77058-3051
(817) 277-1100

PROJECT SUMMARY

Project Code:	2024-0126286
Project Name:	Flytrex/CAU DFW
Project Type:	Drones - Use/Operation of Unmanned Aerial Systems
Project Description:	Causey Aviation Unmanned is applying to the FAA to add the DFW metro area to its operating area and expand its drone package delivery operations. Causey plans to establish up to 30 new distribution centers, extend its delivery radius, increase its daily operations, and add a second UA platform.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@32.89684715,-97.03801112847549,14z

Counties: Texas

ENDANGERED SPECIES ACT SPECIES

There is a total of 9 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
Rufa Red Knot *Calidris canutus rufa* There is **proposed** 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/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

REPTILES

NAME	STATUS
Alligator Snapping Turtle *Macrochelys temminckii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4658	Proposed Threatened

CLAMS

NAME	STATUS
Texas Fawnsfoot *Truncilla macrodon* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8965	Threatened
Texas Heelsplitter *Potamilus amphichaenus*	Proposed Endangered

NAME	STATUS
There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/299	

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 ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

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

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

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

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

---

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

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

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

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

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

Probability of Presence ()

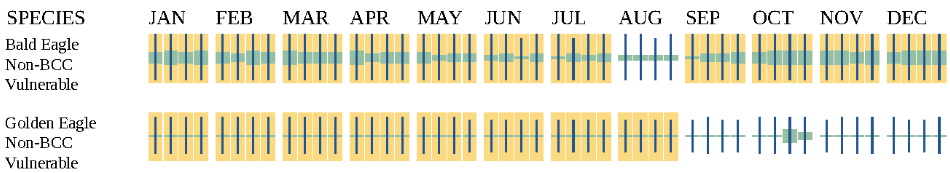
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

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

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

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

probability of presence   breeding season | survey effort   – no data



Additional information can be found using the following links:

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

MIGRATORY BIRDS

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

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

---

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

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

NAME	BREEDING SEASON
American Golden-plover *Pluvialis dominica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10561	Breeds elsewhere
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31
Henslow's Sparrow *Centronyx henslowii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3941	Breeds elsewhere
Kentucky Warbler *Geothlypis formosa* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9443	Breeds Apr 20 to Aug 20
Least Tern *Sternula antillarum antillarum* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/11919	Breeds Apr 25 to Sep 5
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Little Blue Heron *Egretta caerulea* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9477	Breeds Mar 10 to Oct 15
Long-billed Curlew *Numenius americanus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/5511	Breeds elsewhere

NAME	BREEDING SEASON
Pectoral Sandpiper *Calidris melanotos* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9561	Breeds elsewhere
Prairie Loggerhead Shrike *Lanius ludovicianus excubitorides* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/8833	Breeds Feb 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9439	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10
Sprague's Pipit *Anthus spragueii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8964	Breeds elsewhere

PROBABILITY OF PRESENCE SUMMARY

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

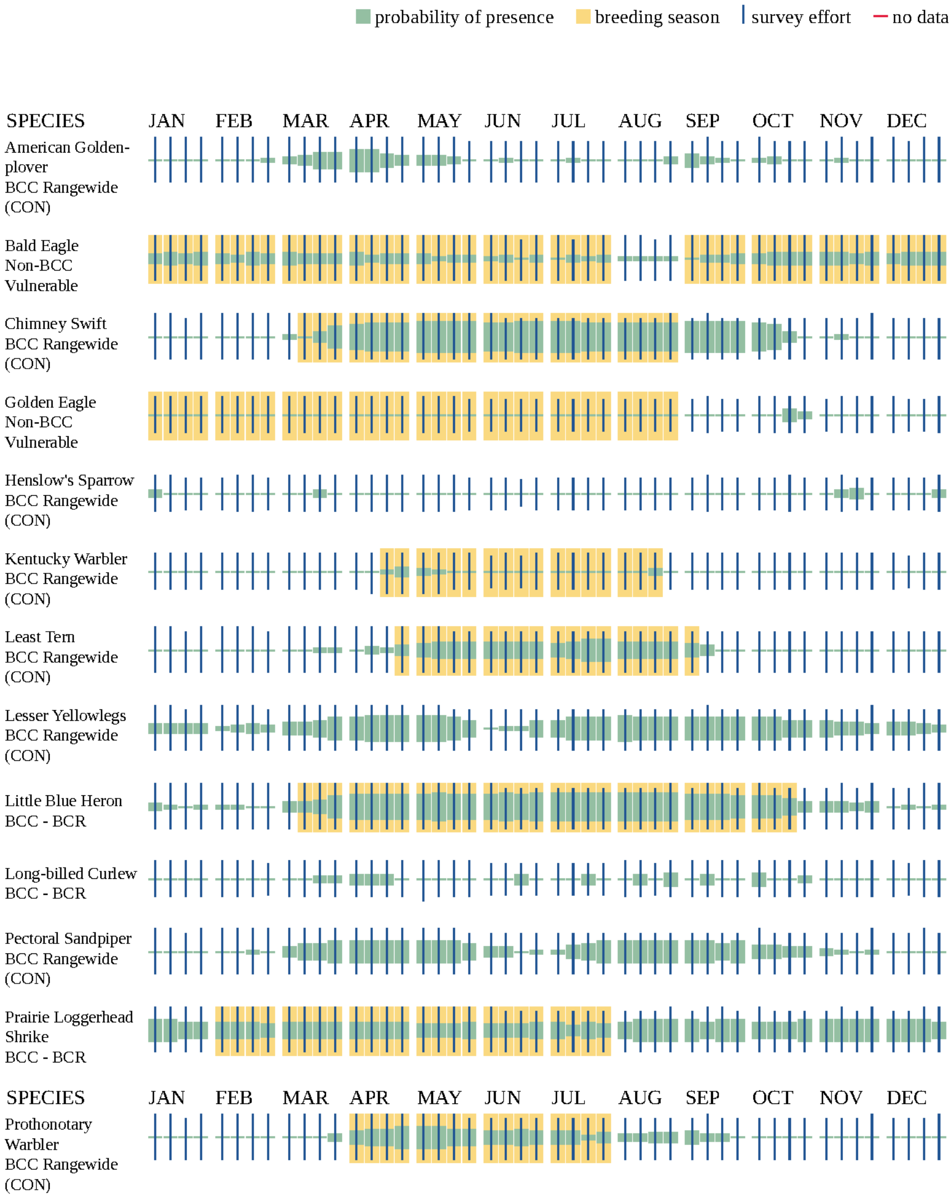
Probability of Presence (■)

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

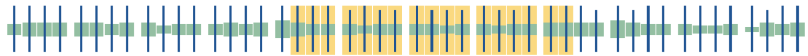
Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

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

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


probability of presence
breeding season
survey effort
no data
SPECIES
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
American Golden-plover BCC Rangewide (CON)
Bald Eagle Non-BCC Vulnerable
Chimney Swift BCC Rangewide (CON)
Golden Eagle Non-BCC Vulnerable
Henslow's Sparrow BCC Rangewide (CON)
Kentucky Warbler BCC Rangewide (CON)
Least Tern BCC Rangewide (CON)
Lesser Yellowlegs BCC Rangewide (CON)
Little Blue Heron BCC - BCR
Long-billed Curlew BCC - BCR
Pectoral Sandpiper BCC Rangewide (CON)
Prairie Loggerhead Shrike BCC - BCR
SPECIES
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Prothonotary Warbler BCC Rangewide (CON)

Red-headed Woodpecker
BCC Rangewide (CON)



Sprague's Pipit
BCC Rangewide (CON)

Additional information can be found using the following links:

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

WETLANDS

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

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

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

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

LAKE

- L1AB4Hh
- L2AB4Hh
- L2USAh
- L2UBFh
- L1UBHh
- L2UBHh
- L2AB/UBFh
- L1UBH

- L2UBFx
- L2AB3Fh
- L2AB4Fh
- L2USCh
- L2UBKx
- L2UBHx
- L1UBHx
- L2USA
- L2USC
- L2USCx

FRESHWATER POND

- PAB/UBFh
- PAB4/EM1Fh
- PAB3/EM1F
- PAB3Fx
- PAB3/EM1Fx
- PAB3/EM1Fh
- PAB4/EM1F
- PAB/UBFx
- PAB3/SS1Fh
- PAB3Fh
- PAB3/UBHh
- PAB3Hh
- PAB/UBKx
- PAB3F

IPAC USER CONTACT INFORMATION

Agency: Harris Miller Miller and Hanson Inc.
Name: Missi Shumer
Address: 113 Williams Court
City: Mobile
State: AL
Zip: 36606
Email mshumer@hmmh.com
Phone: 2516057252

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Aviation Administration
Name: Shelia Neumann

Attachment C
Noise Assessment Reports

(See Appendix C and D of the EA for the noise reports)

APPENDIX C
Noise

Federal Aviation
Administration

Memorandum

Date: August 23, 2024

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

From: Don Scata, Deputy Director, Office of Environment and Energy (AEE)

Subject: Environmental Assessment (EA) Noise Methodology Approval Request for Causey Aviation Unmanned, Inc. Commercial Package Delivery Operations with the Flytrex FTX-M600P and Sky II UAs from Granbury, Rowlett, and Dallas-Fort Worth, TX

The Office of Environment and Energy, Noise Division (AEE-100), has reviewed the proposed non-standard noise modeling methodology to be used for Causey Aviation Unmanned, Inc. (Causey) operations using the Flytrex FTX-M600P and Sky II Unmanned Aircraft (UA) at two sites in Granbury and Rowlett, Texas and up to 30 additional sites located throughout the Dallas-Fort Worth (DFW) metropolitan area. This request is in support of an Environmental Assessment (EA) for Causey to provide expanded package delivery services as a 14 CFR Part 135 operator in DFW and an associated operating area.

The Proposed Action is for Causey to use the FTX-M600P and Sky II UA's to expand its package delivery capabilities from two existing distribution centers located in Rowlett and Granbury, TX by adding the Sky II UA to its fleet, increasing the number of daily operations, expanding the Rowlett and Granbury approved areas of operations, and adding up to 30 additional distribution centers with associated operating areas that encompass most of the DFW metropolitan area. Typical operations of the UAs will consist of departure from the distribution center via a vertical climb to an approximate altitude 230 feet above ground level (AGL). The UA will then navigate en route along a defined path from the distribution center to the intended delivery point at a typical airspeed of 29 knots and 230 feet AGL. Reaching the delivery point, the UA will descend vertically to approximately 82 feet AGL and lower a package via a cable to the ground. Following delivery, the UA will retract the cable, climb back to en route altitude, fly along a defined path back to the distribution center, and then descend vertically to land on the ground upon reaching the distribution center. The flight profile of both UAs is identical except for how packages are loaded into the UA. The Sky II's flight profile for loading packages requires a moment of hovering while the package is attached to a hook suspended from the airborne UA by a tether. The FTX-M600P does not include the additional hovering as the package is loaded while the vehicle is on the ground.

Under the scope of the Proposed Action Causey is proposing add the Sky II UA to its fleet and to increase from 77 and 71 daily average annual daily (AAD) deliveries from the existing Granbury and Rowlett distribution centers, respectively, for up to an average of 500 AAD deliveries from each distribution center. Causey is also proposing to expand the radius of the existing Rowlett and Granbury operating areas from two nautical miles to 3.5 nautical miles and add up to 30 additional distribution centers located throughout the DFW metropolitan area that would each conduct up to an average of 500 AAD deliveries. Each of the new proposed distribution centers would have associated operating areas with a radius of 3.5 nautical miles centered around each. Causey anticipates a total of up to 5.84 million annual deliveries will be completed by FTX-M600P and Sky II UAs between the Rowlett, Granbury, and additional 30 proposed DFW distribution centers. Based on those overall levels Causey expects deliveries to be distributed among delivery locations with a minimum number of 0.1 deliveries per day or less at any one location and maximum of 5.0 per day at any one location on an AAD basis. Causey anticipates delivery flight operations would occur seven (7) days per week and all operations would only during acoustic daytime hours, from 7:00 a.m. to 10:00 p.m., including holidays.

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 methods developed in the following two HMMH Reports:

1. HMMH Report No. 309990.003-5 for the "Noise Assessment for Causey Proposed Package Delivery Operations with Flytrex FTX-M600P Unmanned Aircraft" dated February 28, 2022 for operations performed by the FTX-M600P UA

2. HMMH Report No. 23-0317A for the "Noise Assessment for Causey Aviation Proposed Package Delivery Operations with the Flytrex Sky II Unmanned Aircraft" dated August 12, 2024 for operations performed by the Flytrex Sky II UA

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

Noise Analysis – Sky II

Noise Assessment for Causey Aviation Proposed Package Delivery Operations with the Flytrex SKY II Unmanned Aircraft

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

Final

HMMH Report No. 23-0317A
August 12, 2024

Prepared for:

Flytrex Aviation Ltd.
39 Montefiore St.
Tel Aviv, ISRAEL

Causey Aviation
6120 Smithwood Rd.
Liberty, NC 27298

hmmh

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Noise Assessment for Causey Aviation Proposed Package Delivery Operations with the Flytrex SKY II Unmanned Aircraft

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

Final

HMMH Report No. 23-0317A
August 12, 2024

Prepared for:

Flytrex Aviation Ltd.
39 Montefiore St.
Tel Aviv, ISRAEL

Causey Aviation
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Contents

Figures

Tables

1 Introduction and Background

This document presents the methodology and estimation of noise exposure related to proposed Unmanned Aircraft (UA) package delivery operations conducted by Causey Aviation Unmanned, Inc. ("Causey") as a commercial operator under the provisions of 14 CFR Part 135. Causey is proposing to perform package delivery operations at multiple potential locations in the continental United States utilizing an operational model that involves a central distribution center (DC) and supporting route network to transport small commercial goods to public delivery points and residential backyards.

The DC and delivery points are determined based on partnerships Causey has established with organizations providing products at the DC to various end customers, typically at residential locations. Flight paths to and from the DC and delivery points use a network of route plans, with a structure of common flight path segments near the DC and various branches to deliver to individual locations. Causey selects delivery points after potential customers are identified and their specific locations have been surveyed and satisfy various criteria.

Causey is proposing operations with unmanned aircraft model Flytrex Sky II (referred to throughout as the "Sky II UA" or "UA"). The Sky II UA (Figure 1) has a maximum takeoff weight of 34.2 pounds, and the maximum allowable package weight is 8.8 pounds. The UA features a multi-rotor design with eight propellers mounted on a hash-shaped carbon fiber airframe. The system's computers, power system and winch mechanism are mounted on the center of the airframe. The Sky II model carries the packages without a delivery box. The multi-copter drone uses electric power from rechargeable lithium-ion batteries and includes a parachute safety system that can be deployed in cases of emergency.

Figure 1 depicts the UA considered in this report.

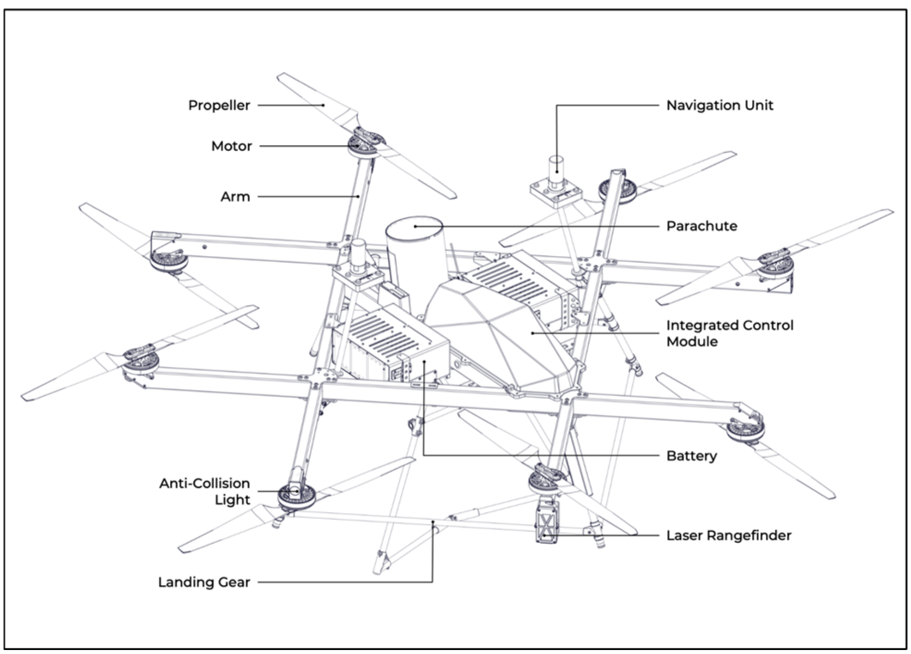

Figure 1. Flytrex FTX Sky II UA Diagram

Source: Causey Aviation Unmanned, Inc, 2024

The methodology proposed in this document provides quantitative guidance to FAA Environmental Protection Specialists to inform environmental decision making on UA noise exposure from proposed Causey package delivery operations with the Sky II UA. 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 Causey Aviation and Flytrex to date and, therefore, is limited to Causey and Flytrex operations with the Sky II 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 collected at Causey Aviation airfield, in the vicinity of Liberty, North Carolina by AAAI in May 2024. 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. The Community Noise Equivalent Level (CNEL) may be used in lieu of DNL for FAA actions in California. Discussion of modification of this process for use of the CNEL is discussed in Section 3.1.

Section 2 of this document describes the relevant noise and operations data. 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 DC, delivery, and enroute flight activity based on varying levels of typical operations. Section 5 describes the methodology to determine cumulative noise resulting from UA package delivery noise in combination with other aviation noise sources.

[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

2 Unmanned Aircraft Delivery Operations and Noise Measurement Data Set Descriptions

Two documents and their associated data form the basis of the noise assessment for the proposed Causey Aviation delivery operations with the Sky II UA. The two documents are:

- CAU PART 135 Concept of Operations (CONOPs) V1.0, Causey Aviation Unmanned, Inc, March 14, 2024
- AAAI Report 1655 Environmental Assessment Noise Measurements: Flytrex SKY II Unmanned Aerial System, Revision A, July 10, 2024

The noise measurements of the Sky II UA were collected by Acoustical Analysis Associates, Incorporated (AAAI) in May 2024 at Causey Aviation airfield, near Liberty, North Carolina.

2.1 Operations, Flight Paths, and Flight Profile Data

Operations and flight profile data for the UA provided by Flytrex 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 over a range of 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.

This report provides variations to the methodology that can be used with either DNL or CNEL, provided that the proper equivalent operations are calculated.

- 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.

- The CNEL noise levels presented in this report are all shown consistent with effective daytime (7 AM to 7 PM) operations levels. For consideration of evening time (7 PM to 10 PM) a three times operational weighting (equivalent to 4.77-dB increase) should be applied and for consideration of nighttime (10 PM to 7 AM) noise levels, a ten times operational weighting (equivalent to 10-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 and CNEL metrics.

2.1.2 Flight Paths and Profiles

CAU operates on-demand aerial deliveries to customers' backyards and public delivery points using the Flytrex Drone Delivery System. Delivery orders are fulfilled by trained crewmembers located at the DC and in other locations, as needed, using the Flytrex cloud based GCS software Remote Pilot in Command Application (RPIC App). The Flytrex RPIC App is designed to support simultaneous operation of multiple UA from multiple launchpads. The launchpad is the area where UA take off and land. A DC is set up following a thorough assessment of potential air and ground risks within the designated operational volume. Typically, a DC will be located in or next to a commercial or healthcare center, in proximity to restaurants, stores or clinics, where goods will be collected for delivery.

In order to enable effective operation of multiple airborne UA, the DC layout will accommodate at the very least, as many launchpads as there are airborne UA. For example, if six (6) UAs are intended to fly simultaneously, the DC will consist of at least six (6) launchpads. A UA takes off and lands on the same launchpad throughout a day of operations. Only one single UA at a time may be present on the launchpad during takeoff and landing. Additional launchpads can be added to facilitate charging while missions are assigned to already charged vehicles. The center of each launchpad must be clearly and physically marked to ensure that all missions take off from the exact same coordinates, including over subsequent days.

The design of a new DC must comply with the following requirements:

- The launchpads must be located within line of sight of the RPIC.
- Minimum distance between the workstation and the center of a launchpad: 10 ft (3 m).
- Minimum radius of the launchpad: 4 ft (1.2 m).
- Minimum distance between two launchpad centers: 16 ft (4.9 m).
- Minimum dimensions of the workstation: 4 x 5 ft (1.2 x 1.5 m).
- Minimum dimensions of the sorting area, and the accepted packages area: 2 x 3 ft (0.6 x 0.9 m) each.

Figure 2 below depicts a viable DC setup employing six (6) launchpads. The number of launchpads employed and the relative position and distance between the DC elements may vary, as long as the conditions specified above are met.

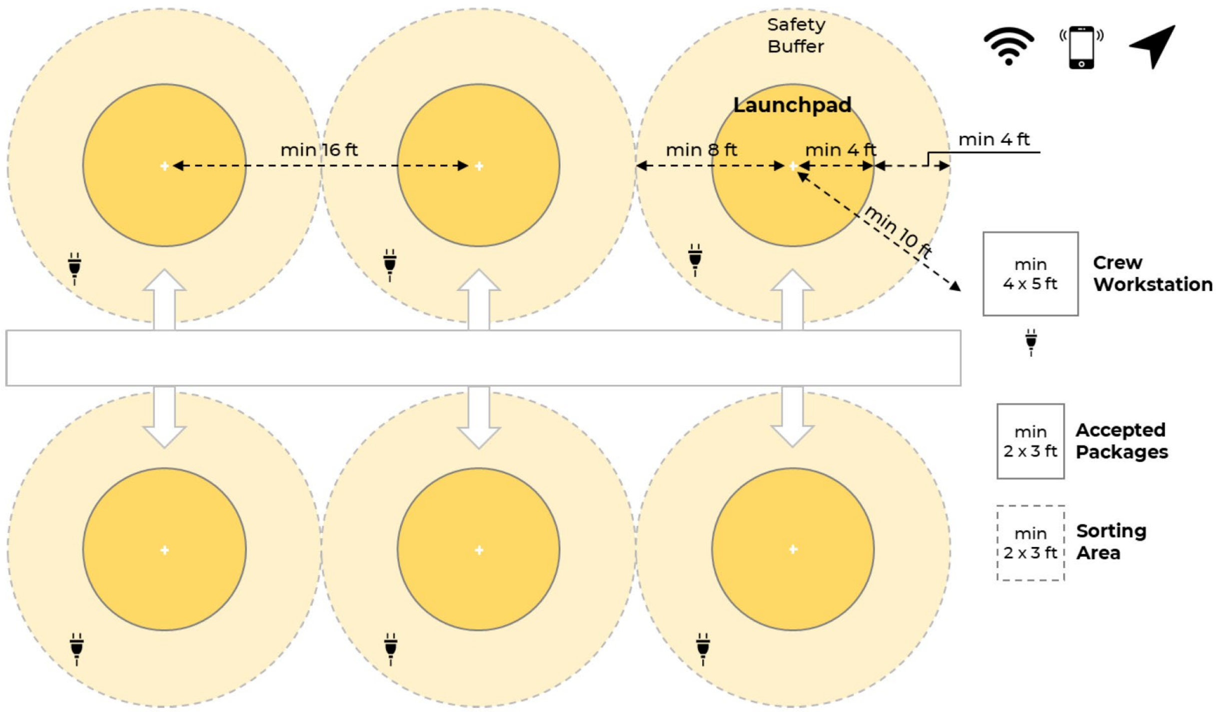

Figure 2. Distribution Center Area Plan Employing Multiple Launchpads

Source: Causey Aviation Unmanned, Inc, 2024

When an order is placed by the customer via the Flytrex App, a delivery mission is created on the RPIC App for a designated delivery point and a UA is assigned, along with a flight route, for the mission. The RPIC then initiates a series of automated checks and manual procedures to load the UA with the package and prepare it for takeoff. Subsequently, the UA embarks on a fully automated flight to deliver the package to the designated delivery point. The Sky II UA does not land at the delivery point but rather releases the package while hovering in the air, using a tethered mechanism. Delivery points are surveyed in advance to eliminate the presence of any obstructions such as trees, brush, buildings, etc.

In every operational area, an operational volume is defined and geofencing boundaries are employed to contain the aircraft within narrow flight corridors, following pre-approved flight routes. In the event of route deviation, a flight termination system is triggered ensuring the containment of the aircraft within the operational volume. All routes are designed to minimize flight over people and incorporate safe landing points capable of mitigating different emergencies.

A typical delivery operation flight profile of the UA can be broken into five discrete flight phases. Table 1 describes the typical flight profile that Causey is expected to use for delivery operations and provides detail of the five flight phases of takeoff and climb; en route outbound; delivery; en route inbound; and descent and landing. The sub sections that follow provide a narrative description of each of the flight phases.

Table 1. Flytrex SKY II Typical Flight Profile

Source: Flytrex

Flight Phase (General)	Flight Segment (Detail)	Weight	Altitude at Segment Start (ft)	Altitude at Segment End (ft)	Ground Speed (kts)	Duration
Takeoff and Climb	Takeoff	Maximum	0	33	0	5 seconds
	Internal checks and loading	Maximum	33	33	0	50+ seconds
	Climb to cruise altitude	Maximum	33	230	0	15 seconds
En route outbound	Cruise to delivery point	Maximum	230	230	29.2	1-5 minutes
Delivery	Descent for delivery	Maximum	230	82	0	22 seconds
	Open doors and lower package to ground	Maximum	82	82	0	35 seconds
	Maneuver to unhook package	Maximum	82	75	0	4 seconds
	Maneuver to unhook package	Empty	75	82	0	4 seconds
	Climb back to cruise altitude	Empty	82	230	0	13 seconds
En route inbound	Cruise back to distribution center	Empty	230	230	29.2	1-5 minutes
Descent and Landing	Descent	Empty	230	33	0	20 seconds
	Landing	Empty	33	0	0	20 seconds

2.1.2.1 Takeoff and Climb

The Takeoff and Climb phase is defined as the portion of flight in which a UA takes off from its launch pad at a DC and climbs vertically to 33 feet AGL. The UA is then loaded with a package, bringing the total maximum weight to 34.2 pounds., and conducts various systems checks in a hover at 33 feet AGL over the course of approximately fifty seconds. If the UA passes its systems checks, the UA then climbs vertically from 33 feet AGL to 230 feet AGL over 15 seconds.

2.1.2.2 En Route Outbound

The En route Outbound phase is defined as the part of flight in which the fully loaded UA transits from the DC to delivery points on a pre-defined network of flight paths. During this flight phase, the UA will typically operate at an altitude of 230 feet AGL and a typical airspeed of 29 knots. However, the UA may operate within a corridor with altitudes as low as 171 feet AGL or as high as 289 feet AGL as needed due to obstructions and operational conditions.

prevent major deviation from the pre-planned flight route. The virtual flight corridor has a 59 ft (18 m) radius around the pre-planned route.

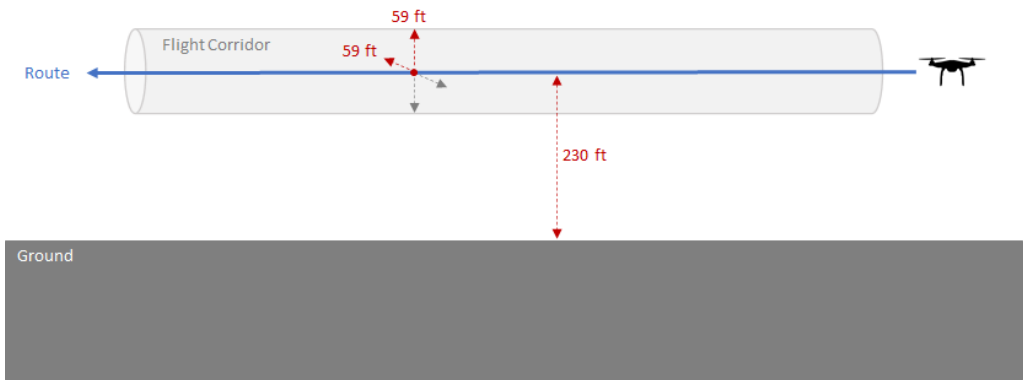

Figure 3. Geofenced flight corridor

Source: Causey Aviation Unmanned, Inc, 2024

2.1.2.3 Delivery

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 delivery point is a minimum 10 by 10-foot square area open to the sky, clear of obstacles, that is coordinated with the property owner and validated by Causey.[2]

During the delivery phase, the aircraft descends vertically from the en route altitude to 82 feet AGL. The UA continues to hover while it lowers the package to the ground by a tether (wire). Once the package is on the ground, the UA releases the package using the following maneuver, which takes approximately eight seconds. The UA descends vertically to 75 feet AGL, unhooks the tether from the package, returns to 82 feet AGL, and retracts the tether back into the UA. The UA then climbs vertically back to en route altitude at 230 feet AGL. The entire process starting with descent from en route altitude, package release, and returning to en route altitude, takes less than a minute and a half.

2.1.2.4 En Route Inbound

Upon completion of a delivery, the UA will fly the en route inbound phase (or "return") via the reverse of the respective en route outbound profile (Section 2.1.2.2) from the delivery point back to the DC. The UA is assumed to be carrying no packages, and at empty weight, after delivery.

2.1.2.5 Descent and Landing

Upon reaching the DC, the UA will commence a vertical descent from 230 feet to 33 feet AGL over 20 seconds. The UA then descends vertically the remaining 33 feet to ground level over 20 seconds. Once on the ground, the UA stops its rotors and is retrieved by the ground crew.

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[2] Causey, CONOPS July 19, 2021, pg. 21

2.2 Acoustical Data

The noise measurements of the Sky II UA were collected by AAAI in May 2024 at Causey Aviation airfield, near Liberty, North Carolina. Noise measurements were collected in accordance with the criteria defined in the FAA's draft UA package delivery noise measurement protocol document[3] and are documented in **Attachment A**[4] to this report. The protocol includes measurement of UA noise at multiple distance positions along axes under track, lateral to, and behind the point from which the UA takes off, lands, and delivers a payload. For en route flight, the protocol includes measurement at multiple distance positions beginning directly under track and extending laterally outward from flight path direction. **Figure 6** and **Figure 7** depict the general measurement setups for simulated DC activity, package deliveries, and en route over flights. For the SKY II UA test setup, each measurement axis included six microphones positioned from 25 feet out to 800 feet (25 ft, 50 ft, 100 ft, 200 ft, 400 ft, 800 ft) from the DC and delivery points and from 0 feet out to 800 feet (0 ft, 50 ft, 100 ft, 200 ft, 400 ft, 800 ft) for en route overflights. A distance of 25 feet was used as the closest measurement distance for the DC and delivery points, as it corresponds to Causey's minimum allowable safety distance for participants to be from the UA while it is in operation.

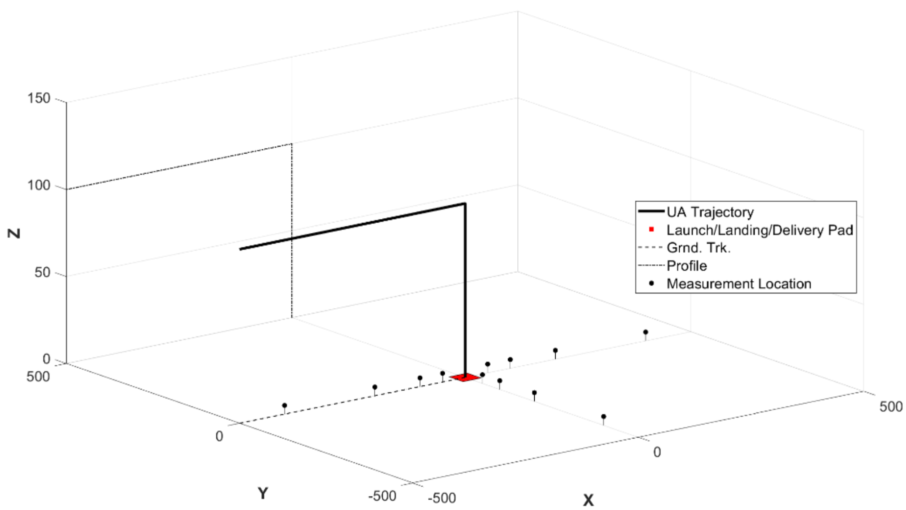

Figure 4. General Noise Measurement Setup for Takeoff, Landing, and Delivery

Source: FAA, October 2023

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[3] Measuring Drone Noise for Environmental Review Process, FAA, October 2023

[4] Attachment A: AAAI Report 1655 Environmental Assessment Noise Measurements: Flytrex SKY II Unmanned Aerial System, Revision A, July 10, 2024

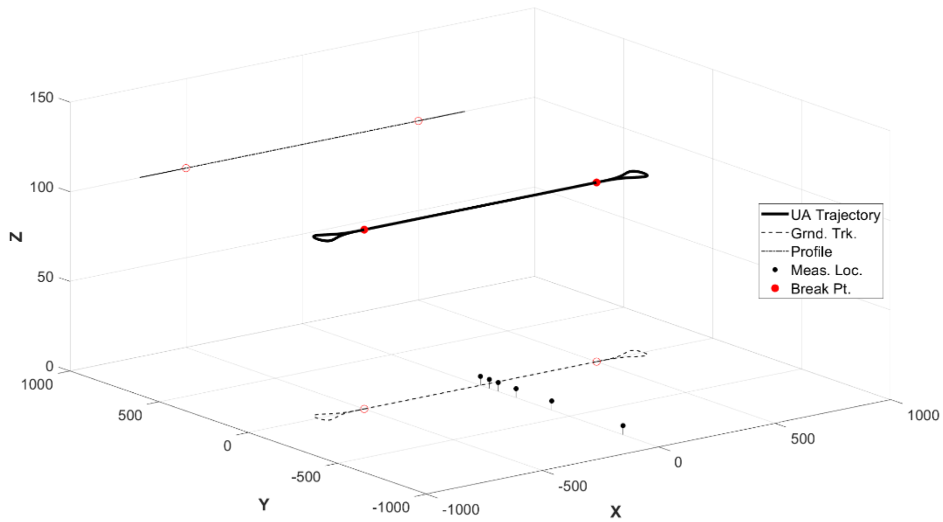

Figure 5. General Noise Measurement Setup En Route Overflight

Source: FAA, October 2023

HMMH processed the SKY II UA measurement data to calculate estimated noise levels as a function of distance from DCs, delivery locations, and en route overflights. Each measurement includes the entire associated flight activity profile of the UA, including the noise from en route flight in both directions from a location, all vertical ascent/descent, and time hovering during package delivery. The average A-weighted Sound Exposure Level (SEL) measured at each distance is presented in **Figure 8**, **Figure 9**, and **Table 4**.

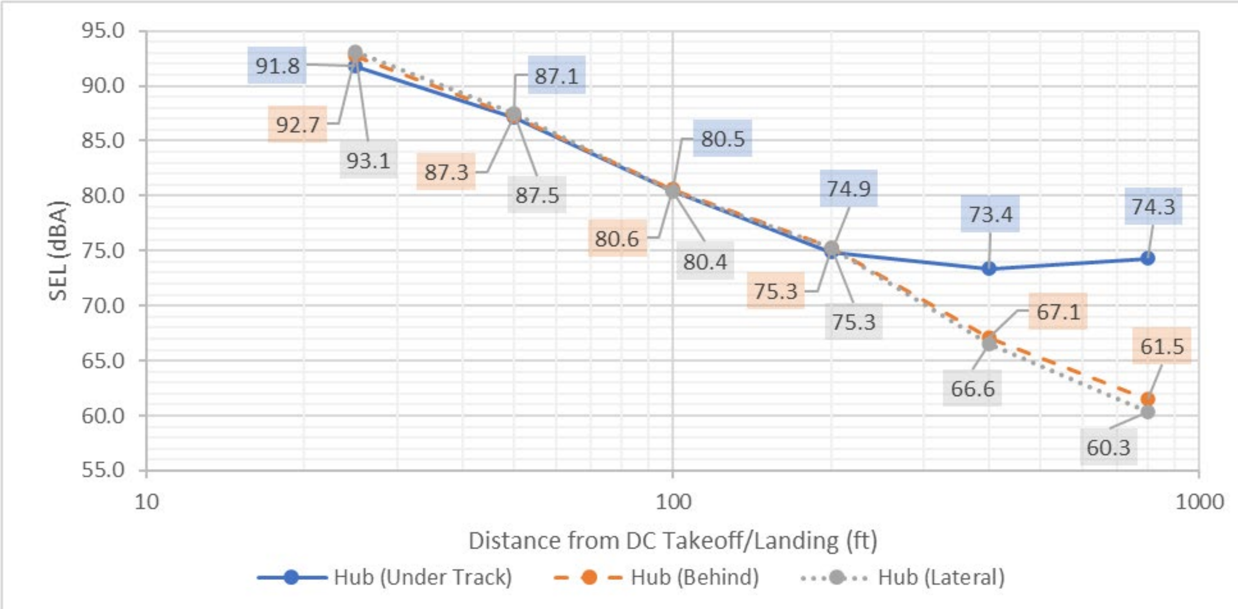

Figure 6. Average Measured A-Weighted SELs from DC Takeoff and Landing

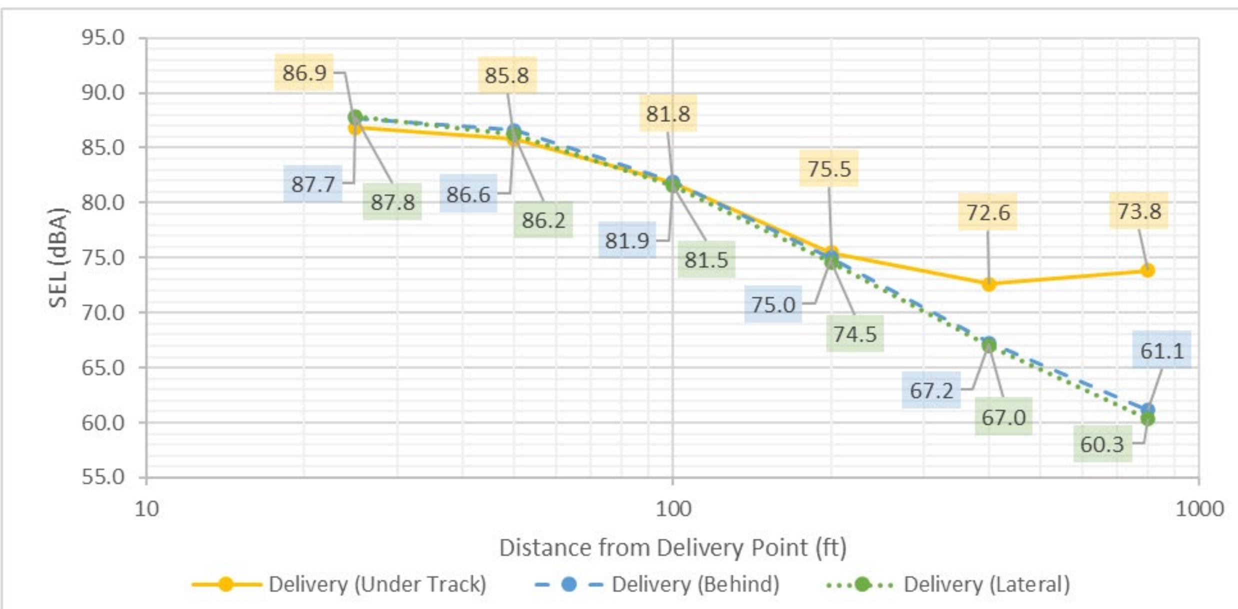

Figure 7. Average Measured A-Weighted SELs from Delivery Point

Because the average measured SELs were generally consistent for all three axes from 25 feet to 200 feet and for the lateral and behind axes from 400 feet to 800 feet, the SEL measurements at those distance positions on each axis were averaged together to develop the relationship of SEL to distance used in this analysis for the calculation of DNL. Additionally, for both the DC and delivery point measurement, noise along the under track axis at the 400 foot and 800 foot positions was found to be dominated by en route noise. As such, the measured en route noise level of 74.3 dB SEL was used as the SEL value starting from

277 feet and beyond based on the slope intercept of the average measured SEL for those positions. **Figure 10** and **Figure 11** present the final consolidated axes SEL averages.

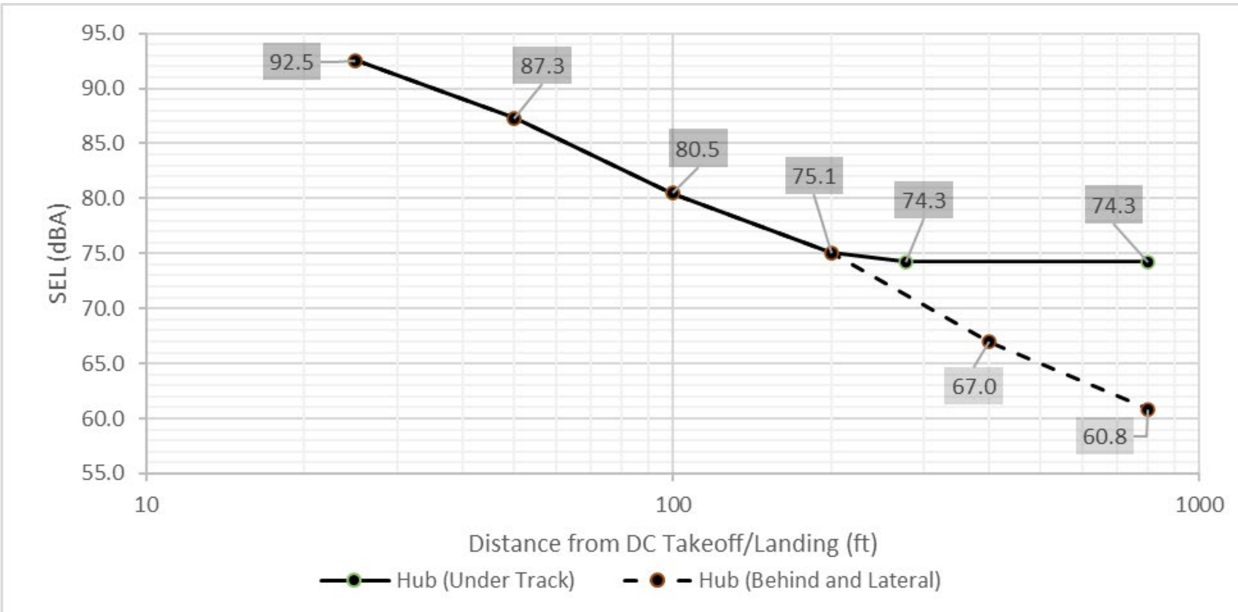

Figure 8. Consolidated Average Measured A-Weighted SELs from DC Takeoff and Landing

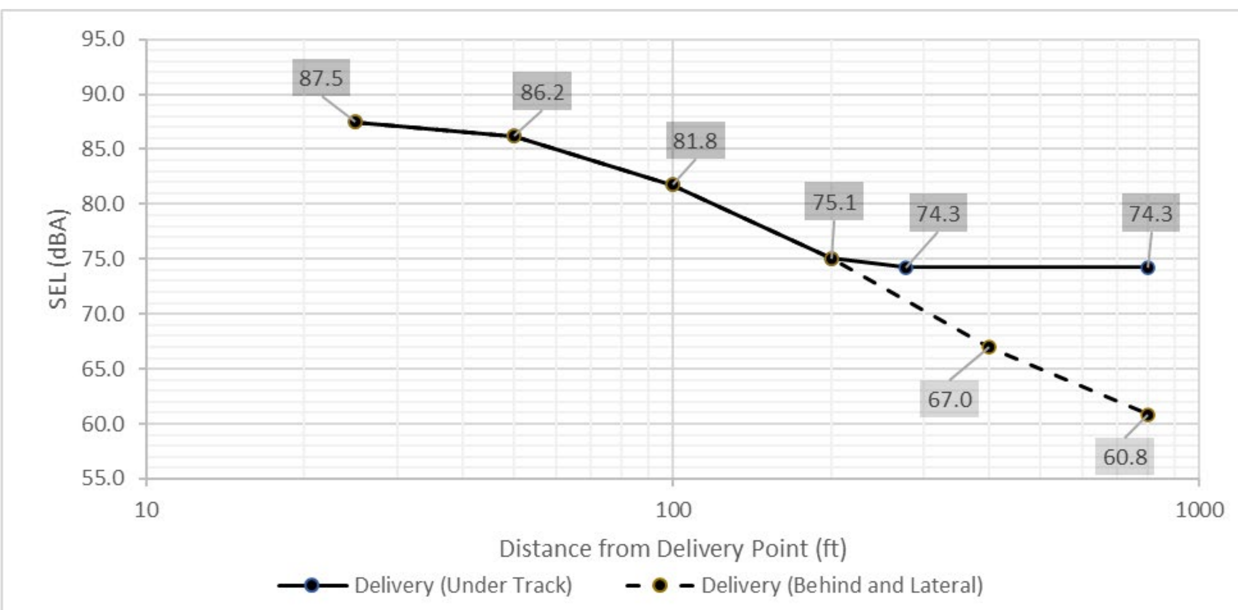

Figure 9. Consolidated Average Measured A-Weighted SELs from Delivery Point

The formula for interpolating SEL values at distances between those which were directly measured is based on **Equation (1)** presented below.

$$SEL = m \times \log_{10}(d) + b, dB \tag{1}$$

Where:

- *d is the distance along the ground in feet between the UA takeoff/landing or delivery location and the receiver*
- *m and b are the parameters provided in the tables below*

Table 2 presents the parameters to use within **Equation (1)** to estimate the SEL associated with DCs as a function of distance from the takeoff and landing position, located within the DC boundary, to the receiver.

Table 2. Parameters for Estimating Sound Exposure Levels at Distances from DCs

Range for d (ft from launch pad)	m (Under Track)	b (Under Track)	m (Behind and Lateral)	b (Behind and Lateral)
25 – 50	-17.387	116.84	-17.387	116.84
50 – 100	-22.632	125.76	-22.632	125.76
100 – 200	-17.997	116.49	-17.997	116.49
200 – 277	-5.116	86.844	-26.940	137.06
277 +	0	74.3	-20.419	120.09

Notes:
a) Distance is along ground from DC takeoff and landing position to receiver.
b) Based on the SEL and distance values from Figure 10

Table 3 presents the parameters to use within **Equation (1)** to estimate SEL areas associated with delivery, as described in Section 2.1.2.5, as a function of distance from the delivery point to the receiver.

Table 3. Parameters for Estimating Sound Exposure Levels at Distances from Deliveries

Range for d (ft from delivery point)	m (Under Track)	b (Under Track)	m (Behind and Lateral)	b (Behind and Lateral)
25 – 50	-4.177	93.301	-4.177	93.301
50 – 100	-14.794	111.34	-14.794	111.34
100 – 200	-22.185	126.12	-22.185	126.12
200 – 277	-5.116	86.844	-26.940	137.06
277 +	0	74.3	-20.419	120.09

Notes:
a) Distance is along ground from delivery point to receiver.
b) Based on the SEL and distance values from Figure 11

Table 4 presents the en route SELs for max takeoff weight, empty weight, and the two combined. The combined max and empty weight SEL is representative of the total noise exposure for receiver overflown by both the en route outbound and en route inbound portions of a delivery. This analysis conservatively assumes that both en route legs of a delivery overfly the same locations and uses the highest combined measured SEL of 74.3 dB at 0 feet as the level for calculating the associated DNL.

Table 4. Average Measured A-Weighted SEL for En Route Overflight versus Lateral Distance from Ground Track

Aircraft Config	Measured air speed (Knots)	Measured Altitude (ft AGL)	0 Feet SEL (dB)	50 Feet SEL (dB)	100 Feet SEL (dB)	200 Feet SEL (dB)	400 Feet SEL (dB)	800 Feet SEL (dB)
Max Weight	29.2	230	72.9	72.9	72.6	69.2	64.1	59.7
Empty Weight	29.2	230	68.5	68.1	68.0	65.2	60.4	54.7
Combined	29.2	230	74.3	74.1	73.9	70.6	65.6	60.9

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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 Causey delivery operations. These would be operations originating from a single DC 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 Causey. 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 weighing 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 (2)**.[5]

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

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 (and CNEL)
- W_{Eve} is the evening weighting factor, which is 1 operation for DNL (or 3 operations for CNEL)
- W_{Night} is the night-time weighting factor, which is 10 operations for DNL (and CNEL)

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

$$N_{DNL,i} = N_{Day,i} + N_{Eve,i} + 10 \times N_{Night,i} \quad (3)$$

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.

[5] 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. Presentation of Equation (2) also allows the practitioner to modify this process for the CNEL metric for use in California.

For the CNEL metric, which may be used in California, the number of CNEL daytime equivalent operations, $N_{CNEL,i}$ simplifies to:

$$N_{CNEL,i} = N_{Day,i} + 3 \times N_{Eve,i} + 10 \times N_{Night,i} \quad (4)$$

3.2 Application of Acoustical Data

The DNLs can be estimated with a summation of the SELs associated with each delivery that would be conducted. SEL values for the SKY II UA operations covered in this report are detailed in Section 2.2.

The SEL for three specific activities are considered:

- DC – including takeoff, en route outbound (at max weight), en route inbound (at empty weight), and landing
- Delivery – including en route inbound (at max weight), package delivery, and en route outbound (at empty weight)
- En route – including travel of the UA in horizontal flight out and back between the DC and the delivery point at max and empty weight

3.2.1 General Assumptions

This analysis is based on the tables presented in Section 2.2. For DC and delivery, the SEL values for distances intermediate to those directly measured are determined from **Equation (1)** and the associated distance interval values presented in **Table 2** and **Table 3.** The SEL for en route only noise utilizes the value of 74.3 dBA measured at 0 feet from under track, as presented in **Table 4**.

The analysis for all three activities conservatively assumes that the UA traverses the same en route flight path outbound from the DC to the delivery location and inbound back from the delivery location to the DC. SEL values at distances less than 25 feet for takeoff, landing, or delivery should not be extrapolated to lesser distances because the deviation of the method of estimation value increases closer to the source. SEL values for DC and delivery under track distances greater than 277 feet should be determined based on the en route only noise levels.

3.2.2 DC Takeoff and Landing

The process for calculating SELs for flight activity near a DC is described in Section 2.1.2 are presented in Section 2.2, specifically **Equation (1)** combined with the parameters presented **Table 2**.

Application of the SEL should be based on the takeoff and landing position at a DC. If the exact position of takeoff and landing is not known or would vary, then using an outer boundary of the DC, at a point closest to the receiver, would be slightly conservative. En route noise associated with DCs is for the UA in level flight at 230 feet AGL, consistent with the altitude flown during noise measurements.

3.2.3 En Route

The typical flight speed of the UA in still air is 29.2 knots, with a typical cruise altitude of 230 feet AGL. Noise measurements of the UA were captured with the UA flying at the expected typical speed and altitude. As such, no adjustments were required to estimate the SEL for UA operation at speeds or altitudes differing from those measured. This section describes the process used to estimate SEL for the UA flying at different speeds and altitudes when needed and is maintained in this document for consistency with other similar noise assessments for UA package delivery operations.

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, was calculated based on the guidance in *14 CFR Part 36 Appendix J, Section J36.205 Detailed Data Correction Procedures*.[6] 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 of a moving UA, is presented here as **Equation (5)**.

$$\Delta J_1 = 12.5 \times \log_{10}\left(\frac{H_A}{H_T}\right),\ dB \tag{5}$$

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 is presented here as **Equation (6)**.

$$\Delta J_3 = 10 \times \log_{10}\left(\frac{V_R}{V_{RA}}\right),\ dB \tag{6}$$

Where ΔJ_3 is the quantity in decibels that must be algebraically added to the measured SEL noise level to estimate the SEL of the UA at speed V_{RA} when the measured SEL corresponds to the UA traveling at a reference speed V_R. This adjustment represents the influence of the different speed on the duration of the overflight at the stationary receptor. If the UA is to be estimated at a speed V_{RA} that is greater than the reference speed V_R of the measured SEL, then the correction ΔJ_3 will be negative. The value of ΔJ_3 is 0 if V_R is equal to V_{RA}. Conversely, if the estimated speed is less than the reference speed, the estimated SEL will be greater than the measured SEL. This stands to reason because a slower moving UA will result in a greater time exposure of its emitted noise at a stationary receptor on the ground.

To estimate the SEL of the UA flying en route at typical speed and altitude, the measured SEL made during overflight (SEL_M) was adjusted by combined application of **Equation (5)** and **Equation (6)**. When the UA is flying at an altitude of Alt_i feet AGL and ground speed of V_i knots, **Equation (7)** was used to arrive at an $SEL_{adjusted}$ dB estimate for the respective phase of en route flight.

[6] 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

$$SEL_{adjusted} = SEL_M + 12.5 \times \log_{10}\left(\frac{Alt_A}{Alt_i}\right) + 10 \times \log_{10}\left(\frac{V_{RA}}{V_i}\right), \ dB \qquad (7)[7]$$

For the purpose of this noise analysis, it should be assumed that **Equation (7)** is applicable for all en route activities.

3.2.4 Delivery

The available SELs for delivery are presented in Section 2.2, specifically in **Equation (1)**, with the appropriate parameters presented in **Table 3** for the delivery profile described in Section 2.1.2.3. Application of the SEL should be based on the distance of the receiver relative to the position of the delivery point. The minimum distance that should be used for calculation between the delivery point and a person is 25 feet. En route noise associated with delivery locations is for the UA in level flight at 230 feet AGL, consistent with the altitude flown during noise measurements.

3.3 Proposed DNL/CNEL Estimation Methodology

The number of operations overflying a particular receiver's location 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 (8)**.

$$DNL_{iA} = SEL_{iA} + 10 \times \log_{10}\left(N_{DNL,\ iA}\right) - 49.4, \ (dB) \qquad (8)$$

The above equation applies to an SEL value representing noise from a single activity as defined in Section 3.2. For cases where a particular receiver would be exposed to multiple activity noise sources (A through Z), the complete DNL at that point would be calculated with **Equation (9)**.

$$DNL_i = 10 \times \log_{10}\left(10^{\left(\frac{DNL_{iA}}{10}\right)} + 10^{\left(\frac{DNL_{iB}}{10}\right)} + \cdots + 10^{\left(\frac{DNL_{iZ}}{10}\right)}\right), \ (dB) \qquad (9)$$

The calculation for the CNEL metric is nearly identical to **Equations (8) and (9)**, with the exception that the DNL daytime equivalent operations ($N_{DNL,iA}$) used to compute DNL is replaced with the CNEL daytime equivalent operations ($N_{CNEL,iA}$). The equations for CNEL are presented below as **Equations (10) and (11)**.

$$CNEL_{iA} = SEL_{iA} + 10 \times \log_{10}\left(N_{CNEL,\ iA}\right) - 49.4, \ (dB) \qquad (10)$$

The above equation applies to an SEL value representing noise from a single activity as defined in Section 3.2. For cases where a particular receiver would be exposed to multiple noise sources (A through Z), the complete DNL at that point would be calculated with **Equation (10)**.

$$CNEL_i = 10 \times \log_{10}\left(10^{\left(\frac{CNEL_{iA}}{10}\right)} + 10^{\left(\frac{CNEL_{iB}}{10}\right)} + \cdots + 10^{\left(\frac{CNEL_{iZ}}{10}\right)}\right), \ (dB) \qquad (11)$$

[7] The SEL adjustments must be less than 2.0 dB(A) for differences between test and reference flight procedures unless a larger adjustment value is approved by the FAA.

For each of the conditions presented below, results will be presented in tabular format based on the equivalent daytime operations, either DNL daytime equivalent or CNEL daytime equivalent, for the estimated DNL or CNEL. The proper output of either DNL or CNEL is dependent on the calculation of respective daytime equivalent operations.

3.3.1 DNL/CNEL for DCs

SEL data for DCs includes the entire associated flight activity profile of the UA, including the noise from en route flight in both directions from a location and all vertical ascent/descent. SEL is calculated at 1-foot distance intervals from 25 to 800 feet by the method described in Sections 2.2 and 3.2.2, and the resulting DNL/CNEL at each distance interval is calculated by use of **Equation (8)** or **Equation (10).** The distances of DNL 45, 50, 55, 60, 65, 70, and 75 dB are associated to the nearest calculated 1-foot value.

3.3.2 DNL/CNEL for En Route

En route includes the UA flying both directions between the DC and delivery destinations as discussed in Sections 2.2 and 3.2.1. The receiver is considered to be directly under the flight path, and the DNL/CNEL is calculated by **Equation (8) or (10)**, based on the altitude and speed adjusted SEL calculated with **Equation (7)**.

3.3.3 DNL/CNEL for Delivery

SEL data for deliveries includes the entire associated flight activity profile of the UA, including the noise from en route flight in both directions from a location, all vertical ascent/descent, and time hovering during package delivery. SEL is calculated at the distance intervals of 25, 50, 75, 100, and 125 feet from the package drop location by the method described in Sections 2.2 and 3.2.4, and the resulting DNL at each distance interval is calculated by use of **Equation (8)** or **Equation (10).** The distance range of 25 to 125 feet is representative of the closest a participant may be during a delivery out to the distances from which nearby properties may experience noise from a delivery.

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4 Noise Exposure Estimate Results

This section presents the estimated noise exposure for Causey'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 DC.

The DNL Equivalent deliveries, $N_{DNL,i}$ as described in Section 3.1, is presented below as **Equation (12)**.

$$Deliveries_{DNL,\ i} = Deliveries_{Day} + 10 \times Deliveries_{Night} \tag{12}$$

$Deliveries_{Day}$ 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 $Deliveries_{Night}$.

The CNEL Equivalent deliveries, $N_{CNEL,i}$ as described in 3.1, is presented below as **Equation (13)**.

$$Deliveries_{CNEL,i} = Deliveries_{Day} + 3 \times Deliveries_{Eve} + 10 \times Deliveries_{Night} \tag{13}$$

$Deliveries_{Day}$ are between 7 AM and 7 PM, $Deliveries_{Eve}$ are between 7 PM and 10 PM, and $Deliveries_{Night}$ are between 10 PM and 7 AM.[8] If a portion of a delivery (either takeoff or landing) occurs in two time periods, then it should be counted within with the time night or evening, rather than the time evening or day, respectively.

4.1 Noise Exposure for Operations at a DC

For operations at a DC, the UA-related noises include the entire associated flight activity profile of the UA, including the noise from en route flight in both directions from a location and all vertical ascent/descent. All operations are assumed to be on the same en route flight path with inbound and outbound flights traversing it in opposite directions.

Table 5 and **Table 6** present data for a given number of daily average DNL or CNEL Equivalent deliveries and the associated estimated extents of DNL/CNEL 45 dB through 75 dB contours along axes under track, behind, and lateral to a DC takeoff and landing position.

[8] Discussion of modification of this process for use in California with the CNEL metric is discussed in Section 3.1.

Table 5. Estimated Extent of Noise Exposure Under Track from DC per Number of Deliveries

Number of DNL/CNEL Equivalent Daytime Deliveries Served by DC		Estimated Extents, feet, for						
Average Daily	Annual	DNL/CNEL 45 dB	DNL/CNEL 50 dB	DNL /CNEL 55 dB	DNL/CNEL 60 dB	DNL/CNEL 65 dB	DNL/CNEL 70 dB	DNL/CNEL 75 dB
<= 1	<= 365	<25	<25	<25	<25	<25	<25	<25
<= 5	<= 1,825	50	26	<25	<25	<25	<25	<25
<= 10	<= 3,650	68	39	<25	<25	<25	<25	<25
<= 15	<= 5,475	81	49	<25	<25	<25	<25	<25
<= 20	<= 7,300	92	56	30	<25	<25	<25	<25
<= 40	<= 14,600	132	75	44	<25	<25	<25	<25
<= 60	<= 21,900	165	90	54	29	<25	<25	<25
<= 80	<= 29,200	194	103	62	34	<25	<25	<25
<= 100	<= 36,500	275	116	68	39	<25	<25	<25
<= 120	<= 43,800	>277	128	74	43	<25	<25	<25
<= 140	<= 51,100	>277	140	79	47	<25	<25	<25
<= 160	<= 58,400	>277	151	84	50	26	<25	<25
<= 180	<= 65,700	>277	161	88	53	28	<25	<25
<= 200	<= 73,000	>277	170	92	56	30	<25	<25
<= 220	<= 80,300	>277	180	96	58	31	<25	<25
<= 240	<= 87,600	>277	188	100	60	33	<25	<25
<= 260	<= 94,900	>277	197	104	62	34	<25	<25
<= 280	<= 102,200	>277	217	109	64	36	<25	<25
<= 300	<= 109,500	>277	248	113	66	37	<25	<25
<= 320	<= 116,800	>277	277	117	68	39	<25	<25
<= 340	<= 124,100	>277	>277	121	70	40	<25	<25
<= 360	<= 131,400	>277	>277	125	72	41	<25	<25
<= 380	<= 138,700	>277	>277	128	74	43	<25	<25
<= 400	<= 146,000	>277	>277	132	75	44	<25	<25
<= 420	<= 153,300	>277	>277	136	77	45	<25	<25
<= 440	<= 160,600	>277	>277	139	79	46	<25	<25
<= 460	<= 167,900	>277	>277	143	80	48	<25	<25
<= 480	<= 175,200	>277	>277	146	82	49	<25	<25
<= 500	<= 182,500	>277	>277	150	83	50	26	<25

Notes:
a) One delivery includes the outbound takeoff and inbound landing and is representative of two operations.
b) If a value for 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 100 feet for 60 daily DNL Equivalent Deliveries, use the value at 90 feet corresponding to DNL 50 dB.
d) "<25": Limit of available data; Level falls within 25' range or is not applicable.
e) ">277": En Route noise dominates beginning at approximately 277 ft and greater. Refer to en route noise DNL table.

Table 6. Estimated Extent of Noise Exposure Behind and Lateral from DC per Number of Deliveries

Number of DNL/CNEL Equivalent Daytime Deliveries Served by DC		Estimated Extents, feet, for						
Average Daily	Annual	DNL/CNEL 45 dB	DNL/CNEL 50 dB	DNL /CNEL 55 dB	DNL/CNEL 60 dB	DNL/CNEL 65 dB	DNL/CNEL 70 dB	DNL/CNEL 75 dB
<= 1	<= 365	<25	<25	<25	<25	<25	<25	<25
<= 5	<= 1,825	50	26	<25	<25	<25	<25	<25
<= 10	<= 3,650	68	39	<25	<25	<25	<25	<25
<= 15	<= 5,475	81	49	<25	<25	<25	<25	<25
<= 20	<= 7,300	92	56	30	<25	<25	<25	<25
<= 40	<= 14,600	132	75	44	<25	<25	<25	<25
<= 60	<= 21,900	165	90	54	29	<25	<25	<25
<= 80	<= 29,200	194	103	62	34	<25	<25	<25
<= 100	<= 36,500	213	116	68	39	<25	<25	<25
<= 120	<= 43,800	228	128	74	43	<25	<25	<25
<= 140	<= 51,100	241	140	79	47	<25	<25	<25
<= 160	<= 58,400	253	151	84	50	26	<25	<25
<= 180	<= 65,700	265	161	88	53	28	<25	<25
<= 200	<= 73,000	275	170	92	56	30	<25	<25
<= 220	<= 80,300	285	180	96	58	31	<25	<25
<= 240	<= 87,600	294	188	100	60	33	<25	<25
<= 260	<= 94,900	303	197	104	62	34	<25	<25
<= 280	<= 102,200	312	204	109	64	36	<25	<25
<= 300	<= 109,500	320	209	113	66	37	<25	<25
<= 320	<= 116,800	328	214	117	68	39	<25	<25
<= 340	<= 124,100	335	219	121	70	40	<25	<25
<= 360	<= 131,400	342	223	125	72	41	<25	<25
<= 380	<= 138,700	349	228	128	74	43	<25	<25
<= 400	<= 146,000	356	232	132	75	44	<25	<25
<= 420	<= 153,300	362	237	136	77	45	<25	<25
<= 440	<= 160,600	369	241	139	79	46	<25	<25
<= 460	<= 167,900	375	245	143	80	48	<25	<25
<= 480	<= 175,200	381	249	146	82	49	<25	<25
<= 500	<= 182,500	387	252	150	83	50	26	<25

Notes:
a) One delivery includes the outbound takeoff and inbound landing and is representative of two operations.
b) If a value for 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 100 feet for 60 daily DNL Equivalent Deliveries, use the value at 90 feet corresponding to DNL 50 dB.
d) "<25": Limit of available data; Level falls within the 25' range or is not applicable.

4.2 Noise Exposure under En Route Paths

For en route conditions, the UA is expected to fly the same outbound flight path between the DC and the delivery point and inbound flight path back to the DC (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 or CNEL for a location on the ground directly under an en route path for various counts of daily average DNL or CNEL Equivalent deliveries. The en route noise calculated for each delivery includes both the inbound and outbound traversal of the en route path at 230 feet AGL and a ground speed of 29.2 knots.

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

Number of DNL/CNEL Equivalent Deliveries Served by Route		DNL/CNEL 230 ft AGL
Average Daily	Annual	
<= 1	<= 365	24.9
<= 5	<= 1,825	31.9
<= 10	<= 3,650	34.9
<= 15	<= 5,475	36.7
<= 20	<= 7,300	37.9
<= 40	<= 14,600	40.9
<= 60	<= 21,900	42.7
<= 80	<= 29,200	43.9
<= 100	<= 36,500	44.9
<= 120	<= 43,800	45.7
<= 140	<= 51,100	46.4
<= 160	<= 58,400	46.9
<= 180	<= 65,700	47.4
<= 200	<= 73,000	47.9
<= 220	<= 80,300	48.3
<= 240	<= 87,600	48.7
<= 260	<= 94,900	49.0
<= 280	<= 102,200	49.4
<= 300	<= 109,500	49.7
<= 320	<= 116,800	49.9
<= 340	<= 124,100	50.2
<= 360	<= 131,400	50.5
<= 380	<= 138,700	50.7
<= 400	<= 146,000	50.9
<= 420	<= 153,300	51.1
<= 440	<= 160,600	51.3
<= 460	<= 167,900	51.5
<= 480	<= 175,200	51.7
<= 500	<= 182,500	51.9

4.3 Noise Exposure for Operations at Delivery Locations

For delivery locations, the UA-related noises include the entire associated flight activity profile of the UA, including the noise from en route flight in both directions from a location and all vertical ascent/descent. All operations are assumed to be on the same en route flight path with outbound and inbound flights traversing it in opposite directions.

Table 8 presents data for a given number of daily average DNL or CNEL Equivalent deliveries and the associated estimated DNL/CNEL along the axis under track axis from a package delivery position at distances of 25 feet, 50 feet, 75 feet, 100 feet, and 125 feet. The distance range of 25 to 125 feet, calculated for deliveries, is representative of the closest a participant may be during a delivery out to the distances from which nearby properties may experience noise from a delivery.[9] For deliveries, the DNL/CNEL for the behind and lateral axes would have equivalent values to the under track axis over the range of 25 to 125 feet. As such, only the values for the under track axis are presented in this section.

Delivery locations may also receive noise from UA flying en route to other delivery locations. In such cases, total noise exposure at a delivery location can be determined with the addition of DNL or CNEL values from **Table 8** with en route levels presented in **Table 7** by application of **Equation (9)** or **Equation (10)** to add the associated levels of each.

[9] The 2022 US Census national average lot size for single-family sold homes was 15,265 square feet. This is representative of a property with dimensions of a 123.55-by-123.55-foot square. The 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 December 6, 2023.

Table 8. Estimated Noise Exposure Under Track from a Delivery Point per Number of Deliveries

Average Daily DNL/CNEL Equivalent Deliveries	Annual DNL/CNEL Equivalent Deliveries	Estimated Delivery DNL/CNEL at 25 feet (Minimum Possible Listener Distance)	Estimated Delivery DNL/CNEL at 50 feet	Estimated Delivery DNL/CNEL at 75 feet	Estimated Delivery DNL/CNEL at 100 feet	Estimated Delivery DNL/CNEL at 125 feet
<= 1	<= 365	38.1	36.8	34.2	32.4	30.2
<= 5	<= 1,825	45.1	43.8	41.2	39.4	37.2
<= 10	<= 3,650	48.1	46.8	44.2	42.4	40.2
<= 15	<= 5,475	49.9	48.6	46.0	44.1	42.0
<= 20	<= 7,300	51.1	49.8	47.2	45.4	43.2
<= 40	<= 14,600	54.1	52.9	50.3	48.4	46.3
<= 60	<= 21,900	55.9	54.6	52.0	50.2	48.0
<= 80	<= 29,200	57.1	55.9	53.3	51.4	49.3
<= 100	<= 36,500	58.1	56.8	54.2	52.4	50.2
<= 120	<= 43,800	58.9	57.6	55.0	53.2	51.0
<= 140	<= 51,100	59.6	58.3	55.7	53.8	51.7
<= 160	<= 58,400	60.1	58.9	56.3	54.4	52.3
<= 180	<= 65,700	60.6	59.4	56.8	54.9	52.8
<= 200	<= 73,000	61.1	59.8	57.2	55.4	53.2
<= 220	<= 80,300	61.5	60.3	57.7	55.8	53.7
<= 240	<= 87,600	61.9	60.6	58.0	56.2	54.0
<= 260	<= 94,900	62.2	61.0	58.4	56.5	54.4
<= 280	<= 102,200	62.6	61.3	58.7	56.9	54.7
<= 300	<= 109,500	62.9	61.6	59.0	57.2	55.0
<= 320	<= 116,800	63.1	61.9	59.3	57.4	55.3
<= 340	<= 124,100	63.4	62.2	59.5	57.7	55.5
<= 360	<= 131,400	63.7	62.4	59.8	57.9	55.8
<= 380	<= 138,700	63.9	62.6	60.0	58.2	56.0
<= 400	<= 146,000	64.1	62.9	60.3	58.4	56.3
<= 420	<= 153,300	64.3	63.1	60.5	58.6	56.5
<= 440	<= 160,600	64.5	63.3	60.7	58.8	56.7
<= 460	<= 167,900	64.7	63.5	60.9	59.0	56.9
<= 480	<= 175,200	64.9	63.7	61.0	59.2	57.0
<= 500	<= 182,500	65.1	63.8	61.2	59.4	57.2

Notes:
a) If a value for deliveries is not specifically defined in this table, use the next highest value. For example, if there are 50 average daily DNL Equivalent

5 Cumulative Noise Exposure

For instances where the proposed Causey operations with the Flytrex SKY II 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 Causey operations occurring in the vicinity of an airport and where Causey 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 12** 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.

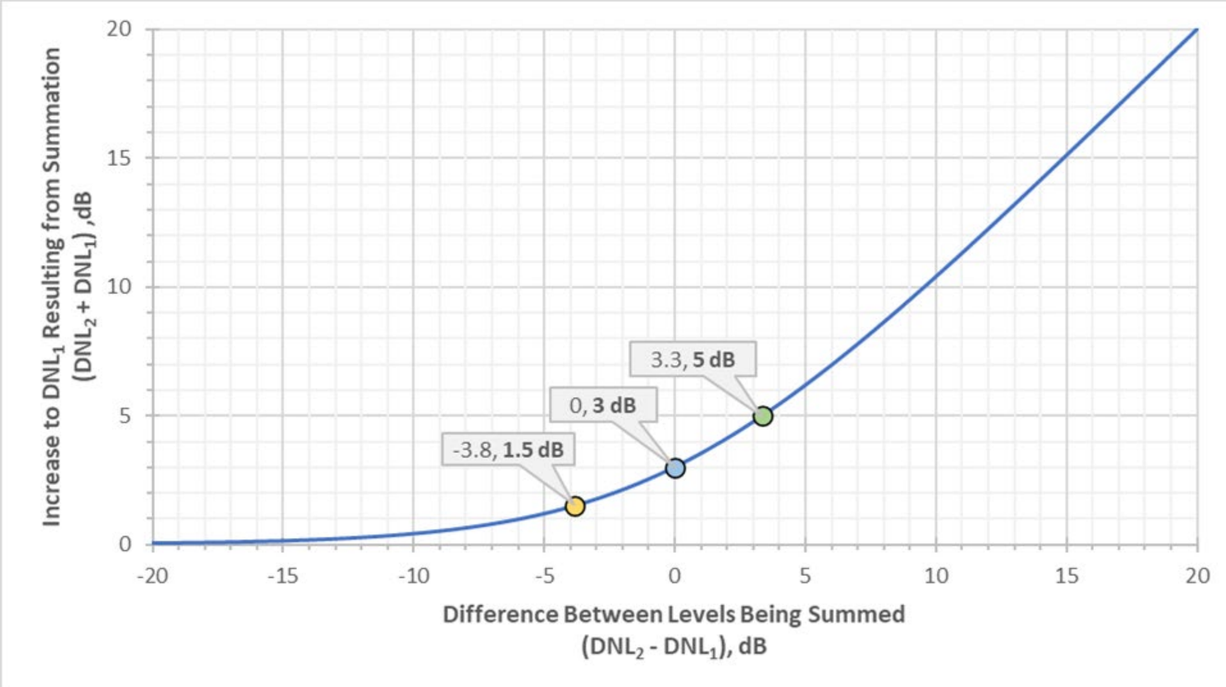

Figure 10. dB Increase Resulting from DNL Summation

Potential increases to DNL resulting from cumulative aviation noise effects can be evaluated with **Figure 12** 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 (9)** presented earlier in Section 3.3**.** An example of applying **Equation (9)** to three aviation noise sources is presented in **Table 9**.

Table 9. 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

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Attachment A

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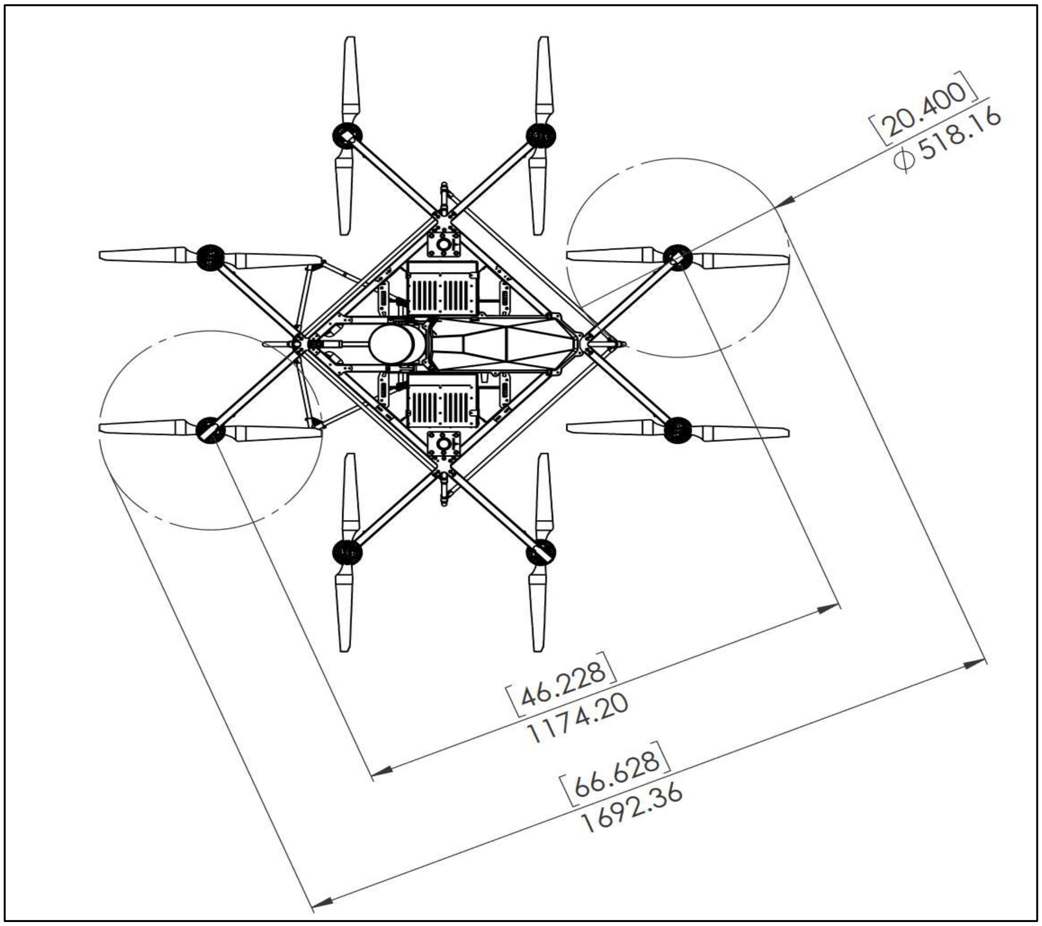
ACOUSTICAL ANALYSIS ASSOCIATES, INCORPORATED

AAAI Report 1655

ENVIRONMENTAL ASSESSMENT NOISE MEASUREMENTS:
Flytrex SKY II Unmanned Aerial System



Initial Release: June 10, 2024

Revision A: July 10, 2024

Submitted to:

Flytrex Aviation Ltd.
39 Montefiore St.
Tel Aviv, ISRAEL

REVISION HISTORY

Date	Rev.	Page(s)	Description of Change(s)
June 10, 2024	IR	All	
July 10, 2024	A	3,4,16,43,44	Corrected reported noise levels, separated outbound and inbound delivery noise levels.

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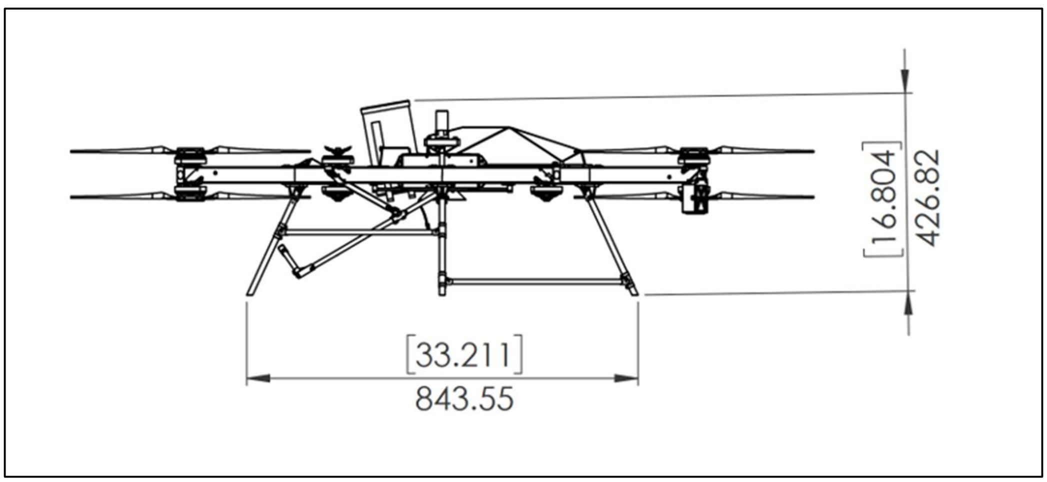
ENVIRONMENTAL NOISE ASSESSMENT REPORT: Flytrex Sky II Unmanned Aerial System

1.0 INTRODUCTION

The flight test results described in this report are designed to demonstrate compliance of the Flytrex Sky II UAS with the AEE-100 DRAFT UAS environmental noise assessment requirements[1]. The cover page shows the Sky II drone in plan view, and Figure 1 displays a side-view drawing.

The Flytrex Sky II is an Unmanned Aerial System with a maximum gross weight of 34 lb., diagonal span dimensions of 46.2 inch (1174.2 mm), equipped with 8 x MN600711 TMotor motors, and 8 x MF2009 TMotor propellers. The intended use of the UAS is on-demand, small parcel delivery, focused on the suburbs and lower density population areas.

Figure 1. Side-view of Flytrex SKY II UAS



The Sky II UAS delivers packages using a winch system, and a typical delivery will have the drone loaded with a less than maximum payload. The drone will approach the unloading zone at the normal enroute altitude of 70 meters (230 feet) and hover. The drone will then descend to the delivery height of 15 meters, unwind the winch hook and lower the package for an attendant to remove the looped handles of the delivery bag. The winch then retracts as the drone climbs back to the enroute altitude and hovers for about 30 seconds. The drone then orients itself as needed for forward motion and departs at the enroute flight altitude.

The flight tests to obtain sound pressure level data were made at the Causey Aviation airfield northeast of Liberty, North Carolina (see Figure 2), in accordance with an approved test plan[2]. The flight tests were made to determine the Sound Exposure Level (SEL) at the locations and conditions specified in reference 1. The results of the program demonstrate that the A-weighted Sound Exposure Level in decibels produced during enroute, takeoff-pickup-delivery-landing (TOPDL), and hover operations are as summarized in Tables 1 and 2.

Table 1. Flytrex Sky II In-flight Sound Exposure Levels

			SEL				SEL	
			Enroute	Enroute	Enroute	Enroute	Enroute	Enroute
		Leq	FULL	FULL	EMPTY	EMPTY	FULL	EMPTY
Pos	Dist	Ambient	Nbound	Sbound	Nbound	Sbound		
C1	0	41.3	72.6	73.2	68.1	68.9	72.9	68.5
S1	50	38.0	72.5	73.3	67.5	68.7	72.9	68.1
S2	100	39.5	72.2	73.0	67.4	68.5	72.6	68.0
S3	200	37.8	68.8	69.5	64.3	66.1	69.2	65.2
S4	400	38.3	64.1	64.0	61.2	59.6	64.1	60.4
S5	800	39.5	59.6	59.9	54.2	55.2	59.7	54.7
			SEL					
			Undertrack	Undertrack	Undertrack	Undertrack		
		Leq	Takeoff	Delivery	Delivery	Landing		
Pos	Dist	Ambient	FULL	FULL	EMPTY	EMPTY		
C1	25	41.3	91.0	86.8	70.9	84.2		
S1	50	38.0	86.1	85.6	72.9	80.5		
S2	100	39.5	79.3	81.6	69.4	74.1		
S3	200	37.8	73.8	74.2	69.4	68.1		
S4	400	38.3	72.3	71.1	67.3	66.9		
S5	800	39.5	72.9	72.2	68.7	68.9		
			SEL					
			Oppotrak	Oppotrak	Oppotrak	Oppotrak		
		Leq	Takeoff	Delivery	Delivery	Landing		
Pos	Dist	Ambient	FULL	FULL	EMPTY	EMPTY		
C1	25	41.3	92.1	87.5	73.6	84.1		
S1	50	38.0	86.6	86.4	73.9	78.7		
S2	100	39.5	79.8	81.6	70.3	73.0		
S3	200	37.8	74.2	73.9	68.6	68.9		
S4	400	38.3	65.8	66.0	61.0	61.1		
S5	800	39.5	59.9	59.1	56.8	56.4		
			SEL					
			90 deg trak	90 deg trak	90 deg trak	90 deg trak		
		Leq	Takeoff	Delivery	Delivery	Landing		
Pos	Dist	Ambient	FULL	FULL	EMPTY	EMPTY		
C1	25	41.3	92.5	87.8	68.2	84.2		
S1	50	38.0	86.9	86.2	67.7	78.6		
S2	100	39.5	79.6	81.4	65.9	72.9		
S3	200	37.8	74.2	73.8	66.2	68.7		
S4	400	38.3	65.6	66.3	58.7	59.4		
S5	800	39.5	58.9	58.9	55.0	54.7		

Table 2. Flytrex Sky II Hover Sound Levels

5 ft hover			82 ft hover			82 ft hover	
82 ft dist	Leq, dBA		82 ft dist	Leq, dBA		0 dist	Leq, dBA
4.01	60.2		5.01	----		6.01	71.5
4.02	60.7		5.02	66.8		6.02	71.8
4.03	61.7		5.03	66.6		6.03	71.8
4.04	60.5		5.04	66.8		6.04	71.3
4.05	61.6		5.05	65.7		6.05	70.6
4.06	61.7		5.06	67.2		6.06	70.8
4.07	61.3						
AVG	61.1			66.6			71.3

2.0 DESCRIPTION OF FLIGHT TEST PROGRAM

Specific test objectives and procedures are defined in Reference 2. A general description of the tests is provided here to assist in the interpretation of the acoustical analyses. Flyovers were conducted at a target height of 230 feet (70m) AGL at the microphone, using the GPS system aboard the UAS to determine the actual height achieved. The average enroute noise level was obtained from an average of valid flights made in equal numbers in the northbound and southbound directions, as shown in Figure 2. Test data were acquired with the UAS at the stabilized speed of 29 knots, the normal enroute speed. Enroute tests were conducted with the drone carrying no payload and repeated with maximum payload.

Takeoff, pickup, delivery, and landing (TOPDL) noise measurements were conducted in three directions (see Figure3); one set of six over the line of microphones, one set opposite that line, and a third set of six at 90 degrees to the line of microphones.

Finally, measurements were conducted with the UAS in hover at 25 meters height and a microphone directly beneath the UAS and another at 25 meters distance, and again with the UAS at 5 feet and the microphone at 25 meters distance.

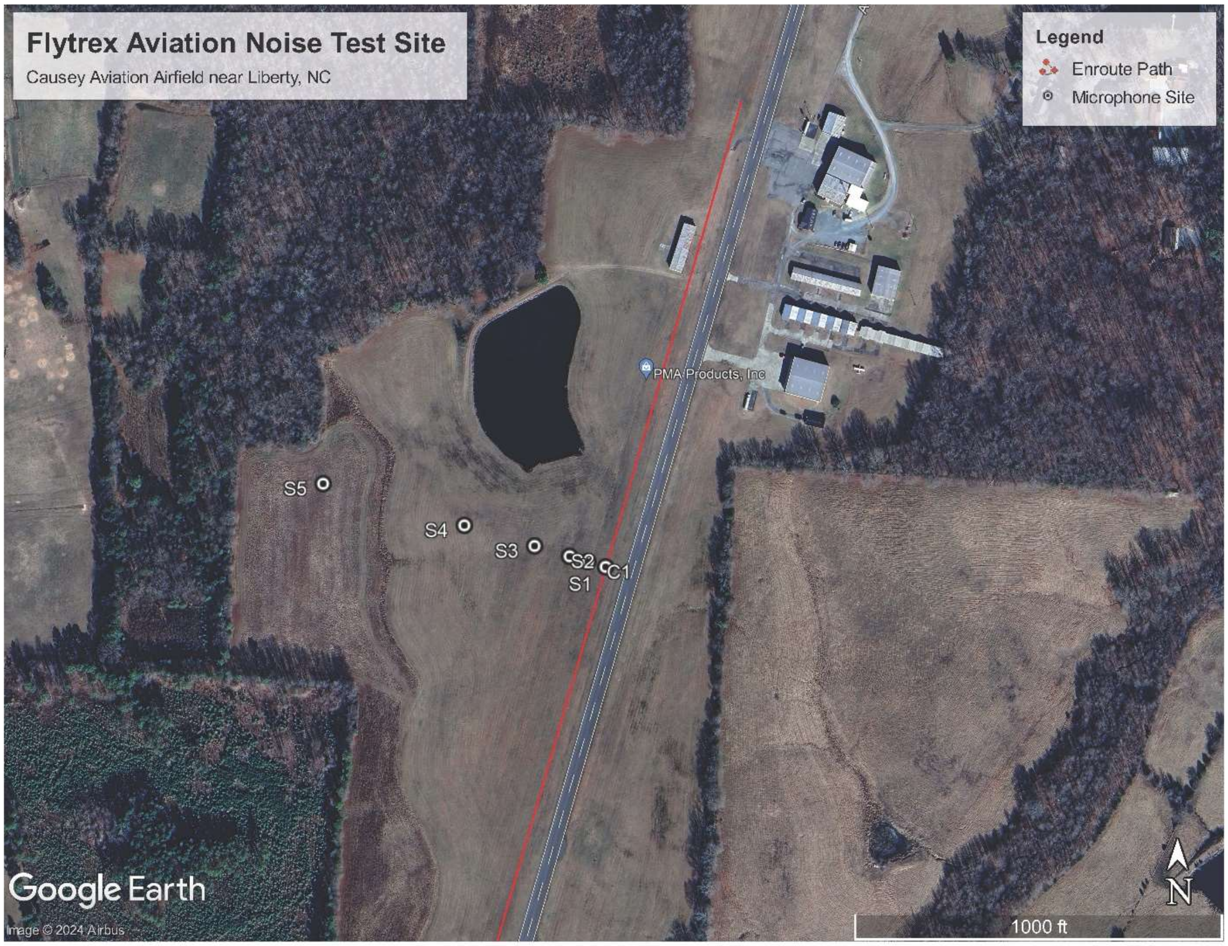


Figure 2. Flytrex Aviation Noise Test Site – Enroute Paths

2.1 Test Site Description

The flight test program to obtain sound pressure level measurements for environmental assessment was conducted on May 5 through 7, 2024 at Causey Aviation airfield, in the vicinity of Liberty, North Carolina (see Figures 2 and 3). Causey is a very lightly used uncontrolled airport, has a 3600 ft paved runway, oriented roughly north/south (02-20), with an airport elevation of about 715 ft MSL. The surrounding terrain is essentially flat. The elevation of the central test area is approximately 724 feet above mean sea level (MSL). The test site has been used previously for acoustical tests and has been approved by FAA for this purpose. The background noise A-weighted sound levels in the remote Causey Airfield area were low (38 to 40 dBA) and did not affect the noise measurements. The microphone locations were established by a GPS survey. Figures 2 and 3 show a map of the area and the location of the measurement positions.

Figure 3. Flytrex Aviation Noise Test Site – Takeoff/Pickup/Delivery/Landing Paths

2.2 Microphone Locations

The microphones were located at positions C1 through S5 in cleared areas as shown in Figure 4. Note that the microphones placed at S4 and S5 are not shown in the photo. The area around each of the measurement sites was mowed to about 3 inches in length. within 50 feet of the microphone to provide a uniform flat surface. The test site met the criteria of 14 CFR part 36 A36.2.2.1 and ICAO Annex 16, Appendix 2, 2.2. A noise measurement system with a microphone 5 feet above ground was used at each site.

Figure 4. Flytrex Sky II Microphones C1, S1, S2, and S3

2.3 Meteorological Measurements

Meteorological conditions affecting the conduct of the test or absorption of sound by the atmosphere were obtained from a measurement system at a height 10 feet above ground level. Measurements of wind speed and direction, temperature, and humidity were made at a location about 150 ft away from the center microphone position using the custom-built weather station described in Reference 3. Outputs of the sensors consisted of temperature, dew point, wind direction and speed. Relative humidity, average wind, crosswind component and the coefficient of atmospheric sound absorption at 8 kHz were computed from measured parameters. All data from this system were stored, along with time-of-day, in the laptop computer memory. The computer clock was synchronized daily to GPS time. This information was also continuously displayed on the computer in the field to monitor compliance with the temperature, humidity, and average wind speed limitations.

2.4 Test Aircraft Instrumentation

The UAS operating conditions and location were recorded from normal UAS instrumentation, consisting of latitude/longitude, rotor RPM, and ground speed. The readings were correlated at the time the UAS was over the landing pad, determined by GPS data, and are summarized in Appendix D.

2.5 Synchronization of Data

Time synchronization between the data recording system on the drone and the noise recording systems was obtained by recording GPS time on a channel of each acoustic recorder.

2.6 Summary of Tests

A total of 28 noise data flights were flown from May 5 through 7, 2024 at the Causey test site to fulfill the requirements of the approved noise test plan, as summarized in Table 3.

The noise test program began at approximately 4:20 pm on May 5, with the enroute testing. The first twelve passes were conducted in alternating opposite directions (six in each direction) with the UAS empty at minimum weight (conditions 1.01, 1.02, 1.03, 1.04, 1.05, and 1.06). Twice as many runs as needed were flown to gain familiarity with the testing procedures, but all twelve runs are considered valid. After landing, the batteries were charged and the drone was loaded to maximum weight so that six more enroute tests (conditions 2.01, 2.02, 2.03, 2.04, 2.05, and 2.06) were flown beginning at about 5:20 pm, three in each direction.

Testing continued with the TOPDL (Takeoff/Pickup/Delivery/Landing) operations at about 6:30 pm on May 5. Three complete cycles were flown along the flight path directly over the line of microphones (conditions 3.01, 3.02, and 3.03). May 5 noise tests ended at about 7:15 pm.

The TOPDL measurements continued the next day, May 6, beginning at about 10:25 am, with test conditions 3.04 and 3.05. Testing was suspended at about 10:45 am due to light rainfall after these two overhead TOPDL cycles were measured, and then resumed at about 3:45 pm. The final overhead TOPDL operation (3.06) was performed by 3:50 pm. Noise tests continued with opposite direction TOPDL tests from 4:00 pm to 5:25 pm (conditions 3.13a and 3.13b, 3.14, 3.15, 3.16, and 3.17a), at which point heavy rainfall began and testing ended for the day.

TOPDL noise tests were resumed the next day (May 7), completing the opposite direction flights from 08:15 am to 8:33 am with test conditions 3.17b and 3.18. The 90 degree track flights were conducted from 8:57 am through 10:16 am (test condition s 3.07, 3.08, 3.09, 3.10, 3.11, and 3.12), which fulfilled the flight noise test card.

Hover noise tests were then conducted from 10:40 am through 10:43 am and were completed (after battery charging) from 11:33 am to 11:36 am, in accordance with the test plan.

Table 3. Summary of Noise Test Flights May 5-7, 2024

# Flight	Date	Test Scenario	Test #	Take Off (UTC-XX:XX)	Landing (UTC-XX:XX)	Scenario	Notes
1	05.05.24	Enroute	1.01 - 1.06	2024-05-05 23:19:05.388943+03:00	2024-05-05 23:28:22.439007+03:00	Cruising Altitude - 70mPayload - 0Kg	Vibrations, No RTL
2	05.05.24	Enroute	1.07 - 1.12	2024-05-05 16:57:50.824002-04:00	2024-05-05 17:06:32.974742-04:00	Cruising Altitude - 70mPayload - 0Kg	
3	06.05.24	Enroute	2.01 - 2.06	2024-05-05 17:21:45.029331-04:00	2024-05-05 17:30:24.985711-04:00	Cruising Altitude - 70mPayload - 4.5Kg	
4	06.05.24	TOPDL	3.01	2024-05-05 18:22:41.477968-04:00	2024-05-05 18:29:18.532427-04:00	Overhead	
5	06.05.24	TOPDL	3.02	2024-05-05 18:39:48.617375-04:00	2024-05-05 18:46:39.759894-04:00	Overhead	
6	06.05.24	TOPDL	3.03	2024-05-05 19:09:29.160914-04:00	2024-05-05 19:16:23.927248-04:00	Overhead	
7	06.05.24	TOPDL	3.04	2024-05-06 10:25:43.981693-04:00	2024-05-06 10:32:37.992180-04:00	Overhead	
8	06.05.24	TOPDL	3.05	2024-05-06 10:38:22.091811-04:00	2024-05-06 10:45:19.597569-04:00	Overhead	
9	06.05.24	TOPDL	3.06	2024-05-06 15:42:04.017309-04:00	2024-05-06 15:48:58.445137-04:00	Overhead	
10	06.05.24	TOPDL	3.13a	2024-05-06 15:59:15.504295-04:00	2024-05-06 16:05:17.145821-04:00	Opposite	Aircraft in area - NA
11	06.05.24	TOPDL	3.13b	2024-05-06 16:43:02.525702-04:00	2024-05-06 16:49:16.218066-04:00	Opposite	
12	06.05.24	TOPDL	3.14	2024-05-06 16:53:28.243172-04:00	2024-05-06 16:59:36.421719-04:00	Opposite	
13	06.05.24	TOPDL	3.15	2024-05-06 17:02:27.802578-04:00	2024-05-06 17:08:32.768653-04:00	Opposite	
14	06.05.24	TOPDL	3.16	2024-05-06 17:15:54.694809-04:00	2024-05-06 17:21:58.156141-04:00	Opposite	
15	06.05.24	TOPDL	3.17a	2024-05-06 17:25:24.831908-04:00	2024-05-06 17:28:13.912322-04:00	Opposite	RTL - Rain
16	07.05.24	TOPDL	3.17b	2024-05-07 08:15:08.860440-04:00	2024-05-07 08:21:25.107466-04:00	Opposite	
17	07.05.24	TOPDL	3.18	2024-05-07 08:26:53.276649-04:00	2024-05-07 08:33:07.057573-04:00	Opposite	
18	07.05.24	TOPDL	3.07a	2024-05-07 08:56:30.027414-04:00	2024-05-07 09:02:29.936197-04:00	Opposite	Windy
19	07.05.24	TOPDL	3.08	2024-05-07 09:05:46.410151-04:00	2024-05-07 09:11:45.885963-04:00	90 Degress	
20	07.05.24	TOPDL	3.09	2024-05-07 09:18:26.711856-04:00	2024-05-07 09:24:36.411973-04:00	90 Degress	
21	07.05.24	TOPDL	3.10	2024-05-07 09:27:30.355964-04:00	2024-05-07 09:33:31.005476-04:00	90 Degress	
22	07.05.24	TOPDL	3.11	2024-05-07 09:45:08.023642-04:00	2024-05-07 09:51:05.824989-04:00	90 Degress	
23	07.05.24	TOPDL	3.12	2024-05-07 09:54:20.203389-04:00	2024-05-07 10:00:15.948608-04:00	90 Degress	
24	07.05.24	TOPDL	3.07b	2024-05-07 10:08:15.455354-04:00	2024-05-07 10:14:54.459439-04:00	90 Degress	
25	07.05.24	Hover	5.01-5.03	2024-05-07 10:37:42.873677-04:00	2024-05-07 10:44:28.007727-04:00	Hover 25mPayload - 4.5Kg1-3	
26	07.05.24	Hover	5.04-5.06	2024-05-07 11:31:41.313756-04:00	2024-05-07 11:39:06.252234-04:00	Hover 25mPayload - 4.5Kg4-6	Pass 6 - aircraft in area regard last 30
27	07.05.24	Hover	4.01-4.02	2024-05-07 11:43:20.269358-04:00	2024-05-07 11:48:59.864848-04:00	Hover 5ftPayload - 4.5Kg1-2	
28	07.05.24	Hover	4.03-4.07	2024-05-07 12:21:36.505794-04:00	2024-05-07 12:31:32.364681-04:00	Hover 5ftPayload - 4.5Kg4-7	

Figure 5. Flytrex Sky II UAS delivery system

3.0 PROCEDURES FOR ANALYZING MEASURED DATA

The A-weighted sound exposure levels (SEL) given in Table 1 were obtained for each data run after 1/3 octave band spectral analysis was performed on the recorded data. The spectral analyzer performed a true linear integration in each one-third octave band at 0.5 sec sample rate. "Slow" detector response was simulated by computing a running average of each one-third octave band level using four adjacent time samples, with the following weighting coefficients (as given in A36.3.7.5):

Current Sample	39%
One previous	27%
Two previous	21%
Three previous	13%

The time 0.75 seconds before the end of the sampling period was ascribed to the sound pressure level thus computed.

Measured spectra are adjusted for the frequency response of each item in the measurement chain, microphone, windscreen, preamplifier, cabling, and recorder. Microphone and windscreen adjustments are taken from current laboratory calibrations and manufacturer's data. The remainder of the measurement system response is obtained from pink noise inputs recorded and played back through the system.

Adjustments were made to account for the presence of background noise in the recordings. The guidance material in AC36-4D was used in making these adjustments. Bands with sound pressure levels (SPL's) which were within 3 dB of the background noise were labeled as "masked". Background noise was subtracted on a mean-squared pressure basis from SPL's in bands which were not masked. The frequency extrapolation method described in AC36-4D was used to develop noise levels for masked bands, using the last band which was not masked as the basis. It was assumed that the source spectrum slope was zero.

A sample of the recordings made during an overhead TOPDL cycle at the six microphone locations is presented in Figures 4 through 6.

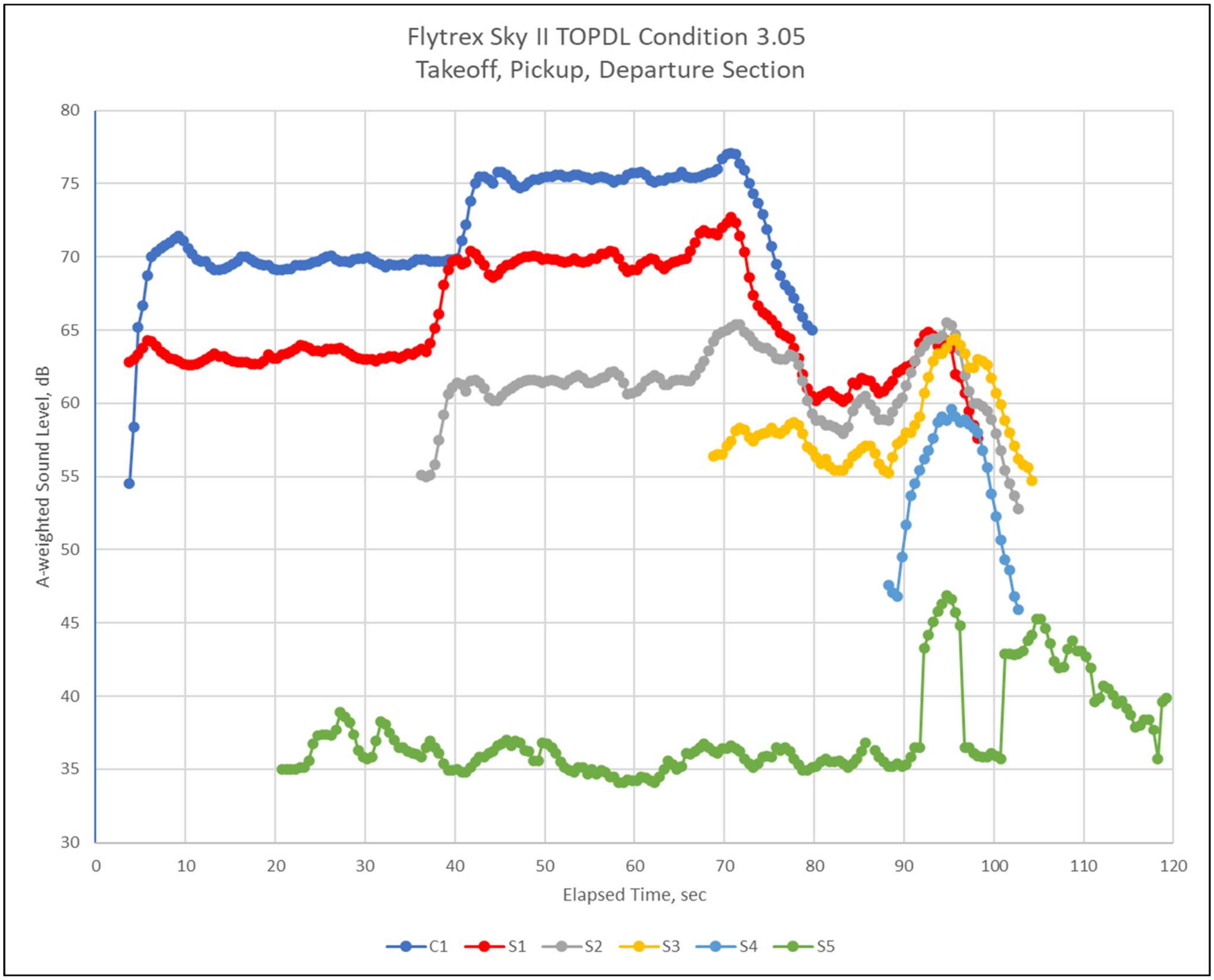


Figure 6. Sound Level Histories during TOPDL condition 3.05 – Takeoff and Pickup

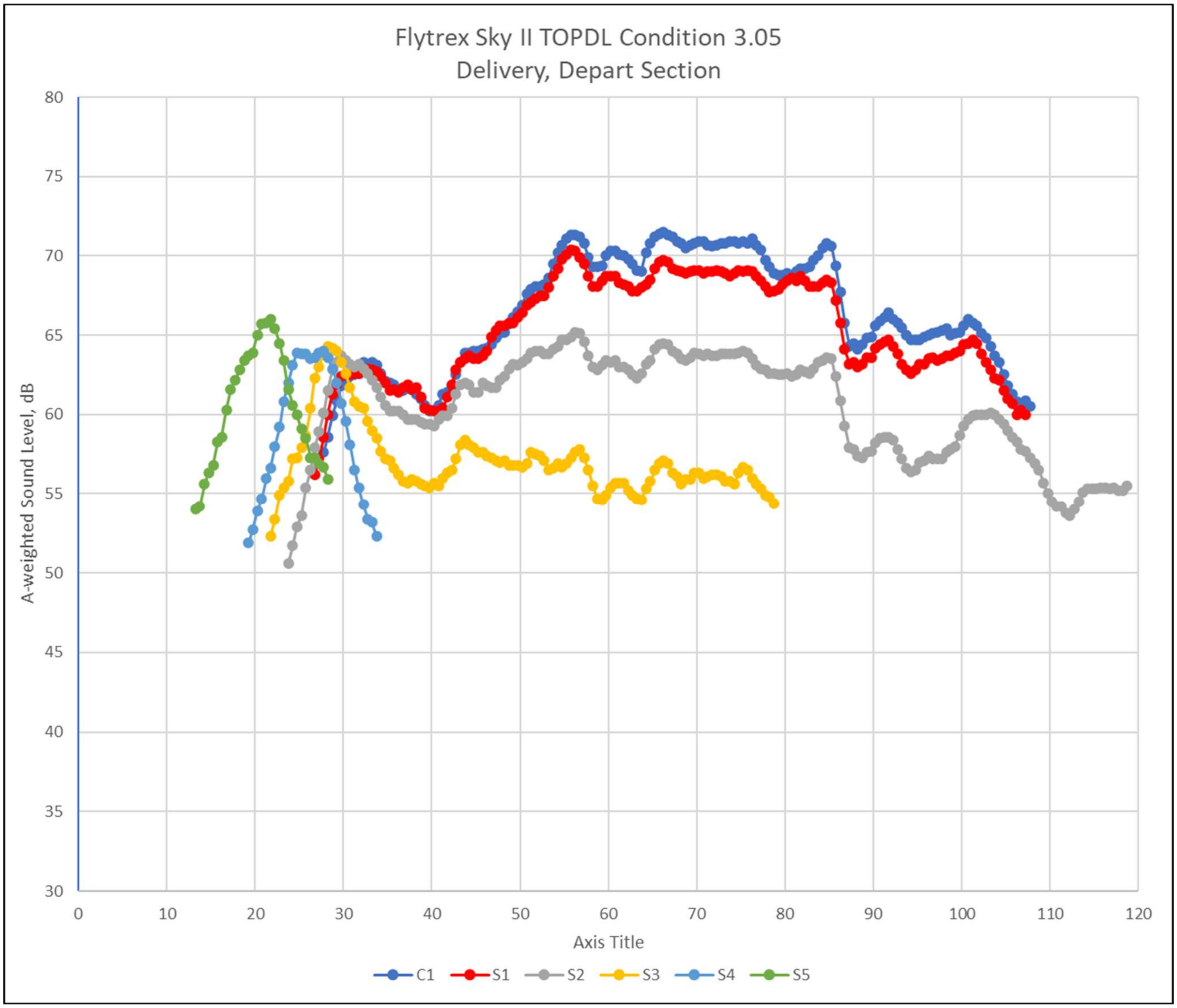


Figure 7. Sound Level Histories during TOPDL condition 3.05 – Delivery and Departure

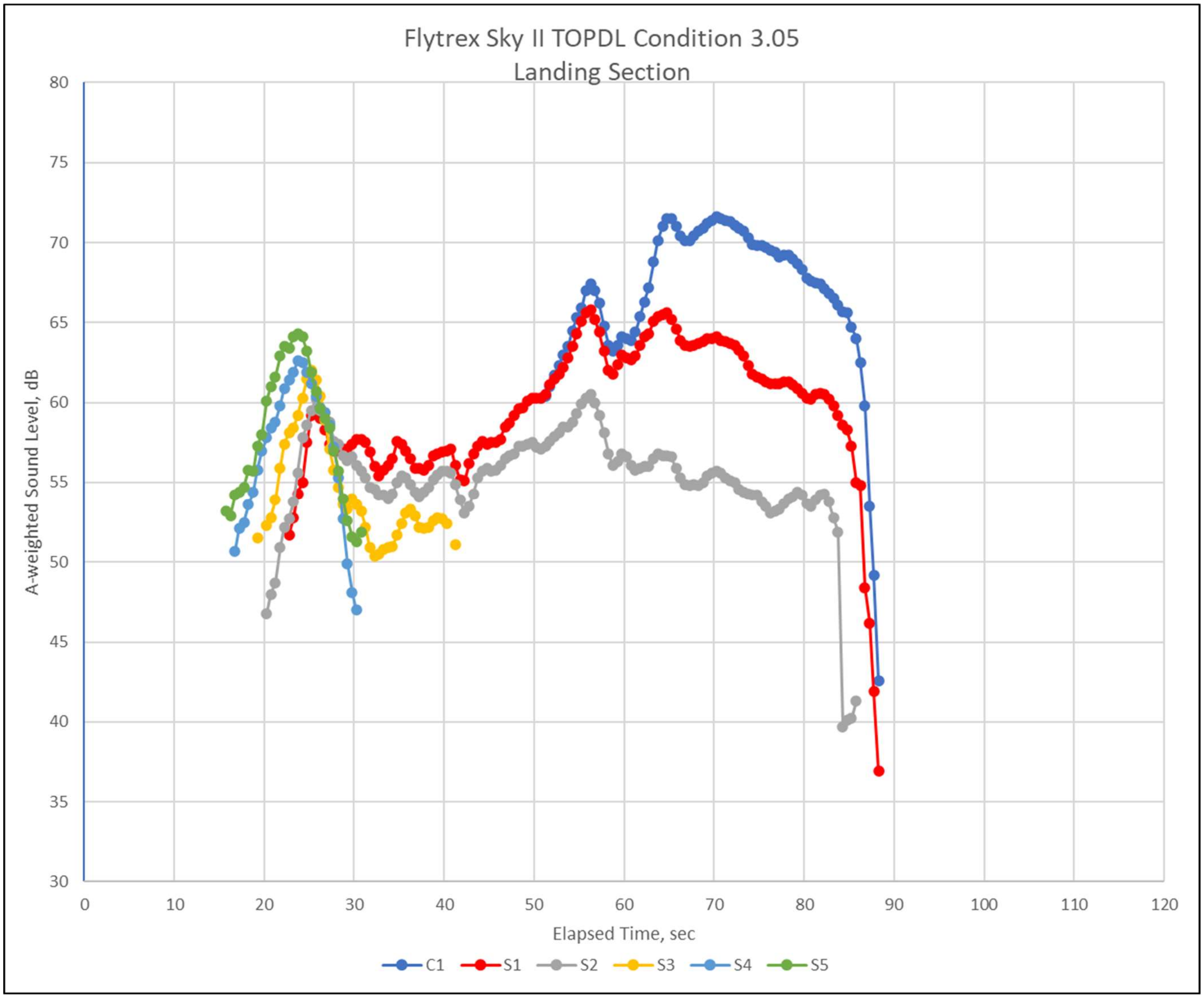


Figure 8. Sound Level Histories during TOPDL condition 3.05 – Landing

4.0 MAXIMUM A-WEIGHTED SOUND LEVELS TO DEMONSTRATE ADEQUATE SIGNAL-TO-NOISE RATIO

Table 4 presents the maximum A-weighted sound level obtained during each noise recording at each microphone. Comparing the maximum A-levels measured during enroute testing to the ambient noise levels obtained at each station shows that there was a minimum of 19 dBA signal over the background level at the undertrack stations. Enroute levels were as low as 4 to 5 dBA above the ambient level at the most distant microphone, position S5. Decreasing the enroute measurement height would not have increased the measured level appreciably at this location, 800 feet to the side of the landing pad, due to the very small decrease in slant range.

5.0 SOUND RECORDING EQUIPMENT

Appendix A of this report lists the model numbers and serial numbers of the sound recording equipment used to acquire the data. A complete description of each item and its function is found in the test plan, Reference 3.

6.0 WEATHER DATA

Appendix B lists the temperature and relative humidity measured at intervals during the test periods. Also shown are graphs of the temperature, dew point, relative humidity, and air absorption values gathered at 10 feet above ground level during each noise test run.

7.0 GPS TRACKING DATA

Appendix C displays the GPS data acquired during noise testing in terms of height and lateral offset from the landing pad during each noise test run. The tolerances of ± 10% for height and ± 10 degrees for lateral offset were easily achieved for all test runs.

Table 4. Flytrex Sky II In-flight Maximum A-weighted sound levels

			Lmax				Lmax	
			Enroute	Enroute	Enroute	Enroute	Enroute	Enroute
		Leq	FULL	FULL	EMPTY	EMPTY	FULL	EMPTY
	Dist	Ambient	Nbound	Sbound	Nbound	Sbound		
C1	0	41.3	64.2	64.7	60.0	60.5	64.5	60.2
S1	50	38.0	64.2	64.7	59.3	60.1	64.4	59.7
S2	100	39.5	63.9	64.6	58.4	59.8	64.3	59.1
S3	200	37.8	59.1	59.9	54.6	56.2	59.5	55.4
S4	400	38.3	53.3	52.3	50.4	49.4	52.8	49.9
S5	800	39.5	43.9	44.2	43.7	43.2	44.1	43.4

			Lmax			
			Undertrack	Undertrack	Undertrack	Undertrack
		Leq	Takeoff	In Del.	Out Del.	Landing
	Dist	Ambient	FULL	FULL	EMPTY	EMPTY
C1	25	41.3	76.0	72.3	60.2	72.3
S1	50	38.0	71.0	71.1	60.5	67.2
S2	100	39.5	65.1	66.6	59.9	60.7
S3	200	37.8	62.6	62.7	58.8	58.4
S4	400	38.3	64.0	63.0	59.0	58.7
S5	800	39.5	64.0	63.8	60.1	60.3
				(in/outbnd)		

			Lmax			
			Oppotrak	Oppotrak	Oppotrak	Oppotrak
		Leq	Takeoff	In Del.	Out Del.	Landing
	Dist	Ambient	FULL	FULL	EMPTY	EMPTY
C1	25	41.3	76.8	72.8	64.4	72.5
S1	50	38.0	72.1	71.8	63.9	66.5
S2	100	39.5	65.0	66.8	59.5	58.8
S3	200	37.8	59.7	58.9	55.6	55.6
S4	400	38.3	53.2	53.3	48.8	47.7
S5	800	39.5	47.5	45.2	42.4	45.3

			Lmax			
			90 deg trak	90 deg trak	90 deg trak	90 deg trak
		Leq	Takeoff	In Del	Out Del	Landing
	Dist	Ambient	FULL	FULL	EMPTY	EMPTY
C1	25	41.3	77.1	72.3	60.0	72.1
S1	50	38.0	71.7	70.8	59.5	66.3
S2	100	39.5	65.0	65.4	57.4	59.2
S3	200	37.8	59.8	58.4	54.8	55.3
S4	400	38.3	52.6	52.1	48.1	48.0
S5	800	39.5	46.8	46.6	43.8	42.9

8.0 REFERENCES

1. "DRAFT Measurement Protocol for Applications for EA Noise Analysis," Power Point Presentation by Drone Team, AEE-100, dated October 2023.

2. "TEST PLAN FOR ENVIRONMENTAL ASSESSMENT NOISE MEASUREMENTS: Flytrex SKY II Unmanned Aerial System," AAAI Report 1650 dated April 10, 2024.

APPENDIX A

MEASUREMENT EQUIPMENT

This Appendix contains a listing of the sound recording equipment used during the Flytrex Sky II Environmental Assessment noise program. Also given are the current calibration records for each microphone and acoustical calibrator used in the noise test program.

This appendix also shows the calculation of measurement system frequency corrections for each noise data channel and recorder used. The actuator response is combined with the windscreen insertion loss, grazing incidence correction and the electrical system response to compute the overall system corrections in each 1/3 octave frequency band.

TABLE A-1. SOUND RECORDING EQUIPMENT

Item	System 104 Model	System 104 Serial No.	System 102 Model	System 102 Serial No.	System 103 Model	System 103 Serial No.
Condenser Microphone						
Bruel & Kjaer ½-inch	4155	1138914	4155	1769336	4155	1567765
	4155	1931342	4155	1769342	4155	1393890
Microphone Preamplifier						
General Radio	P-42	UY-126	P-42	43009	P-42	UY-120
	P-42		P-42		P-42	3025
Acoustic Calibrator						
Bruel & Kjaer	4231	3013421	4231	2313397	4231	2422752
Windscreen						
Bruel & Kjaer	UA2037	-----	UA2037	-----	UA2037	-----
Data Recorder(s)						
Sound Devices 744T Digital Recorder						
	460706198005		461007078004		461710099000	

Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **28219-2**

Certificate of Calibration for
Brüel & Kjær 1/2" Free-field Microphone

This calibration is performed by comparison with measurement reference standard microphone:

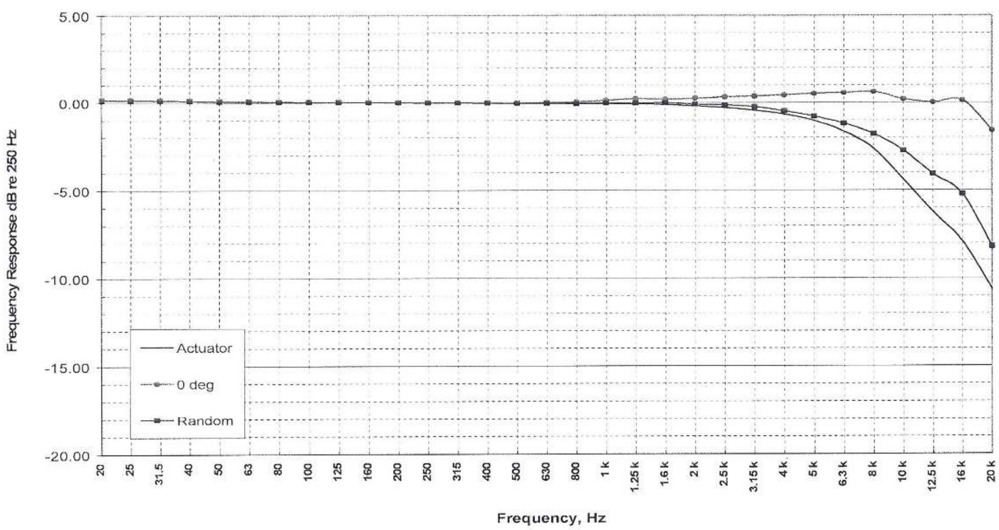
Reference Standards	
Type No.	4134/UA0825
Serial No.	1866523
Calibrated by	DANAK
Cal Date	19 OCT 2022
Due Date	19 OCT 2024

a) Estimated uncertainty of comparison: ± **0.05** dB
b) Estimated uncertainty of reference microphone: ± **0.04** dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± **0.064** dB
d) Expanded uncertainty (coverage factor k = 2 for 95% confidence level): = ± **0.13** dB

Type no.	**4155**
Serial no.	**1567765**
With preamplifier type no.	**N/A**
Preamplifier Serial no.	**N/A**
Submitted by	**AAA, Inc.** **Simi Valley, CA 93065**
Purchase order no.	**Verbal/Michael Bucka**
Asset no.	**103L**

Performance Data		
Open circuit sensitivity at 1,013 hPa, 23°C, 50% RH, 251.2 Hz	**-27.32**	dB re 1 V/Pa
	43.08	mV/Pa
Open circuit correction factor K_o	**1.3**	dB
System sensitivity (with preamplifier) at 251.2 Hz	**N/A**	dB re 1 V/Pa
	N/A	mV/Pa
Correction factor K	**N/A**	dB

Microphone Frequency Response Type 4155
S/N 1567765 : Measured 31 Oct 2023



Calibration performed by

Harold Lynch

Harold Lynch, Service Manager

Condition of Test		
Ambient Pressure	**991.81**	hPa
Temperature	**23**	°C
Relative Humidity	**34**	%
Polarization Voltage	**0**	V
Frequency	**251.2**	Hz
Date of Calibration	**31 OCT 2023**	
Re-calibration due on	**31 OCT 2024**	

ODIN METROLOGY, INC.
3537 OLD CONEJO ROAD, SUITE 108
THOUSAND OAKS, CA 91320
PHONE: (805) 375-0830; FAX: (805) 375-0405

The calibration data is both "as found" and "as final." At the time of calibration this microphone was found to be **within** the manufacturer's specifications. Calibration Procedure: **OM-P-1008-Microphone Rev. 1.2 20130618.**

This calibration is traceable to DANAK/DPLA No. **M2.10-1539-3.1** and through inter-laboratory comparisons to NIST Test Number: **683/289533-17.** *See page 2 Traceability.

Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **28219-3**

Certificate of Calibration for Brüel & Kjær 1/2" Free-field Microphone

This calibration is performed by comparison with measurement reference standard microphone:

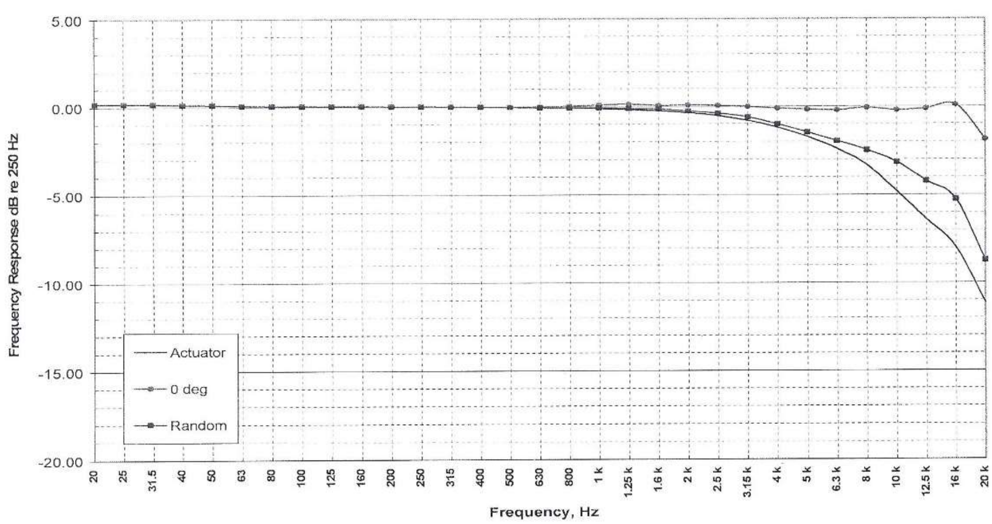
REFERENCE STANDARDS	
Type No.	4134/UA0825
Serial No.	1866523
Calibrated by	DANAK
Cal Date	19 OCT 2022
Due Date	19 OCT 2024

a) Estimated uncertainty of comparison: ± **0.05** dB
b) Estimated uncertainty of reference microphone: ± **0.04** dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± **0.064** dB
d) Expanded uncertainty (coverage factor k = 2 for 95% confidence level): = ± **0.13** dB

Type no.	**4155**
Serial no.	**1393890**
With preamplifier type no.	**N/A**
Preamplifier Serial no.	**N/A**
Submitted by	**AAA, Inc.** **Simi Valley, CA 93065**
Purchase order no.	**Verbal/Michael Bucka**
Asset no.	**103R**

PERFORMANCE DATA		
Open circuit sensitivity at 1,013 hPa, 23°C, 50% RH, 251.2 Hz	**-26.81**	dB re 1 V/Pa
	45.68	mV/Pa
Open circuit correction factor K_0	**0.8**	dB
System sensitivity (with preamplifier) at 251.2 Hz	**N/A**	dB re 1 V/Pa
	N/A	mV/Pa
Correction factor K	**N/A**	dB

Microphone Frequency Response Type 4155
S/N 1393890 : Measured 31 Oct 2023



Calibration performed by

Harold Lynch

Harold Lynch, Service Manager

CONDITION OF TEST		
Ambient Pressure	**991.81**	hPa
Temperature	**23**	°C
Relative Humidity	**34**	%
Polarization Voltage	**0**	V
Frequency	**251.2**	Hz
Date of Calibration	**31 OCT 2023**	
Re-calibration due on	**31 OCT 2024**	

ODIN METROLOGY, INC.
3537 OLD CONEJO ROAD, SUITE 108
THOUSAND OAKS, CA 91320
PHONE: (805) 375-0830; FAX: (805) 375-0405

The calibration data is both "as found" and "as final." At the time of calibration this microphone was found to be **within** the manufacturer's specifications. Calibration Procedure: **OM-P-1008-Microphone Rev. 1.2 20130618.**

This calibration is traceable to DANAK/DPLA No. **M2.10-1539-3.1** and through inter-laboratory comparisons to NIST Test Number: **683/289533-17.** *See page 2 Traceability.

Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **28219-4**

Certificate of Calibration for
Brüel & Kjær 1/2" Free-field Microphone

This calibration is performed by comparison with measurement reference standard microphone:

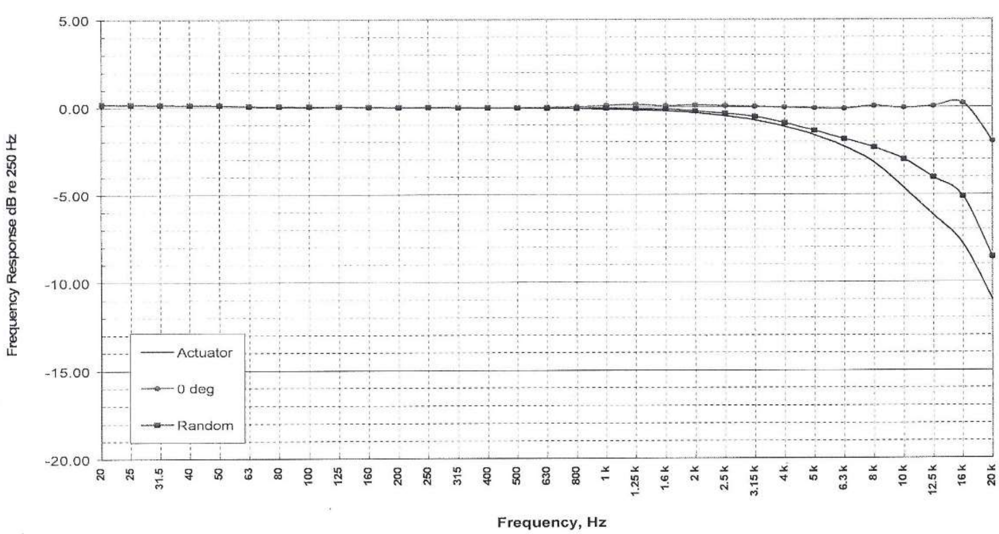
Reference Standards	
Type No.	4134/UA0825
Serial No.	1866523
Calibrated by	DANAK
Cal Date	19 OCT 2022
Due Date	19 OCT 2024

a) Estimated uncertainty of comparison: ± **0.05** dB
b) Estimated uncertainty of reference microphone: ± **0.04** dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± **0.064** dB
d) Expanded uncertainty (coverage factor k = 2 for 95% confidence level): = ± **0.13** dB

Type no.	**4155**
Serial no.	**1138914**
With preamplifier type no.	**N/A**
Preamplifier Serial no.	**N/A**
Submitted by	**AAA, Inc.** **Simi Valley, CA 93065**
Purchase order no.	**Verbal/Michael Bucka**
Asset no.	**104L**

Performance Data		
Open circuit sensitivity at 1,013 hPa, 23°C, 50% RH, 251.2 Hz	**-26.45**	dB re 1 V/Pa
	47.60	mV/Pa
Open circuit correction factor K_o	**0.4**	dB
System sensitivity (with preamplifier) at 251.2 Hz	**N/A**	dB re 1 V/Pa
	N/A	mV/Pa
Correction factor K	**N/A**	dB

Microphone Frequency Response Type 4155
S/N 1138914 : Measured 31 Oct 2023



Calibration performed by

Harold Lynch

Harold Lynch, Service Manager

Condition of Test		
Ambient Pressure	**991.81**	hPa
Temperature	**23**	°C
Relative Humidity	**34**	%
Polarization Voltage	**0**	V
Frequency	**251.2**	Hz
Date of Calibration	**31 OCT 2023**	
Re-calibration due on	**31 OCT 2024**	

ODIN METROLOGY, INC.
3537 OLD CONEJO ROAD, SUITE 108
THOUSAND OAKS, CA 91320
PHONE: (805) 375-0830; FAX: (805) 375-0405

The calibration data is both "as found" and "as final." At the time of calibration this microphone was found to be **within** the manufacturer's specifications. Calibration Procedure: **OM-P-1008-Microphone Rev. 1.2 20130618.**

This calibration is traceable to DANAK/DPLA No. **M2.10-1539-3.1** and through inter-laboratory comparisons to NIST Test Number: **683/289533-17.** *See page 2 Traceability.

Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **28219-1**

Certificate of Calibration for
Brüel & Kjær 1/2" Free-field Microphone

This calibration is performed by comparison with measurement reference standard microphone:

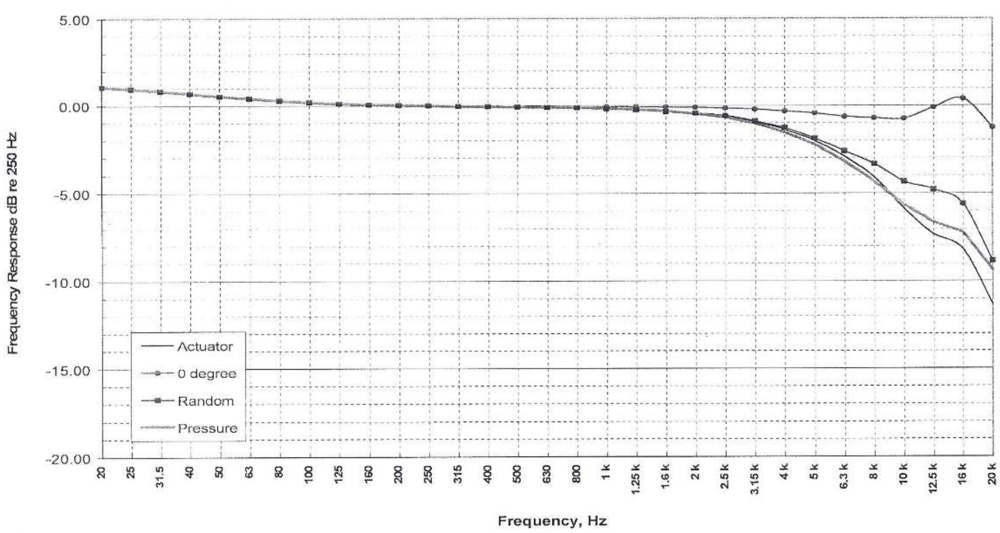
Reference Standards	
Type No.	4134/UA0825
Serial No.	1866523
Calibrated by	DANAK
Cal Date	19 OCT 2022
Due Date	19 OCT 2024

a) Estimated uncertainty of comparison: ± **0.05** dB
b) Estimated uncertainty of reference microphone: ± **0.04** dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± **0.064** dB
d) Expanded uncertainty (coverage factor k = 2 for 95% confidence level): = ± **0.13** dB

Type no.	**4189**
Serial no.	**1931342**
With preamplifier type no.	**N/A**
Preamplifier Serial no.	**N/A**
Submitted by	**AAA, Inc. Simi Valley, CA 93065**
Purchase order no.	**Verbal/Michael Bucka**
Asset no.	**N/A**

Performance Data		
Open circuit sensitivity at 1,013 hPa, 23°C, 50% RH, 251.2 Hz	**-25.77**	dB re 1 V/Pa
	51.49	mV/Pa
Open circuit correction factor K_0	**-0.2**	dB
System sensitivity (with preamplifier) at 251.2 Hz	**N/A**	dB re 1 V/Pa
	N/A	mV/Pa
Correction factor K	**N/A**	dB

Microphone Frequency Response Type 4189
S/N 1931342 : Measured 31 Oct 2023



Calibration performed by

Harold Lynch

Harold Lynch, Service Manager

Condition of Test		
Ambient Pressure	**991.81**	hPa
Temperature	**23**	°C
Relative Humidity	**34**	%
Polarization Voltage	**0**	V
Frequency	**251.2**	Hz
Date of Calibration	**31 OCT 2023**	
Re-calibration due on	**31 OCT 2024**	

ODIN METROLOGY, INC.
3537 OLD CONEJO ROAD, SUITE 108
THOUSAND OAKS, CA 91320
PHONE: (805) 375-0830; FAX: (805) 375-0405

The calibration data is both "as found" and "as final." At the time of calibration this microphone was found to be **within** the manufacturer's specifications. Calibration Procedure: **OM-P-1008-Microphone Rev. 1.2 20130618.**

This calibration is traceable to DANAK/DPLA No. **M2.10-1539-3.1** and through inter-laboratory comparisons to NIST Test Number: **683/289533-17.** *See page 2 Traceability.

Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **28048-6**

Certificate of Calibration for
Brüel & Kjær 1/2" Free-field Microphone

This calibration is performed by comparison with measurement reference standard microphone:

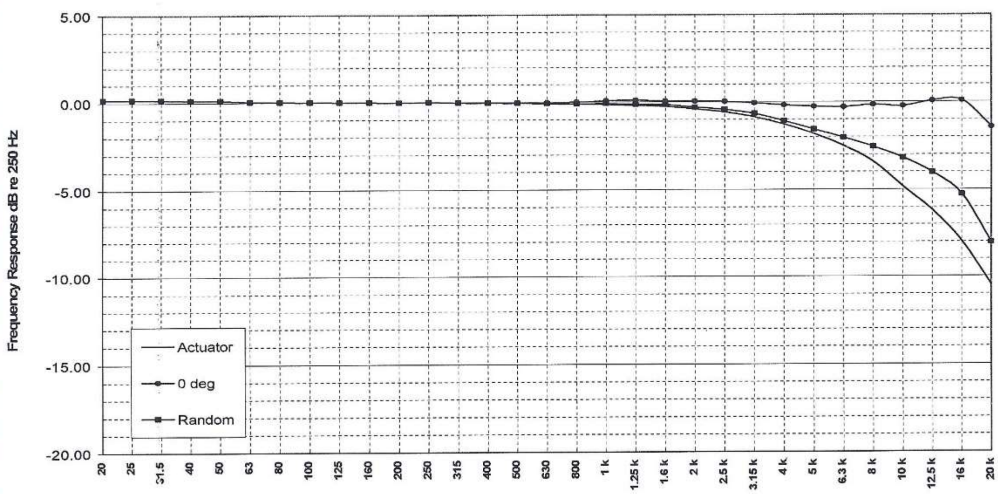
Reference Standards	
Type No.	4134/UA0825
Serial No.	1866523
Calibrated by	DANAK
Cal Date	19 OCT 2022
Due Date	19 OCT 2024

a) Estimated uncertainty of comparison: ± **0.05** dB
b) Estimated uncertainty of reference microphone: ± **0.04** dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± **0.064** dB
d) Expanded uncertainty (coverage factor k = 2 for 95% confidence level): = ± **0.13** dB

Type no.	**4155**
Serial no.	**1769336**
With preamplifier type no.	**N/A**
Preamplifier Serial no.	**N/A**
Submitted by	**AAA, Inc.** **Simi Valley, CA 93065**
Purchase order no.	**Verbal/Michael Bucka**
Asset no.	**102L**

Performance Data		
Open circuit sensitivity at 1,013 hPa, 23°C, 50% RH, 251.2 Hz	**-26.43**	dB re 1 V/Pa
	47.68	mV/Pa
Open circuit correction factor K_o	**0.4**	dB
System sensitivity (with preamplifier) at 251.2 Hz	**N/A**	dB re 1 V/Pa
	N/A	mV/Pa
Correction factor K	**N/A**	dB

Microphone Frequency Response Type 4155
S/N 1769336 : Measured 9 Aug 2023



Calibration performed by

Harold Lynch, Service Manager

Condition of Test		
Ambient Pressure	**987.68**	hPa
Temperature	**23**	°C
Relative Humidity	**44**	%
Polarization Voltage	**0**	V
Frequency	**251.2**	Hz
Date of Calibration	**09 AUG 2023**	
Re-calibration due on	**09 AUG 2024**	

ODIN METROLOGY, INC.
3537 OLD CONEJO ROAD, SUITE 108
THOUSAND OAKS, CA 91320
PHONE: (805) 375-0830; FAX: (805) 375-0405

The calibration data is both "as found" and "as final." At the time of calibration this microphone was found to be **within** the manufacturer's specifications.
Calibration Procedure: **OM-P-1008-Microphone Rev. 1.2 20130618.**

This calibration is traceable to DANAK/DPLA No. **M2.10-1539-3.1** and through inter-laboratory comparisons to NIST Test Number: **683/289533-17.** *See page 2 Traceability.

Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **28048-7**

Certificate of Calibration for
Brüel & Kjær 1/2" Free-field Microphone

This calibration is performed by comparison with measurement reference standard microphone:

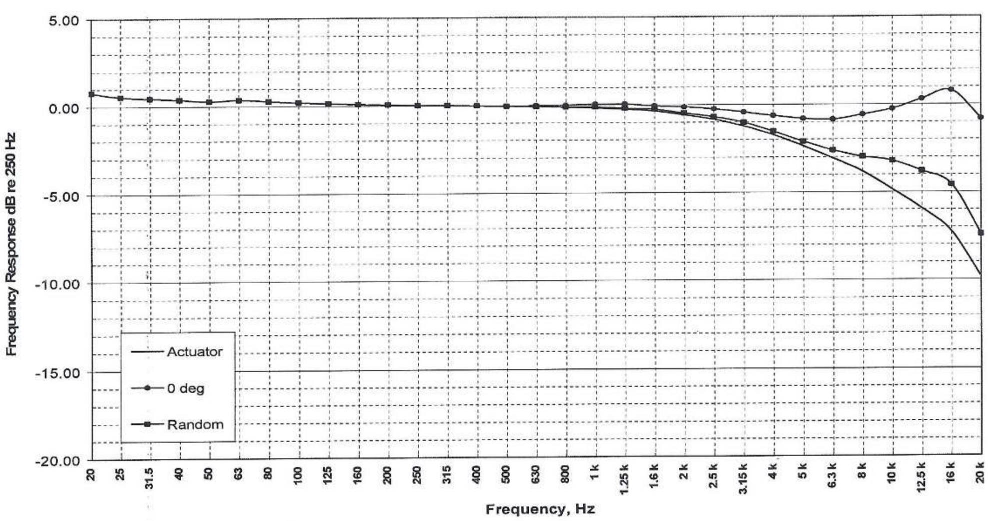
REFERENCE STANDARDS	
Type No.	4134/UA0825
Serial No.	1866523
Calibrated by	DANAK
Cal Date	19 OCT 2022
Due Date	19 OCT 2024

a) Estimated uncertainty of comparison: ± **0.05** dB
b) Estimated uncertainty of reference microphone: ± **0.04** dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± **0.064** dB
d) Expanded uncertainty (coverage factor k = 2 for 95% confidence level): = ± **0.13** dB

Type no.	**4155**
Serial no.	**1769342**
With preamplifier type no.	**N/A**
Preamplifier Serial no.	**N/A**
Submitted by	**AAA, Inc.** **Simi Valley, CA 93065**
Purchase order no.	**Verbal/Michael Bucka**
Asset no.	**102R**

PERFORMANCE DATA		
Open circuit sensitivity at 1,013 hPa, 23°C, 50% RH, 251.2 Hz	**-27.07**	dB re 1 V/Pa
	44.32	mV/Pa
Open circuit correction factor K_o	**1.1**	dB
System sensitivity (with preamplifier) at 251.2 Hz	**N/A**	dB re 1 V/Pa
	N/A	mV/Pa
Correction factor K	**N/A**	dB

Microphone Frequency Response Type 4155
S/N 1769342 : Measured 9 Aug 2023



Calibration performed by

Harold Lynch, Service Manager

CONDITION OF TEST		
Ambient Pressure	**987.68**	hPa
Temperature	**23**	°C
Relative Humidity	**44**	%
Polarization Voltage	**0**	V
Frequency	**251.2**	Hz
Date of Calibration	**09 AUG 2023**	
Re-calibration due on	**09 AUG 2024**	

ODIN METROLOGY, INC.
3537 OLD CONEJO ROAD, SUITE 108
THOUSAND OAKS, CA 91320
PHONE: (805) 375-0830; FAX: (805) 375-0405

The calibration data is both "as found" and "as final." At the time of calibration this microphone was found to be **within** the manufacturer's specifications. Calibration Procedure: **OM-P-1008-Microphone Rev. 1.2 20130618.**

This calibration is traceable to DANAK/DPLA No. **M2.10-1539-3.1** and through inter-laboratory comparisons to NIST Test Number: **683/289533-17.** *See page 2 Traceability.

Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **28048-11**

Certificate of Calibration for Brüel & Kjær Sound Level Calibrator

This calibration is performed by comparison with measurement reference standard pistonphones:

Type No.	4228	4228
Serial No.	1793011	1504084
Calibrated by	HL	HL
Cal Date	30 NOV 2022	30 NOV 2022
Due Date	30 NOV 2023	30 NOV 2023

a) Estimated uncertainty of comparison: ± **0.05** dB
b) Estimated uncertainty of calibration service for standard pistonphone: ± **0.06** dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± **0.08** dB
d) Expanded uncertainty (coverage factor *k* = 2 for 95% confidence level): = ± **0.16** dB

This acoustic calibrator has been calibrated using standards with values traceable to the National Institute of Standards and Technology. This calibration is traceable to NIST Test Number **683/289533-17.**

Condition of Test		
Ambient Pressure	**987.68**	hPa
Temperature	**23**	°C
Relative Humidity	**44**	%
Date of Calibration	**09 AUG 2023**	
Re-calibration due on	**09 AUG 2024**	

The calibration of this acoustic calibrator was performed using a test system conforming to the requirements of ANSI/NCSLZ540-1, 1994, ISO 17025, and ISO 9001:2015, Certification NQA No. 11252.

Calibration procedure: **OM-P-1001-Acoustic_Calibrator, Rev. 1.0 20130522.**

Calibration performed by Harold Lynch

Harold Lynch, Service Manager

Calibrator type **4231**
Serial no. **3013421**
Submitted by **AAA, Inc.**
Simi Valley, CA 93065
Purchase order no. **Verbal/Michael Bucka**
Asset no. **101**

This calibrator has been found to perform **within** the specifications listed below at the normalized conditions stated.

SPL produced in coupler terminated by a loading volume of 1.333 cm^3	94.0 ± 0.2 dB
Level Step	20 ± 0.1 dB
Frequency	1,000 Hz ± 0.1%
Distortion	< 1%
At 1,013 hPa, 23°C, and 65% relative humidity	

Performance as Received		
Frequency	**1000.0**	Hz
SPL	**93.99**	dB
SPL+20 dB	**114.00**	dB
Distortion	**0.3**	%
Battery Voltage	**1.45**	V

Was repair or adjustment performed? **No**
Were parts replaced? **No**
Were batteries replaced? **Yes**

Final Performance		
Frequency	**1000.0**	Hz
SPL	**93.99**	dB
SPL+20 dB	**114.00**	dB
Distortion	**0.3**	%

Note: This calibrator was **within** manufacturer's specifications as received.

ODIN METROLOGY, INC.
3537 OLD CONEJO ROAD, SUITE 108
THOUSAND OAKS, CA 91320
PHONE: (805) 375-0830; FAX: (805) 375-0405

Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **28048-9**

Certificate of Calibration for Brüel & Kjær Sound Level Calibrator

This calibration is performed by comparison with measurement reference standard pistonphones:

Type No.	4228	4228
Serial No.	1793011	1504084
Calibrated by	HL	HL
Cal Date	30 NOV 2022	30 NOV 2022
Due Date	30 NOV 2023	30 NOV 2023

a) Estimated uncertainty of comparison: ± **0.05** dB
b) Estimated uncertainty of calibration service for standard pistonphone: ± **0.06** dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± **0.08** dB
d) Expanded uncertainty (coverage factor k = 2 for 95% confidence level): = ± **0.16** dB

This acoustic calibrator has been calibrated using standards with values traceable to the National Institute of Standards and Technology. This calibration is traceable to NIST Test Number **683/289533-17.**

Condition of Test		
Ambient Pressure	**987.68**	hPa
Temperature	**23**	°C
Relative Humidity	**44**	%
Date of Calibration	**09 AUG 2023**	
Re-calibration due on	**09 AUG 2024**	

The calibration of this acoustic calibrator was performed using a test system conforming to the requirements of ANSI/NCSLZ540-1, 1994, ISO 17025, and ISO 9001:2015, Certification NQA No. 11252.

Calibration procedure: **OM-P-1001-Acoustic_Calibrator, Rev. 1.0 20130522.**

Calibration performed by Harold Lynch

Harold Lynch, Service Manager

Calibrator type	**4231**
Serial no.	**2313397**
Submitted by	**AAA, Inc.**
	Simi Valley, CA 93065
Purchase order no.	**Verbal/Michael Bucka**
Asset no.	**102**

This calibrator has been found to perform **within** the specifications listed below at the normalized conditions stated.

SPL produced in coupler terminated by a loading volume of 1.333 cm^3	94.0 ± 0.2 dB
Level Step	20 ± 0.1 dB
Frequency	1,000 Hz ± 0.1%
Distortion	< 1%
At 1,013 hPa, 23°C, and 65% relative humidity	

Performance as Received		
Frequency	**1000.0**	Hz
SPL	**94.02**	dB
SPL+20 dB	**114.04**	dB
Distortion	**0.3**	%
Battery Voltage	**1.45**	V

Was repair or adjustment performed?	**No**
Were parts replaced?	**No**
Were batteries replaced?	**Yes**

Final Performance		
Frequency	**1000.0**	Hz
SPL	**94.02**	dB
SPL+20 dB	**114.04**	dB
Distortion	**0.3**	%

Note: This calibrator was **within** manufacturer's specifications as received.

Odin Metrology, Inc.
3537 Old Conejo Road, Suite 108
Thousand Oaks, CA 91320
Phone: (805) 375-0830; Fax: (805) 375-0405

Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **28048-10**

Certificate of Calibration for
Brüel & Kjær Sound Level Calibrator

This calibration is performed by comparison with measurement reference standard pistonphones:

Type No.	4228	4228
Serial No.	1793011	1504084
Calibrated by	HL	HL
Cal Date	30 NOV 2022	30 NOV 2022
Due Date	30 NOV 2023	30 NOV 2023

a) Estimated uncertainty of comparison: ± **0.05** dB
b) Estimated uncertainty of calibration service for standard pistonphone: ± **0.06** dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± **0.08** dB
d) Expanded uncertainty (coverage factor k = 2 for 95% confidence level): = ± **0.16** dB

This acoustic calibrator has been calibrated using standards with values traceable to the National Institute of Standards and Technology. This calibration is traceable to NIST Test Number **683/289533-17.**

Condition of Test		
Ambient Pressure	**987.68**	hPa
Temperature	**23**	°C
Relative Humidity	**44**	%
Date of Calibration	**09 AUG 2023**	
Re-calibration due on	**09 AUG 2024**	

The calibration of this acoustic calibrator was performed using a test system conforming to the requirements of ANSI/NCSLZ540-1, 1994, ISO 17025, and ISO 9001:2015, Certification NQA No. 11252.

Calibration procedure: **OM-P-1001-Acoustic_Calibrator, Rev. 1.0 20130522.**

Calibration performed by Harold Lynch

Harold Lynch, Service Manager

Calibrator type **4231**
Serial no. **2422752**
Submitted by **AAA, Inc.**
Simi Valley, CA 93065
Purchase order no. **Verbal/Michael Bucka**
Asset no. **103**

This calibrator has been found to perform **within** the specifications listed below at the normalized conditions stated.

SPL produced in coupler terminated by a loading volume of 1.333 cm^3	94.0 ± 0.2 dB
Level Step	20 ± 0.1 dB
Frequency	1,000 Hz ± 0.1%
Distortion	< 1%
At 1,013 hPa, 23°C, and 65% relative humidity	

Performance as Received		
Frequency	**1000.0**	Hz
SPL	**94.03**	dB
SPL+20 dB	**114.04**	dB
Distortion	**0.3**	%
Battery Voltage	**1.67**	V

Was repair or adjustment performed? **No**
Were parts replaced? **No**
Were batteries replaced? **No**

Final Performance		
Frequency	**1000.0**	Hz
SPL	**94.03**	dB
SPL+20 dB	**114.04**	dB
Distortion	**0.3**	%

Note: This calibrator was **within** manufacturer's specifications as received.

ODIN METROLOGY, INC.
3537 OLD CONEJO ROAD, SUITE 108
THOUSAND OAKS, CA 91320
PHONE: (805) 375-0830; FAX: (805) 375-0405

103R SYSTEM FREQUENCY SWEEPS
Aug 2023

1/3 OB FREQ, Hz	ACTUATOR MIC CORR 09 Aug 2023 4155 #1393890	WIND SCREEN	90 DEG CORR	mic corr 103R0822.M	SYS 103R ELEC CORR	TOTAL CORR 103R0822.SYS	
50	0.1	0.0	0.0	0.1	0.0	0.1	
63	0.1	0.0	0.0	0.1	0.0	0.1	63
80	0.1	0.0	0.0	0.1	0.0	0.1	
100	0.0	0.0	0.0	0.0	0.0	0.0	
125	0.0	0.0	0.0	0.0	0.0	0.0	125
160	0.0	0.0	0.0	0.0	0.0	0.0	
200	0.0	0.0	0.0	0.0	0.0	0.0	
250	0.0	0.0	0.0	0.0	0.0	0.0	250
315	-0.0	0.0	0.0	-0.0	0.0	-0.0	
400	-0.0	0.0	0.0	-0.0	0.0	-0.0	
500	-0.0	-0.1	0.0	-0.1	0.0	-0.1	500
630	-0.1	-0.2	0.0	-0.3	0.0	-0.3	
800	-0.1	-0.3	0.0	-0.4	0.0	-0.4	
1000	-0.1	-0.3	0.0	-0.4	0.0	-0.4	1000
1250	-0.2	-0.4	0.0	-0.6	0.0	-0.6	
1600	-0.3	-0.6	0.0	-0.9	0.0	-0.9	
2000	-0.4	-0.7	0.0	-1.1	0.0	-1.1	2000
2500	-0.6	-0.8	0.0	-1.4	0.0	-1.4	
3150	-0.8	-0.7	0.0	-1.5	0.0	-1.5	
4000	-1.2	-0.3	0.0	-1.5	0.0	-1.5	4000
5000	-1.7	0.5	0.0	-1.2	0.0	-1.2	
6300	-2.4	0.4	0.0	-2.0	0.0	-2.0	
8000	-3.3	-3.4	-0.4	-7.2	0.0	-7.2	8000
10000	-4.8	0.9	-1.0	-4.9	0.0	-4.9	

103L SYSTEM FREQUENCY SWEEPS
AUG 2023

1/3 OB FREQ, Hz	ACTUATOR MIC CORR 09 Aug 2023 4155 #1567765	WIND SCREEN	90 DEG CORR	mic corr 103L0822.I	SYS 103L ELEC CORR	TOTAL CORR 103L0822.SYS	
50	0.1	0.0	0.0	0.1	-0.1	0.0	
63	0.1	0.0	0.0	0.1	-0.1	-0.0	63
80	0.1	0.0	0.0	0.1	0.0	0.1	
100	0.1	0.0	0.0	0.1	0.0	0.1	
125	0.1	0.0	0.0	0.1	-0.2	-0.1	125
160	0.0	0.0	0.0	0.0	-0.1	-0.1	
200	0.0	0.0	0.0	0.0	0.0	0.0	
250	0.0	0.0	0.0	0.0	0.0	0.0	250
315	0.0	0.0	0.0	0.0	-0.1	-0.1	
400	0.0	0.0	0.0	0.0	0.0	0.0	
500	-0.0	-0.1	0.0	-0.1	0.0	-0.1	500
630	-0.0	-0.2	0.0	-0.2	0.0	-0.2	
800	-0.0	-0.3	0.0	-0.3	0.0	-0.3	
1000	-0.1	-0.3	0.0	-0.4	0.1	-0.3	1000
1250	-0.1	-0.4	0.0	-0.5	0.1	-0.4	
1600	-0.1	-0.6	0.0	-0.7	0.0	-0.7	
2000	-0.2	-0.7	0.0	-0.9	0.1	-0.8	2000
2500	-0.3	-0.8	0.0	-1.1	0.0	-1.1	
3150	-0.4	-0.7	0.0	-1.1	0.0	-1.1	
4000	-0.7	-0.3	0.0	-1.0	0.0	-1.0	4000
5000	-1.1	0.5	0.0	-0.6	0.0	-0.6	
6300	-1.7	0.4	0.0	-1.3	0.1	-1.1	
8000	-2.7	0.3	-0.4	-2.8	0.0	-2.8	8000
10000	-4.4	0.9	-1.0	-4.5	0.0	-4.5	

104L SYSTEM FREQUENCY SWEEPS
AUG 2023

1/3 OB FREQ, Hz	ACTUATOR MIC CORR 31 Oct 2023 4155 #1138914	WIND SCREEN	90 DEG CORR	mic corr 103L0822.M	SYS 104L ELEC CORR	TOTAL CORR 104L1023.SYS	
50	0.1	0.0	0.0	0.1	-0.1	0.0	
63	0.1	0.0	0.0	0.1	-0.1	-0.0	63
80	0.1	0.0	0.0	0.1	0.0	0.1	
100	0.0	0.0	0.0	0.0	0.0	0.0	
125	0.0	0.0	0.0	0.0	-0.2	-0.2	125
160	0.0	0.0	0.0	0.0	-0.1	-0.1	
200	0.0	0.0	0.0	0.0	0.0	0.0	
250	0.0	0.0	0.0	0.0	0.0	0.0	250
315	-0.0	0.0	0.0	-0.0	-0.1	-0.1	
400	-0.0	0.0	0.0	-0.0	0.0	-0.0	
500	-0.0	-0.1	0.0	-0.1	0.0	-0.1	500
630	-0.1	-0.2	0.0	-0.3	0.0	-0.3	
800	-0.1	-0.3	0.0	-0.4	0.0	-0.4	
1000	-0.1	-0.3	0.0	-0.4	0.1	-0.3	1000
1250	-0.2	-0.4	0.0	-0.6	0.1	-0.4	
1600	-0.2	-0.6	0.0	-0.8	0.0	-0.8	
2000	-0.3	-0.7	0.0	-1.0	0.1	-0.9	2000
2500	-0.5	-0.8	0.0	-1.3	0.0	-1.3	
3150	-0.8	-0.7	0.0	-1.5	0.0	-1.5	
4000	-1.1	-0.3	0.0	-1.4	0.0	-1.4	4000
5000	-1.6	0.5	0.0	-1.1	0.0	-1.1	
6300	-2.3	0.4	0.0	-1.9	0.1	-1.8	
8000	-3.2	0.3	-0.4	-3.3	0.0	-3.3	8000
10000	-4.7	0.9	-1.0	-4.8	0.0	-4.8	

102L SYSTEM FREQUENCY SWEEPS
AUG 2023

1/3 OB FREQ, Hz	ACTUATOR MIC CORR 8 AUG 2023 4155 #1769336	WIND SCREEN	90 DEG CORR	mic corr 102L0823.M	SYS 102L ELEC CORR	TOTAL CORR 102L0823.SYS	
50	0.1	0.0	0.0	0.1	-0.1	0.0	
63	0.0	0.0	0.0	0.0	-0.1	-0.1	63
80	0.0	0.0	0.0	0.0	0.0	0.0	
100	0.0	0.0	0.0	0.0	0.0	0.0	
125	0.0	0.0	0.0	0.0	-0.2	-0.2	125
160	0.0	0.0	0.0	0.0	-0.1	-0.1	
200	-0.0	0.0	0.0	-0.0	0.0	-0.0	
250	0.0	0.0	0.0	0.0	0.0	0.0	250
315	-0.0	0.0	0.0	-0.0	-0.1	-0.1	
400	-0.0	0.0	0.0	-0.0	0.0	-0.0	
500	-0.1	-0.1	0.0	-0.2	0.0	-0.2	500
630	-0.1	-0.2	0.0	-0.3	0.0	-0.3	
800	-0.1	-0.3	0.0	-0.4	0.0	-0.4	
1000	-0.1	-0.3	0.0	-0.4	0.1	-0.3	1000
1250	-0.2	-0.4	0.0	-0.6	0.1	-0.5	
1600	-0.3	-0.6	0.0	-0.9	0.0	-0.9	
2000	-0.4	-0.7	0.0	-1.1	0.1	-1.0	2000
2500	-0.6	-0.8	0.0	-1.4	0.0	-1.4	
3150	-0.9	-0.7	0.0	-1.6	0.0	-1.6	
4000	-1.3	-0.3	0.0	-1.6	0.0	-1.6	4000
5000	-1.8	0.5	0.0	-1.3	0.0	-1.3	
6300	-2.5	0.4	0.0	-2.1	0.1	-2.0	
8000	-3.4	0.3	-0.4	-3.5	0.0	-3.5	8000
10000	-4.9	0.9	-1.0	-5.0	0.0	-5.0	

102R SYSTEM FREQUENCY SWEEPS
AUG 2023

1/3 OB FREQ, Hz	ACTUATOR MIC CORR 8 AUG 2023 4155 #1769342	WIND SCREEN	90 DEG CORR	mic corr 102R0823.I	SYS 102R ELEC CORR	TOTAL CORR 102R0823.SYS	
50	0.3	0.0	0.0	0.3	-0.1	0.2	
63	0.4	0.0	0.0	0.4	-0.1	0.3	63
80	0.3	0.0	0.0	0.3	0.0	0.3	
100	0.2	0.0	0.0	0.2	0.0	0.2	
125	0.2	0.0	0.0	0.2	-0.2	-0.0	125
160	0.1	0.0	0.0	0.1	-0.1	0.0	
200	0.0	0.0	0.0	0.0	0.0	0.0	
250	0.0	0.0	0.0	0.0	0.0	0.0	250
315	0.0	0.0	0.0	0.0	-0.1	-0.1	
400	-0.0	0.0	0.0	-0.0	0.0	-0.0	
500	-0.0	-0.1	0.0	-0.1	0.0	-0.1	500
630	-0.1	-0.2	0.0	-0.3	0.0	-0.3	
800	-0.1	-0.3	0.0	-0.4	0.0	-0.4	
1000	-0.2	-0.3	0.0	-0.5	0.1	-0.4	1000
1250	-0.3	-0.4	0.0	-0.7	0.1	-0.5	
1600	-0.4	-0.6	0.0	-1.0	0.0	-1.0	
2000	-0.6	-0.7	0.0	-1.3	0.1	-1.2	2000
2500	-0.9	-0.8	0.0	-1.7	0.0	-1.7	
3150	-1.2	-0.7	0.0	-1.9	0.0	-1.9	
4000	-1.7	-0.3	0.0	-2.0	0.0	-2.0	4000
5000	-2.4	0.5	0.0	-1.9	0.0	-1.9	
6300	-3.1	0.4	0.0	-2.7	0.1	-2.6	
8000	-3.8	0.3	-0.4	-3.9	0.0	-3.9	8000
10000	-4.9	0.9	-1.0	-5.0	0.0	-5.0	

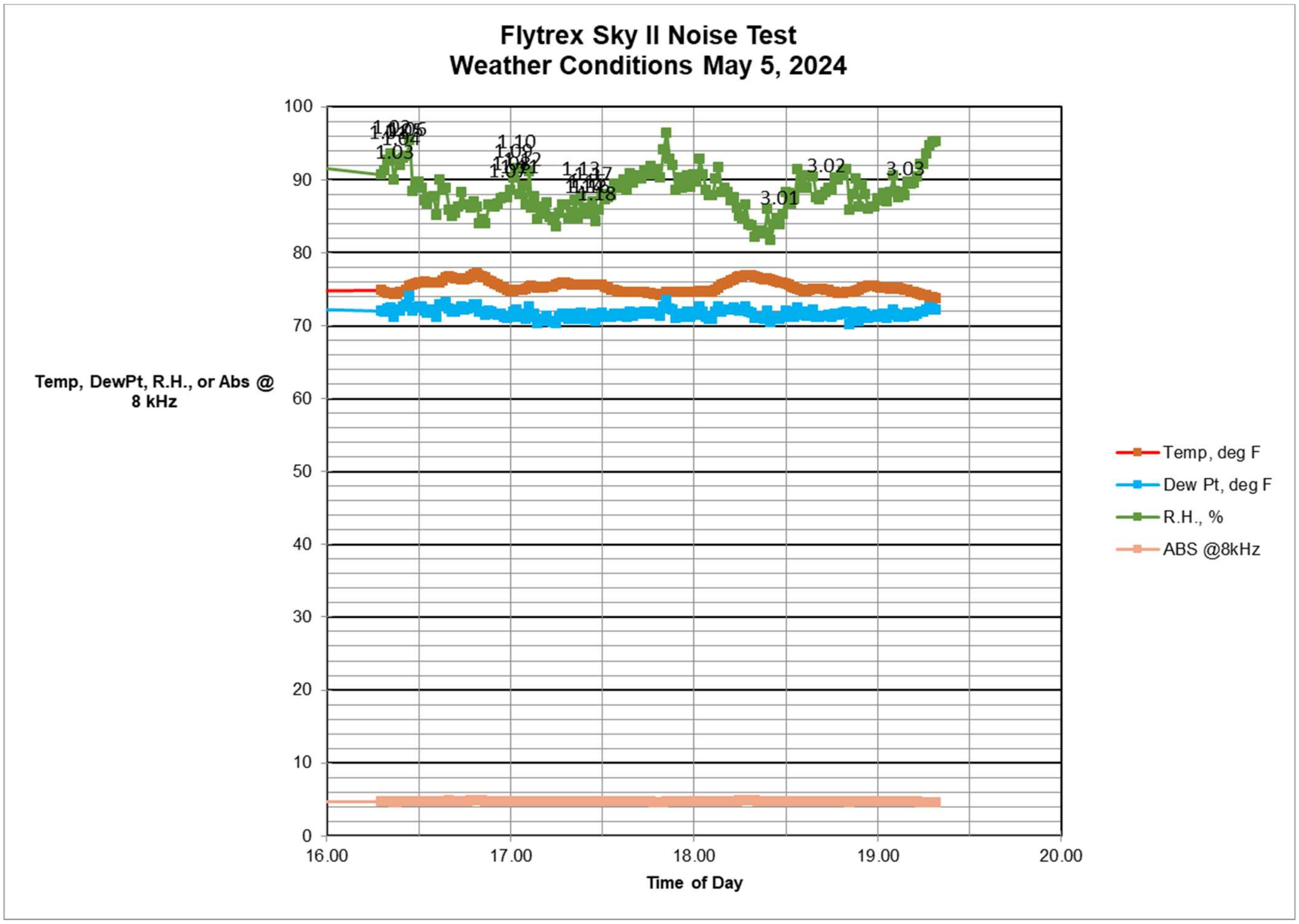
104R SYSTEM FREQUENCY SWEEPS
AUG 2023

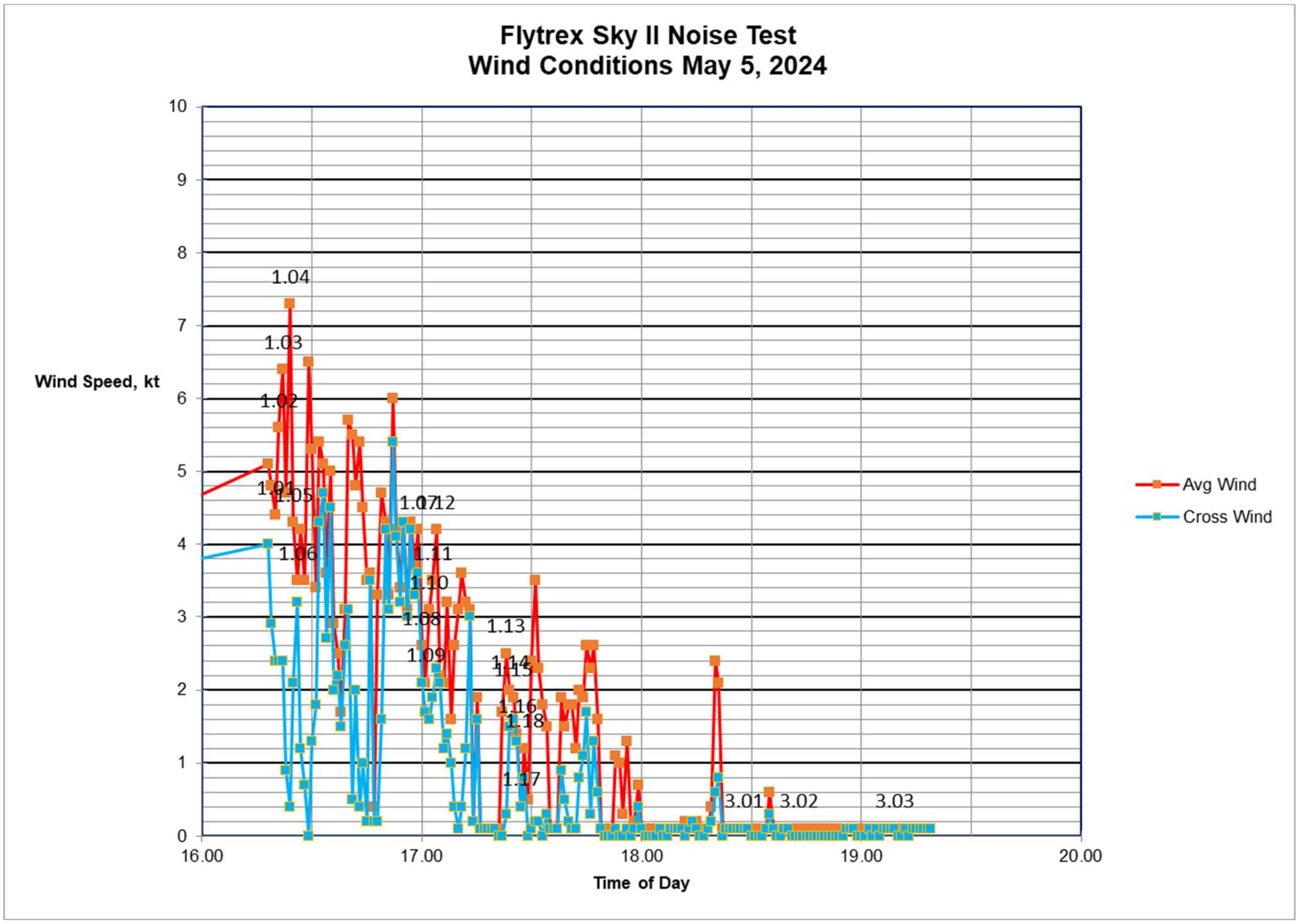
1/3 OB FREQ, Hz	ACTUATOR MIC CORR 8 AUG 2023 4155 #1931342	WIND SCREEN	90 DEG CORR	mic corr 104R0823.I	SYS 104R ELEC CORR	TOTAL CORR 104R0823.SYS	
50	0.6	0.0	0.0	0.6	-0.1	0.5	
63	0.4	0.0	0.0	0.4	-0.1	0.3	63
80	0.3	0.0	0.0	0.3	0.0	0.3	
100	0.3	0.0	0.0	0.3	0.0	0.3	
125	0.2	0.0	0.0	0.2	-0.2	0.0	125
160	0.1	0.0	0.0	0.1	-0.1	-0.0	
200	0.0	0.0	0.0	0.0	0.0	0.0	
250	-0.0	0.0	0.0	-0.0	0.0	-0.0	250
315	-0.0	0.0	0.0	-0.0	-0.1	-0.1	
400	-0.1	0.0	0.0	-0.1	0.0	-0.1	
500	-0.1	-0.1	0.0	-0.2	0.0	-0.2	500
630	-0.1	-0.2	0.0	-0.3	0.0	-0.3	
800	-0.1	-0.3	0.0	-0.4	0.0	-0.4	
1000	-0.2	-0.3	0.0	-0.5	0.1	-0.4	1000
1250	-0.2	-0.4	0.0	-0.6	0.1	-0.5	
1600	-0.3	-0.6	0.0	-0.9	0.0	-0.9	
2000	-0.5	-0.7	0.0	-1.2	0.1	-1.1	2000
2500	-0.7	-0.8	0.0	-1.5	0.0	-1.5	
3150	-0.9	-0.7	0.0	-1.6	0.0	-1.6	
4000	-1.4	-0.3	0.0	-1.7	0.0	-1.7	4000
5000	-2.0	0.5	0.0	-1.5	0.0	-1.5	
6300	-2.9	0.4	0.0	-2.5	0.1	-2.4	
8000	-4.2	0.3	-0.4	-4.3	0.0	-4.3	8000
10000	-5.9	0.9	-1.0	-6.0	0.0	-6.0	

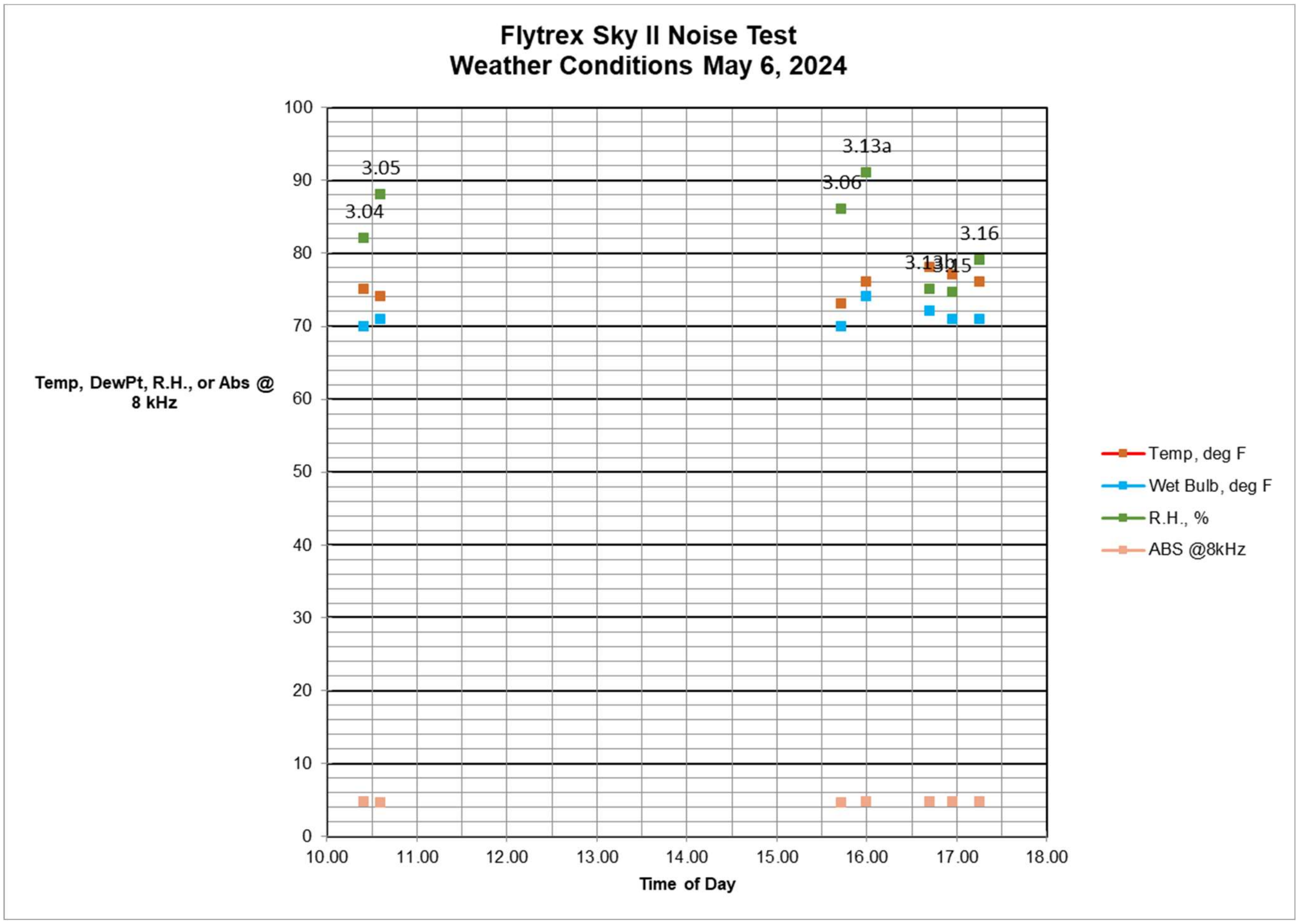
APPENDIX B

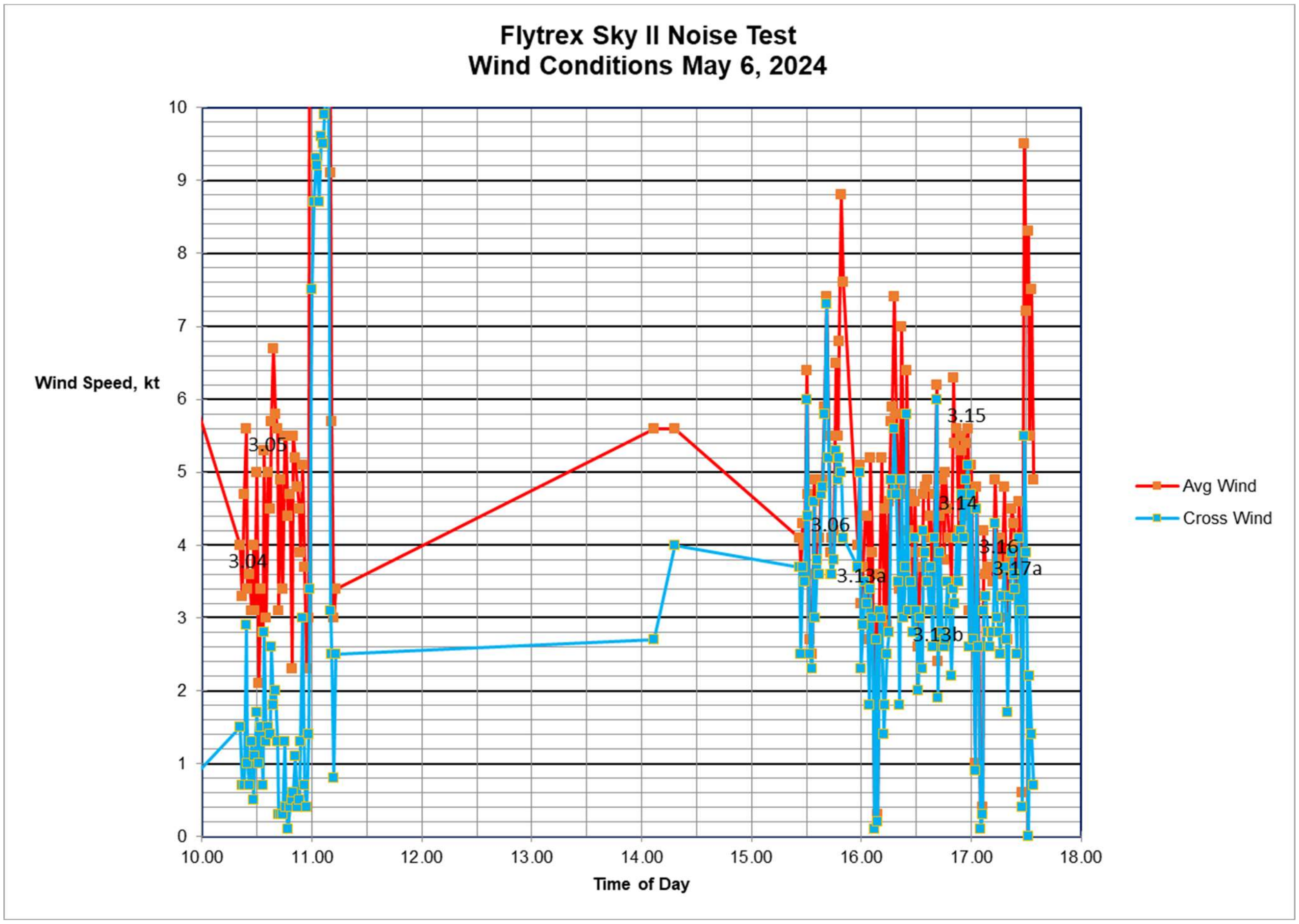
NOISE TEST WEATHER DATA

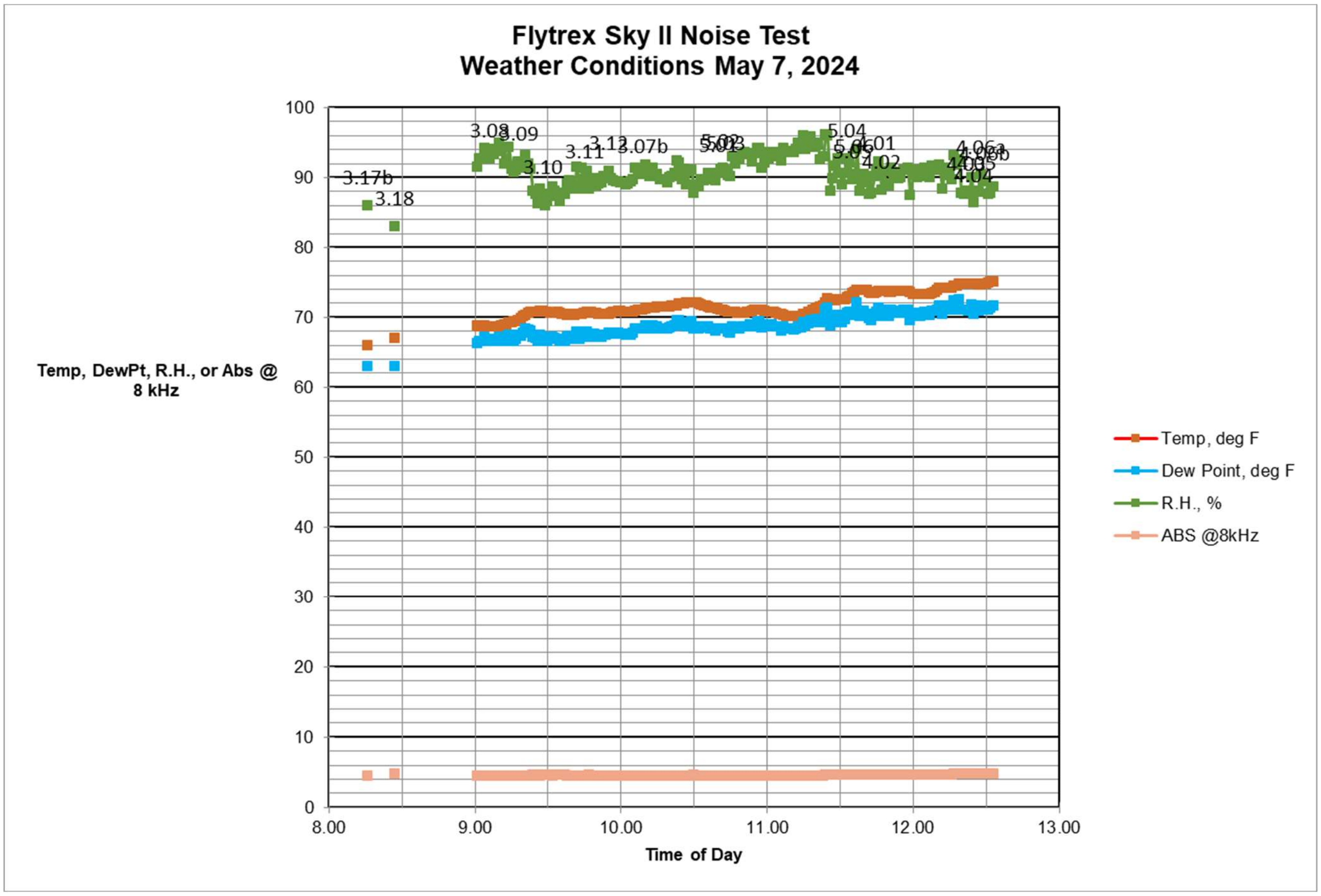
This Appendix contains the ground weather data measured at one-minute intervals during the Flytrex Sky II noise test program as measured at 10 feet above ground. Temperature and dew point are measured; relative humidity and absorption at 8 kHz are computed. On May 6 and part of May 7, the dew point hygrometer was inoperative so a dry bulb/wet bulb psychrometer was used to determine relative humidity during such times.

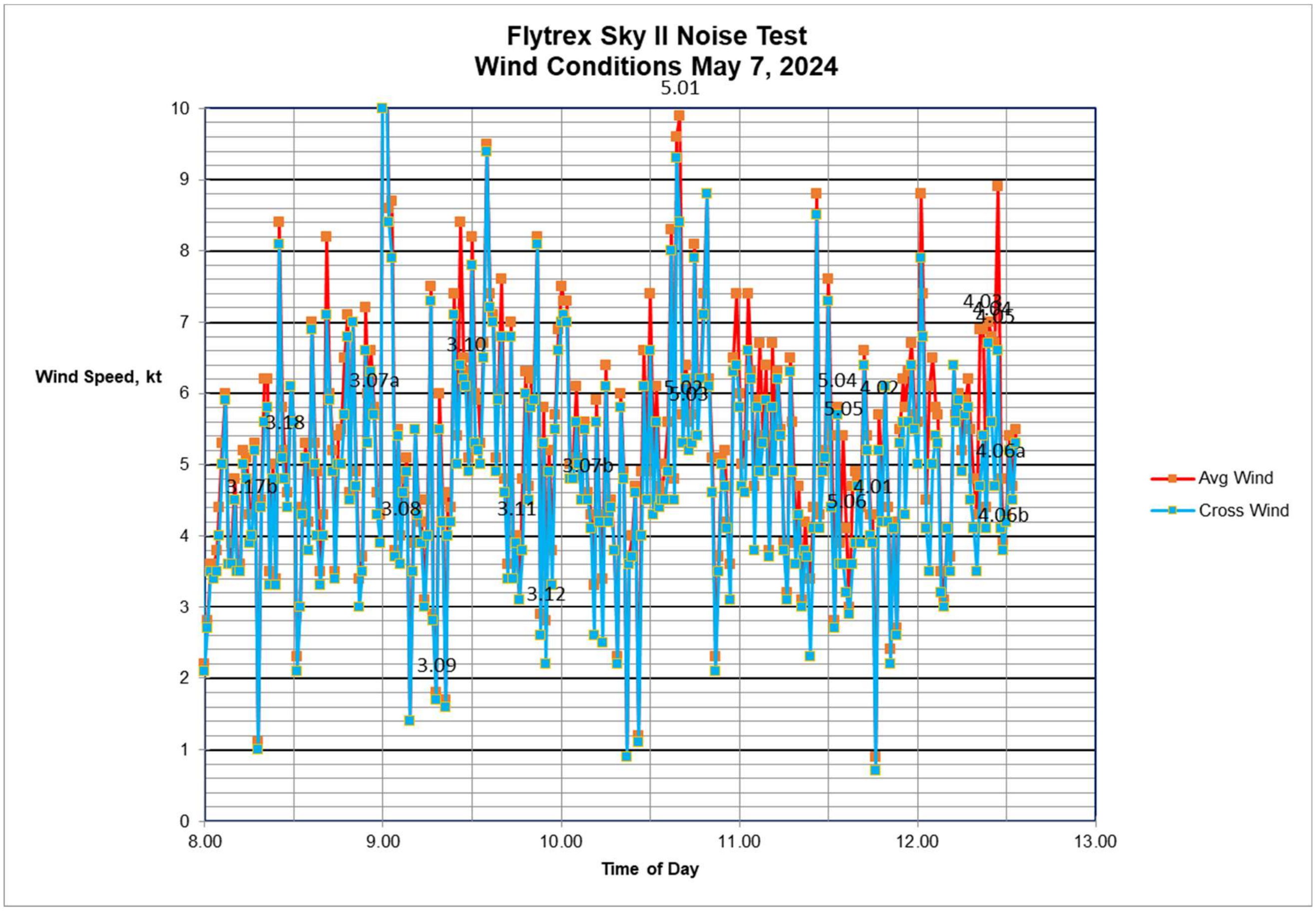

Flytrex Sky II Noise Test
Weather Conditions May 5, 2024
Temp, DewPt, R.H., or Abs @ 8 kHz
100
90
80
70
60
50
40
30
20
10
0
16.00
17.00
18.00
19.00
20.00
Time of Day
1.03
1.10
1.18
3.01
3.02
3.03
Temp, deg F
Dew Pt, deg F
R.H., %
ABS @8kHz


Flytrex Sky II Noise Test
Wind Conditions May 5, 2024
Wind Speed, kt
Time of Day
Avg Wind
Cross Wind
0
1
2
3
4
5
6
7
8
9
10
16.00
17.00
18.00
19.00
20.00
1.01
1.02
1.03
1.04
1.05
1.06
1.07
1.08
1.09
1.10
1.11
1.12
1.13
1.14
1.15
1.16
1.17
1.18
3.01
3.02
3.03


Flytrex Sky II Noise Test
Weather Conditions May 6, 2024
Temp, DewPt, R.H., or Abs @ 8 kHz
Time of Day
3.04
3.05
3.06
3.13a
3.13b
3.15
3.16
Temp, deg F
Wet Bulb, deg F
R.H., %
ABS @8kHz
100
90
80
70
60
50
40
30
20
10
0
10.00
11.00
12.00
13.00
14.00
15.00
16.00
17.00
18.00


Flytrex Sky II Noise Test
Wind Conditions May 6, 2024
Wind Speed, kt
Time of Day
Avg Wind
Cross Wind
3.04
3.05
3.06
3.13a
3.13b
3.14
3.15
3.16
3.17a
0
1
2
3
4
5
6
7
8
9
10
10.00
11.00
12.00
13.00
14.00
15.00
16.00
17.00
18.00


Flytrex Sky II Noise Test
Weather Conditions May 7, 2024
Temp, DewPt, R.H., or Abs @ 8 kHz
Time of Day
3.17b
3.18
3.08
3.09
3.10
3.11
3.12
3.07b
5.02
5.03
5.04
5.06
5.01
4.01
4.02
4.06a
4.06b
4.03
4.05
4.04
Temp, deg F
Dew Point, deg F
R.H., %
ABS @8kHz


Flytrex Sky II Noise Test
Wind Conditions May 7, 2024
Wind Speed, kt
Time of Day
Avg Wind
Cross Wind
5.01
3.17b
3.18
3.07a
3.08
3.09
3.10
3.11
3.12
3.07b
5.02
5.03
5.04
5.05
5.06
4.01
4.02
4.03
4.04
4.05
4.06a
4.06b
0
1
2
3
4
5
6
7
8
9
10
8.00
9.00
10.00
11.00
12.00
13.00

APPENDIX C

NOISE TEST UAS DATA

This Appendix contains the flight data log of Sound Exposure Level for each in-flight noise data run. Also given are the GPS data for the enroute, takeoff-pickup-delivery-landing, and hover noise tests.

SEL metric

			1.01	1.02	1.03	1.04	1.05	1.06
			Enroute	Enroute	Enroute	Enroute	Enroute	Enroute
			FULL	FULL	FULL	FULL	FULL	FULL
Pos	Dist	Ambient	Nbound	Sbound	Nbound	Sbound	Nbound	Sbound
C1	0		72.6	73.2	72.8	72.8	72.4	73.7
S1	50		72.6	73.3	72.5	72.8	72.3	73.8
S2	100		72	72.7	72.3	72.6	72.2	73.6
S3	200		68.6	69.2	68.9	69.3	68.8	70.1
S4	400		62.9	63.8	64.4	63.4	65.1	64.8
S5	800		56.3	55.9	62.9	-----	-----	63.8

			2.01	2.02	2.03	2.04	2.05	2.06	2.07	2.08	2.09	2.10	2.11	2.12
			Enroute	Enroute	Enroute	Enroute	Enroute	Enroute	Enroute	Enroute	Enroute	Enroute	Enroute	Enroute
			EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY
Pos	Dist	Ambient	Nbound	Sbound	Nbound	Sbound	Nbound	Sbound	Nbound	Sbound	Nbound	Sbound	Nbound	Sbound
C1	0		67.6	71	68.1	68.6	67.6	68.3	68.8	67.9	67.5	68.4	69	69.2
S1	50		67.1	70.8	67.6	68.4	67	68		67.7	67.3	68.2	68.3	68.8
S2	100		66.7	70.6	67.4	68.1	67	68.2	68.3	67.5	67	68	67.9	68.7
S3	200		63.2	67.7	63.8	65.3	63.8	68.7	65.6	64.8	64.4	64.9	65.2	65
S4	400		62.6	60.3	62.8	59	61.5	59.9	59.7	59.7	60.1	59.5	60.6	58.9
S5	800		57	57.3	55.4	57.1	50.8	56.8	51.9	53.7	54.9	53.7	55.4	52.6

			3.01				3.02				3.03				3.04			
			Undertrak	Undertrak	Undertrak	Undertrak	Undertrak	Undertrak	Undertrak	Undertrak	Undertrak	Undertrak	Undertrak	Undertrak	Undertrak	Undertrak	Undertrak	Undertrak
Pos	Dist	Ambient	Takeoff	In Del.	Out Del.	Landing	Takeoff	In Del.	Out Del.	Landing	Takeoff	In Del.	Out Del.	Landing	Takeoff	In Del.	Out Del.	Landing
C1	25		88.5	83.6	67.3	83.3	90.7	87.8	70.1	84.4	91.4	86.9	68.7	84.4	91.7	86.9	71.7	84.4
S1	50		84.3	85.1	79.1	86.4	85.4	85.1	70.4	79.4	86.9	85	68.9	79.3	86.5	85.7	72.1	79.4
S2	100		79	82.1	67.9	74.9	78	81.3	69.4	74	79.6	81.2	68.1	73.6	79.2	81.4	70.2	74
S3	200		73.7	73.9	67.6	67.9	72.9	73.5	70.6	67.4	72.2	73.6	67.9	67.2	73.9	75	70.3	68.8
S4	400		71.9	71.5	66.6	65.9	71.8	70.7	67.5	66.1	70.9	70.3	67.1	66.3	72.5	71.5	66.9	66.8
S5	800		73	72.5	69.3	68.3	72.3	71.9	69.4	68.3	72.4	71.8	69.2	68.7	72.5	72.6	68.3	69

			3.05				3.06			
			Undertrak	Undertrak	Undertrak	Undertrak	Undertrak	Undertrak	Undertrak	Undertrak
Pos	Dist	Ambient	Takeoff	In Del.	Out Del.	Landing	Takeoff	In Del.	Out Del.	Landing
C1	25		91.9	86.8	76.9	84	91.6	88.5	70.5	84.6
S1	50		86.8	85.5	76.1	79.3	86.5	86.9	70.8	79
S2	100		80	81.3	69.4	74.2	80.2	82.1	71.3	73.6
S3	200		74	74.4	70.3	68.3	76.3	75	69.6	69
S4	400		71.6	71.5	67.3	69.1	75	71.1	68.4	66.9
S5	800		72.2	72.6	68.2	70.7	74.8	71.9	68	68.1

			3.07				3.08				3.09				3.10			
			Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak
Pos	Dist	Ambient	Takeoff	In Del.	Out Del.	Landing	Takeoff	In Del.	Out Del.	Landing	Takeoff	In Del.	Out Del.	Landing	Takeoff	In Del.	Out Del.	Landing
C1	25		91.7	87.3	69.7	84.2	92.2	87.1	75.7	84.6	92	87.8	70	84.2	91.8	88.2	75.4	83.9
S1	50		86.3	86.1	69.8	78.9	86.8	86	75.2	79.2	86.7	86.5	70.6	78.5	86.4	87	74.8	78.2
S2	100		79.5	81.1	60.2	72.8	80	81.1	72.2	73.2	78.9	81.7	68.9	73.2	80.2	82	72.2	72.5
S3	200		76.3	73.8	68.4	75.8	69.1	74	68.8	67.3	74.9	74	67.8	67.7	74.9	74.2	68.6	67.4
S4	400		66.3	66.9	58.9	62.8	68.1	67.7	62.4	61.9	63.9	65.6	59.9	61.5	65.6	65.8	62.2	61.2
S5	800		-----	-----		-----	-----	-----		-----	-----	-----		-----	-----	-----		-----

			3.11				3.12				3.07			
			Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak	Oppotrak
Pos	Dist	Ambient	Takeoff	In Del.	Out Del.	Landing	Takeoff	In Del.	Out Del.	Landing	Takeoff	In Del.	Out Del.	Landing
C1	25		92.4	87.3	75.6	84.6	91.7	87.1	76	83.6	92.7	88	72.6	83.9
S1	50		86.9	86.4	75.7	79.4	86.4	86.1	75.5	78.1	86.9	86.6	75.8	78.3
S2	100		79.8	81.8	72.6	73.7	79.8	81.6	72.5	72.7	80.2	81.9	73.7	72.7
S3	200		74.7	73.8	69	69.4	74.6	73.7	67.7	67.3	74.8	73.6	70.1	67.4
S4	400		65.2	65.5	60.7	61	66	65.2	59.5	60.3	65.5	65.6	63.4	58.9
S5	800		-----	-----		-----	-----	-----		-----	59.9	59.1	56.8	56.4

			3.13				3.14				3.15				3.16			
			90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk
Pos	Dist	Ambient	Takeoff	In Del.	Out Del.	Landing	Takeoff	In Del.	Out Del.	Landing	Takeoff	In Del.	Out Del.	Landing	Takeoff	In Del.	Out Del.	Landing
C1	25		93.3	87.1	60.1	84	92.2	88.1	68.5	84.6	91.9	87.7	67.9	84.2	92.4	87.2	66.6	83.8
S1	50		87.6	85.2	58.5	78.4	86.5	86.2	68.4	78.7	86.3	85.8	67.9	78.8	86.7	85.5	66.5	78.2
S2	100		79.3	80.9	59.3	73	80	81.5	67.3	72.7	79.3	81.2	66.1	73.3	79.5	81.3	65.1	72.8
S3	200		74.3	73.9	62	67	73.9	73.7	64.1	67	73.3	73	68.9	67.6	74.1	73.6	64.9	67.1
S4	400		66.8	66.4	56.6	55.4	65.1	66.8	59.1	60.2	65.6	65.9	61.7	59	64.8	65.5	59.6	58.9
S5	800		59.9	59.3	52.7	56.6	60.5	60.1	56.3	57	57.5	59	56.6	54.5	57.8	57	54.2	50.7

			3.17				3.18			
			90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk	90 deg trk
Pos	Dist	Ambient	Takeoff	In Del.	Out Del.	Landing	Takeoff	In Del.	Out Del.	Landing
C1	25		92.1	88.4	66.9	84.2	93.1	88.1	79	84.5
S1	50		86.8	87.2	67.1	78.5	87.6	87	78	79.2
S2	100		79.4	81.8	65.4	72.3	79.9	81.7	72.3	73.4
S3	200		75.2	74.4	68.6	68.2	74.5	74.3	68.7	75.1
S4	400		66.3	67.2	56	61.5	65.2	66.1	[illegible]	61.4
S5	800		-----	-----	-----	-----	-----	-----	-----	-----

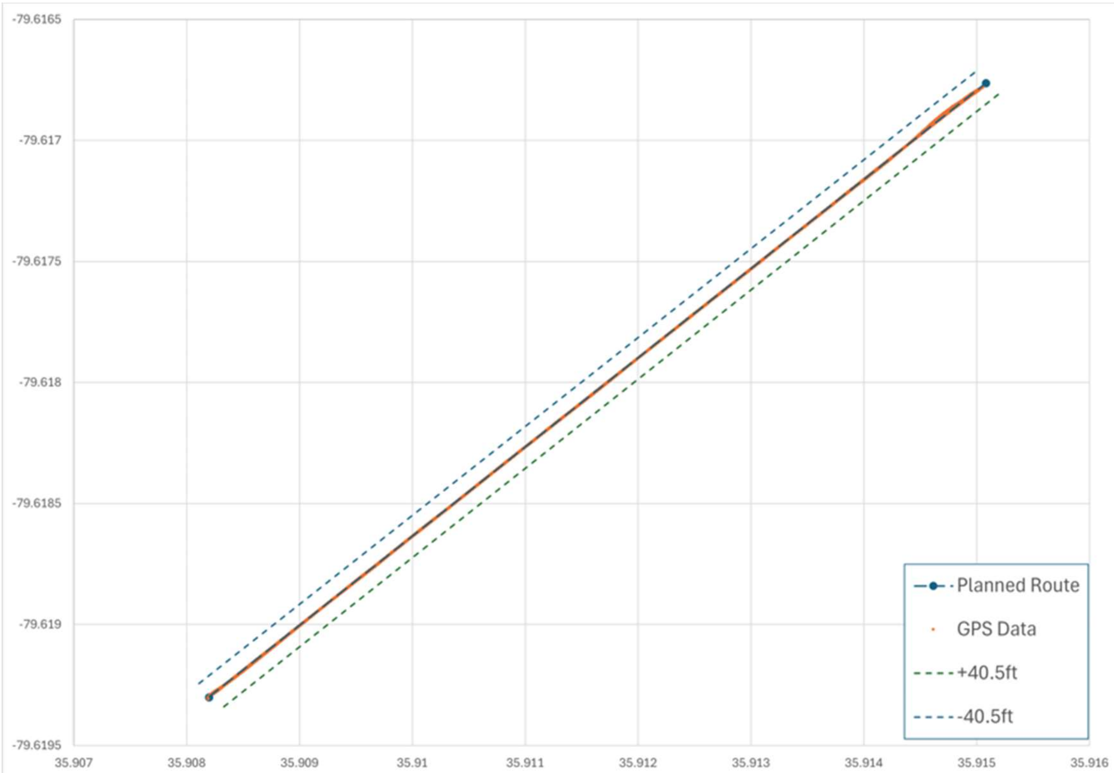
GPS Data for Enroute Noise Tests

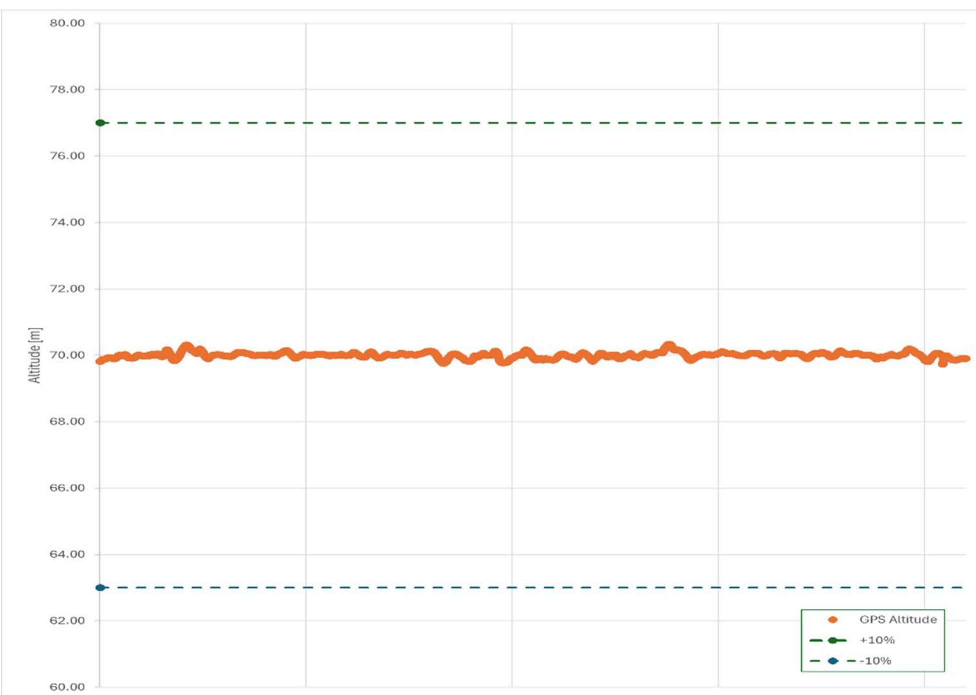
Test	Mission	W. Payloa	Pass	Date	Start Time	End Time	LP Pass Time	Lat	Lon	Alt. Over LP [m]	Distance From LP [m]
1	d3d13	X	1	05/05/2024	16:20:13	16:20:56	2024-05-05 16:20:33.453	35.911728	-79.6180006	70.01129	0.95
1		X	2	05/05/2024	16:21:12	16:21:55	2024-05-05 16:21:33.453	35.911727	-79.6180001	69.9426	0.96
1		X	3	05/05/2024	16:22:14	16:22:43	2024-05-05 16:22:30.553	35.911726	-79.6180023	69.90086	0.74
1		X	4	05/05/2024	16:24:11	16:24:56	2024-05-05 16:24:33.353	35.911719	-79.6179987	69.99129	1.14
1.1		X	5	05/05/2024	16:25:09	16:25:54	2024-05-05 16:25:30.653	35.911725	-79.6180009	70.00012	0.83
1.1		X	6	05/05/2024	16:26:07	16:26:53	2024-05-05 16:26:30.553	35.911724	-79.6180058	69.96917	0.38
1.1	b7398	X	7	05/05/2024	16:59:00	16:59:41	2024-05-05 16:59:18.731	35.911721	-79.6180048	70.00394	0.57
1.1		X	8	05/05/2024	16:59:57	17:00:41	2024-05-05 17:00:18.631	35.911725	-79.6180016	70.08284	0.76
1.1		X	9	05/05/2024	17:00:57	17:01:39	2024-05-05 17:01:15.831	35.911724	-79.6180039	70.03025	0.54
1.10		X	10	05/05/2024	17:02:23	17:03:06	2024-05-05 17:02:44.531	35.91172	-79.6180035	69.99676	0.75
1.1		X	11	05/05/2024	17:03:22	17:04:05	2024-05-05 17:03:41.831	35.911727	-79.6180003	70.00273	0.92
1.1		X	12	05/05/2024	17:04:20	17:05:04	2024-05-05 17:04:41.831	35.911726	-79.6179996	69.98127	0.96
2	0988	4.5kg	1	05/05/2024	17:22:53	17:23:36	2024-05-05 17:23:13.439	35.911719	-79.6180048	69.98206	0.72
2		4.5kg	2	05/05/2024	17:23:53	17:24:34	2024-05-05 17:24:13.439	35.911722	-79.6180023	70.03411	0.72
2		4.5kg	3	05/05/2024	17:24:52	17:25:34	2024-05-05 17:25:10.640	35.911729	-79.6180003	69.98736	1.04
2		4.5kg	4	05/05/2024	17:26:14	17:26:57	2024-05-05 17:26:35.239	35.911722	-79.6180024	69.9836	0.74
2.1		4.5kg	5	05/05/2024	17:27:11	17:27:55	2024-05-05 17:27:32.439	35.911728	-79.6179988	69.95174	1.12
2.1		4.5kg	6	05/05/2024	17:28:12	17:28:54	2024-05-05 17:28:32.640	35.911727	-79.6180033	69.97128	0.70

Plots of GPS position during Enroute Tests

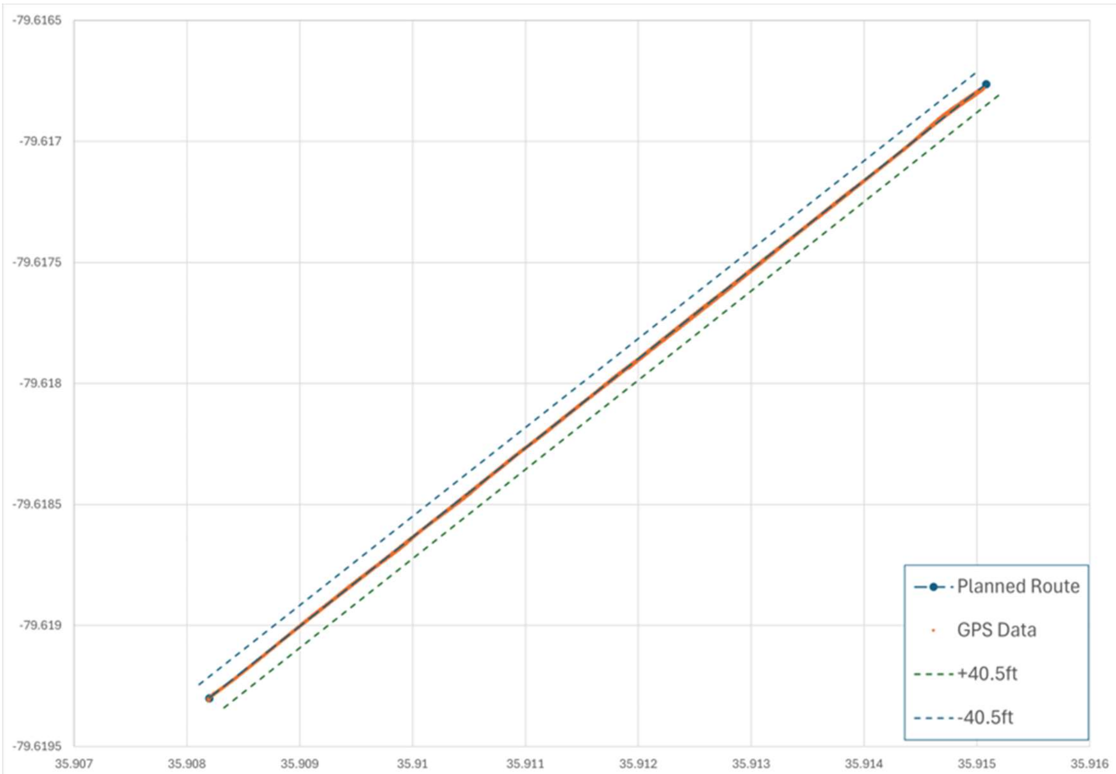
The following graphs demonstrate that the position of the Flytrex Sky II UAS during the enroute portion of the noise tests was within the ± 10% altitude and ± 10 degree offset from azimuth flight path limits established in the noise test plan.

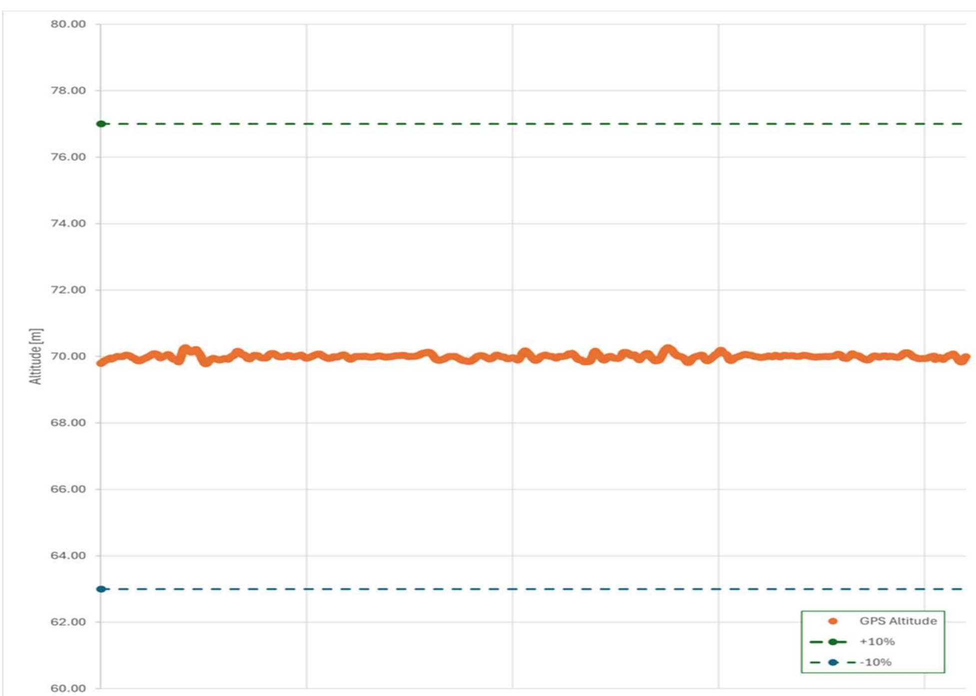
Enroute Test Conditions 1.01 through 1.06



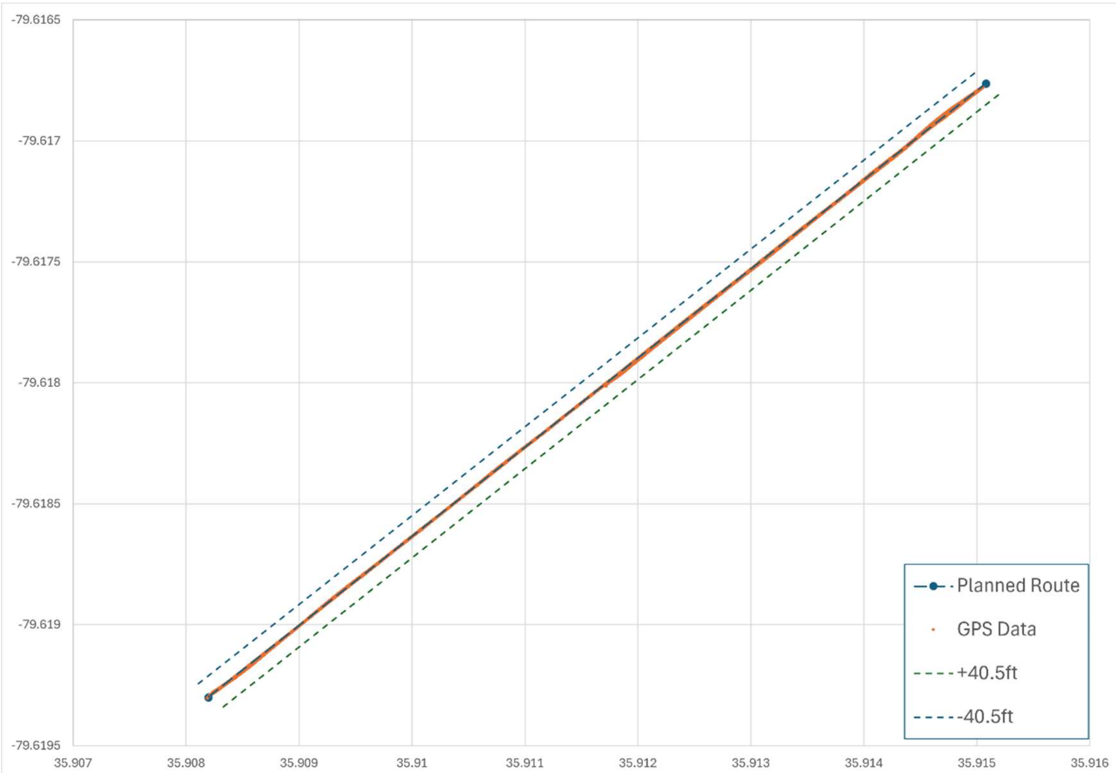


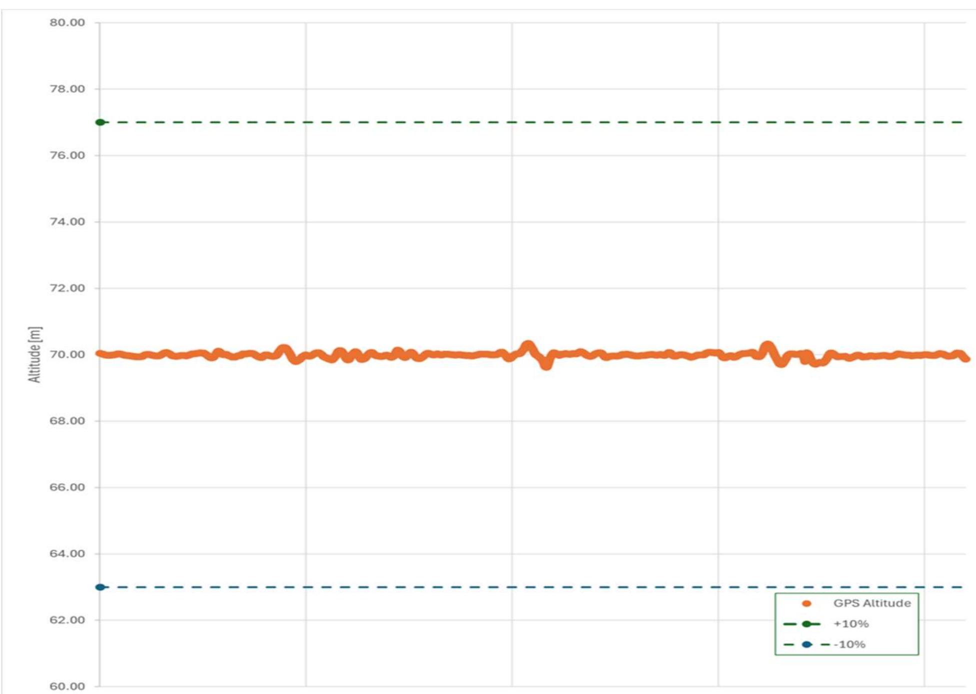
Enroute Test Conditions 1.07 through 1.12





Enroute Test Conditions 2.01 through 2.06





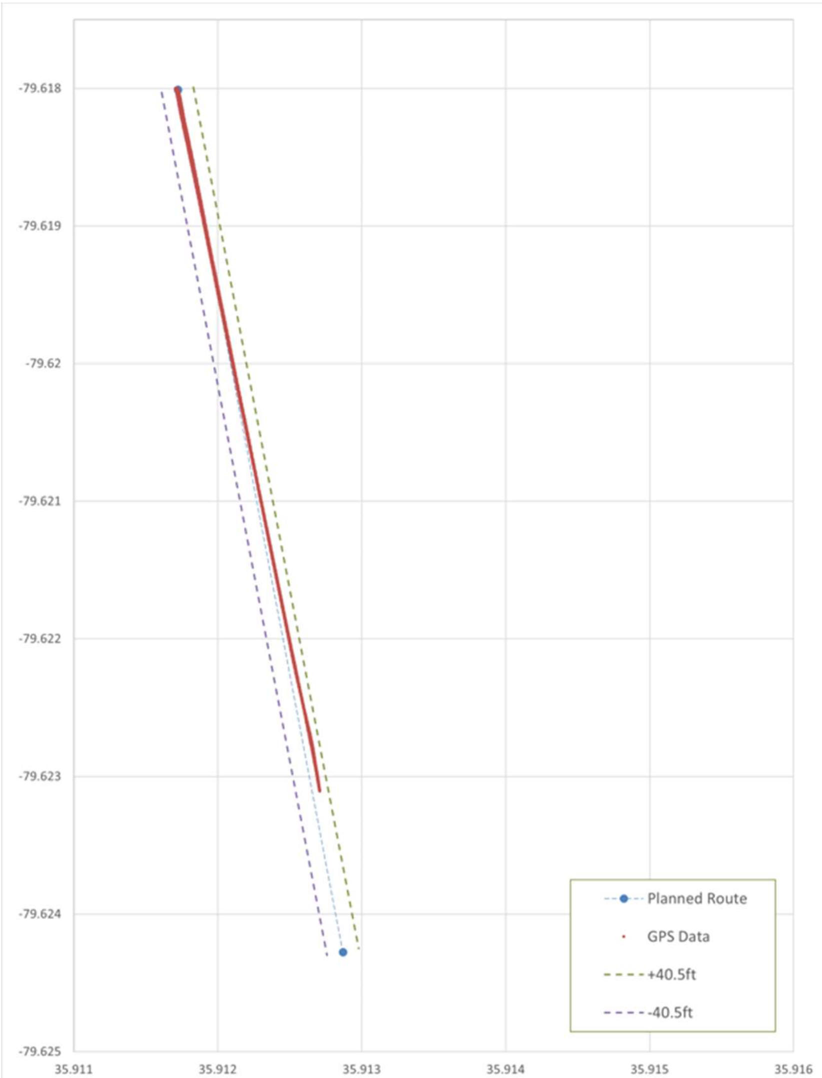
GPS Data for TOPDL (TakeOff, Pickup, Delivery, Landing) Noise Tests

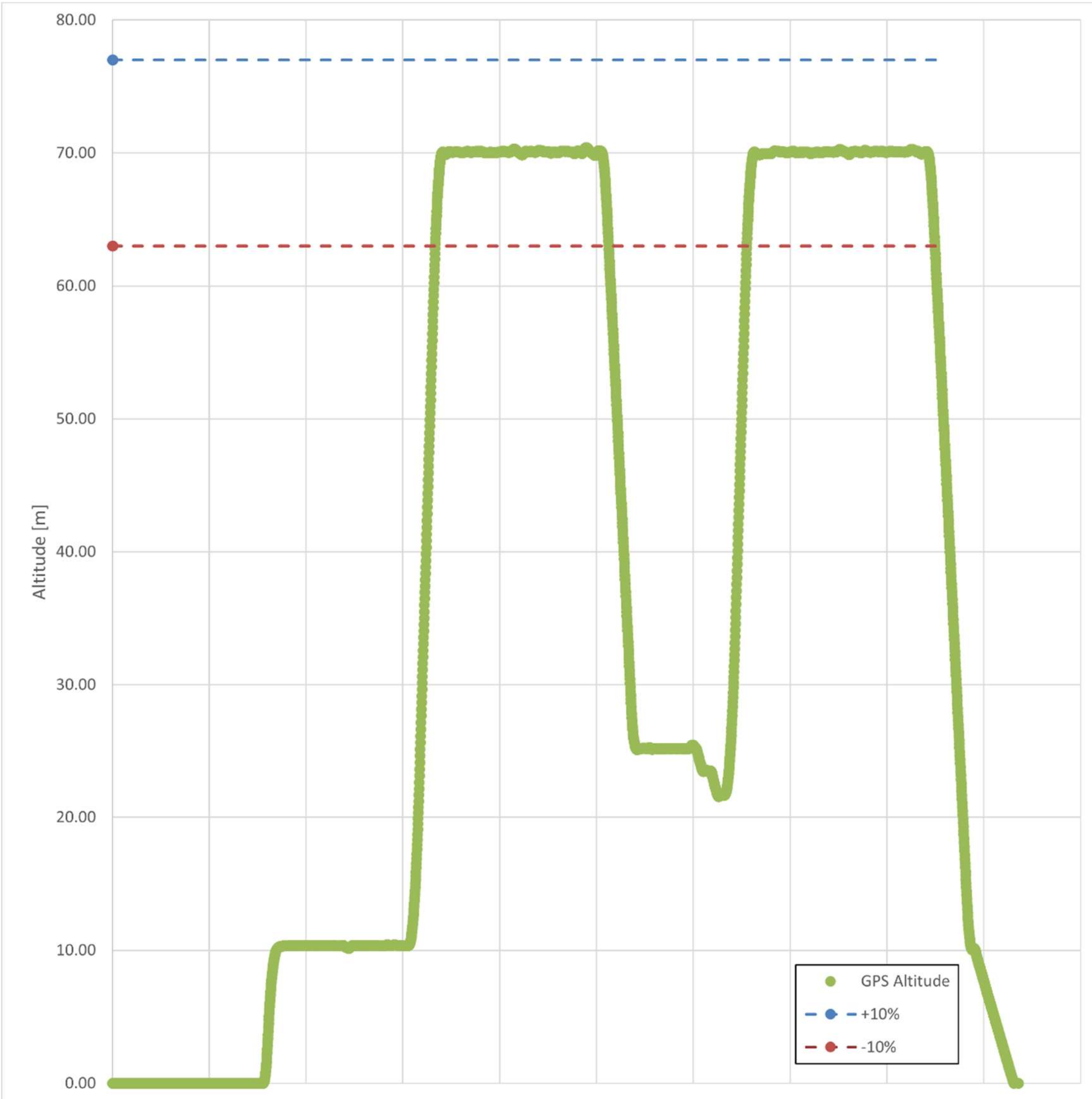
	Route	Missior	Date	TO Time	Delivery Approa	Landing Approa	Landing	Notes
3.01	W	2a97	05/05/2024	18:24:22	18:25:02	18:27:51	18:28:29	
3.02	W	68b9	05/05/2024	18:41:22	18:42:07	18:45:04	18:45:50	
3.03	W	a579	05/05/2024	19:11:02	19:11:47	19:14:48	19:15:34	
3.04	W	ba76	06/05/2024	10:27:17	10:28:01	10:31:02	10:31:47	
3.05	W	191d	06/05/2024	10:39:55	10:40:40	10:43:38	10:44:23	
3.06	W	deaf	06/05/2024	15:43:35	15:45:03	15:46:38	15:48:04	
3.13a	E	1713a	06/05/2024	16:00:48	16:01:49	16:03:24	16:04:23	aircraft in area - NG
3.13b	E	efaa	06/05/2024	16:44:56	16:45:48	16:47:22	16:48:24	
3.14	E	5d08	06/05/2024	16:55:03	16:56:01	16:57:43	16:58:43	
3.15	E	da85	06/05/2024	17:03:56	15:05:00	17:06:39	17:07:41	
3.16	E	e5ea	06/05/2024	17:15:54	17:16:58	17:24:35	17:21:58	
3.17a	E	5bb20	06/05/2024	17:25:24	-	-	17:28:13	RTL - Rain
3.17b	E	88a9c	07/05/2024	8:16:47	8:17:46	8:19:32	8:20:31	
3.18	E	4e4f7e	07/05/2024	8:28:33	8:29:34	8:31:11	8:32:13	
3.07a	N	5389d	07/05/2024	8:58:06	8:59:04	9:00:42	9:01:37	Windy
3.08	N	7e93e	07/05/2024	9:07:21	9:08:19	9:09:57	9:10:52	
3.09	N	7d742	07/05/2024	9:20:11	9:21:06	9:22:46	9:23:43	
3.10	N	a5551	07/05/2024	9:29:08	9:30:03	9:31:41	9:32:38	
3.11	N	b3ae6	07/05/2024	9:46:44	9:47:38	9:49:17	9:50:12	
3.12	N	72727	07/05/2024	9:55:57	9:56:52	9:58:26	9:59:23	
3.07b	N	2def2	07/05/2024	10:09:55	10:10:51	10:13:04	10:14:01	

Plots of GPS position during TOPDL Tests

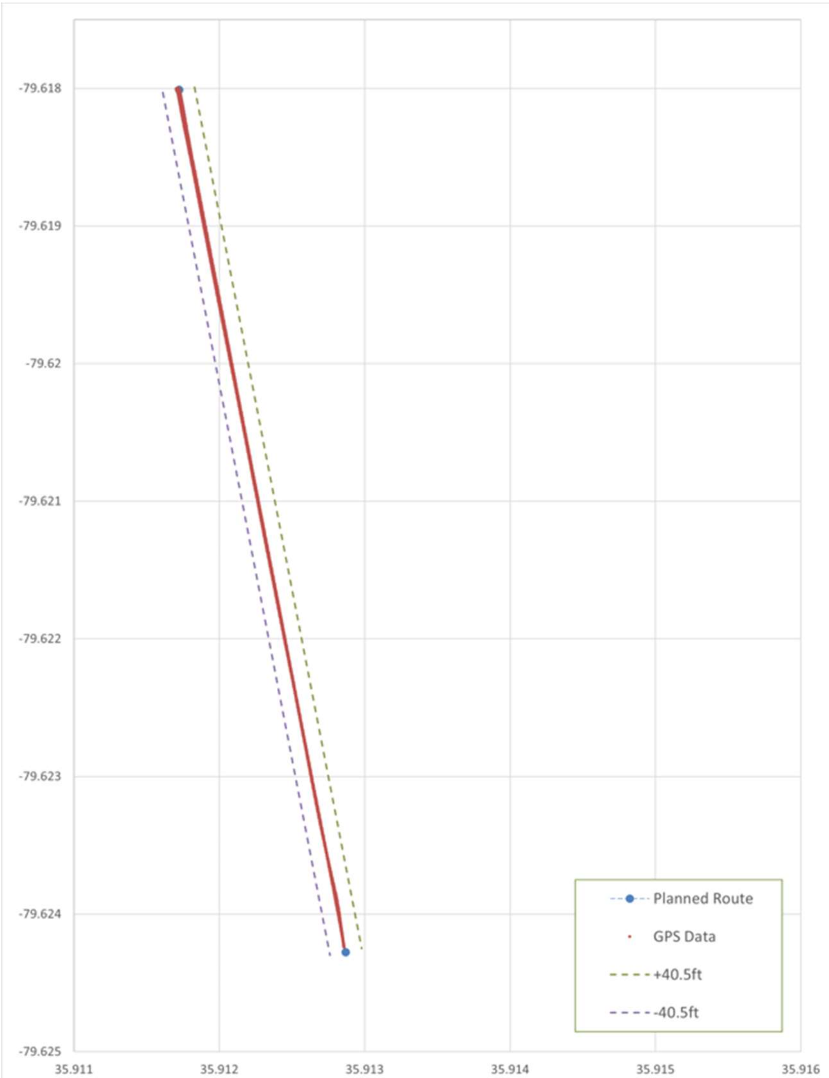
The following graphs demonstrate that the position of the Flytrex Sky II UAS during the flight portion of the TOPDL noise tests was within the ± 10% altitude and ± 10 degree offset from azimuth flight path limits established in the noise test plan.

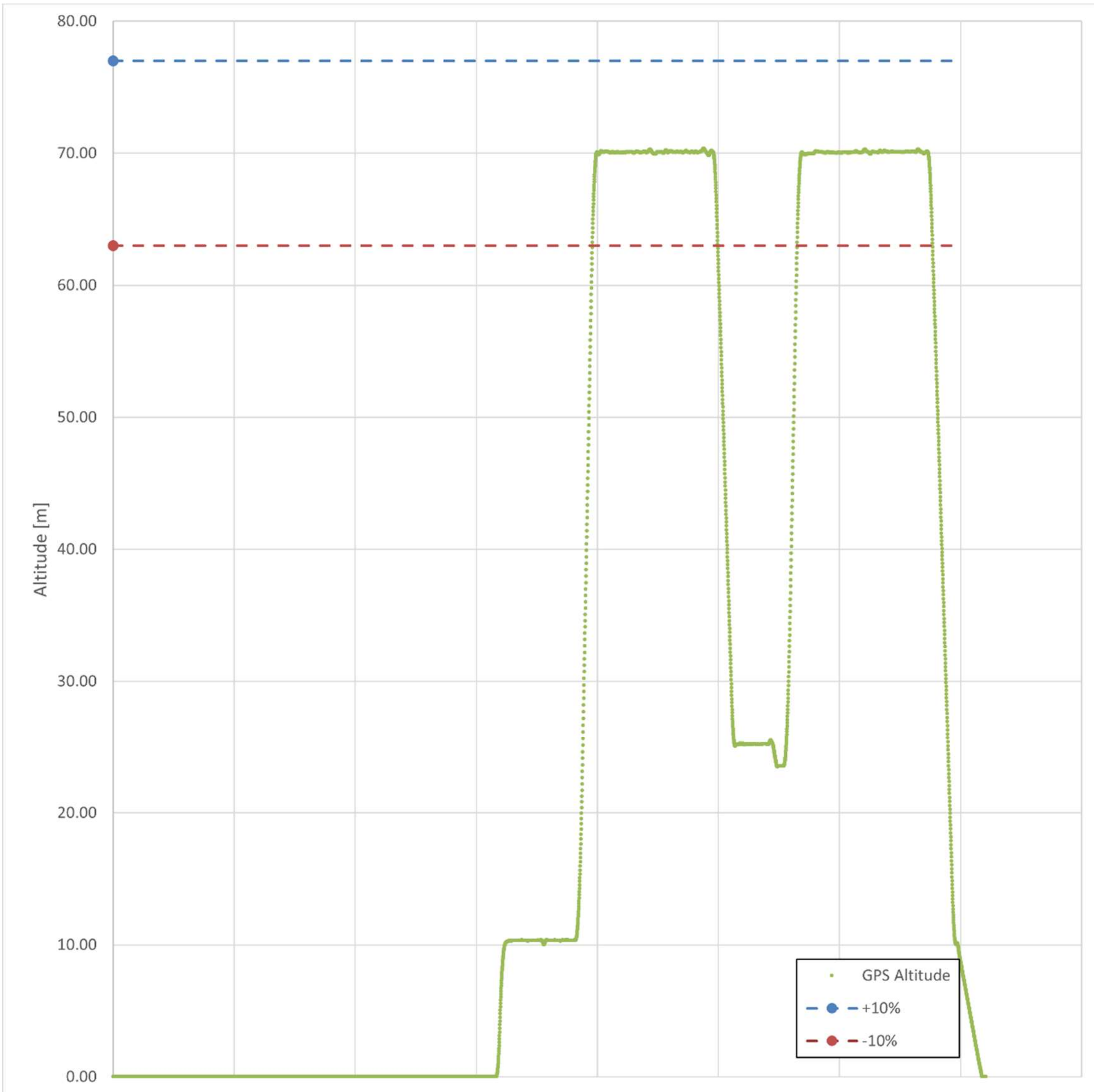
3.01


-79.618
-79.619
-79.62
-79.621
-79.622
-79.623
-79.624
-79.625
35.911
35.912
35.913
35.914
35.915
35.916
Planned Route
GPS Data
+40.5ft
-40.5ft

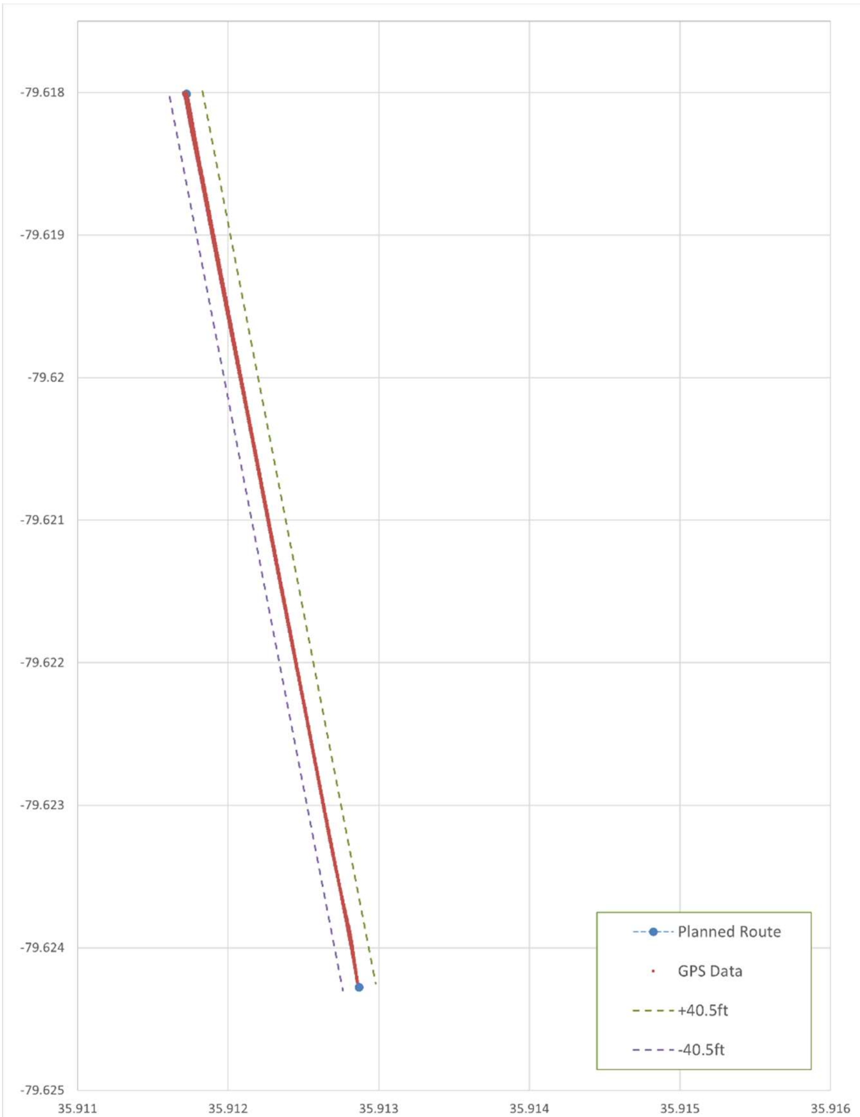

80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

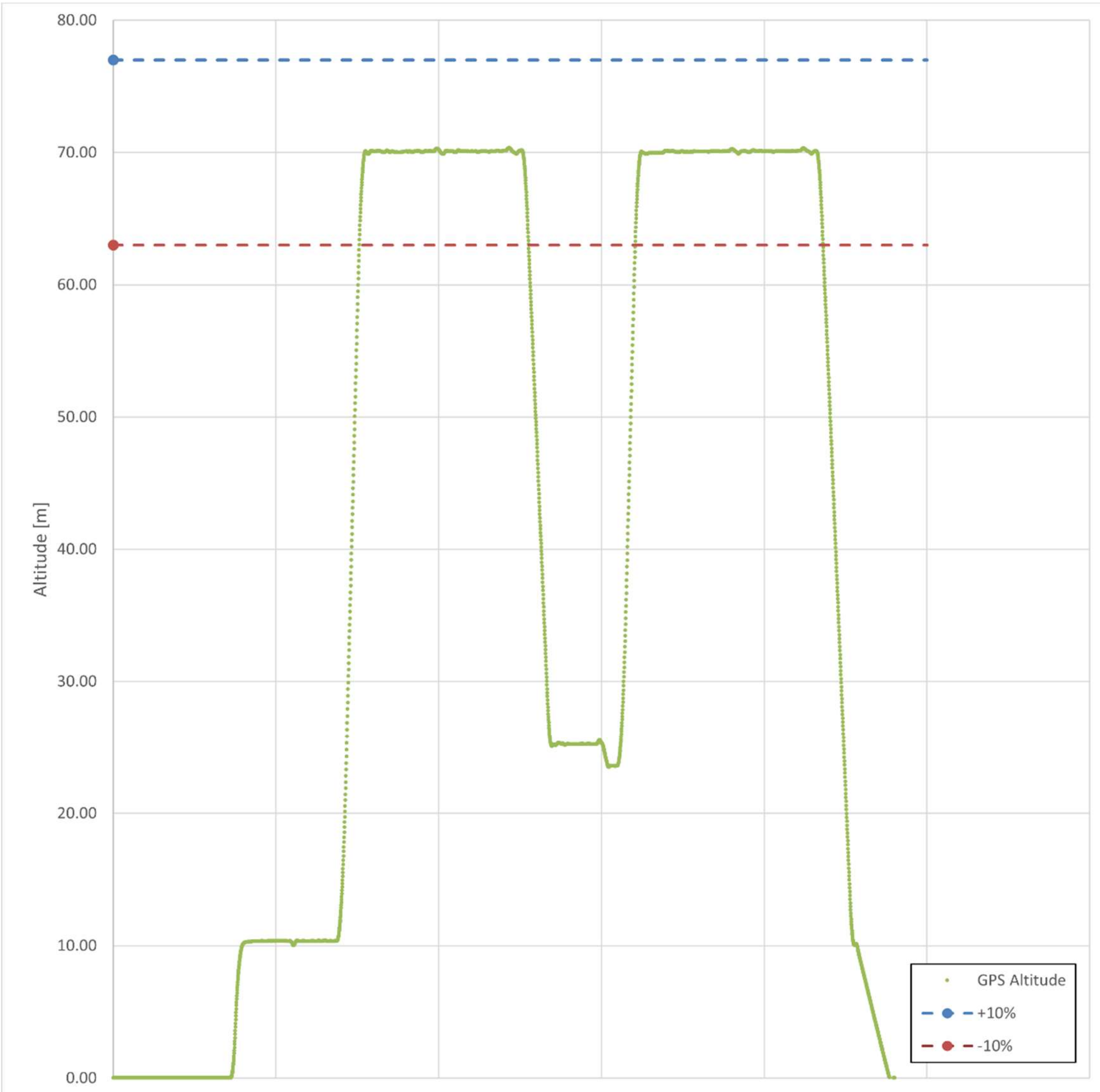
3.02


-79.618
-79.619
-79.62
-79.621
-79.622
-79.623
-79.624
-79.625
35.911
35.912
35.913
35.914
35.915
35.916
Planned Route
GPS Data
+40.5ft
-40.5ft

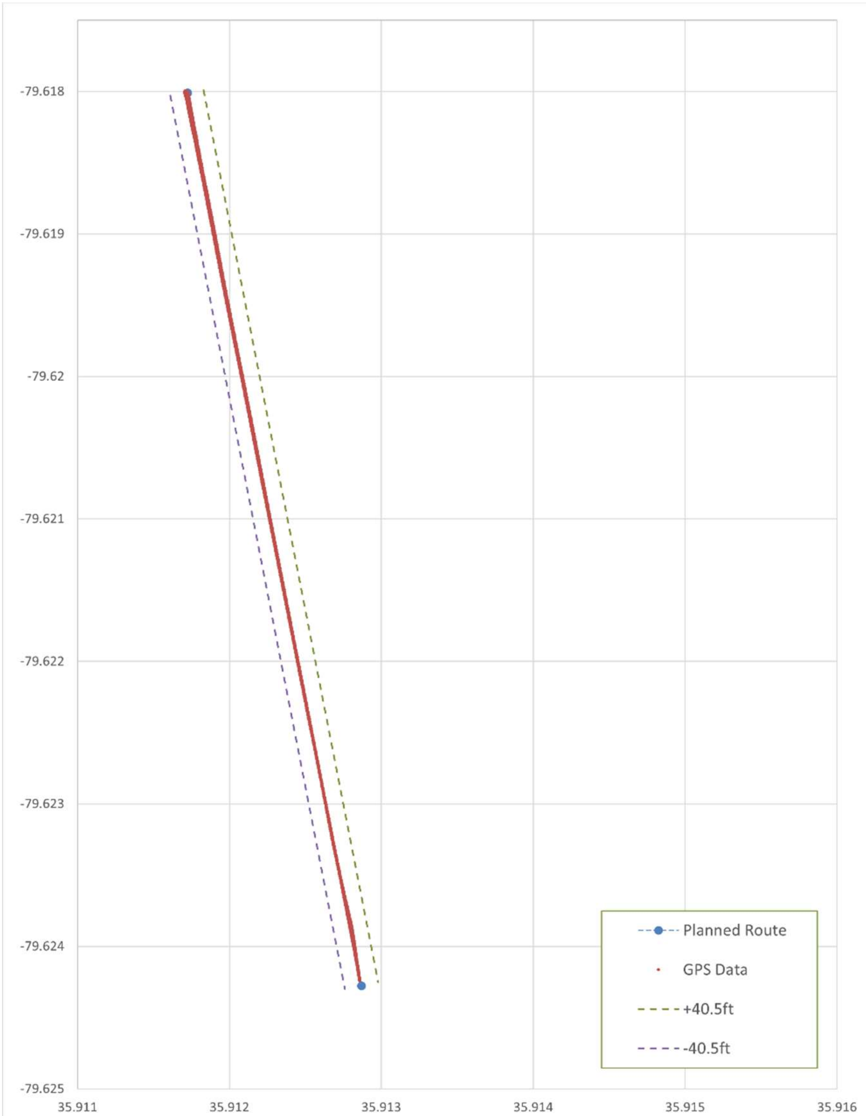

80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

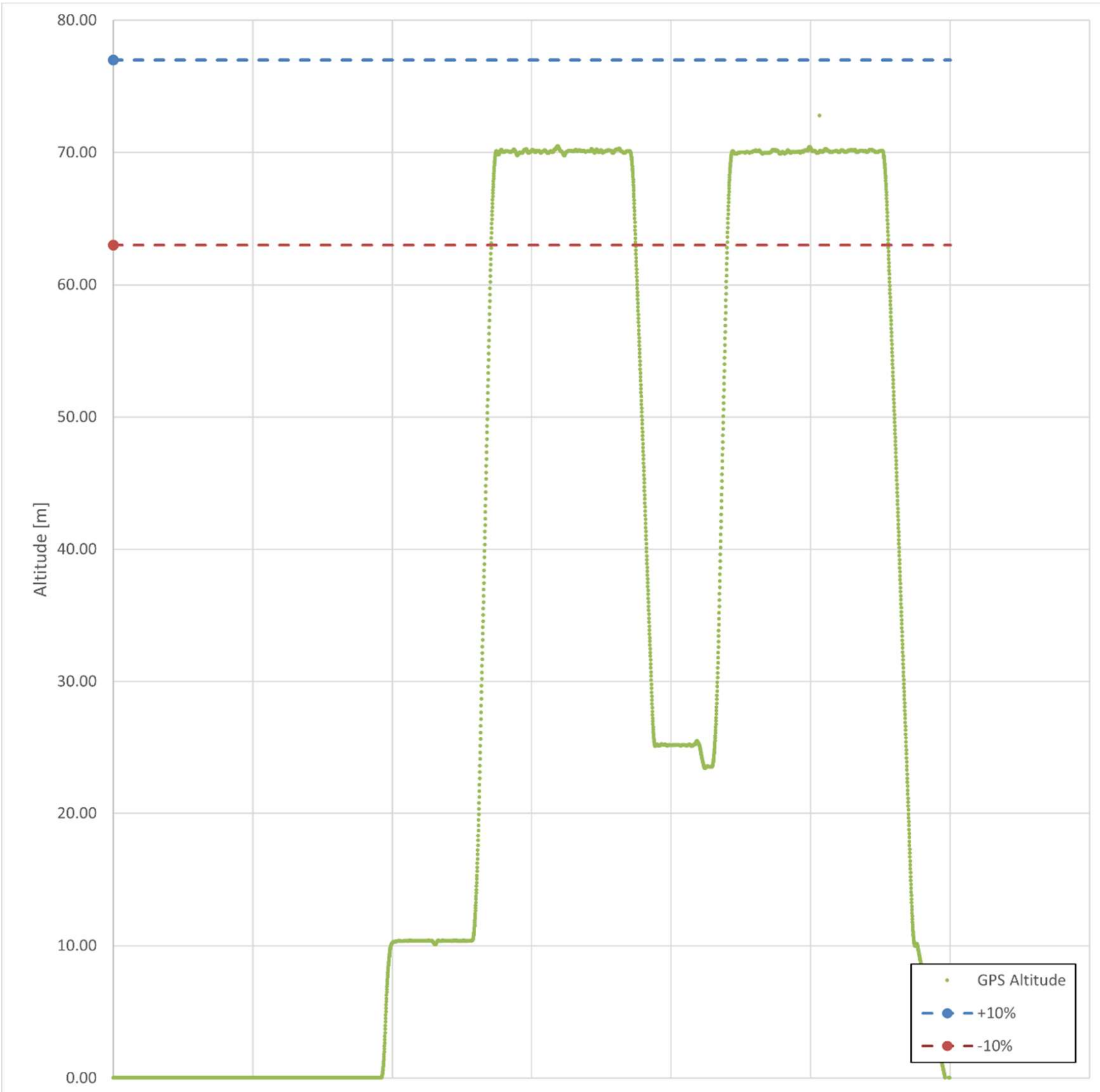
3.03


-79.618
-79.619
-79.62
-79.621
-79.622
-79.623
-79.624
-79.625
35.911
35.912
35.913
35.914
35.915
35.916
Planned Route
GPS Data
+40.5ft
-40.5ft

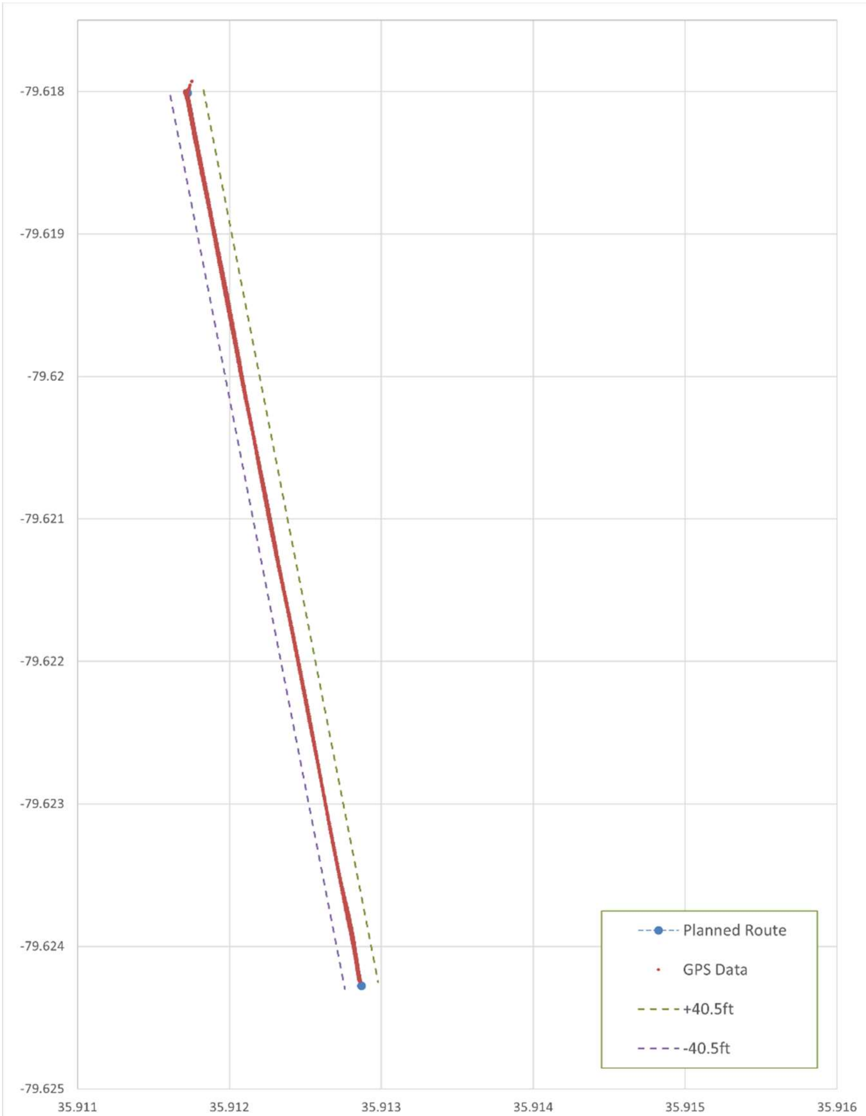

80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

3.04


-79.618
-79.619
-79.62
-79.621
-79.622
-79.623
-79.624
-79.625
35.911
35.912
35.913
35.914
35.915
35.916
Planned Route
GPS Data
+40.5ft
-40.5ft


80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

3.05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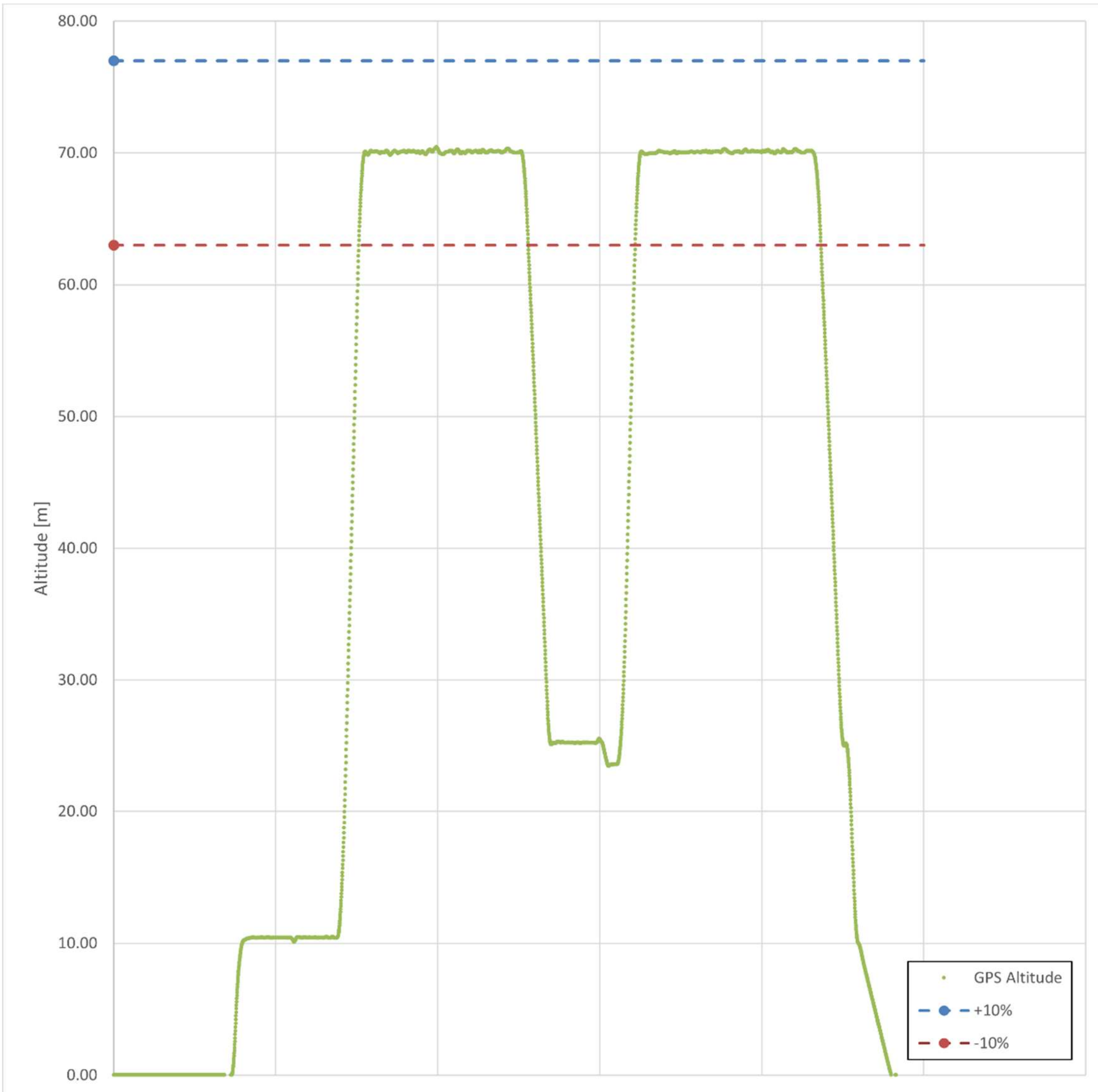
-79.62
-79.621
-79.622
-79.623
-79.624
-79.625
35.911
35.912
35.913
35.914
35.915
35.916
Planned Route
GPS Data
+40.5ft
-40.5ft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30.00
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10.00
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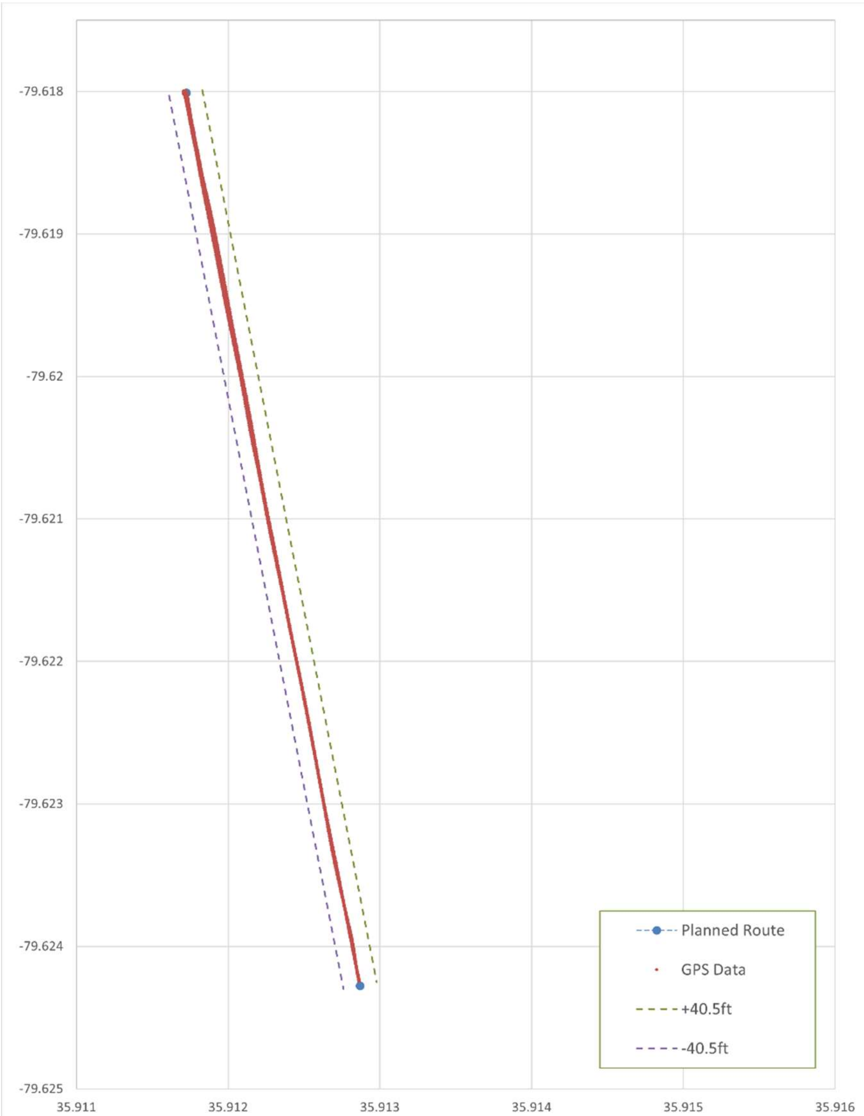
Altitude [m]
GPS Altitude
+10%
-10%

3.06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-79.622
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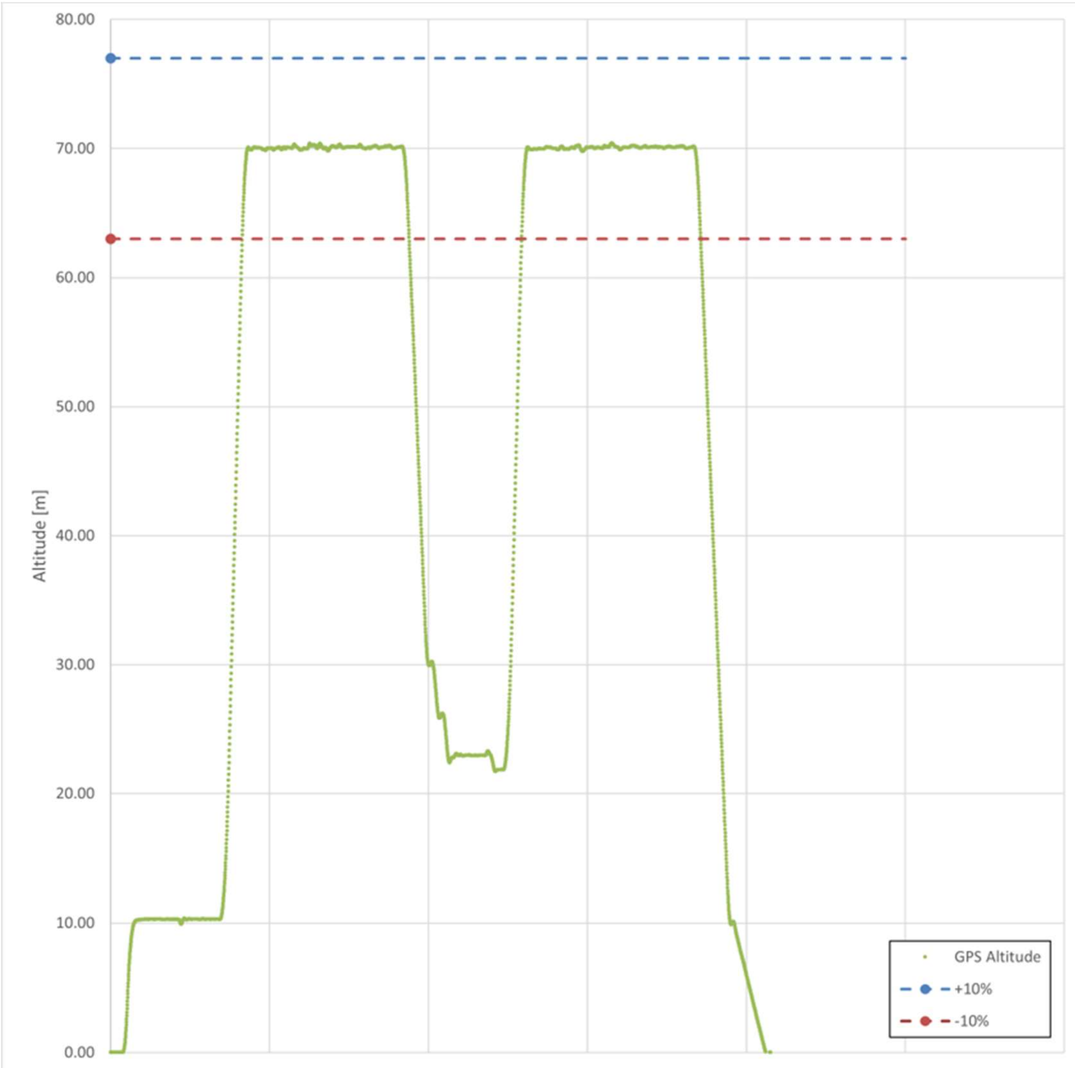
-79.624
-79.625
35.911
35.912
35.913
35.914
35.915
35.916
Planned Route
GPS Data
+40.5ft
-40.5ft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Altitude [m]
GPS Altitude
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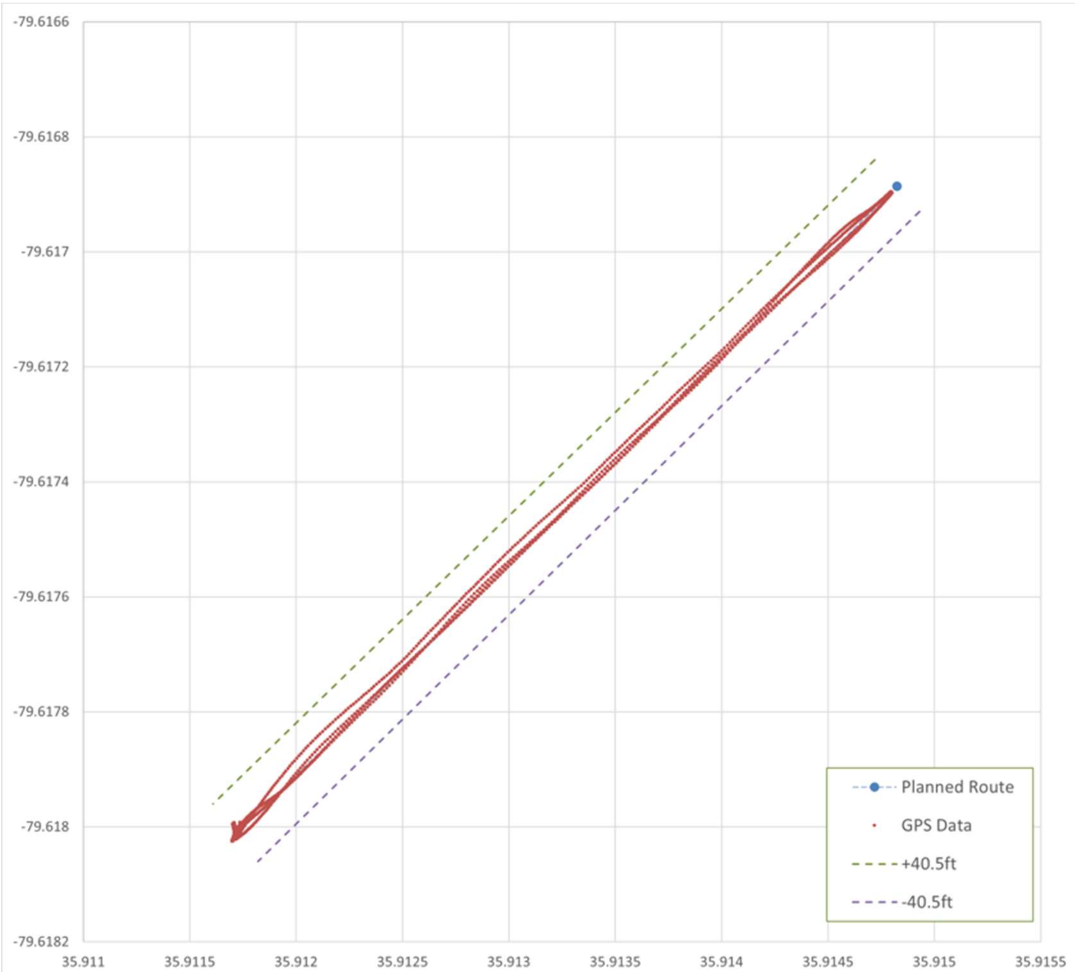
-10%

3.07a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-79.6172
-79.6174
-79.6176
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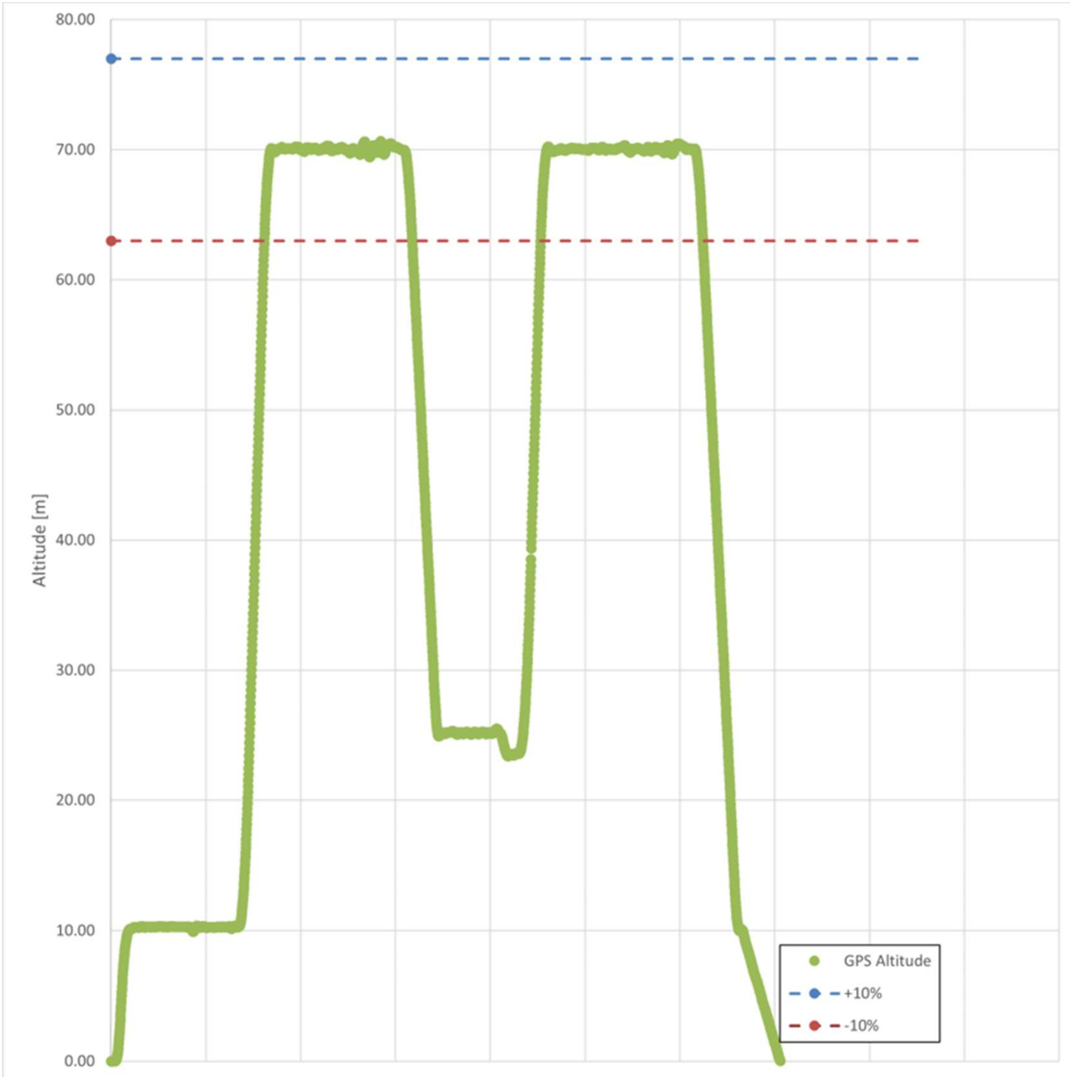
-79.618
-79.6182
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
35.9145
35.915
35.9155
Planned Route
GPS Data
+40.5ft
-40.5ft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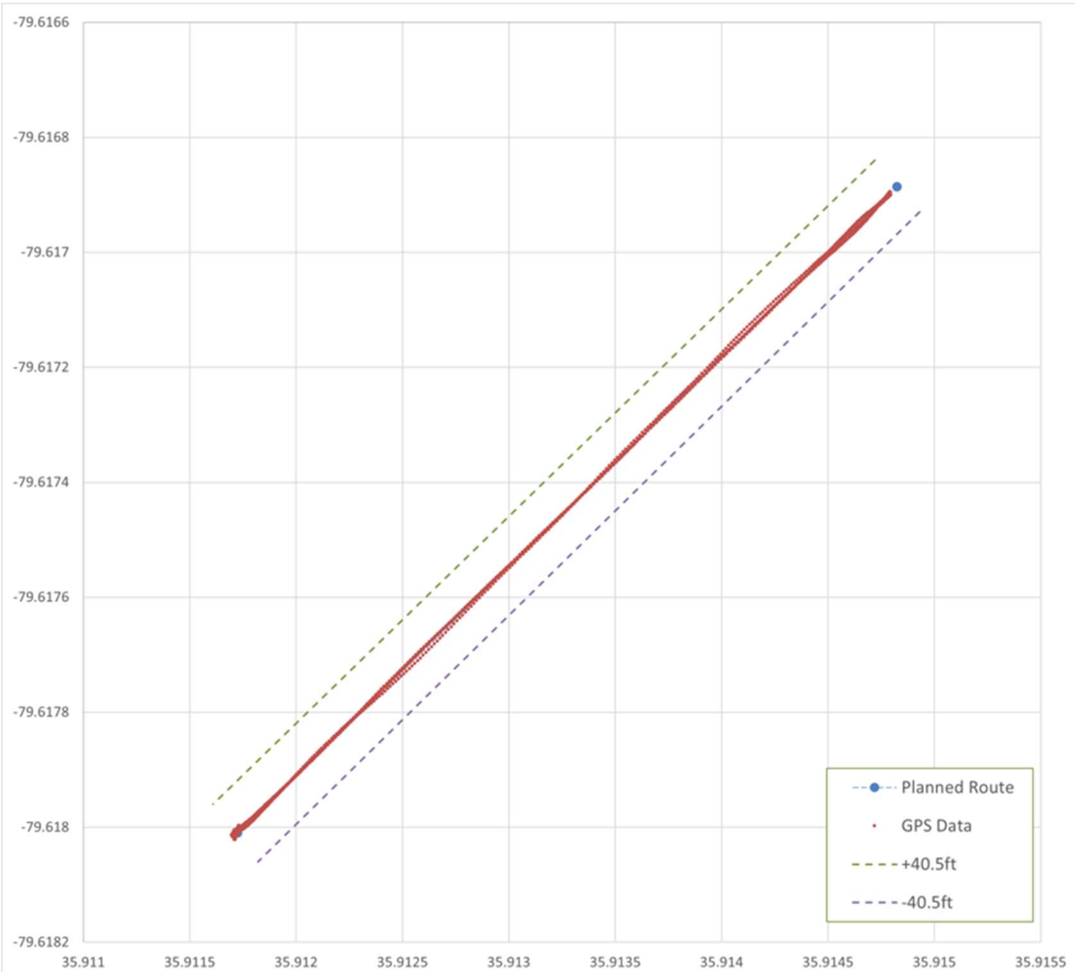
0.00
Altitude [m]
GPS Altitude
+10%
-10%

3.07b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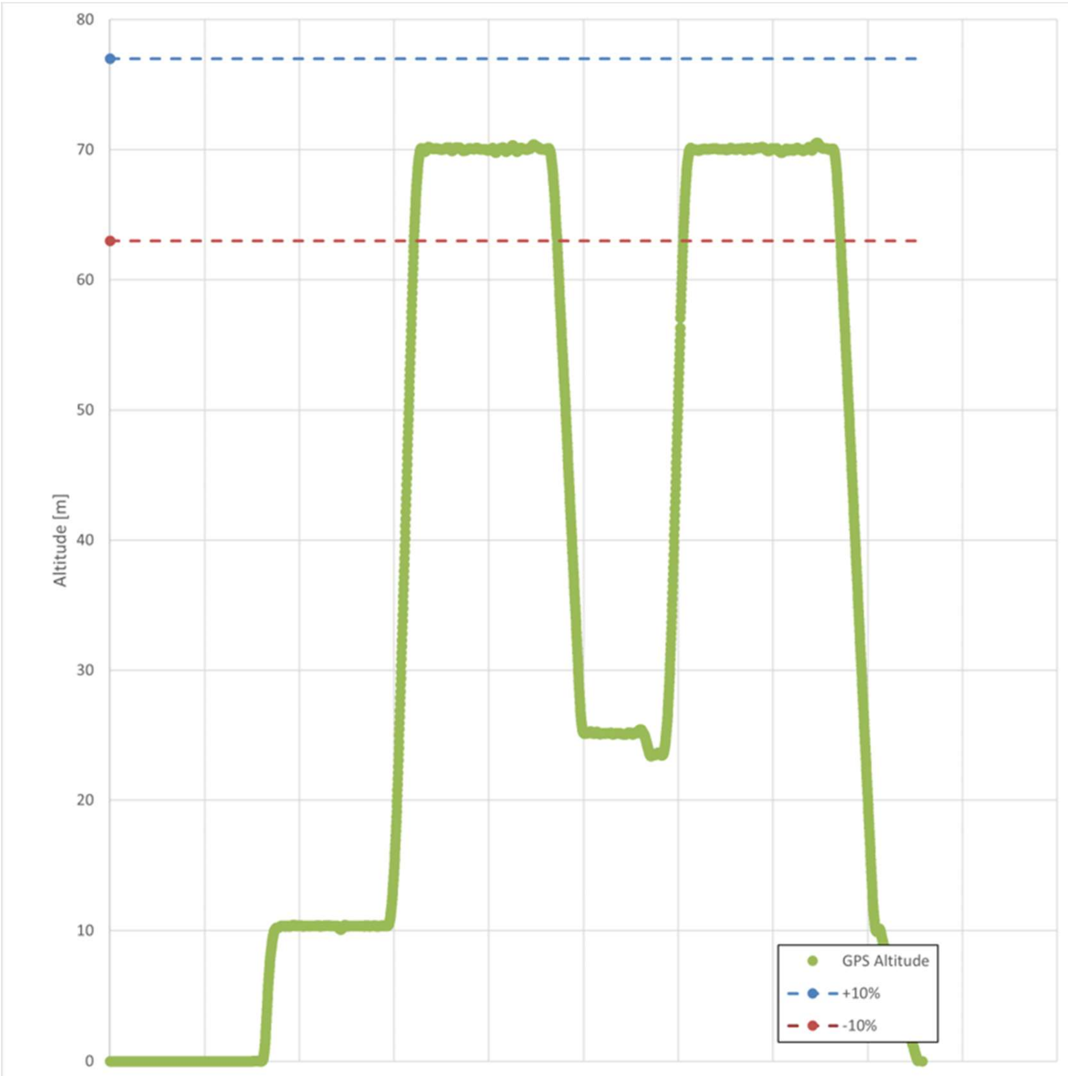
-79.618
-79.6182
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
35.9145
35.915
35.9155
Planned Route
GPS Data
+40.5ft
-40.5ft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20
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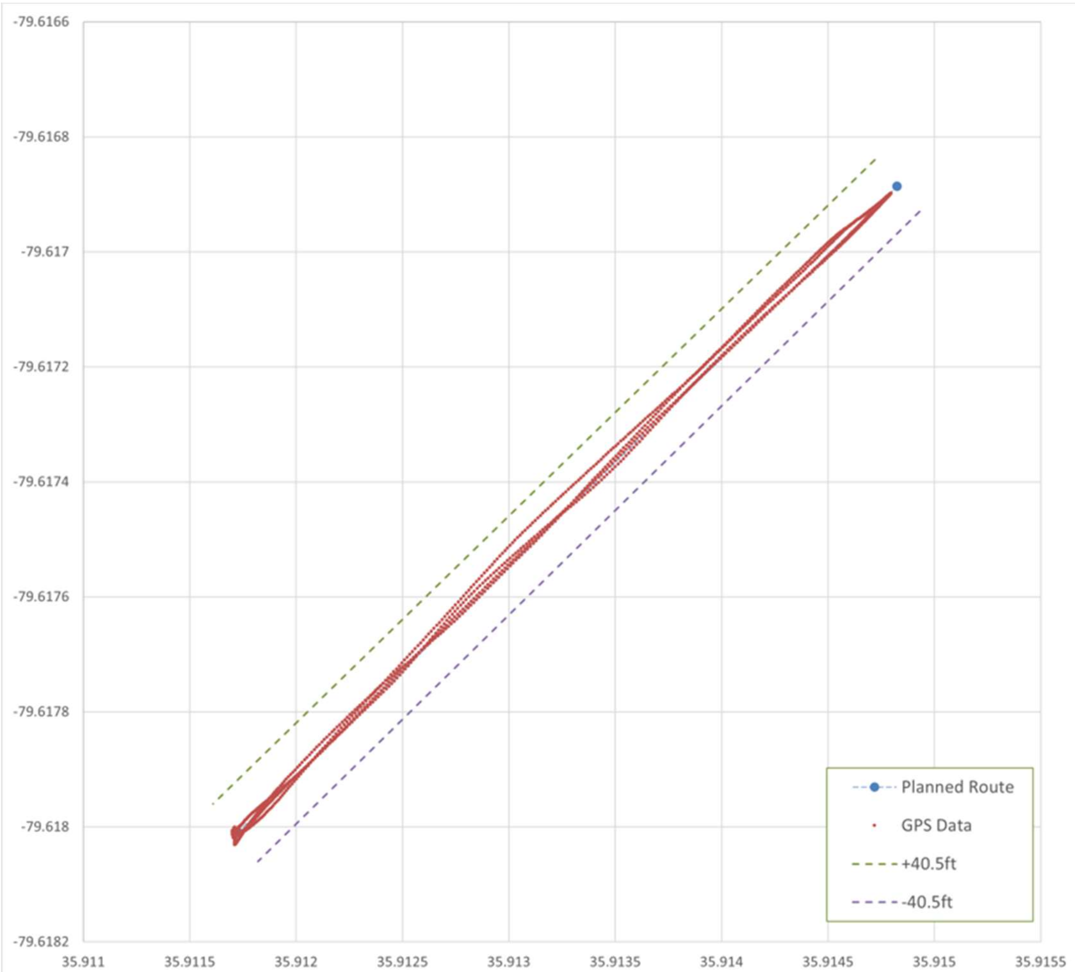
Altitude [m]
GPS Altitude
+10%
-10%

3.08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-79.6168
-79.617
-79.6172
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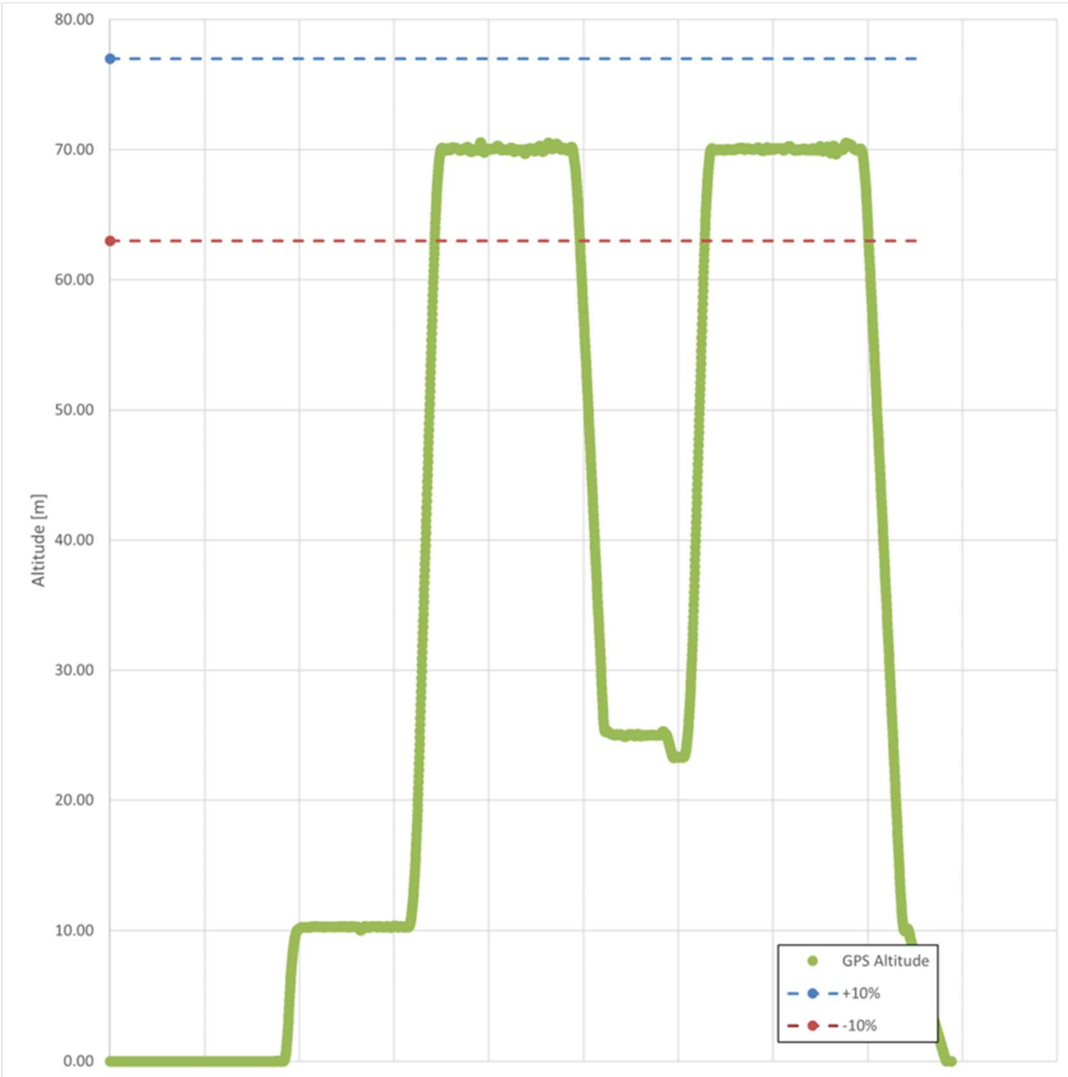
-79.6178
-79.618
-79.6182
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
35.9145
35.915
35.9155
Planned Route
GPS Data
+40.5ft
-40.5ft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70.00
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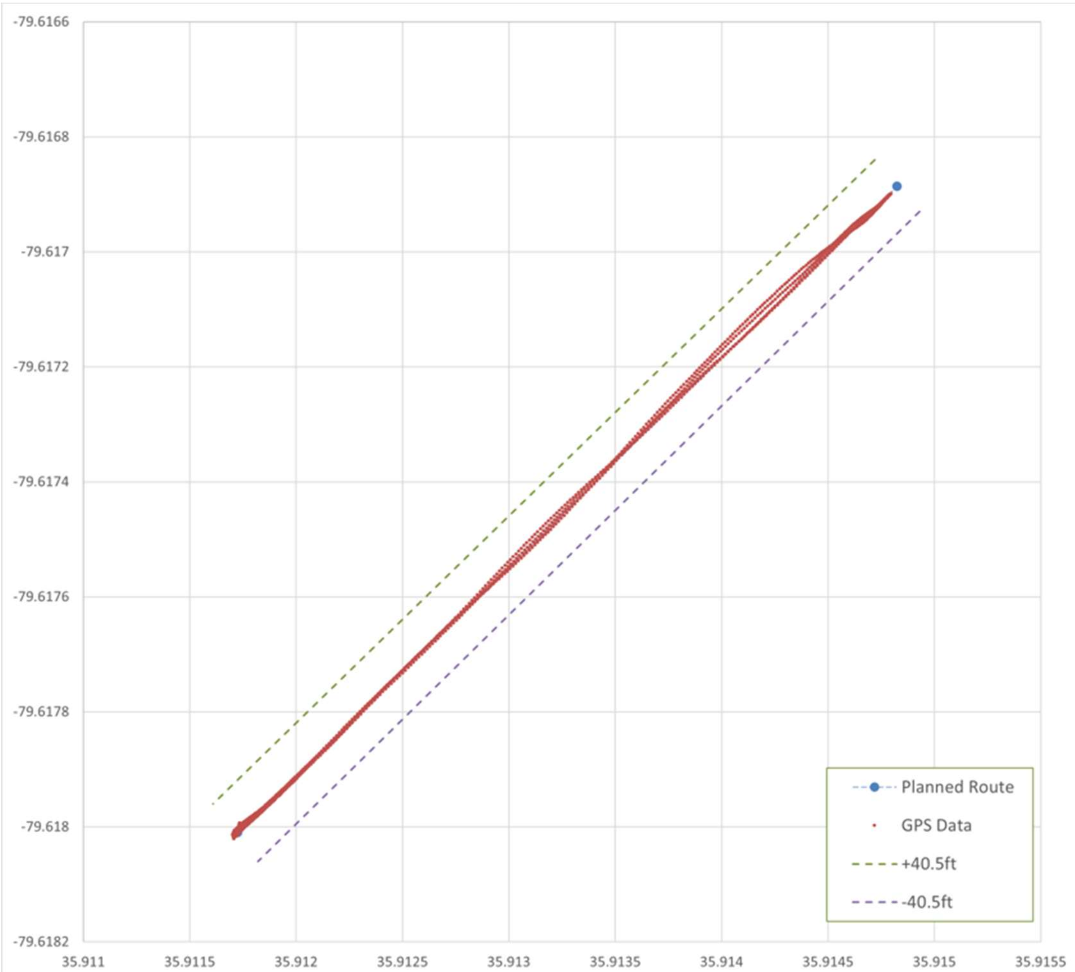
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

3.09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-79.617
-79.6172
-79.6174
-79.6176
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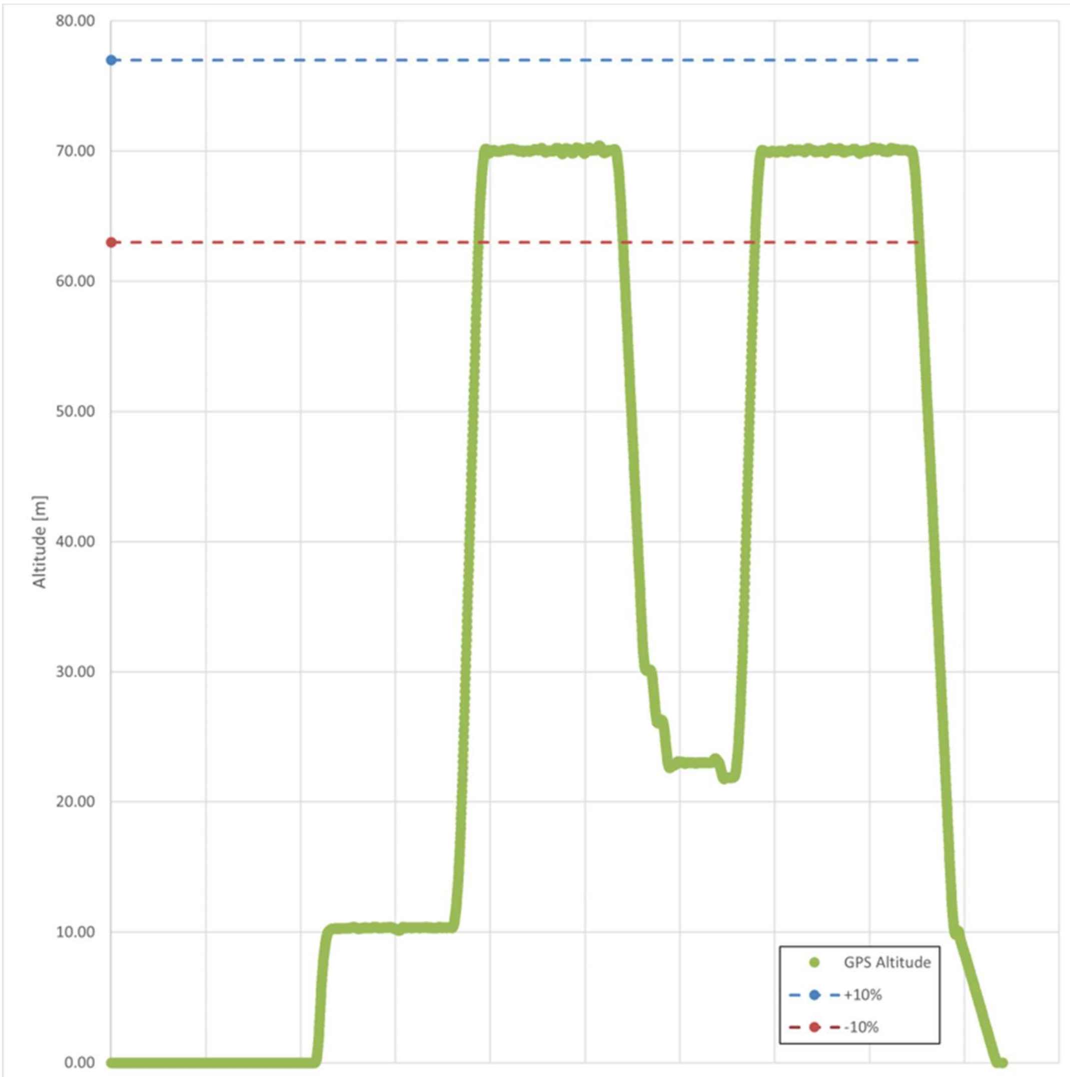
-79.618
-79.6182
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
35.9145
35.915
35.9155
Planned Route
GPS Data
+40.5ft
-40.5ft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70.00
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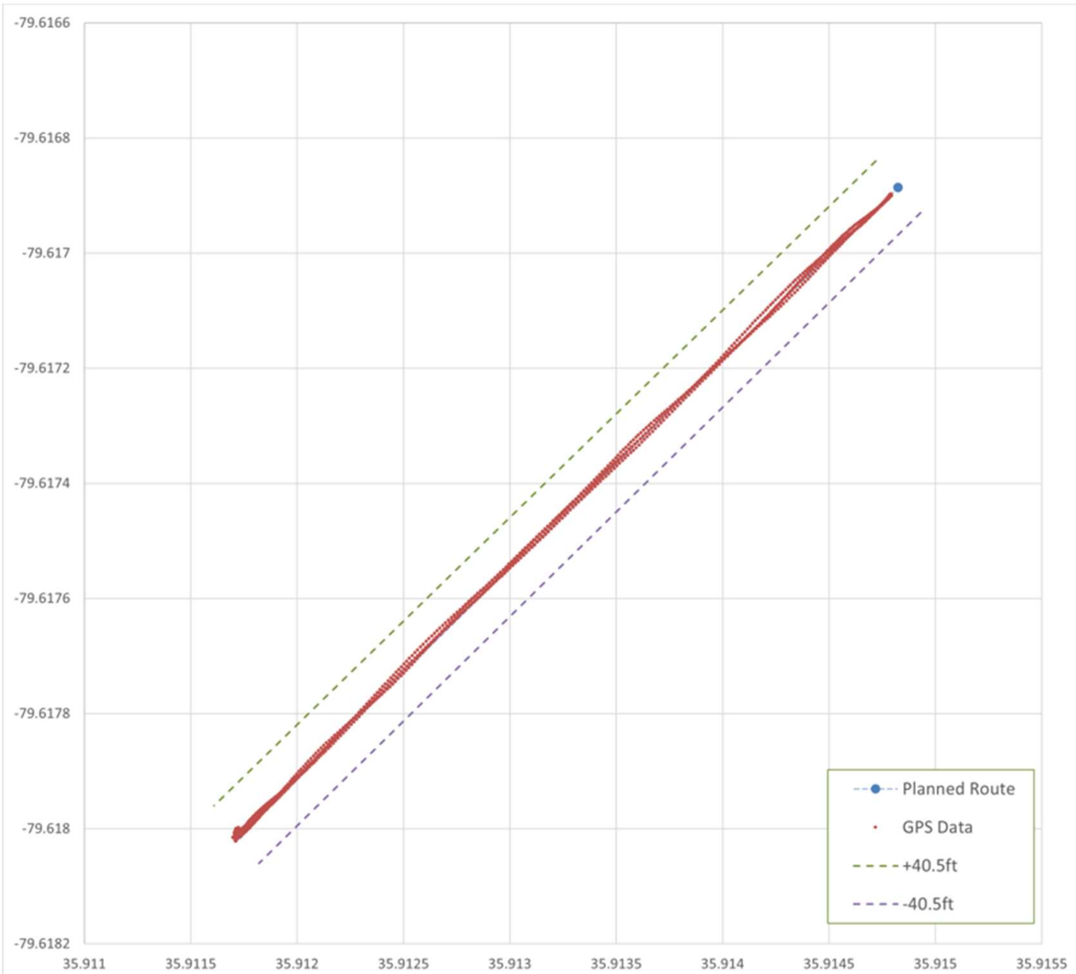
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

3.10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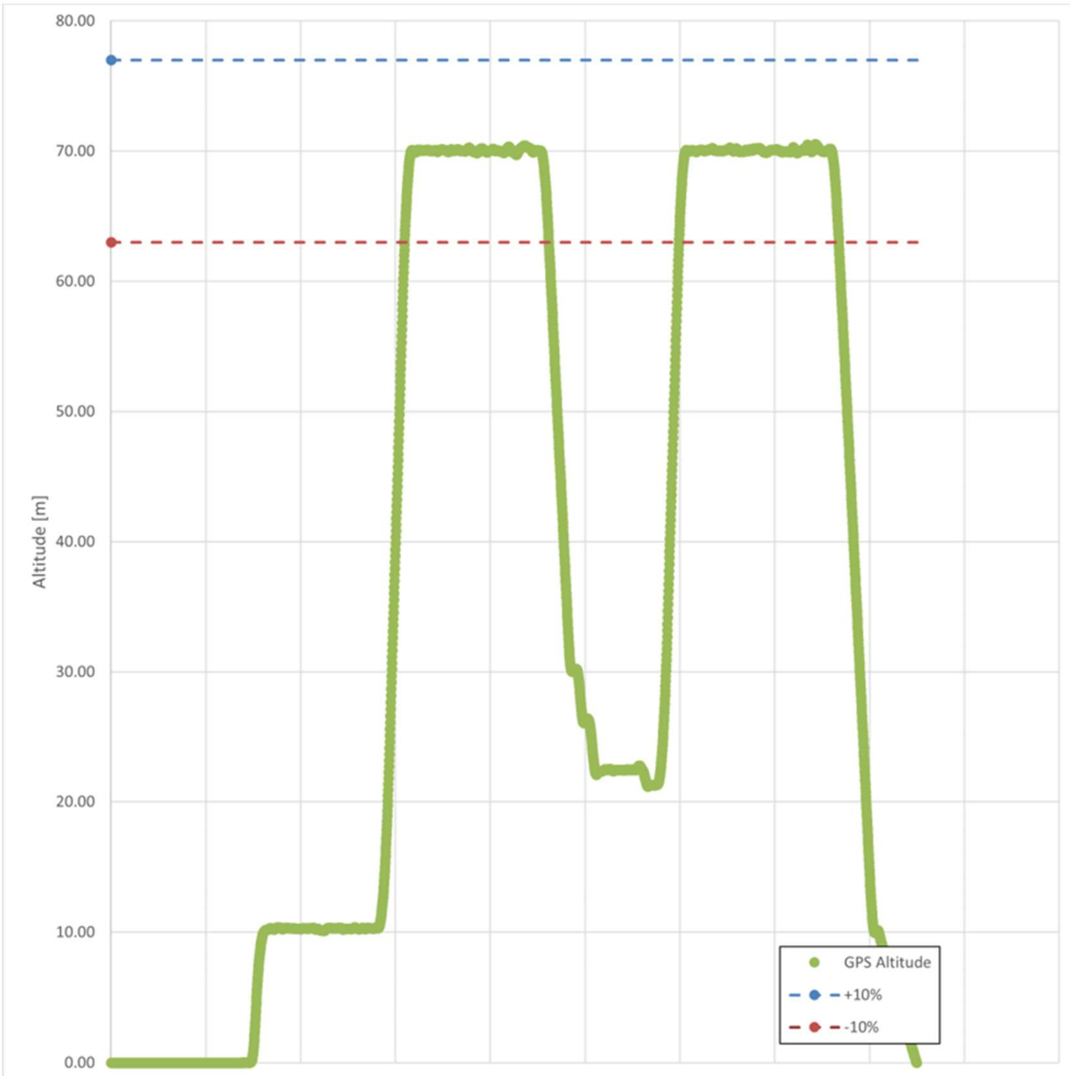
-79.6168
-79.617
-79.6172
-79.6174
-79.6176
-79.6178
-79.618
-79.6182
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
35.9145
35.915
35.9155
Planned Route
GPS Data
+40.5ft
-40.5ft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70.00
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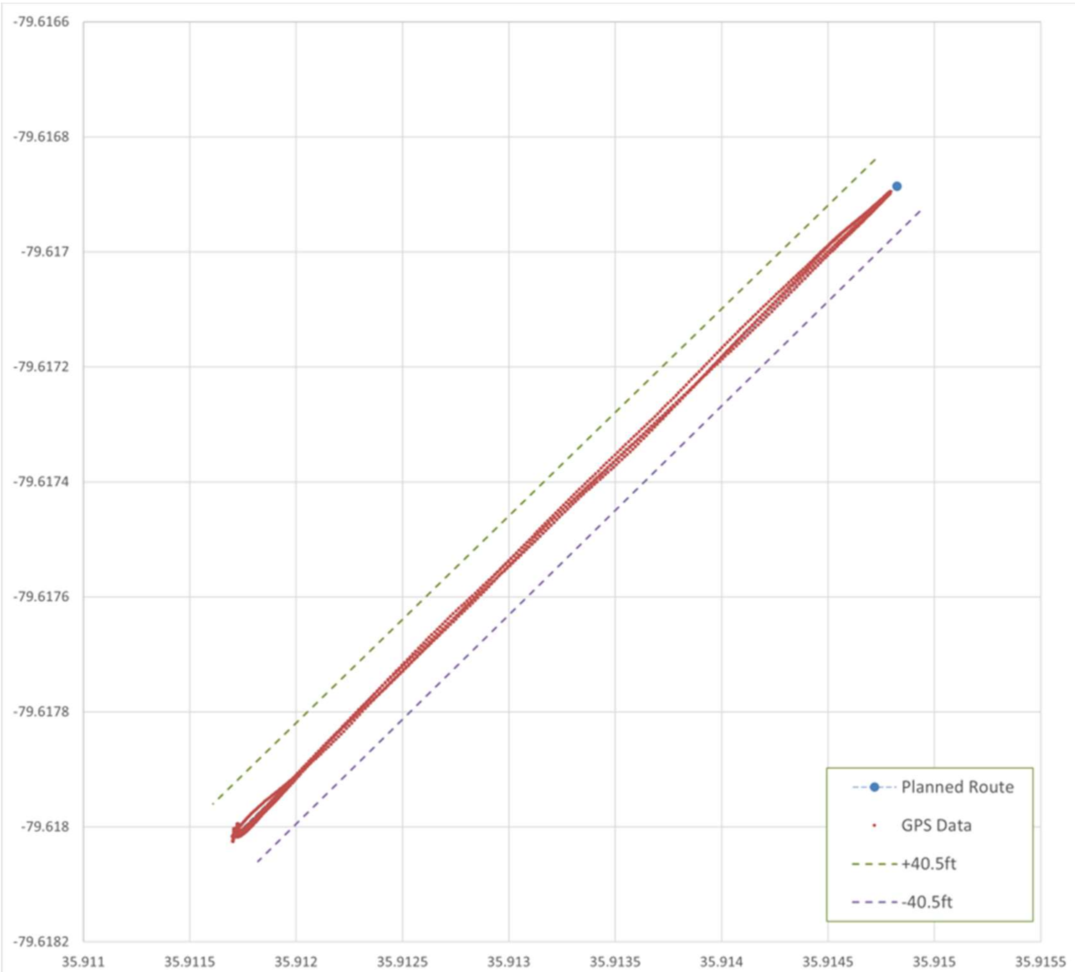
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

3.11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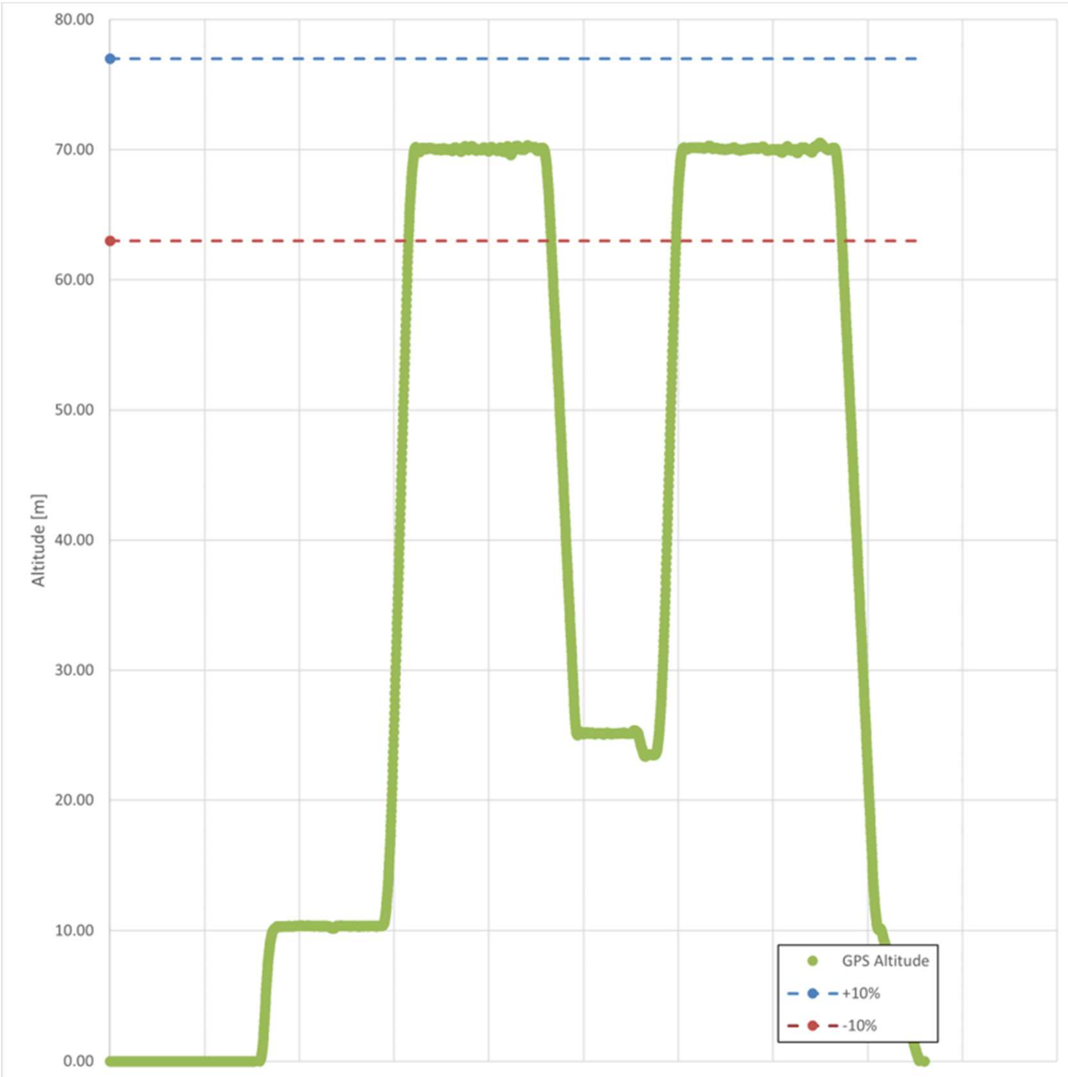
-79.6168
-79.617
-79.6172
-79.6174
-79.6176
-79.6178
-79.618
-79.6182
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
35.9145
35.915
35.9155
Planned Route
GPS Data
+40.5ft
-40.5ft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70.00
60.00
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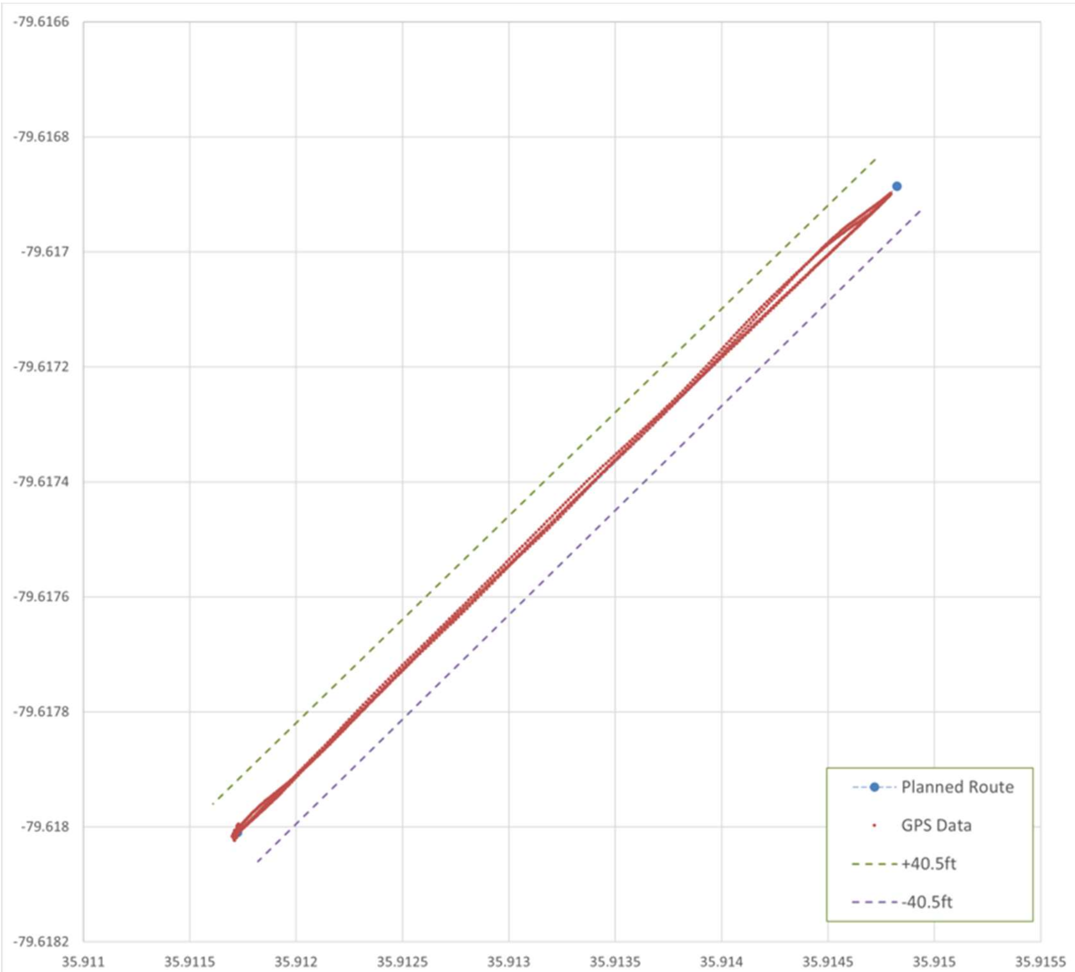
40.00
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

3.12


-79.6166
-79.6168
-79.617
-79.6172
-79.6174
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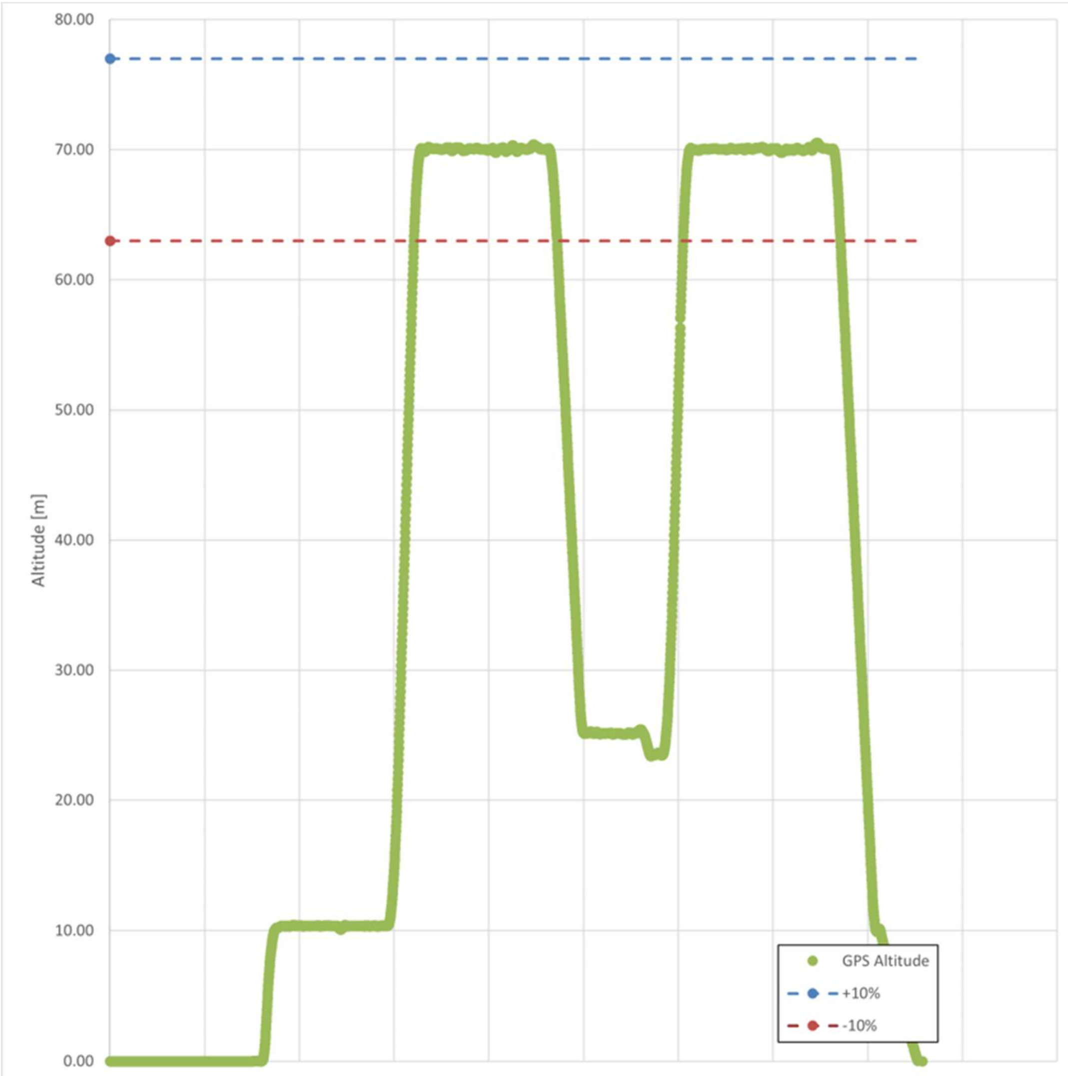
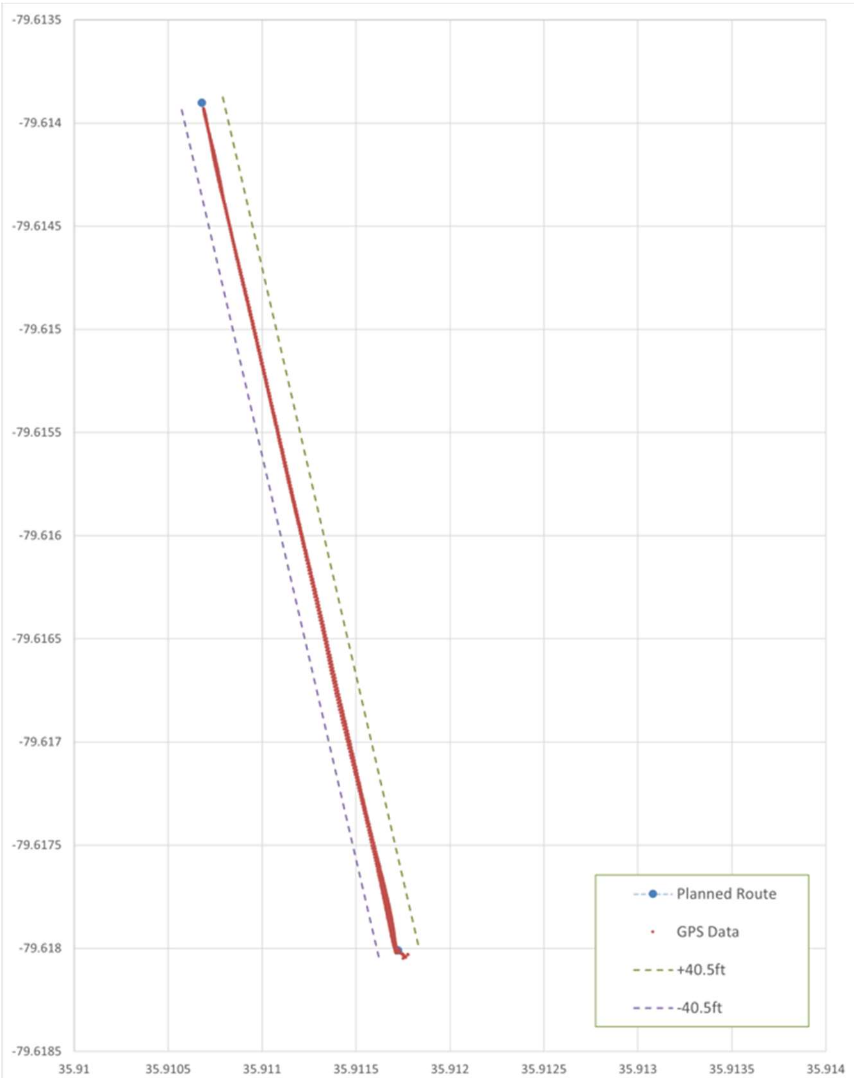
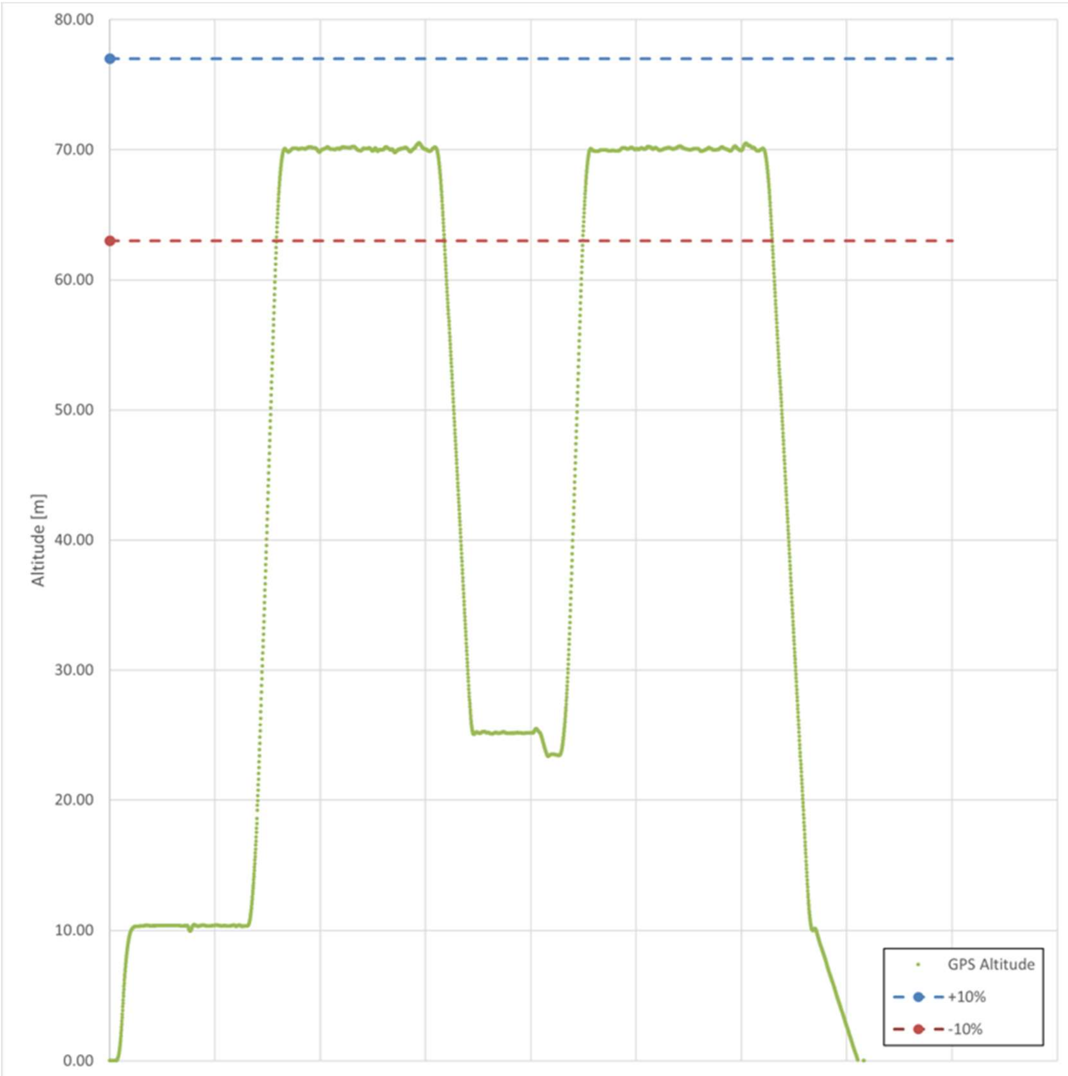
-79.6178
-79.618
-79.6182
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
35.9145
35.915
35.9155
Planned Route
GPS Data
+40.5ft
-40.5ft


80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

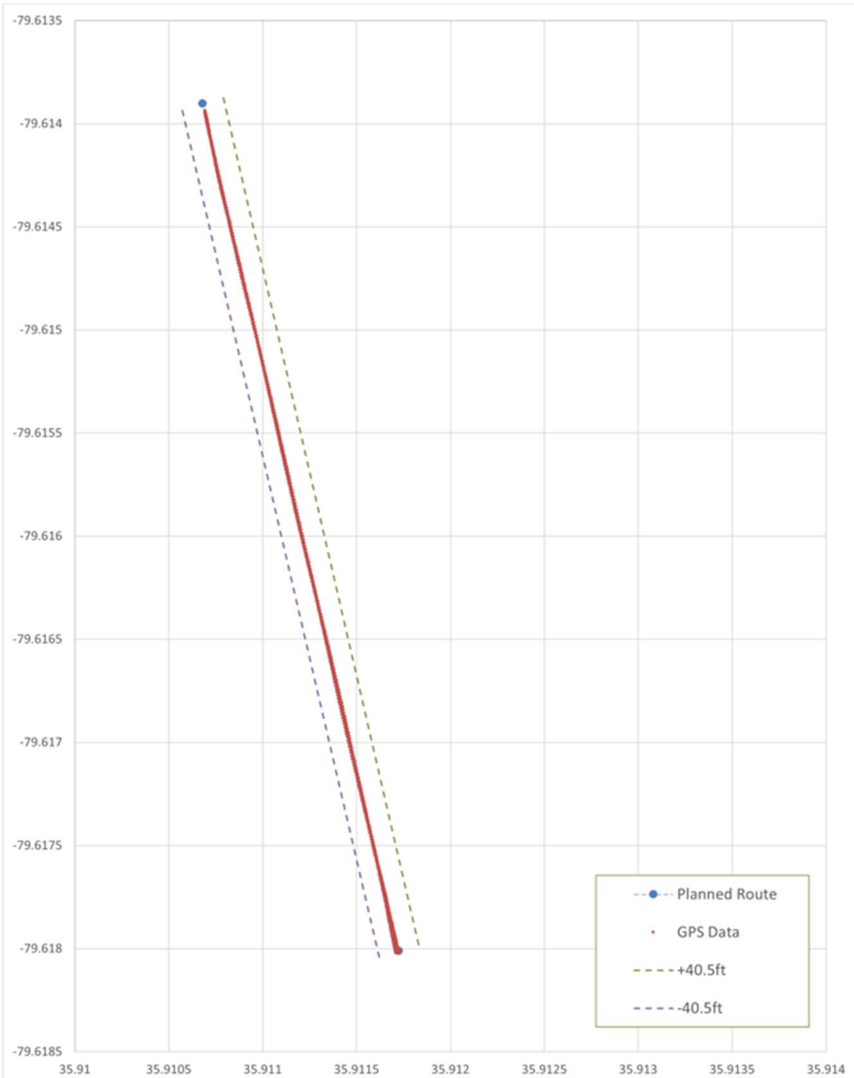
3.13a



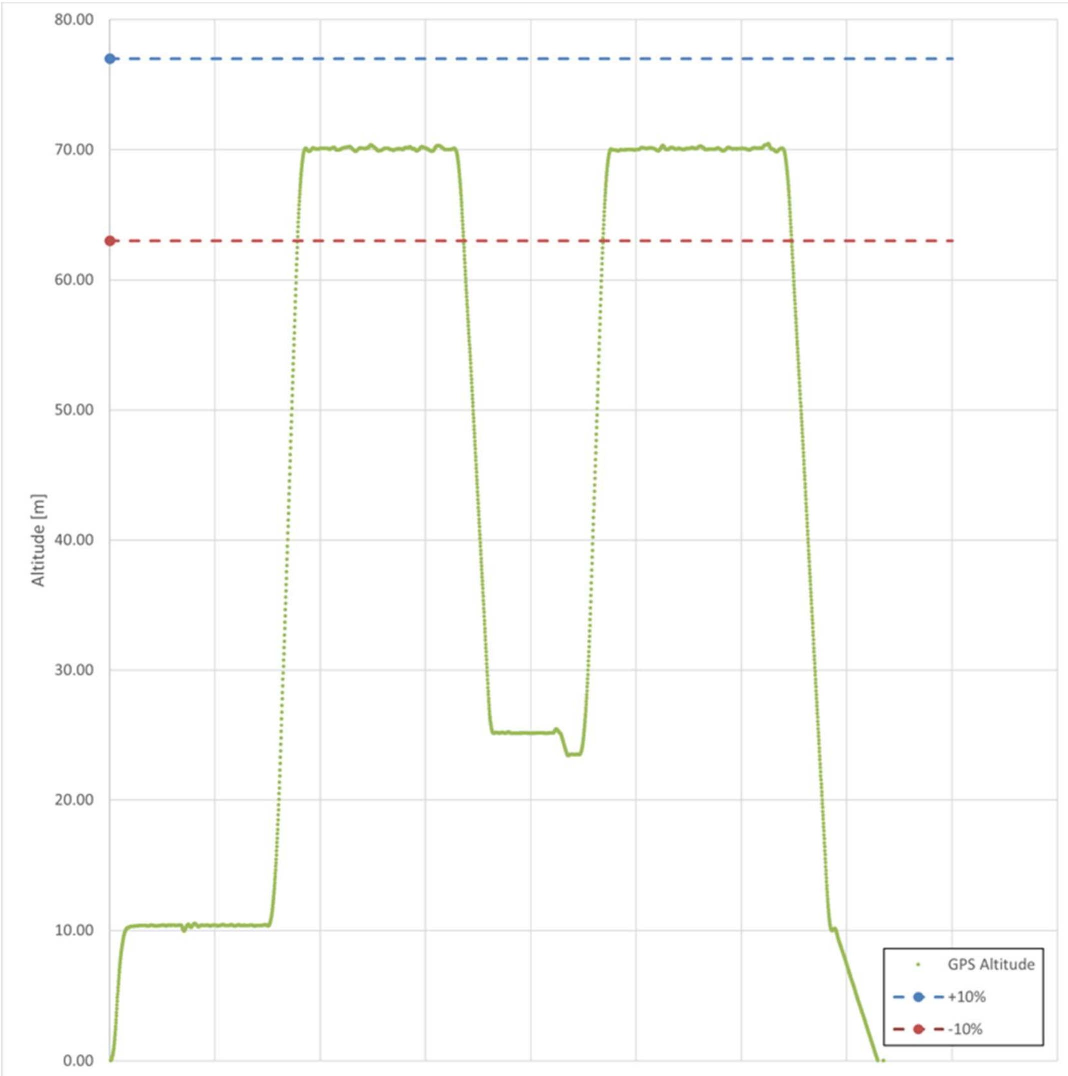
-79.6135
-79.614
-79.6145
-79.615
-79.6155
-79.616
-79.6165
-79.617
-79.6175
-79.618
-79.6185
35.91
35.9105
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
Planned Route
GPS Data
+40.5ft
-40.5ft


80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

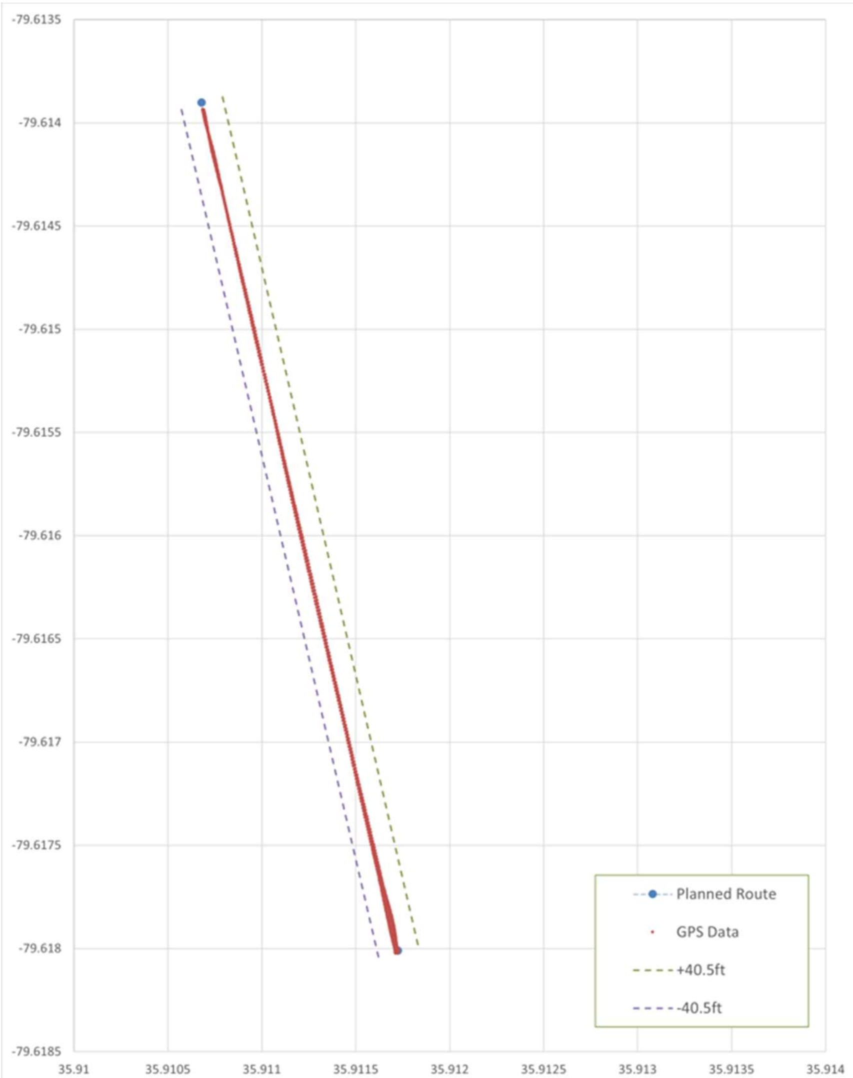
3.13b



-79.6135
-79.614
-79.6145
-79.615
-79.6155
-79.616
-79.6165
-79.617
-79.6175
-79.618
-79.6185
35.91
35.9105
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
Planned Route
GPS Data
+40.5ft
-40.5ft


80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

3.14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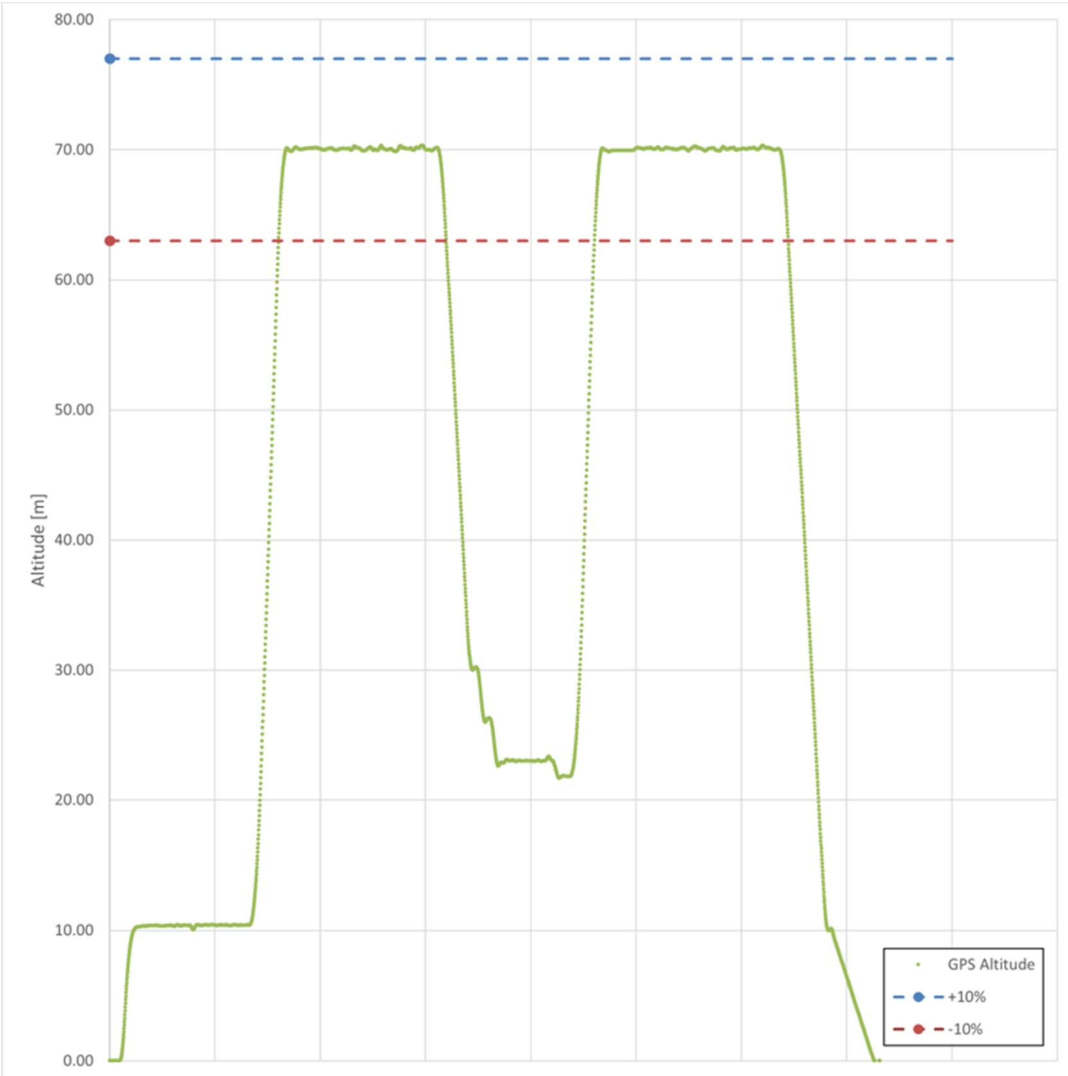
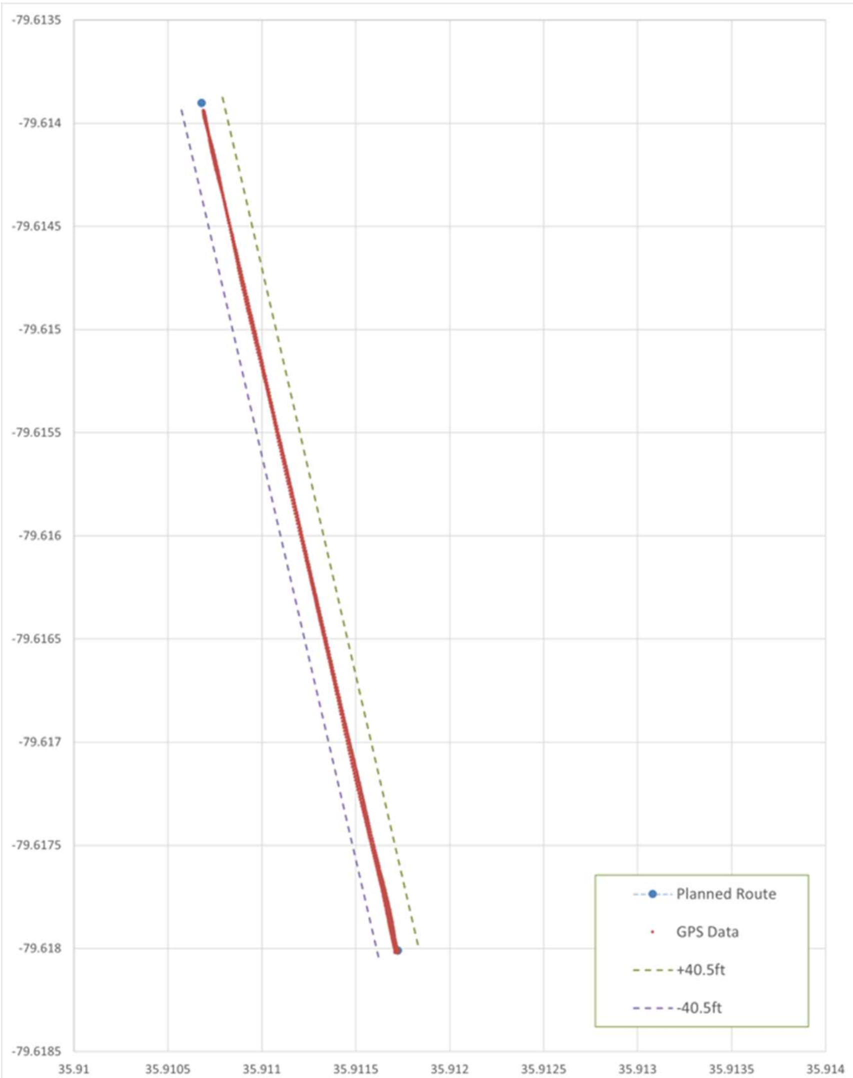
-79.614
-79.6145
-79.615
-79.6155
-79.616
-79.6165
-79.617
-79.6175
-79.618
-79.6185
35.91
35.9105
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
Planned Route
GPS Data
+40.5ft
-40.5ft


80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

3.15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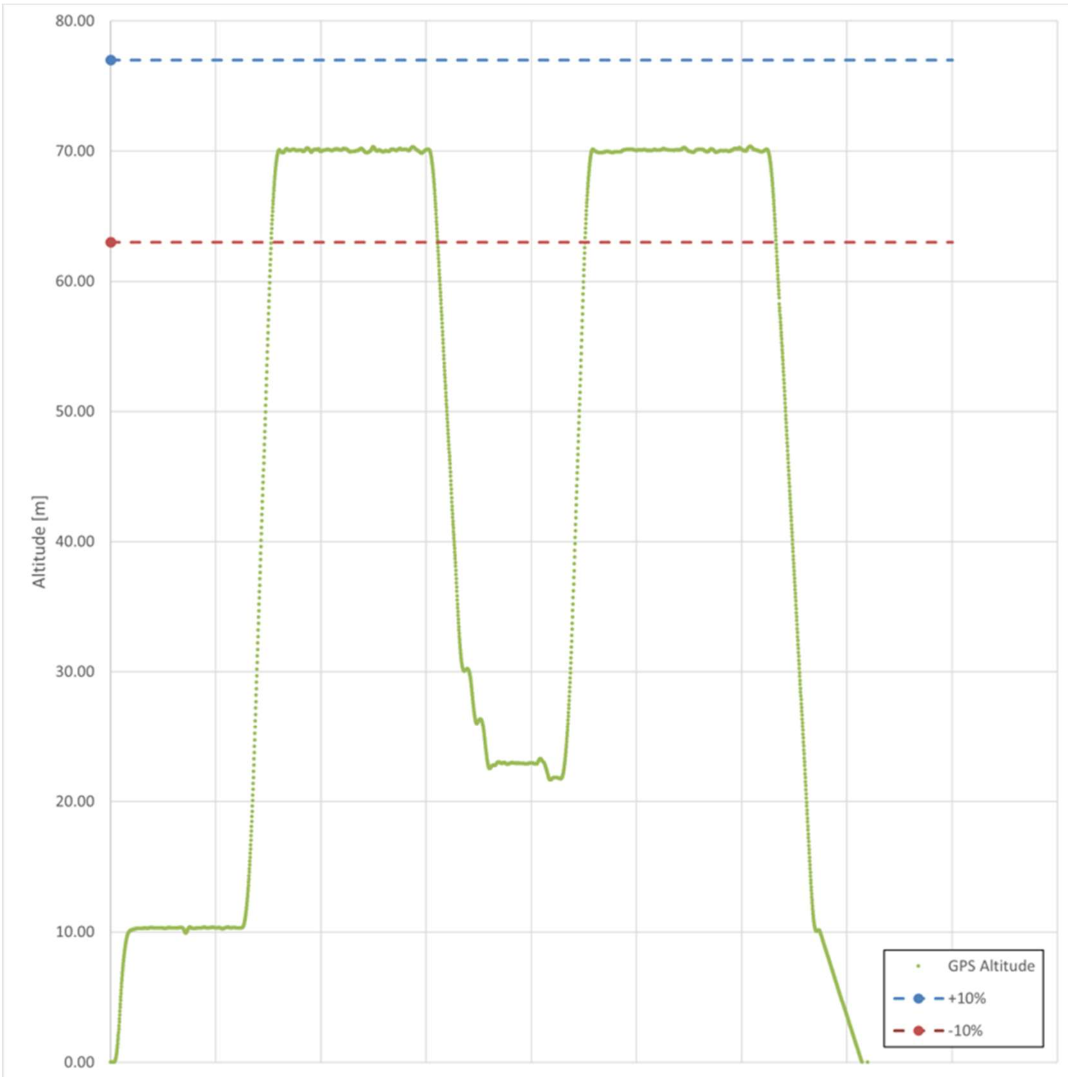
-79.614
-79.6145
-79.615
-79.6155
-79.616
-79.6165
-79.617
-79.6175
-79.618
-79.6185
35.91
35.9105
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
Planned Route
GPS Data
+40.5ft
-40.5ft


80.00
70.00
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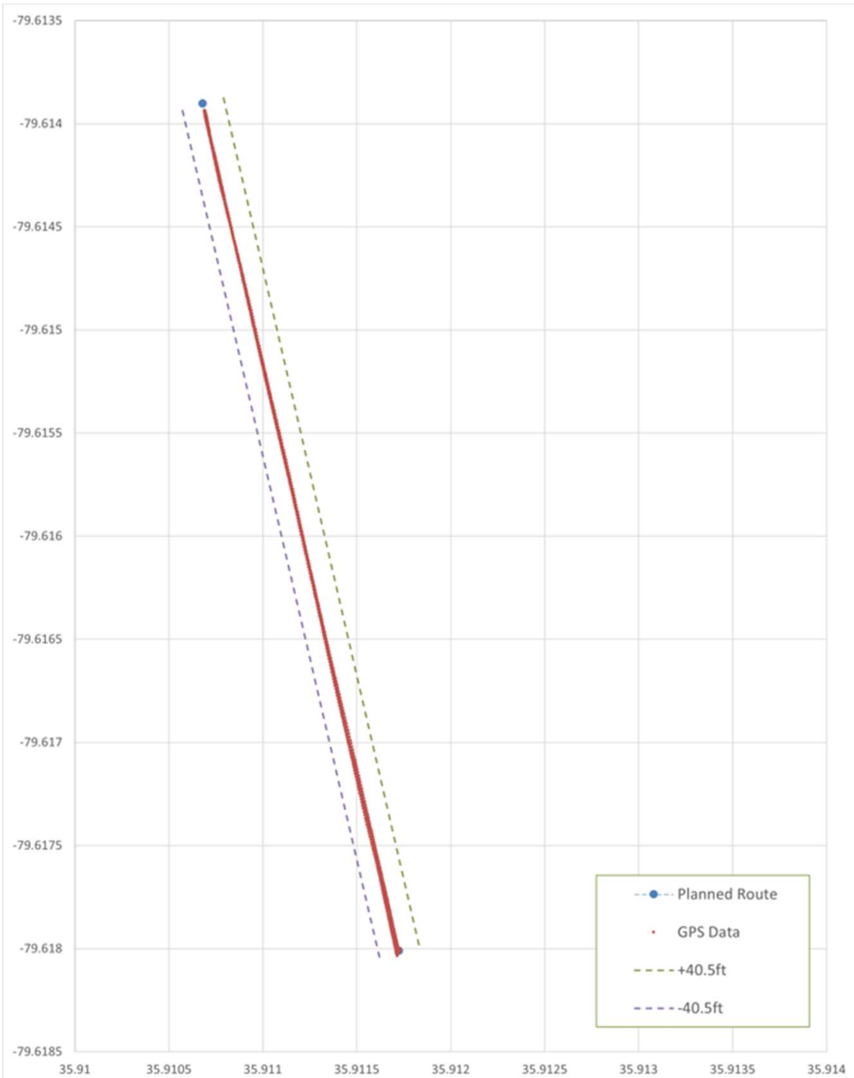
40.00
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

3.16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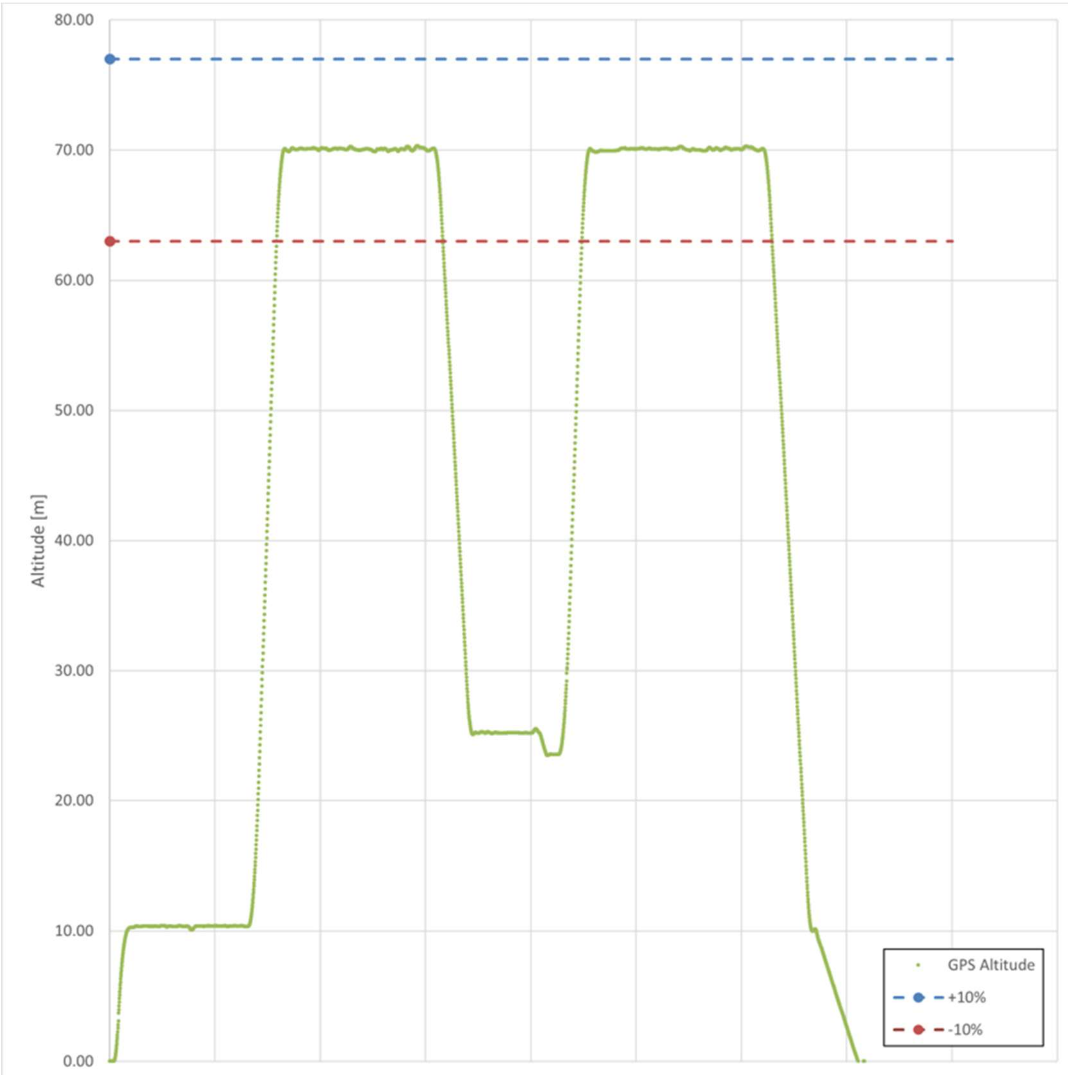
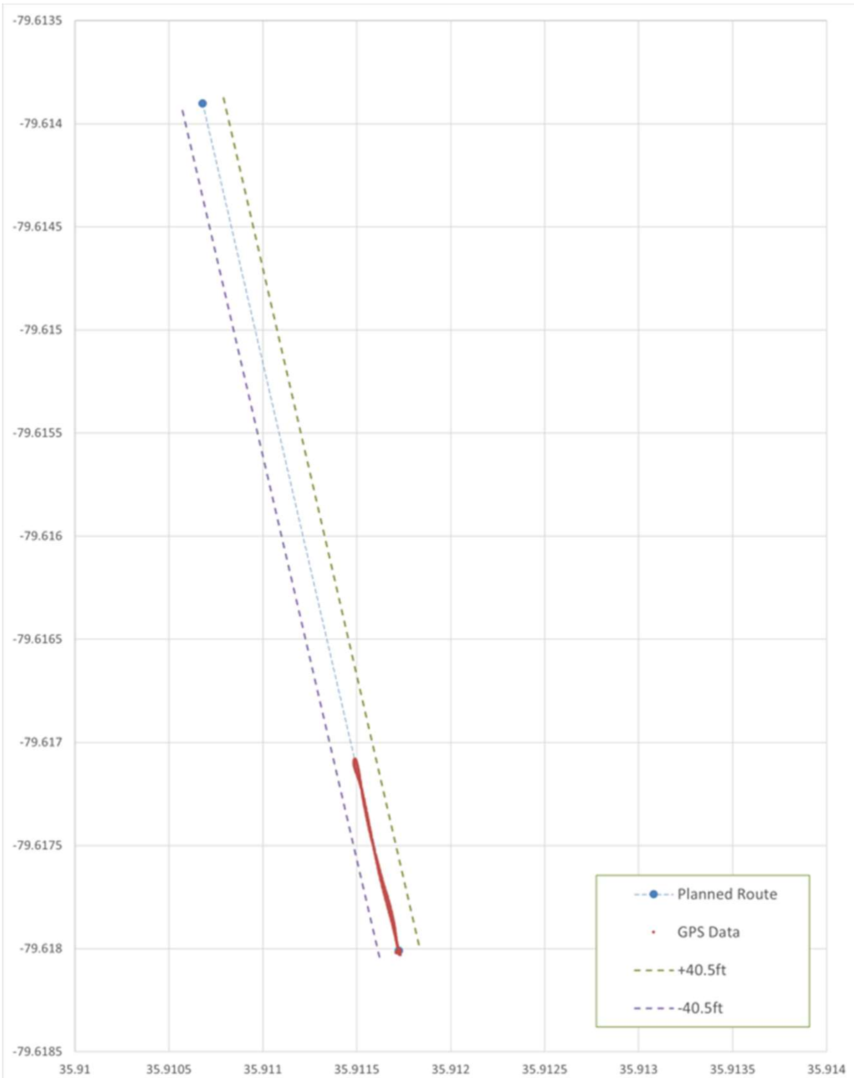
-79.614
-79.6145
-79.615
-79.6155
-79.616
-79.6165
-79.617
-79.6175
-79.618
-79.6185
35.91
35.9105
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
Planned Route
GPS Data
+40.5ft
-40.5ft


80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

3.17a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-79.6145
-79.615
-79.6155
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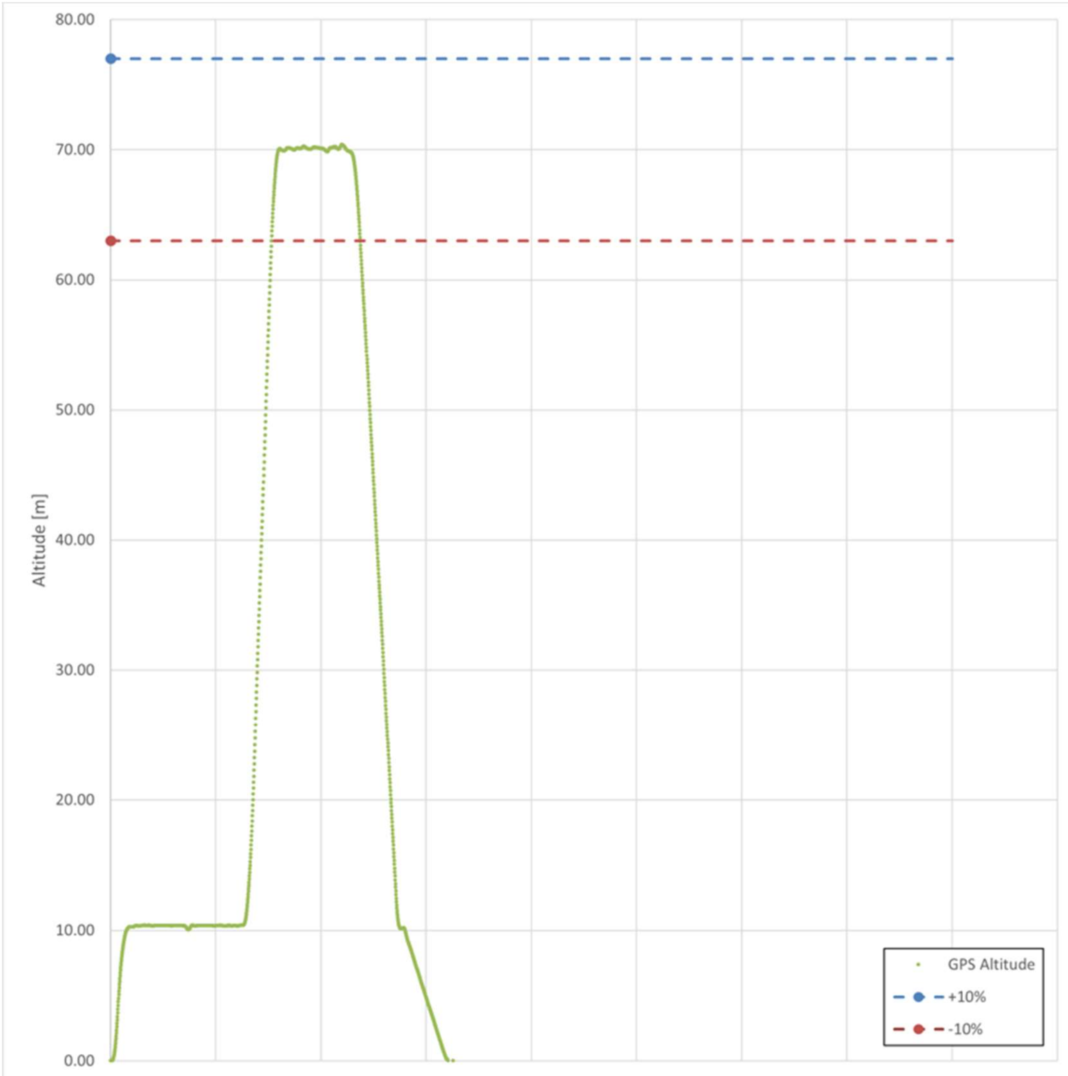
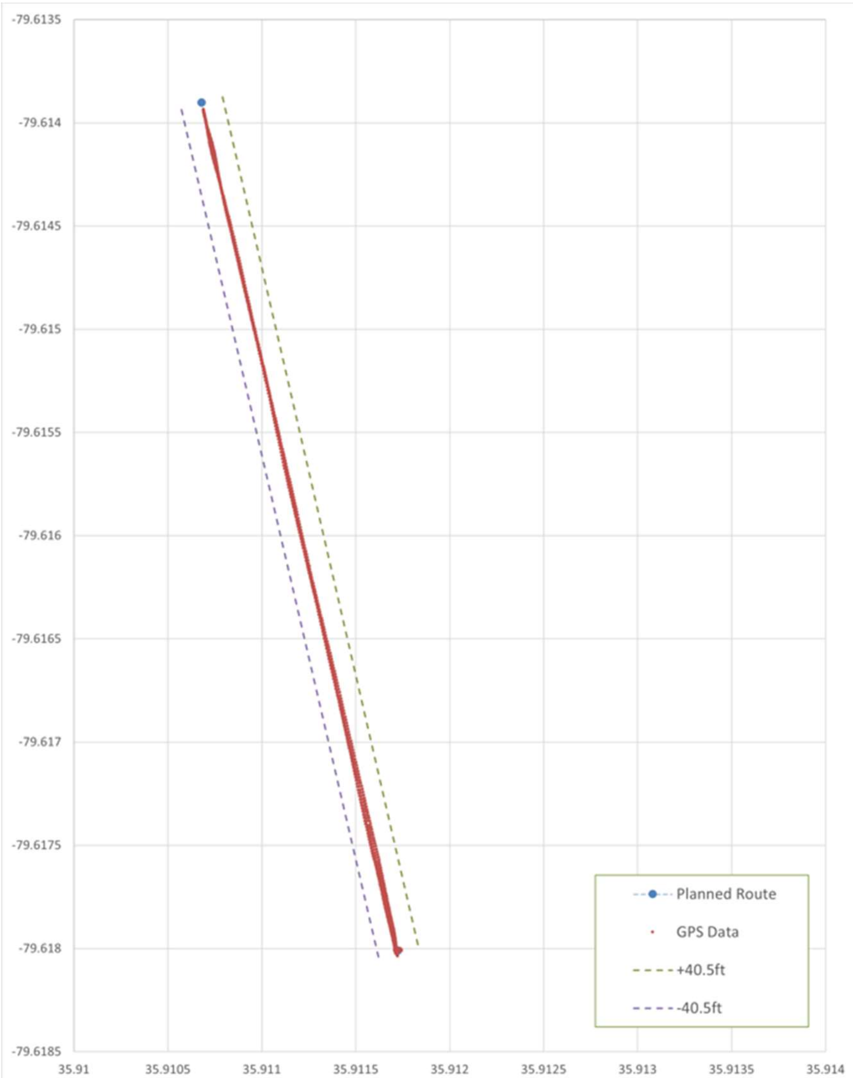
-79.6165
-79.617
-79.6175
-79.618
-79.6185
35.91
35.9105
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
Planned Route
GPS Data
+40.5ft
-40.5ft


80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

3.17b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-79.614
-79.6145
-79.615
-79.6155
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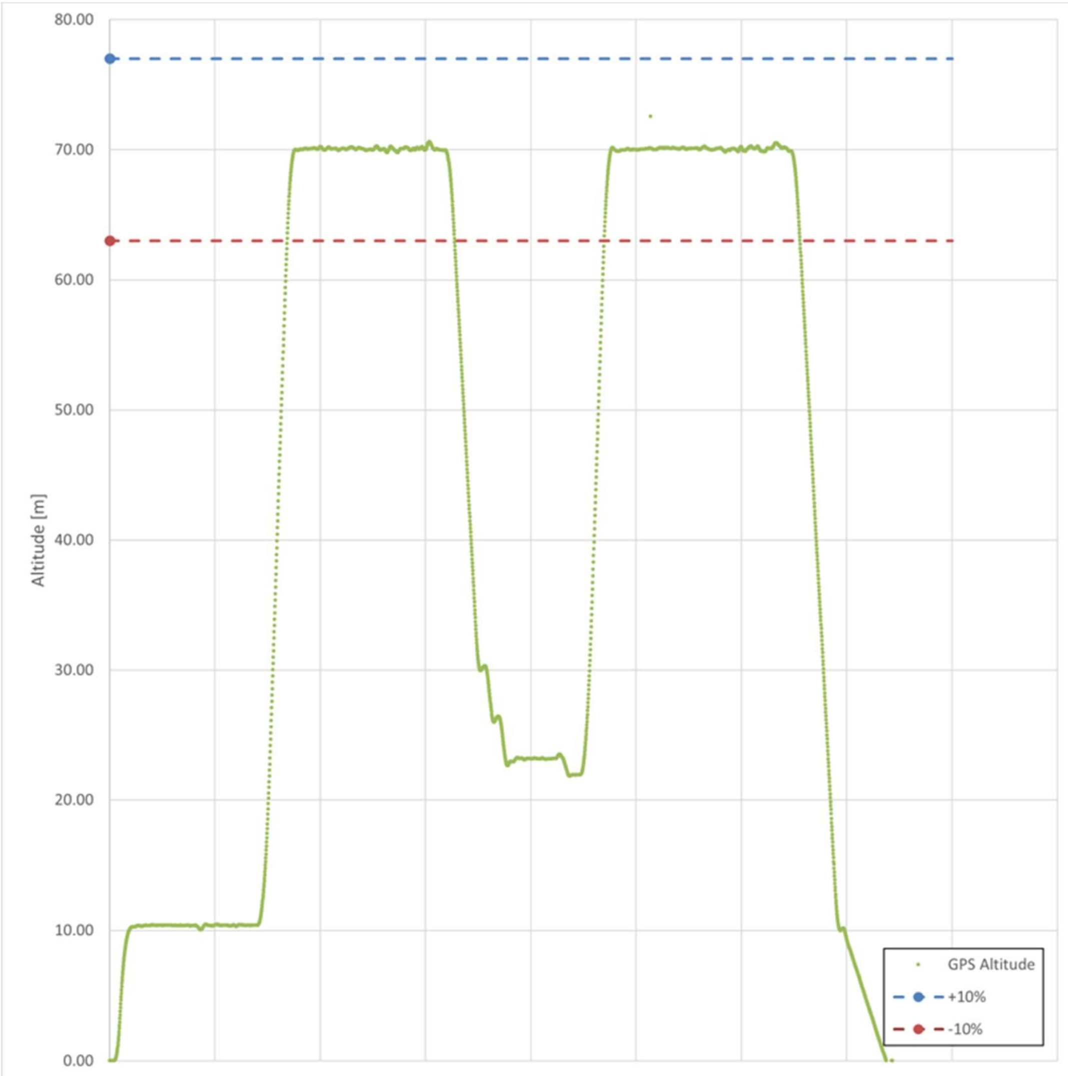
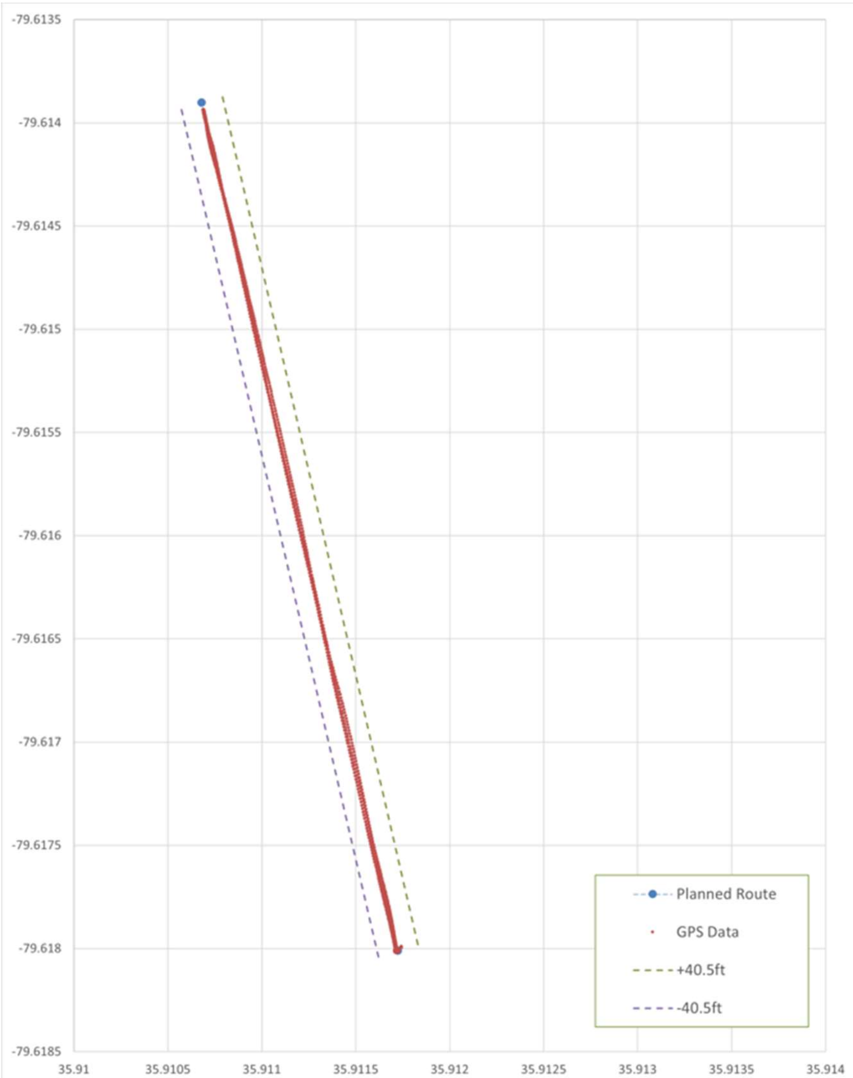
-79.6165
-79.617
-79.6175
-79.618
-79.6185
35.91
35.9105
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
Planned Route
GPS Data
+40.5ft
-40.5ft


80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

3.18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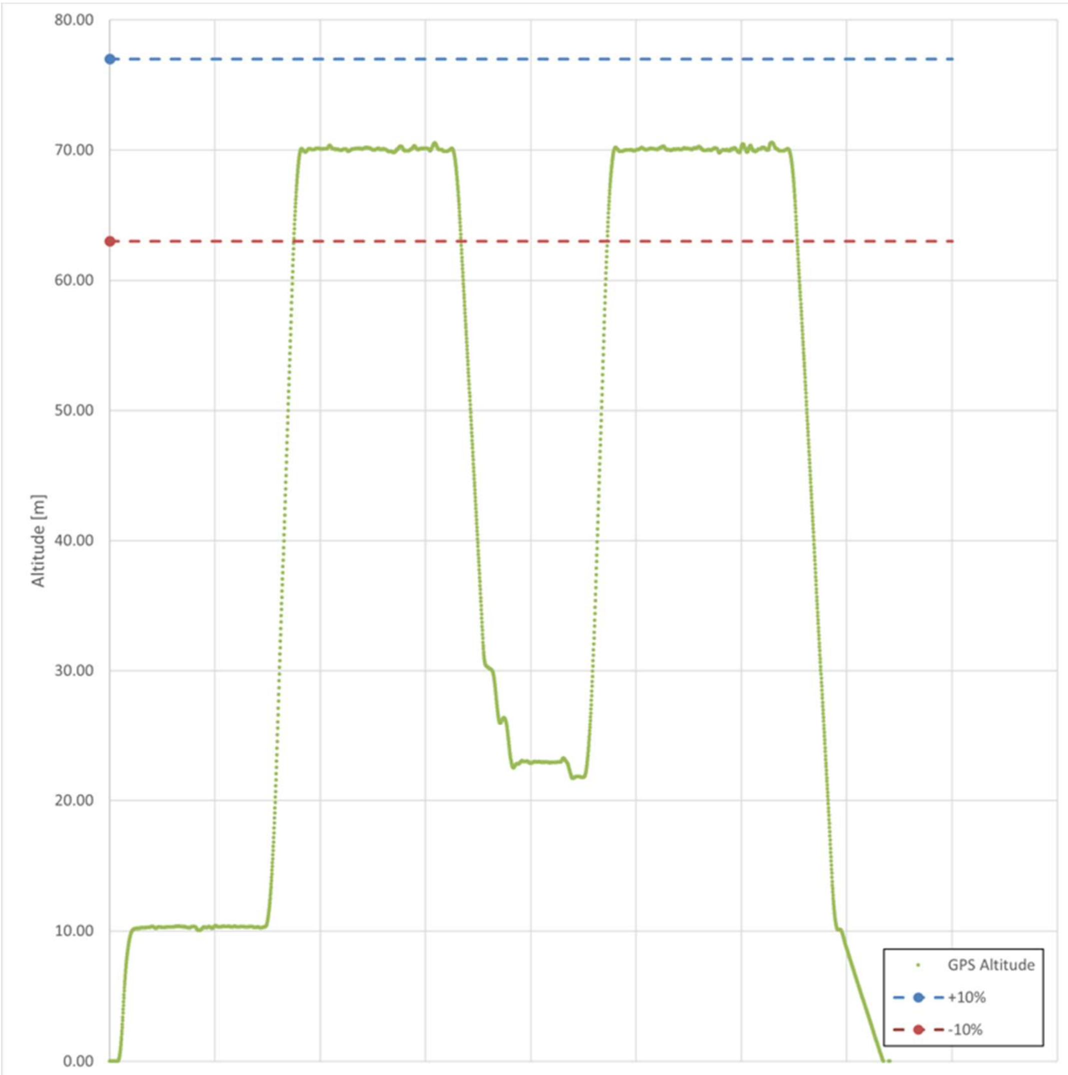
-79.614
-79.6145
-79.615
-79.6155
-79.616
-79.6165
-79.617
-79.6175
-79.618
-79.6185
35.91
35.9105
35.911
35.9115
35.912
35.9125
35.913
35.9135
35.914
Planned Route
GPS Data
+40.5ft
-40.5ft


80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Altitude [m]
GPS Altitude
+10%
-10%

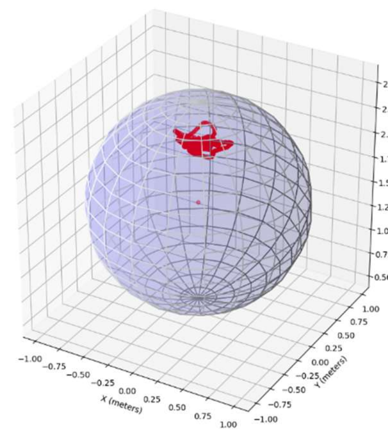
GPS Data for Hover Noise Tests

Test #	Mission ID	Hover Alt [m]	Beginning of hover	End of hover	Duration	Notes
5.01	6d0a7	25.1-25.3	17:39:09	17:39:49	0:00:40	
5.02		25.0-25.2	17:40:46	17:41:24	0:00:38	
5.03		25.0-25.3	17:42:22	17:42:55	0:00:33	
5.04	15fdd	25.1-25.2	18:33:06	18:33:43	0:00:37	
5.05		25.2-25.4	18:34:44	18:35:23	0:00:39	
5.06		25.0-25.3	18:36:20	18:37:32	0:01:12	Aircraft in vicinity- regard last 30 sec.
4.01	ccee27	2.0-2.1	18:44:47	18:45:37	0:00:50	
4.02		2.1-2.2	18:46:44	18:47:23	0:00:39	
4.03	041356	2.1-2.2	12:23:07	12:23:42	0:00:35	
4.04		2.2-2.3	12:24:39	12:25:11	0:00:32	
4.05		2.2	12:26:13	12:26:46	0:00:33	
4.06		2.1-2.2	12:27:42	12:28:15	0:00:33	
4.07		2.1-2.3	12:29:16	12:29:57	0:00:41	

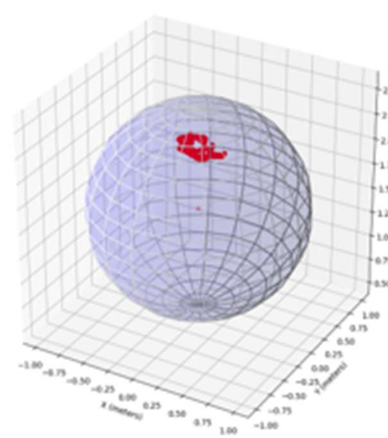
Hover Sphere Plots

Following are graphs showing that the Flytrex Sky II drone remained within a 3-foot sphere during the hover noise tests on May 7, 2024 at Causey field.

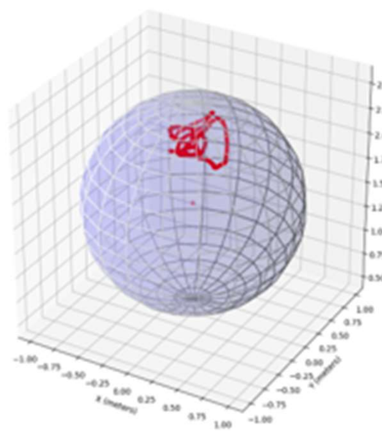
Hover Run 1 Condition 5.01/6.01



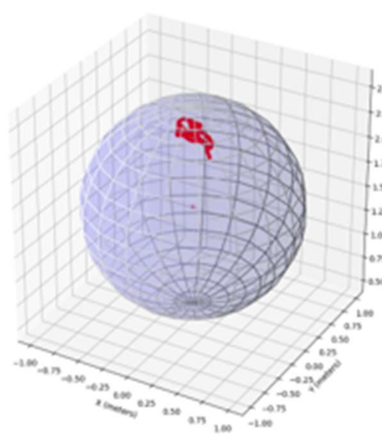
Hover Run 2 Condition 5.02/6.02



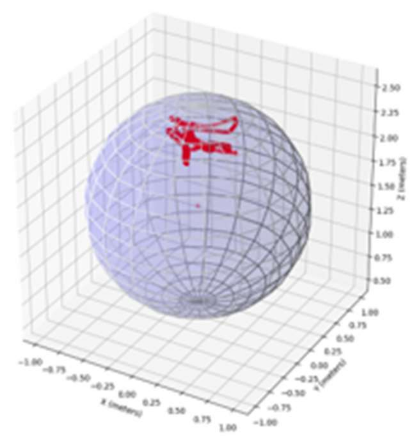
Hover Run 4 Condition 5.03/6.03



Hover Run 4 Condition 5.04/6.04



Hover Run 5 Condition 5.05/6.05



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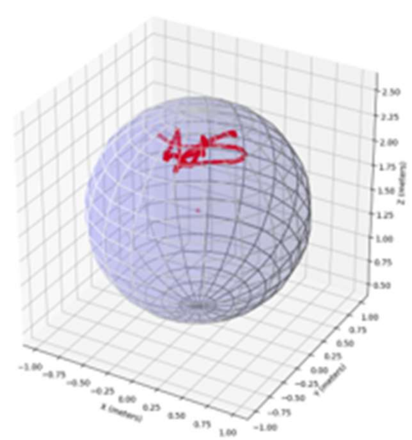

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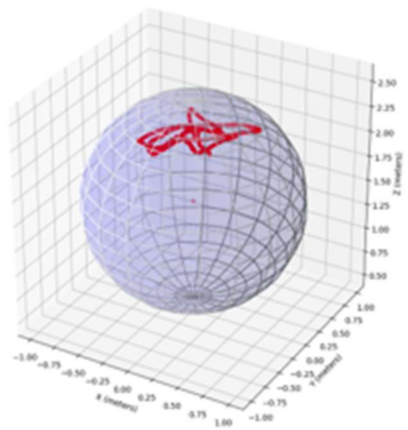

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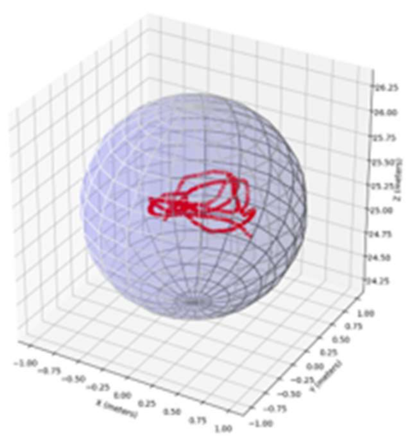

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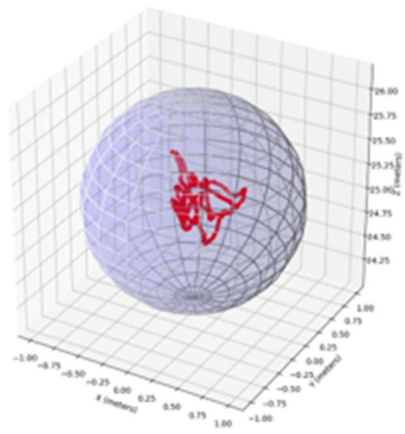

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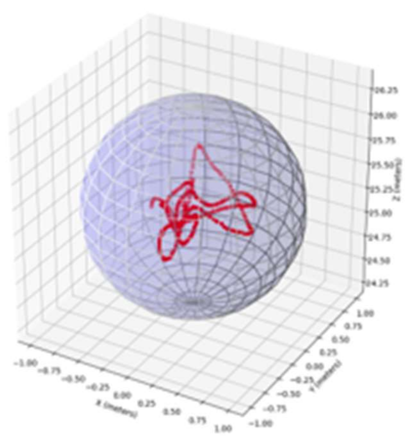

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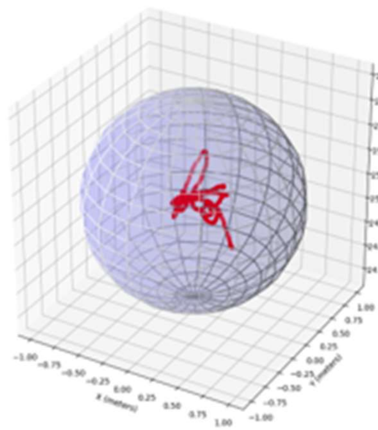

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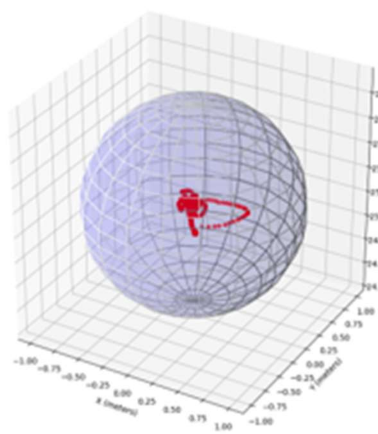
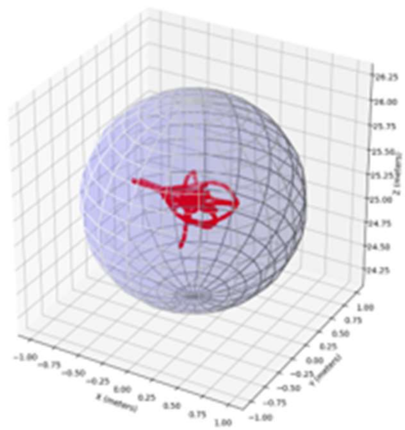


Hover Run 13 Condition 4.06 Repeat



Noise Analysis – FTX-M600P

Noise Assessment for Causey Proposed Package Delivery Operations with Flytrex FTX-M600P Unmanned Aircraft

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

Final

HMMH Report No. 309990.003-5

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Contents

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1 Introduction and Background

This document presents the methodology and estimation of noise exposure related to proposed Unmanned Aircraft (UA) package delivery operations conducted by Causey Aviation Unmanned, Inc. ("Causey") as a commercial operator under the provisions of 14 CFR Part 135. Causey is proposing to perform package delivery operations at multiple potential locations in the continental United States utilizing an operational model that involves a central distribution center and supporting route network to transport small commercial goods to public delivery points and residential backyards.

The distribution center and delivery points are determined based on partnerships Causey has established with organizations providing products at the distribution center to various end customers, typically at residential locations. Flight paths to and from the distribution center and delivery points use a network of route plans, with a structure of common flight path segments near the distribution center and various branches to deliver to individual locations. Causey selects delivery points after potential customers are identified and their specific locations have been surveyed and satisfy various criteria.

Causey is proposing operations with unmanned aircraft model Flytrex FTX-M600P (referred to throughout as "the Flytrex FTX-M600P UA," or "UA"). The Flytrex FTX -M600P UA is a multi-rotor design featuring six propellers mounted on equally spaced arms extending horizontally from a center frame. The system's computers and package containers are located on the underside of the airframe. The maximum allowable takeoff weight of the UA is 33.4 pounds, and the maximum allowable package weight is 6.6 pounds.

Figure 1 depicts the UA considered in this report.

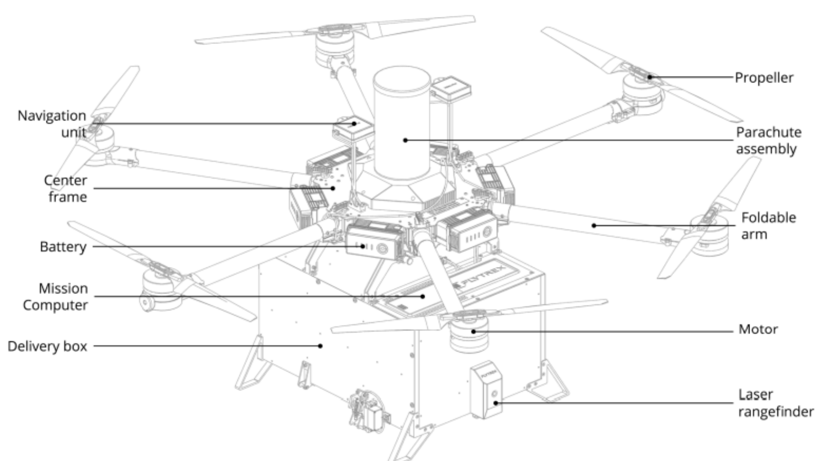

Figure 1: Flytrex FTX-M600P UA

Source: Causey, CONOPS July 19, 2021

The proposed delivery system will be implemented in suburban areas with distribution centers located at commercial or healthcare centers. At distribution centers, a remote pilot in command (RPIC) will load the Flytrex FTX-M600P UA with the desired package and launch the UA to perform aerial deliveries. The UA will fly a predetermined flight path with supervision from the RPIC and per approved Federal Aviation Administration (FAA) operating authority until it reaches its desired delivery point. Once the UA arrives at the delivery point, it hovers above the ground and lowers the package to the ground on a cable.

With a multirotor design, the UA can take off and descend vertically as well as hover. Airspeeds during normal cruise are expected to be approximately 29 knots. Typical flights begin with the UA departing from a distribution center and ascending vertically to 230 feet Above Ground Level (AGL). The UA then flies a pre-assigned route at 230 feet AGL and 29 knots to a selected delivery point. Upon arrival at the delivery point, the UA descends vertically to the delivery hover altitude of 82 feet AGL and waits for the customer to accept package delivery through a user interface application (sometimes referred to as, an app). If the delivery is not accepted within 15 seconds, the UA will return to the distribution center with the package. If the delivery is accepted, the UA will lower the package to the ground using a tethered mechanism and subsequently return to the distribution center. When returning to the distribution center, the UA climbs vertically back to 230 feet AGL and follows a predefined route from the delivery point back to the distribution center. Upon arrival at the distribution center, the UA descends vertically from 230 feet AGL to the ground for landing.

The methodology proposed in this document provides quantitative guidance to FAA Environmental Specialists to inform environmental decision making on UA noise exposure from proposed Causey 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 non-standard 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 Causey and FAA to date and therefore is limited to Causey operations with the FTX-M600P UA and the flight phases and maneuvers described herein. The noise analysis methodology and estimated noise levels of the proposed activity levels are based upon noise measurement data provided by the FAA.[2] Results of the noise analysis are presented in terms of the Day-Night Average Sound Level (DNL) based on varying levels of operations for areas at ground level below each phase of the flight.[3]

Section 2 of this document describes the relevant noise and operations data made available by Causey and FAA. Section 3 describes the methodology to developing 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 by Causey to date.

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[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

[2] Hobbs, Chris, *Estimated Noise Levels for Flytrex FTXM600P UA* (Federal Aviation Administration, February 2, 2022)

[3] Discussion of modification of this process for use of the Community Noise Equivalent Level metric (CNEL) is discussed in Section 3.1.

2 Unmanned Aircraft Delivery Operations and Noise Measurement Data Set Descriptions

Two data sets form the basis of the noise assessment for the proposed Causey delivery operations. The data sets include the Causey Aviation Unmanned, Inc. Part 135 Concept of Operations (CONOPS) dated July 19, 2021 and the FAA's Memorandum, "Estimated Noise Levels for Flytrex MTXM600P UA," dated February 17, 2022, which is provided with this report as Attachment A.[4]

2.1 Operations, Flight Paths, and Flight Profile Data

Operations and flight profile data for the UA provided by Causey 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 over a range of proposed activity levels; however, FAA review and approval of its use at specified activity levels is required. The activity ranges shown below in Section 4 represent what FAA considers low to moderate activity levels and anticipates as being 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.

Note that 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 DNL 10 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 network of defined flight paths between a central distribution center and delivery points that are developed as needed, based on demand. Each delivery point is selected based on customer demand after a suitability survey is completed specific to each candidate location.

Distribution centers may include one or multiple launch pads for both UA takeoffs and landings depending on the frequency of UA operations. Figure 2 presents an example distribution center area plan for supporting only one airborne UA at time. Such facilities have a single launch pad for takeoffs

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[4] Most of these documents have various markings indicating that that the contents are "Confidential & Proprietary". Only elements required to support the noise analysis methodology have been disclosed in this report.

and landings. Figure 3 presents an example distribution center area plan supporting two or more simultaneous airborne UAs. This example includes one launch pad that may be used for takeoffs and landings and multiple alternate landing pads. In addition to launch and landing pads, distribution centers include facilities for the crew to monitor and control the UAs, lineup positions where the UA batteries are charged and preparations are made for the next delivery, and areas where packages are accepted and sorted before loading into an UA.

After takeoff from the distribution center, the UA flies a network of defined flight paths from the distribution center to the intended delivery points that are developed on an “as-needed basis.” As routes are developed, the UA navigates the same defined paths for both the outbound (distribution center to delivery) and inbound (post-delivery to landing) legs. Figure 4 provides an overview of a representative sample route system, including the distribution center, routes, and delivery points.

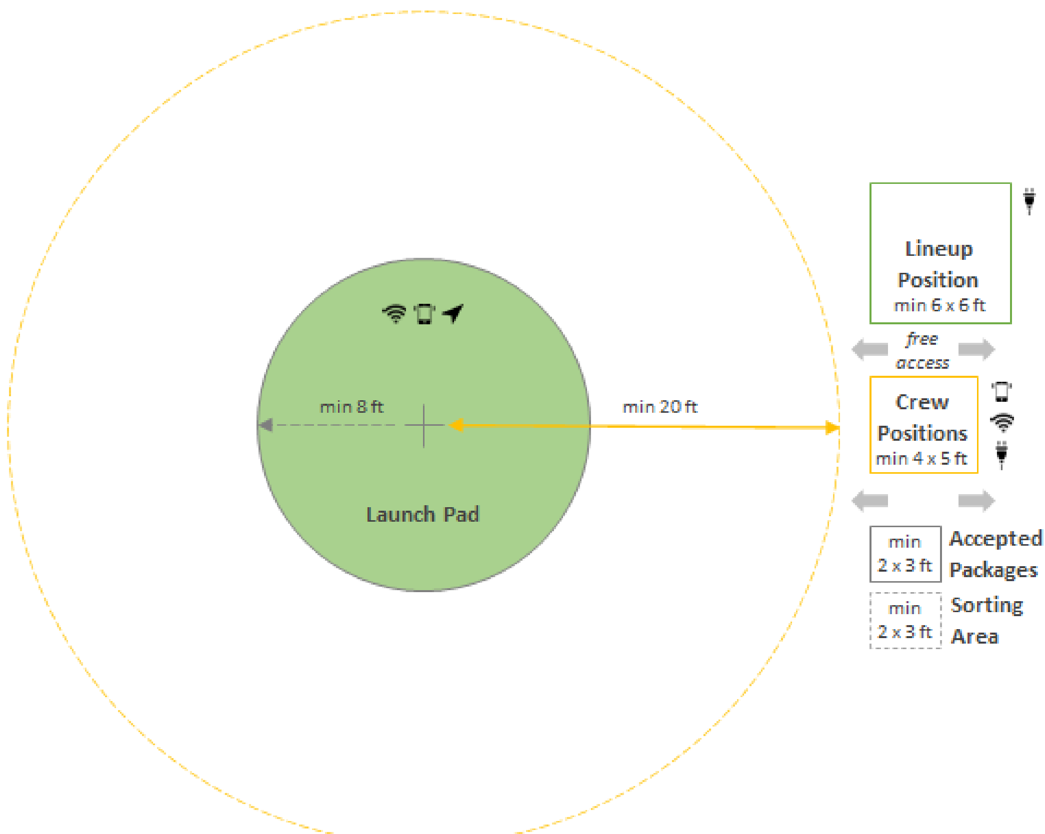

Figure 2: Distribution Center Area Plan for a Single Operating UA

Source: Causey, CONOPS July 19, 2021

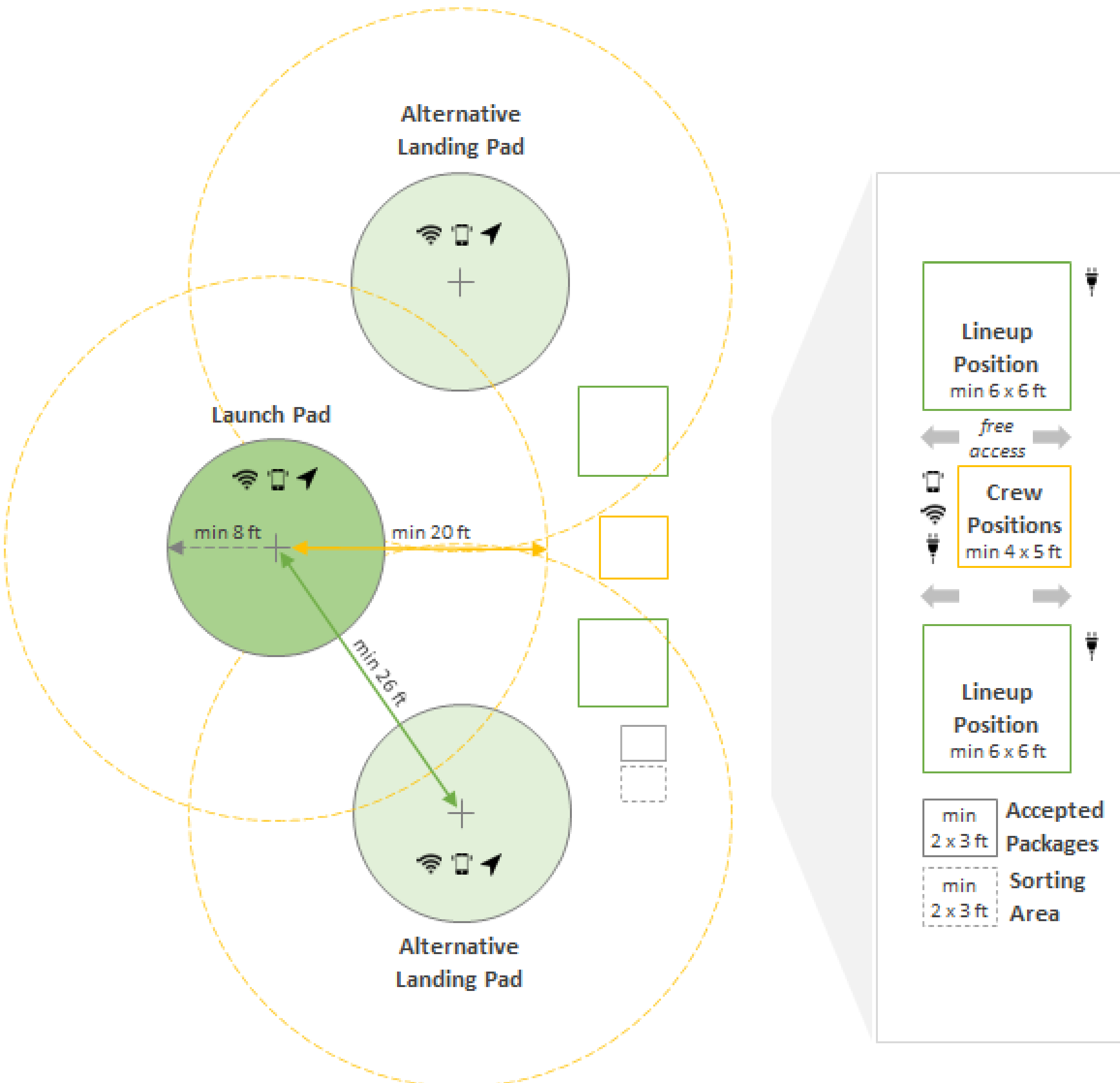

Figure 3: Distribution Center Area Plan with Two Simultaneous UAs Operating

Source: Causey, CONOPS July 19, 2021

Figure 3. Flight Network illustration. Flytrex GCS display, satellite view

Description of Points

Center — Represents the Distribution Center location on the map.

Waypoint — Represents location on the route which the sUA passes through and makes a turn.

Semaphore — Represents points where the sUA can safely hover at lower altitudes and perform emergency landing if needed, without posing a risk to people or property on the ground.

Delivery point — Represents a safe location where the sUA can lower packages to the ground for delivery and delivery requests can be made to this point.

Figure 4: Visualization of a Route System

Source: Causey, CONOPS July 19, 2021

Analysis of flight profile data provided by Causey and the FAA Office of Environment and Energy described that a typical operation profile of the UA can be broken into five discrete flight phases. Table 1 describes the typical flight profile that Causey is expected to use for delivery operations and provides detail of the five flight phases of takeoff and climb; en route outbound; delivery; en route inbound; and descent and landing. The sub sections that follow provide a narrative description of each of the flight phases.

Table 1. Flytrex FTX-M600P Typical Flight Profiles

Source: FAA February 17, 2022 (Attachment A)

Flight Phase (General)	Flight Segment (Detail)	Weight	Altitude at Segment Start (ft)	Altitude at Segment End (ft)	Ground Speed	Duration
Takeoff and Climb	Takeoff	Maximum	0	33	0	5 seconds
	Internal checks	Maximum	33	33	0	3 seconds
	Climb to cruise altitude	Maximum	33	230	0	15 seconds
En route outbound	Cruise to delivery point	Maximum	230	230	29.2 kts	1-5 minutes
Delivery	Descent for delivery	Maximum	230	82	0	22 seconds
	Open doors, Await Customer Response and lower package to ground	Maximum	82	82	0	35 seconds
	Maneuver to Unhook Package	Maximum	82	75	0	4 seconds
	Maneuver to Unhook Package	Empty	75	82		4 seconds
	Climb back to cruise altitude	Empty	82	230	0	13 seconds
En route inbound	Cruise back to distribution center	Empty	230	230	29.2 kts	1-5 minutes
Descent and Landing	Descent	Empty	230	33	0	20 seconds
	Landing	Empty	33	0	0	20 seconds

2.1.2.1 Takeoff and Climb

The Takeoff and Climb phase is defined as the portion of flight in which a fully loaded UA takes off from its launch pad at a distribution center and climbs vertically to 33 feet AGL. The UA is assumed to be carrying a package and at the maximum weight of 33.4 pounds. The UA then conducts various systems checks in a hover at 33 feet AGL over the course of three seconds. If the UA passes its systems checks, the UA then climbs vertically from 33 feet AGL to 230 feet AGL over five seconds.

2.1.2.2 En Route Outbound

The En route Outbound phase is defined as the part of flight in which the fully loaded UA transits from the distribution center to delivery points on a pre-defined network of flight paths. During this flight phase, the UA will typically operate at an altitude of 230 feet AGL and a typical airspeed of 29 knots.[5] However, the UA may operate within a corridor with altitudes as low as 171 feet AGL or as high as 289 feet AGL as needed due to obstructions and operational conditions.[6]

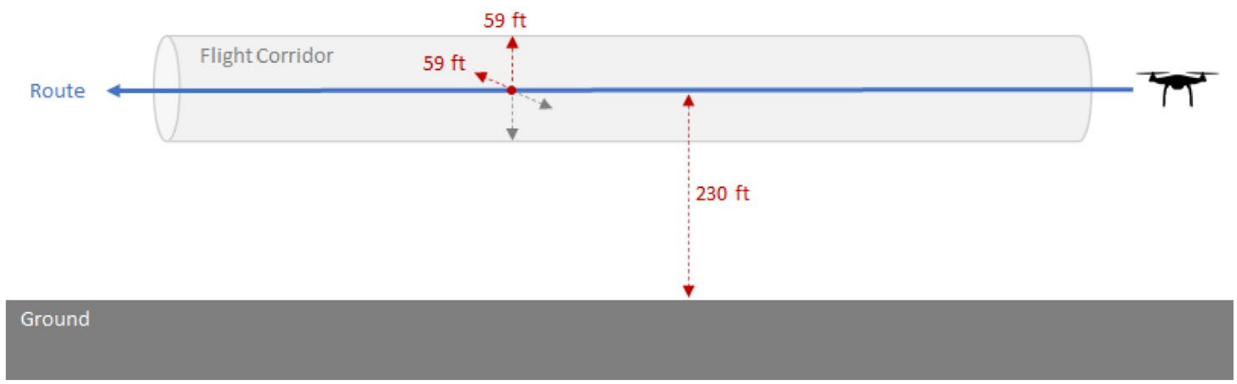

Figure 5: Flight Corridor

Source: Causey, CONOPS July 19, 2021

2.1.2.3 Delivery

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 delivery point is a minimum 10 by 10-foot square area open to the sky, clear of obstacles, that is coordinated with the property owner and validated by Causey.[7]

During the delivery phase, the aircraft descends vertically from the en route altitude to 82 feet AGL. The UA then hovers at 82 feet AGL and waits for up to 15 seconds for confirmation of the delivery from the recipient. Once the recipient has communicated approval of the delivery, the UA continues to hover while it lowers the package to the ground by a tether (wire). Once the package is on the ground, the UA releases the package using the following maneuver, which takes approximately eight seconds. The UA descends vertically to 75 feet AGL, unhooks the tether from the package, returns to 82 feet AGL, and retracts the tether back into the UA. The UA then climbs at empty weight of 28.6 pounds vertically back to en route altitude at 230 feet AGL. The entire process starting with descent from en route altitude, package release, and returning to en route altitude, takes less than a minute and a half.

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[5] Causey materials specify the speed as “33.6 mph (15m/s)" Speed in this memorandum is converted to knots.

[6] Causey, CONOPS July 19, 2021, pg. 15

[7] Causey, CONOPS July 19, 2021, pg. 21

2.1.2.4 En Route Inbound

Upon completion of a delivery, the UA will fly the en route inbound phase (or "return") via the reverse of the respective en route outbound profile (Section 2.1.2.2) from the delivery point back to the distribution center. The UA is assumed to be carrying no packages, and at empty weight, after delivery.

2.1.2.5 Descent and Landing

Upon reaching the distribution center, the UA will commence a vertical descent from 230 feet to 33 feet AGL over 20 seconds. The UA then descends vertically the remaining 33 feet to ground level over 20 seconds. Once on the ground, the UA stops its rotors and is retrieved by the ground crew.

2.2 Acoustical Data

Noise estimates for the UA were provided by the FAA Office of Environment and Energy representative of each phase of flight (takeoff and climb, en route, delivery, and descent and landing) as described in Section 2.1.2. The UA noise measurements were performed at a Causey facility near Liberty, North Carolina in July 2021. FAA analyzed the measurement data and summarized the acoustical data used in this report and included in Attachment A.

The following tables show the Sound Exposure Levels (SELs) used for this analysis as detailed in Attachment A, which can be matched to each flight phase detailed in Table 1.

Table 2 provides the estimated SEL for takeoff and climb associated with the flight phase described in Section 2.1.2.1. SEL in this table represents the aircraft starting from rest at the distribution center on the ground to climbing vertically to en route altitude. It does not include any horizontal/lateral flight.

Table 2. Estimate of SEL for Takeoff and Climb at Maximum Weight

Source: FAA February 17, 2022 (Attachment A)

Distance between Launch Pad and Receiver (ft) [a]	SEL (dB)
50	75.0
100	71.9
150	69.7
200	67.9
250	66.4
300	65.1
350	63.9
400	62.9
450	62.0
500	61.1

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

Table 3 presents the en route sound exposure levels for maximum weight and empty weight. The maximum weight SELs are applicable for the UA carrying a package while flying outbound to a delivery point while the empty weight SEL is applicable for the UA flying inbound to the distribution center after the UA completes a delivery and/or is not carrying cargo, respectively. The estimates are based on measurements of the UA passing 216 feet above the microphone. FAA recommends that while the parameters for en route operation of the UA are typically at a speed of 29 knots and altitude of 230 feet AGL, the estimates derived from measurements at 216 feet AGL suggest that they should be used as is for the basis of any calculations.

Table 3. Estimates of En Route SEL

Source: FAA February 17, 2022 (Attachment A)

Configuration [a]	Applicable Flight Phase	Distance between Source and Microphone (ft)	SEL (dB)
Maximum	En route outbound	216	66.4
Empty	En route inbound	216	62.8
Note: a) Level flight at 29 knots			

Table 4 presents the SEL of the delivery profile discussed in Section 2.1.2.3. The SELs presented in the table are relative to the delivery point and can be applied radially/as a circle with the delivery point in the center. The values in Table 4 do not include the UA transiting to or from the delivery point at en route altitude.

Table 4. Estimate of SEL for Delivery Profile

Source: FAA February 17, 2022 (Attachment A)

Sideline Distance between Delivery Point and Receiver (ft)[a]	SEL [b] (dB)
0	81.0
50	79.7
100	77.3
150	75.1
200	73.3
250	71.7
300	70.3
350	69.1
400	68.1
450	67.1
500	66.2

Notes:
a) Distance is along ground from delivery point to receiver.
The distance of 0 feet represents a receiver directly underneath the UA.
b) Delivery profile as described in Table 1 Flight phases "Delivery – Maximum Weight" and "Delivery – Empty Weight", starting directly over delivery point at an altitude of 230 feet AGL, and remaining over the delivery point through descent, unhooking of the package, and climb back to an altitude of 230 feet AGL.

Table 5 presents the SEL associated with the descent from en route altitude to landing at the distribution center on the ground, as discussed in Section 2.1.2.5.

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

Source: FAA February 17, 2022 (Attachment A)

Distance between Launch Pad and Receiver (ft) [a]	SEL (dB)
50	79.2
100	74.4
150	71.4
200	69.2
250	67.5
300	66.1
350	64.8
400	63.8
450	62.8
500	61.9

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

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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 Causey delivery operations. These would be operations originating at a single distribution center within a proposed single area of operations, with each distribution center operating up to seven days a week with varying levels of daily and equivalent annual delivery operations. There are currently no standardized tools or processes in place to conduct a noise assessment for the proposed operational scenario and UA. 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 Causey. The following subsections describe that 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 weighing 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).[8]

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

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.

For the Community Noise Equivalent Level (CNEL) metric, which may be used in California, the number of CNEL daytime equivalent operations, $N_{CNEL,i}$ simplifies to:

[8] Equation (1) 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. Presentation of Equation (1) also allows the practitioner to modify this process for the CNEL metric for use in California.

$$N_{CNEL,i} = N_{Day,i} + 3 \times N_{Evening,i} + 10 \times N_{Night,i} \quad (3)$$

3.2 Distribution Center Infrastructure

As noted in Section 1 and Section 2.1.2, Causey operates UAs from a central distribution center. If the distribution center operates one UA, then it needs a single launch pad and landing pad. This launch pad must be at least sixteen feet wide with a protective radius of at least 20 feet around it. If the distribution center operates multiple UAs simultaneously, then it may need one launch pad and two landing pads. All three pads must be at least sixteen feet wide, with safety radii of at least forty feet between landing pads. The launch pad has a safety radius of twenty feet around it. The launch pad and alternate landing pads may be 10 feet apart from one another. The distribution center include facilities to recharge, pack, monitor, and prepare the UAs. For the purpose of this noise analysis methodology, the distribution center extents depicted in Figure 2 and Figure 3 refer to the portion of the property in which the launch and landing pads could be positioned depending on the frequency of UA operations, as appropriate. The distribution center extents for the noise analysis shall be a rectangle, circle, or other polygon that includes all the possible locations for the launch and landing pads.

3.3 Application of Acoustical Data

The Day-Night Average Sound Levels (DNLs) can be estimated with a summation of the SELs. SEL values for the UA and Causey operations covered in this report are detailed in the FAA's February 17, 2022 Memorandum and provided with this report as Attachment A.

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

- The UA taking off from the distribution center;
- En route travel of the UA between the distribution center, the delivery point, and return;
- Delivery maneuvers of the UA at the delivery point; and
- Landing related activities of the UA at the distribution center.

3.3.1 General Assumptions

This analysis is based on the tables presented in Section 2.2. Table 2, Table 4, and Table 5 present noise exposure values at discrete distances in 50 foot increments relative to the UA's vertical profile from 0 to 500 feet for delivery, and 50 to 500 feet for takeoff and landing, respectively. If additional values between 0 to 500 feet are needed for delivery, or 50 to 500 feet for takeoff or landing, then SEL values at intermediary distances can be approximated by linear interpolation. In most cases, this should yield slightly conservative (higher) values compared to revisiting the FAA's detailed process. SEL values at distances less than 50 feet for takeoff or landing should not be extrapolated from the tables because the deviation of the method of estimation from the linearly extrapolated value increases closer to the source.

3.3.2 Takeoff and Climb

The available sound exposure levels for takeoff and climb are presented in Section 2.2 and specifically in Table 2, for the takeoff and climb profile described in Section 2.1.2.1. It should be noted that the SEL values provided only include climb to altitude and do not include horizontal flight that would occur after climb. As noted in Section 3.3.1, the values in Table 2 should only be used for distances between the launch pad at a distribution center and the receiver for distances of 50 feet to 500 feet.

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

3.3.3 En Route

Flight of the aircraft in still air is anticipated to be typically 29 knots, with a typical altitude of 230 feet AGL. However, the CONOPs indicates that the aircraft could be +/- 59 feet relative to the typical 230 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*.[9] 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 (4).

$$\Delta J_1 = 12.5 \times log_{10}\left(\frac{H_A}{H_T}\right), dB \tag{4}$$

where ΔJ_1 is the quantity in decibels that must be algebraically added to the measured SEL to adjust for a level flight path at an altitude differing from the measured altitude; H_A is the height, in feet, of the vehicle when directly over the noise measurement point; H_T is the height of the vehicle during the measurement (or reference height), and the constant (12.5) accounts for the effects on spherical spreading and duration from the off-reference altitude.

The sound exposure level adjustment for speed, as defined in 14 CFR Part 36, is presented here as Equation (5).

$$\Delta J_3 = 10 \times log_{10}\left(\frac{V_{RA}}{V_R}\right), dB \tag{5}$$

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 reference speed, and V_{RA} is the adjusted speed.

To estimate the SEL of the UA flying en route the measured SEL made during delivery will be used. As shown in Table 3, the SEL is 66.4 dB when the vehicle is at maximum weight, at 216 feet from the sound

[9] 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

receiver and traveling at approximately 29 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 (6) to arrive at an estimate $SEL_{maximum\ weight}$ dB for that respective phase of flight.

$$SEL_{maximum\ weight} = 66.4 + 12.5\ \times log_{10}\left(\frac{216}{Alt_i}\right) + 10\ \times\ log_{10}\left(\frac{29}{V_i}\right), dB \tag{6}$$

The SEL for en route conditions inbound at empty weight can also be calculated using the values in Table 3. Equation (7) presents the calculation for en route conditions at empty weight.

$$SEL_{empty\ weight} = 62.8 + 12.5\ \times log_{10}\left(\frac{216}{Alt_i}\right) + 10\ \times log_{10}\left(\frac{29}{V_i}\right), dB \tag{7}$$

3.3.4 Delivery

The available SELs for delivery are presented in Section 2.2 and specifically in Table 4, for the delivery profile described in Section 2.1.2.3. It should be noted that the SEL values provided only include descent from en route to delivery altitude, various maneuvers associated with the delivery, and climb back to en route altitude. The SEL values do not include the noise contribution from the horizontal en route portion of the flight connecting the distribution center to the delivery point. As noted in Section 3.3.1, the values in Table 4 should only be used for distances between the launch pad and the receiver for distances between 0 to 500 feet.

3.3.5 Descent and Landing

The available SELs for descent and landing are presented in Section 2.2 and specifically in Table 5, for the descent and landing profile described in Section 2.1.2.5. It should be noted that the SEL values provided only include descent from en route altitude and do not include horizontal flight that would occur as the UA approached the landing at a distribution center. As noted in Section 3.3.1, the values in Table 5 should only be used for distances between the landing site at the distribution center and the receiver for distances of 50 feet to 500 feet.

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

3.4 Proposed DNL Estimation Methodology

The number of operations overflying a particular receiver's location 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 (8).

$$DNL_{iA} = SEL_{iA} + 10\ \times log_{10}(N_{DNL,iA}) - 49.4, (dB) \tag{8}$$

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 (9).

$$DNL_i = 10 \times log_{10}\left(10^{\left(\frac{DNL_{iA}}{10}\right)} + 10^{\left(\frac{DNL_{iB}}{10}\right)} + \cdots + 10^{\left(\frac{DNL_{iZ}}{10}\right)}\right), (dB) \tag{9}$$

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

3.4.1 DNL for Distribution Center

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 two sound levels. First, aircraft will take off and climb to en route altitude with the relationship discussed in Section 3.3.2. Second, the UA will begin en route flight at maximum weight towards its first waypoint or semaphore[10] assuming that the UA will pass directly over the representative receiver using the relationship in Section 3.3.3.

Landing operations will be represented by two sound levels. First, the UA will fly to the distribution center from its last waypoint or semaphore at en route altitude and empty weight (Section 3.3.3). Second, the UA will descend from en route altitude to the ground and come to rest, which will be represented by the relationships defined in 3.3.5.

The four 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 (9).

3.4.2 DNL for En Route

En route includes the UA flying to and from the distribution center to delivery points as discussed in Section 2.1.2.2 and 2.1.2.4 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 3.3.3. 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 (9).

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

[10] As presented in Figure 4, a semaphore is defined as a point where the UA can safely hover at lower altitudes and perform an emergency landing on an as needed basis without posing risks to people or property on the ground. A waypoint is defined as a location along a route from which the UA will pass and make a turn.

profile over the delivery point, and then ascending vertically over the delivery point at empty weight and returning to en route altitude (Section 3.3.4).

Use of the DNL Delivery, by itself, does not include the horizontal flight as the UA approaches the delivery point with the package or the horizontal flight as the UA leaves the delivery point after releasing the package. The FAA's envisioned use of this report is that the user will add the DNL Delivery to the appropriate en route DNL values with Equation (9). To assist simple conservative analyses, the results of DNL Delivery will also be presented with conservative en route approach and departure from the delivery point.

4 Noise Exposure Estimate Results

This section presents the estimated noise exposure for Causey'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 distribution center. 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 3.1, is presented below as Equation (10).

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

$Deliveries_{Day}$ are between 7 AM and 10 PM and $Deliveries_{Night}$ are 10 PM and 7 AM.[11] If a portion of a delivery occurs in the nighttime hours (either takeoff or landing) 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 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 distribution center;
2. En route flight at a defined altitude to and from a distribution center to a delivery point; and
3. Descent from en route flight to complete a delivery at the delivery point and ascent back to en route altitude for return to the distribution center.

The cumulative noise from the UA is then determined by adding the noise from each of these phases.

4.1 Noise Exposure for Operations at the Distribution Center

For operations at the distribution center, the UA-related noises include the takeoff and landing. To provide a conservative view, all operations are assumed to be on the same flight path operating in opposite directions.

Table 6 presents data for a given number of daily average DNL Equivalent deliveries (including the takeoff and climb, en route outbound, 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 a distribution center extents as described in Section 3.2. The analyses presented in Table 6 were rounded up conservatively to the nearest 50 ft intervals out to 500 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.[12]

[11] Discussion of modification of this process for use in California with the CNEL metric is discussed in Section 3.1.

[12] The calculation of the equations presented in Section 3 require that distance is provided. The DNL levels were calculated at 50-foot intervals from 50 to 500 ft as provided in Section 2.2. The interval of 50 feet was selected as it represented the smallest distance for which measurement data was available for the UA.

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

Number of DNL Equivalent Deliveries Served by Distribution Center		Estimated Extents, feet, for				
Average Daily	Annual	DNL 45 dB	DNL 50 dB	DNL 55 dB	DNL 60 dB	DNL 65 dB
<= 1	<= 365	50	50	50	50	50
<= 5	<= 1,825	50	50	50	50	50
<= 10	<= 3,650	50	50	50	50	50
<= 15	<= 5,475	50	50	50	50	50
<= 20	<= 7,300	50	50	50	50	50
<= 40	<= 14,600	100	50	50	50	50
<= 60	<= 21,900	150	50	50	50	50
<= 80	<= 29,200	150	100	50	50	50
<= 100	<= 36,500	200	100	50	50	50
<= 120	<= 43,800	200	100	50	50	50
<= 140	<= 51,100	250	100	50	50	50
<= 160	<= 58,400	250	100	50	50	50
<= 180	<= 65,700	300	150	50	50	50
<= 200	<= 73,000	300	150	50	50	50
<= 220	<= 80,300	350	150	50	50	50
<= 240	<= 87,600	400	150	100	50	50
<= 260	<= 94,900	450	150	100	50	50
<= 280	<= 102,200	500	150	100	50	50
<= 300	<= 109,500	Note c	200	100	50	50
<= 340	<= 124,100	Note c	200	100	50	50
<= 360	<= 131,400	Note c	200	100	50	50
<= 380	<= 138,700	Note c	200	100	50	50
<= 400	<= 146,000	Note c	200	100	50	50
<= 420	<= 153,300	Note c	250	100	50	50
<= 440	<= 160,600	Note c	250	100	50	50
<= 460	<= 167,900	Note c	250	100	50	50
<= 480	<= 175,200	Note c	250	100	50	50
<= 500	<= 182,500	Note c	250	100	50	50

Notes:
a) One delivery includes the outbound takeoff and inbound landing and is representative of two operations.
b) If a value for 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) The extents of the 45 dB DNL extents are more than 500 feet based on the level of operations specified as the aircraft continues along its flight path. En route results may be more applicable in these instances for determining noise levels.

4.2 Noise Exposure under En Route Paths

For en route conditions, the UA is expected to fly the same outbound flight path between the distribution center and the delivery point and inbound flight path back to the distribution center (Section 3.4.3). 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 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.

Table 7. Estimated DNL Directly Under En Route Flight Paths at Various Altitudes

Number of DNL Equivalent Deliveries Served by Route		Estimated DNL for		
Average Daily	Annual	Altitude 171 feet AGL	Altitude 216 feet AGL	Altitude 289 feet AGL
<= 1	<= 365	19.9	18.6	17.0
<= 5	<= 1,825	26.9	25.6	24.0
<= 10	<= 3,650	29.9	28.6	27.0
<= 15	<= 5,475	31.6	30.4	28.8
<= 20	<= 7,300	32.9	31.6	30.0
<= 40	<= 14,600	35.9	34.6	33.0
<= 60	<= 21,900	37.7	36.4	34.8
<= 80	<= 29,200	38.9	37.6	36.1
<= 100	<= 36,500	39.9	38.6	37.0
<= 120	<= 43,800	40.7	39.4	37.8
<= 140	<= 51,100	41.3	40.1	38.5
<= 160	<= 58,400	41.9	40.6	39.1
<= 180	<= 65,700	42.4	41.2	39.6
<= 200	<= 73,000	42.9	41.6	40.0
<= 220	<= 80,300	43.3	42.0	40.5
<= 240	<= 87,600	43.7	42.4	40.8
<= 260	<= 94,900	44.0	42.8	41.2
<= 280	<= 102,200	44.3	43.1	41.5
<= 300	<= 109,500	44.6	43.4	41.8
<= 340	<= 124,100	45.2	43.9	42.3
<= 360	<= 131,400	45.4	44.2	42.6
<= 380	<= 138,700	45.7	44.4	42.8
<= 400	<= 146,000	45.9	44.6	43.0
<= 420	<= 153,300	46.1	44.8	43.3
<= 440	<= 160,600	46.3	45.0	43.5
<= 460	<= 167,900	46.5	45.2	43.7
<= 480	<= 175,200	46.7	45.4	43.8
<= 500	<= 182,500	46.9	45.6	44.0

Notes:
a) One delivery includes an outbound operation and inbound operation along the same flight path, thus two overflights.
b) If a value for deliveries is not specifically defined in this table, use the next highest value. For example, if there are 50 average daily deliveries, use the entry for 60 average daily deliveries.
c) If a value for altitude is not specifically defined in this table, use the next lowest value. For example, if the UA is anticipated to operate at an altitude of 190 ft AGL use the entry for 171 ft AGL.

In some instances, the UA may overfly locations at operations levels that may 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 DNL Directly Under Overflights, Maximum and Empty Weight

Altitude, speed and configuration of Overflight and of Delivery		SEL for 1 Overflight (dB)	DNL for 1 Overflight between 7 AM and 10 PM (dB)	DNL equation for the number of DNL Equivalent Overflights
Altitude	**Weight**			
171 feet AGL	Empty	64.1	14.7	$10 \times \log_{10}(N_o) + 14.7$
171 feet AGL	Maximum	67.7	18.3	$10 \times \log_{10}(N_o) + 18.3$
230 feet AGL	Empty	62.8	13.4	$10 \times \log_{10}(N_o) + 13.4$
230 feet AGL	Maximum	66.4	17.0	$10 \times \log_{10}(N_o) + 17.0$
289 feet AGL	Empty	61.2	11.9	$10 \times \log_{10}(N_o) + 11.9$
289 feet AGL	Maximum	64.8	15.5	$10 \times \log_{10}(N_o) + 15.5$

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) If a value for altitude or speed is not specifically defined in this table, use the next lowest value. For example, if the UA is anticipated to operate at an altitude of 190 ft AGL, use the entry for 171 ft AGL.

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. Only the partial DNL values associated with the delivery vertical flight maneuvers are presented. Also included in Table 9 is the equation for calculating the estimated DNL for a specific number of daily average DNL Equivalent 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.

In anticipated use, the value from Table 9 would be added using Equation (9) to the appropriate values from Table 7 for an UA flying to and from the delivery point at en route altitude, along with any other nearby en route operations.

Table 9. Estimated DNL at Delivery Point for Vertical Maneuvers

Number of DNL Equivalent Deliveries		Partial Estimated Delivery DNL of Vertical Maneuvers
Average Daily	**Annual**	**Estimated DNL (dB)**
<= 1	<= 365	31.7
<= 5	<= 1,825	38.7
<= 10	<= 3,650	41.7
<= 15	<= 5,475	43.4
<= 20	<= 7,300	44.7
<= 40	<= 14,600	47.7
<= 60	<= 21,900	49.5
<= 80	<= 29,200	50.7
<= 100	<= 36,500	51.7
<= 120	<= 43,800	52.5
<= 140	<= 51,100	53.1
<= 160	<= 58,400	53.7
<= 180	<= 65,700	54.2
<= 200	<= 73,000	54.7
<= 220	<= 80,300	55.1
<= 240	<= 87,600	55.5
<= 260	<= 94,900	55.8
<= 280	<= 102,200	56.2
<= 300	<= 109,500	56.5
<= 340	<= 124,100	57.0
<= 360	<= 131,400	57.2
<= 380	<= 138,700	57.5
<= 400	<= 146,000	57.7
<= 420	<= 153,300	57.9
<= 440	<= 160,600	58.1
<= 460	<= 167,900	58.3
<= 480	<= 175,200	58.5
<= 500	<= 182,500	58.7
N_d	$N_d\ x\ 365$	$10 \times \log_{10}(N_d) + 31.7$

Notes:
a) The DNL values presented in this table only reflect the UA conducting vertical flight maneuvers associated with a delivery. DNL values associated with en route flight to and from a distribution center to a delivery point associated with a delivery, or nearby en route overflights, should be added to these values utilizing the DNL levels presented in Table 7.
b) If a value for 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.

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Attachment A

Federal Aviation Administration

Memorandum

Date: February 17, 2022

To: Donald Scata, Manager, Noise Division, Office of Environment and Energy (AEE-100)

From: Chris Hobbs, General Engineer, Noise Division, Office of Environment and Energy (AEE-100)

Subject: Estimated Noise Levels for Flytrex FTXM600P UA

This document presents an analysis of noise measurements of the Flytrex FTXM600P Unmanned Aircraft (UA) by the FAA's Office of Environment and Energy (AEE), recorded in July 2021 at Causey Airfield (Causey) near Liberty, North Carolina. The purpose of the analysis is to provide estimates of expected sound exposure levels resulting from typical operations of the FTXM600P UA[1] by Causey Aviation Unmanned and provides the methods used to create the noise estimates.

1. Flight Profile and Segment Noise

The phases of a typical flight profile from takeoff to landing with an included delivery are listed in Table 1 for the FTXM600P UA. Because the noise level of the UA for a given speed varies with weight, the aircraft configuration lists the vehicle weight for each phase of flight. The noise measurements at Causey were made with the UA at its maximum takeoff weight (33.4 lbs/15.1kg) and empty weight (26.8 lbs/12.2 kg). The measurements showed that noise from the vehicle was greatest at maximum takeoff weight for all phases of flight; thus, using the maximum weight for phases of flight where the UA is carrying a package is a conservative estimate of the vehicle noise for that phase of flight as compared to the UA carrying a lighter package.

[1] M. James et al., "Causey UAS Acoustic Measurement," Technical Report 21-05, Blue Ridge Research and Consulting, LLC, 23 September 2021.

Table 1. Phases of Flight for Typical Flight Profile of FTXM600P UA

Phase of Flight	Description	Configuration
Takeoff	Launch from ground to operational altitude (230 ft)	Max weight (carrying package for delivery)
En Route to Delivery	Flying at operational altitude and cruise speed (29 kts)	Max weight
Delivery	Vertical descent from operational altitude to delivery height; Delivery of package; Vertical ascent to operational altitude	Max weight on descent/empty weight on ascent
En Route from Delivery	Flying at operational altitude and cruise speed	Empty weight
Landing	Land by vertical descent from operational altitude	Empty weight

The method used to estimate the noise on the ground during each phase of flight is listed below followed by suggestions on how to combine them for a representative estimate of the entire flight. The methodology presented for estimating the noise for each flight phase was chosen based on a comparison of the calculated noise estimates by AEE against the measurement data for each flight phase and determined to be an appropriate and conservative estimate based on available data received by AEE to date for the of the FTXM600P UA. The information detailing the flight profile was provided to the FAA via letter exchanges[2].

1.1. Takeoff Noise

The profile of the FTXM600P UA climbing to an operational altitude of 230 ft above ground level is detailed in Table 2. Following is the method used to estimate the sound exposure level (L_{AE}) of this part of the flight profile.

Table 2. FTXM600P UA Takeoff Profile Details

Flight Segment	Altitude (ft AGL)	Ground Speed (kts)	Duration (s)
Takeoff	0 ascend to 33	0	5
Internal Checks	Hover at 33	0	3
Climb to Operational Altitude	33 ascend to 230	0	15

Measurements of the noise emissions of the FTXM600P UA were made when it was at maximum weight and hovering 50 feet AGL above the ring of ground microphones shown in Fig. 1. Each recording lasted for 30 seconds and began after the UA was in a steady condition.

[2]Causey Letter Exchange UA_P135_Environmental_Analysis_FAA_AEE_Operational_Data_Needs_Causey_20211130.pdf, 15 December 2021.

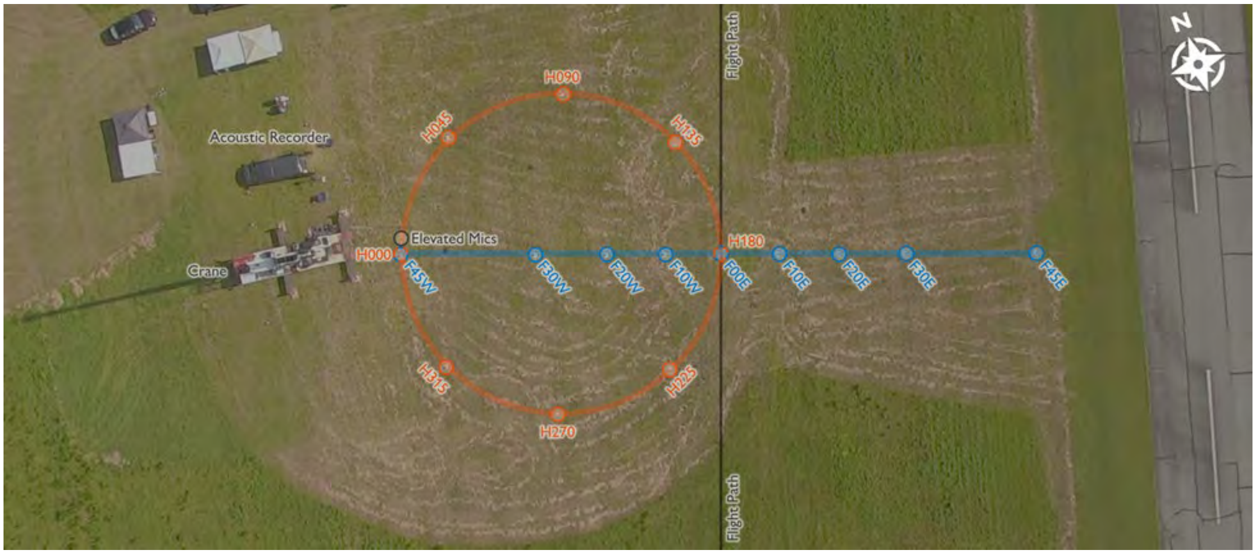


Figure 1. Microphone locations for hover measurements shown in orange when FTXM600P UA hovered above the origin.

The average sound pressure level was calculated at each of the microphones for five separate recordings. The average sound pressure level was normalized to a distance of 70.7 ft using spherical spreading from the actual distance from the FTXM600P UA to each microphone and corrected by 6 dB because all the microphones used were on ground boards. The results from one of the five recordings were discarded and the remaining four were averaged to generate the results as presented in Table 3. It is important to note that these measurements are all at the same relative angle from the bottom of the UA. It is expected that this is a conservative estimate of the noise due to the fact that broadband noise from the rotors is being captured; whereas, the noise emitted closer to the plane of the rotors would be dominated by blade passage frequency which is lower than the broadband frequency range and would consequently have a lower A-weighted sound level.

Table 3. Average Sound Pressure Level of FTXM600P UA while Hovering

Sound Pressure Level (dBA)	Distance (ft)	Aircraft Configuration
64.9	70.7	Maximum Weight
63.1	70.7	Empty Weight

In order to estimate the noise levels from the UA, the following assumptions have been made.

Sound transmission between the noise source and the receiver is solely a function of distance with no additional atmospheric attenuation or ground effects.

In this analysis, the levels in Table 3 represent reference sound pressure levels measured at reference distances for each weight configuration of the UA. Those reference levels will be adjusted for spherical spreading to develop the levels at other distances for each configuration of the aircraft. For a stationary point source, the spherical spreading relationship of the sound pressure level (L_i) at distance D_i from the reference sound pressure level (L_R) measured at a reference distance D_R is given by Eq. 1.

$$L_i = L_R + 20\log_{10}\left(\frac{D_R}{D_i}\right),\ dB$$

Sound transmits equally in all directions.

The levels in Table 3 are based on the measurement locations depicted in Figure 1 while the UA was hovering at approximately 50 ft AGL. The assumption that the UA is an omnidirectional sound source implies that the same sound levels would have been measured at any point on the surface of a sphere centered on the UA.

To estimate the sound exposure level of the takeoff segment of a flight, the takeoff path from ground to an operational height of 230 ft AGL is evenly divided into stations (blue ovals) as illustrated in Figure 2. The hover noise level noted in Table 3 is spherically spread from each station to a point on the ground a fixed distance from the takeoff point. Using the total takeoff duration of 23 seconds from Table 2, the sound exposure level is calculated assuming the UA spent equal amounts of time at each station. The brief hover time at 33 ft AGL is accounted for in this estimation as the first hover station is set to 33 ft AGL and the duration at each of the seven stations is approximately three seconds. Based on examination of the measured data during simulated takeoffs the duration of the climb from ground to operational height is best represented by a continuous climb with the duration of the entire climb divided into even intervals at each station.

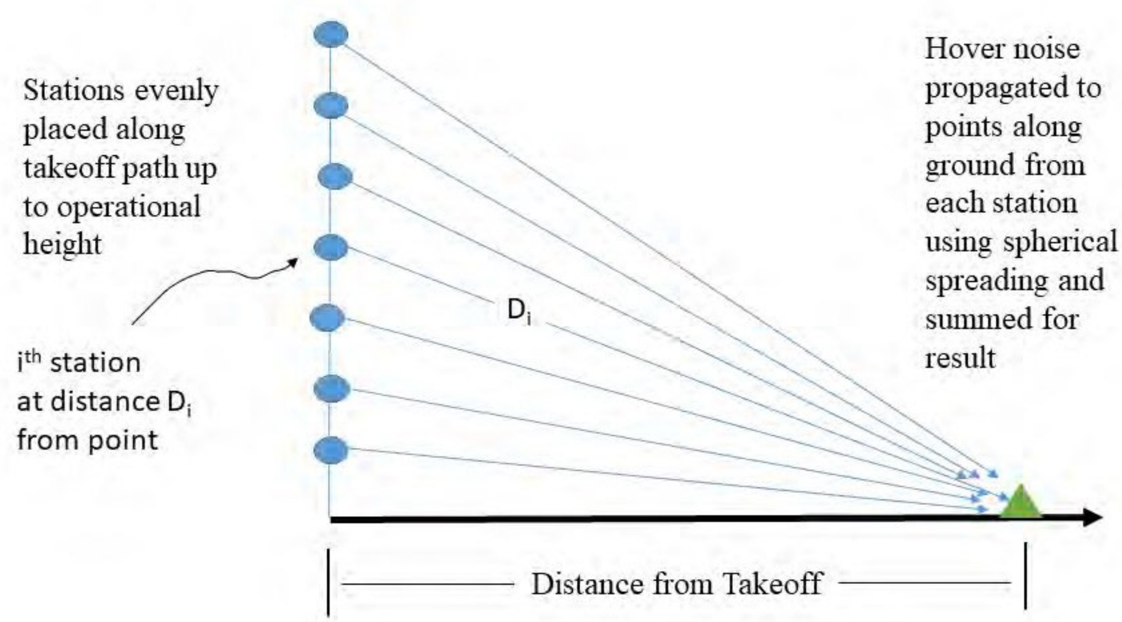


Figure 2. Graphical representation of how hover noise is used to simulate takeoff noise.

The sound exposure level ($L_{AEi}(r)$) as a function of distance from takeoff (*r*) from the UA at the i^{th} station shown in the figure is the product of the acoustic energy calculated from the Sound Pressure Level (L_i) spherically spread to a distance D_i using Equation 1 and the duration dt (~ 3 s) as given in the following equation:

$$L_{AEi}(r) = 10\log_{10}\left(10^{(.1L_i)}dt\right),\ dB \quad (2)$$

To calculate the sound exposure level for the entire takeoff at the distance from takeoff, r, one need only sum the levels calculated from each station according to Equation 3.

$$L_{AE}(r) = 10\log_{10}\left(\sum_{i}^{n} 10^{.1L_{AEi(r)}}\right),\ dB \quad (3)$$

Where n = number of stations used to simulate the takeoff.

The results of the computations using the 7 stations shown in Figure 2 are presented in Table 4.

Table 4. Estimate of Sound Exposure Level for Takeoff of FTXM600P UA at Maximum Weight

Distance from Takeoff (ft)	L_{AE} (dBA)
50	75.0
100	71.9
150	69.7
200	67.9
250	66.4
300	65.1
350	63.9
400	62.9
450	62.0
500	61.1

1.2. En Route Noise at Maximum and Empty Weights

The FTXM600P UA was measured flying at a cruise speed of 29 kts at an average altitude of 216 ft AGL both at max weight and empty weight over the array pictured in Figure 1. The average of the metrics measured for all the passes over the F00E microphone (undertrack) going both upwind and downwind are listed in Table 5. A 6 dB correction was made to the average because the microphone was on a ground board; thus, no attempt is being made to account for ground reflection at an observer's ear above the ground. While the parameters for en route operation of the FTXM600P UA are at a speed of 29 kts and altitude of 230 ft AGL, it is suggested that the measured metrics be used as is for the basis of any calculations.

Table 5. Estimates of En Route Noise of FTXM600P UA

Aircraft Configuration	Ground Speed (kts)	Altitude (ft AGL)	L_{AE} (dBA)
Max Weight	29	216	66.4
Empty Weight	29	216	62.8

1.3. Delivery Noise

The parameters for the delivery portion of a typical flight profile for the FTXM600P UA are included in Table 6. The ground speed is 0 kts for all flight segments. The noise for each segment listed in the table is modeled in similar fashion as the takeoff portion of the flight profile; each ascent and descent was divided into stations along the path; the hover portions of the profile were modeled with the vehicle at one location for the duration of the hover; and the sound pressure level was estimated at points along the ground using the appropriate aircraft configuration as presented in Table 3. The duration for each segment was used to sum the energy to get the sound exposure level for that segment at that point along the ground. All segments were added to get the sound exposure level as a function of distance along the ground from the delivery point as presented in Table 7. The same equations used and methodology applied for the takeoff portion of the profile were applied in this estimate of the delivery noise as a function of distance from the delivery point on the ground. The hover condition was modeled due to the extended time at that part of the profile.

Table 6. FTXM600P UA Delivery Profile Details

Flight Segment	Altitude (ft AGL)	Aircraft Configuration	Duration (s)
Descent for Delivery	230 descend to 82	Max Weight	22
Open Doors, Await Customer Response, and Lower Package	Hover at 82	Max Weight	35
Maneuver to Unhook Package	82 descent to 75 then ascend to 82	Max for Descent/Empty for Ascent	8
Ascend to Operational Height	82 ascend to 230	Empty Weight	13

Table 7. Estimate of Sound Exposure Level for Delivery Profile of FTXM600P UA

Distance from Delivery (ft)	L_{AE} (dBA)
0	81.0
50	79.7
100	77.3
150	75.1
200	73.3
250	71.7
300	70.3
350	69.1
400	68.1
450	67.1
500	66.2
Note: 0 feet represents a receiver directly underneath the UA.	

1.4. Landing Noise

The profile of the FTXM600P UA descending from an operational altitude of 230 ft AGL is detailed in Table 8. Because the UA spends half the descent time between 33 ft AGL and the ground, the modeling of the landing was done in the same manner as the takeoff for both flight segments separately and summed together to generate the final estimated noise level as presented in Table 9.

Table 8. FTXM600P UA Landing Profile Details

Flight Segment	Altitude (ft)	Ground Speed (kts)	Duration (s)
Descent	230 descend to 33	0	20
Landing	33 descend to 0	0	20

Table 9. Estimate of Sound Exposure Level for Landing of FTXM600P UA at Empty Weight

Distance Landing (ft)	L_{AE} (dBA)
50	79.2
100	74.4
150	71.4
200	69.2
250	67.5
300	66.1
350	64.8
400	63.8
450	62.8
500	61.9

2. Conclusion

The information and noise levels presented in this document represent conservative estimates of the noise made by the FTXM600P UA during each segment of a typical flight profile. In order to get the sound exposure level at any point on the ground, a calculation of the contributions from each flight segment should be combined to arrive at a final estimate of cumulative noise exposure. In order to calculate the maximum sound level from the takeoff, delivery, or landing portions of the flight profile, it is recommended that the sound pressure level from the appropriate aircraft configuration be used at the lowest altitude of the flight segment. Due to the directivity of the source and the excessive attenuation of ground to ground propagation this estimate of the sound exposure level will most likely be an over estimate, but this is conservative and appropriate for use in estimating noise exposure. Although further analysis of the measurements of the UA will be forthcoming and may change the estimates as presented in the document; the estimates presented here represent the most appropriate, conservative estimates of the noise based on comparison of the estimates to available measurement data received by AEE to date and can be used with confidence in conjunction with developing a generalized methodology for noise estimates of proposed Causey Unmanned operations using the FTXM600P UA.

Attachment A

Noise Measurement Data
(available upon request)

APPENDIX D
Section 106 Consultation

From: noreply@thc.state.tx.us
To: Neumann, Shelia S (FAA); reviews@thc.state.tx.us
Subject: FAA-Causey Part 135 UAS Package Delivery DFW/Granbury
Date: Friday, September 6, 2024 4:17:37 PM

Re: Project Review under Section 106 of the National Historic Preservation Act
THC Tracking #202413268
Date: 09/06/2024
FAA-Causey Part 135 UAS Package Delivery DFW/Granbury
Dallas-Fort Worth Metro Area and Granbury
Dallas,TX 75201, multi

Description: Attached consultation letter. This project is UAS package delivery within DFW (30-mi radius)/Granbury. Does not have potential for any ground disturbance or construction as part of this project.

Dear Shelia Neumann:
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

- THC/SHPO concurs with information provided.

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 Bradford Patterson
Chief Deputy State Historic Preservation Officer

Please do not respond to this email.

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Mr. Bradford Patterson
Chief Deputy State Historic Preservation Officer
Texas Historical Commission
P.O. Box 12276
Austin, Texas 78711-2276

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

RE: Section 106 Consultation
Causey/Flytrex Drone Package Deliveries
Dallas-Fort Worth Metro Area, Granbury, and Rowlett, Texas

Dear Mr. Patterson:

The Federal Aviation Administration (FAA) is currently evaluating a proposal from Causey Aviation Unmanned, LLC (CAU) to begin unmanned aircraft (UA; also referred to as a drone) small package delivery operations in the Dallas-Fort Worth (DFW) metropolitan area and to expand its operations in Granbury and Rowlett, Texas. CAU must obtain approval from the FAA prior to beginning operations in DFW and prior to expanding operations in Granbury and Rowlett where it is currently operating the Flytrex FTX-M600P 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 late 2022 when evaluating CAU's initial proposed operations in Granbury and Rowlett (**THC Tracking #202301883**). The SHPO concurred with the FAA's finding of *no historic properties affected* on November 7, 2022.

Project Description

CAU currently operates under 14 Code of Federal Regulations (CFR) Part 135 in Granbury and Rowlett, Texas. CAU 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] CAU is applying to the FAA to add the DFW metropolitan area to the operating area included in its OpSpecs for Texas and to expand its operations in Granbury and Rowlett.

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

CAU plans to establish up to 30 new distribution centers within the proposed operating area within the next three years, including locations in Cedar Hill, Frisco/Little Elm, Murphy, North Richland Hills, and Wylie (see **Attachment A**). CAU would extend its delivery radius from the Granbury and Rowlett distribution centers from 2 nautical miles to 3.5 nautical miles (see **Attachment A**). CAU also requests to expand its number of average annual daily operations to a maximum of 500 deliveries per distribution center.

Initially, CAU would likely fly less than the maximum of 500 deliveries per day from each distribution center. Over time, deliveries would increase as demand from consumers increases. Proposed operations would occur seven days per week, including holidays, between the hours of 8 a.m. and 10 p.m.

The UA would transport small consumer goods and packages in partnership with merchants in the community. CAU typically partners with established businesses and identifies locations for distribution centers at the partner's parking lot, rooftop, or other area where it is not disruptive to the business, does not present a safety hazard, and is consistent with local land use and zoning regulations. This approach allows the drone operator to conduct operations with minimal infrastructure requirements and no ground disturbance activities. Each DC would contain charging pads for up to 20 drones.

<u>Unmanned Aircraft</u>

Initially, CAU plans to use two UA platforms for the proposed operations— the Flytrex FTX-M600P and the Flytrex Sky II (see **Attachment A**). Causey intends to phase out the Flytrex FTX-M600P UA and replace it with the Flytrex Sky II in the first half of 2025.

The Flytrex FTX-M600P has a maximum takeoff weight of 33.4 pounds, and the maximum allowable package weight is 5.73 pounds. The UA features a multi-rotor design with six propellers mounted on equally-spaced arms extending horizontally from a center frame. The system's computers and package containers are mounted on the underside of the airframe.

The Flytrex Sky II has a maximum takeoff weight of 34.2 pounds, and the maximum allowable package weight is 8.8 pounds. The UA features a multi-rotor design with eight propellers mounted on a hash-shaped carbon fiber airframe. The system's computers, power system, and winch mechanism are mounted on the center of the airframe. The Sky II model carries packages without a delivery box.

Both drone models use electric power from rechargeable lithium-ion batteries and include a parachute safety system that can be deployed in cases of emergency.

<u>Flight Operations</u>

Packages are loaded into the UA at the distribution center. The UA then launches to perform aerial deliveries. With a multi-rotor design, the UA can take off and descend vertically, as well as hover. Normal cruising speeds are expected to be approximately 29 knots (33 miles per hour [mph]). Typical flights begin with the UA departing from a distribution center and ascending vertically to 230 feet above ground level (AGL). The UA then flies a pre-determined route at 230 feet AGL to the delivery point. Upon arrival at the delivery point, the UA descends vertically to the delivery hover altitude of 75 to 82 feet AGL, lowers the package to the ground using a tethered mechanism, ascends to cruising altitude and speed, and returns to the DC. Upon arrival at the DC, the UA descends vertically from 230 feet AGL to the ground for landing.

Neither aircraft would touch the ground in any place other than the distribution center (except during emergency landings) since they remain airborne while conducting deliveries.

The total distance flown for deliveries would vary depending on the DC and delivery locations with a maximum distance of 8.5 miles (round trip) for the Flytrex FTX-M600P UA and 8 miles (round trip) for the newer Flytrex Sky II UA. The package would be delivered directly to the customer's requested location using the Flytrex automated route planning algorithm that is designed to optimize route planning while minimizing overflights and repeated flight patterns. The delivery cycle can generally be divided into the following five phases: (1) takeoff and climb, (2) en route outbound, (3) delivery, (4) en route inbound, and (5) descent and landing (see **Attachment A**). Prior to takeoff, packages are manually loaded onto the UA by a ground crew at the DC.

Takeoff and Climb

The takeoff and climb phase is described as the portion of the flight in which a fully loaded UA takes off from the DC and climbs vertically. Packages are loaded into the UA at the DC. The UA then launches to perform aerial deliveries. The UA climbs from 0 to 33 feet AGL and then hovers briefly as various systems checks are conducted to ensure it is functioning properly. Upon completion of systems checks, the UA ascends from 33 feet AGL to its cruising altitude of approximately 230 feet AGL. The takeoff and climb phase lasts up to 23 seconds.

En Route Outbound

The en route outbound phase is defined as the part of the flight in which the fully loaded UA flies the assigned route from its hub to a delivery point. During this flight phase, en route cruising speeds average around 29 knots (33 miles per hour) at a cruising altitude of 230 feet AGL. This phase lasts from 1 to 8 minutes.

Delivery

The delivery phase is defined by descent from the en route outbound phase to a delivery point to deliver a package. Upon arrival at the delivery point, the UA descends vertically to the delivery hover altitude of 75 to 82 feet AGL and lowers the package to the ground using a tethered mechanism. CAU's aircraft does not touch the ground in any place other than the DC (except during emergency landings). Upon completing the delivery, the UA ascends vertically to reach its en route cruising altitude of 230 feet AGL. The delivery phase takes approximately 1 minute from arrival at the delivery location to the UA's return to cruising altitude.

En Route Inbound

Once the UA reaches its cruising altitude of 230 feet AGL, it returns from the delivery point back to the DC via the same assigned route. It travels at approximately 29 knots (33 miles per hour) for approximately 1 to 8 minutes.

Descent and Landing

Upon arrival at the DC, the UA descends vertically from 230 feet AGL to 33 feet AGL where it hovers before lowering to the ground and shutting down. The descent and landing phase lasts up to 40 seconds.

<u>Predicted Sound Levels</u>

The FAA conducted a noise analysis using sound level measurement data for the Flytrex FTX-M600P and the Flytrex Sky II. The Flytrex Sky II, which will replace the FTX-M600P in the first half of 2025, has higher noise levels than the FTX-M600P. For the purpose of considering potential environmental effects, the noise values for the Flytrex Sky II are used since it represents the worst-case scenario.

Based on the Flytrex Sky II noise measurement data, the 65 dB day-night average sound level (DNL) would extend to 50 feet from the takeoff/landing pad at a distribution center conducting 500 daily deliveries. For package delivery locations, the maximum DNL at 25 feet from the delivery drop point would range from 38.1 dB to 45.1 dB for locations receiving 1 to 5 daily deliveries, respectively. Sound levels decrease as distances from the drone increase. At locations along the en route flight path between the DC and delivery point, the DNL directly under the en route flight path would be up to 51.9 dB for the combined outbound and inbound noise from 500 daily deliveries.

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 comprised of the DFW Operating Area, Rowlett Operating Area, and Granbury Operating Area shown in **Attachment A**. This area encompasses much of the DFW metro area within a 30-nautical mile radius around the DFW international airport, as well as a 3.5-nautical mile radius around Granbury and Rowlett. 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 227 historic properties and 146 historic districts are in the APE (see **Attachment B**). 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; however, the APE also contains 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 listed in the NRHP because of their architectural features.

Assessment of Effects

The regulations used for assessing effects are outlined in 36 CFR Part 800.

The undertaking would not result in physical alterations to historic properties and would not directly affect the existing or continued use of any historic property. Given the small size of the UA and the predicted noise 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 visual or auditory intrusion from drone operations. The operations would not diminish the integrity of any property's significant historic features. The undertaking would not result in neglect of a property and would not alter the existing ownership or zoning. The undertaking is not anticipated to result in planned growth or a change in land use. Therefore, cumulative effects are not anticipated.

In summary, based on the assessment above and in accordance with 36 CFR 800.4(d)(1), the FAA has made a ***finding of no adverse effect***.

Conclusion

The FAA requests your concurrence on the definition of the APE and finding of ***no adverse effect***. Your response within the next 30 days will greatly assist us in our environmental review process.

If you have any questions or need additional information, please contact Dr. Shelia Neumann via e-mail at 9-faa-drone-environmental@faa.gov.

Sincerely,

Joseph K. Hemler Jr.
Manager, AFS-752
Emerging Technologies Division
Office of Safety Standards, Flight Standards Service

Attachments:
Attachment A – Area of Potential Effects
Attachment B – Causey/Flytrex FTX-M600P and SKY II Unmanned Aircraft and Typical Flight Profile
Attachment C -- Historic Properties (date of information – 8/1/2024)
Attachment D -- Historic Districts (date of information – 8/1/2024)

ATTACHMENTS A and B

Operating Area

Pictures of FLYTREX Unmanned Aircraft

and Typical Flight Profile

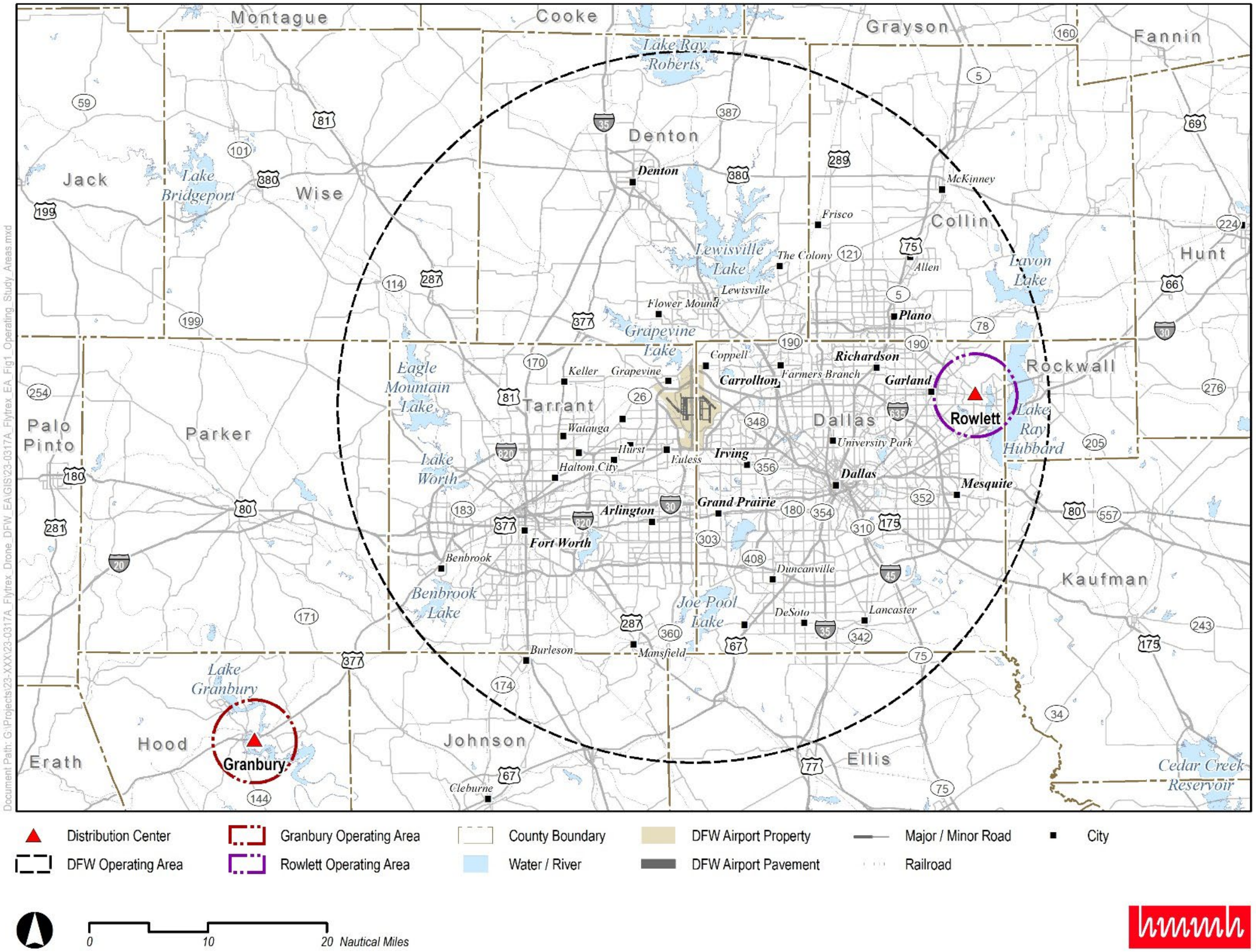


Figure 1. Operating Areas

Figure 2. Flytrex FTX-M600P UA

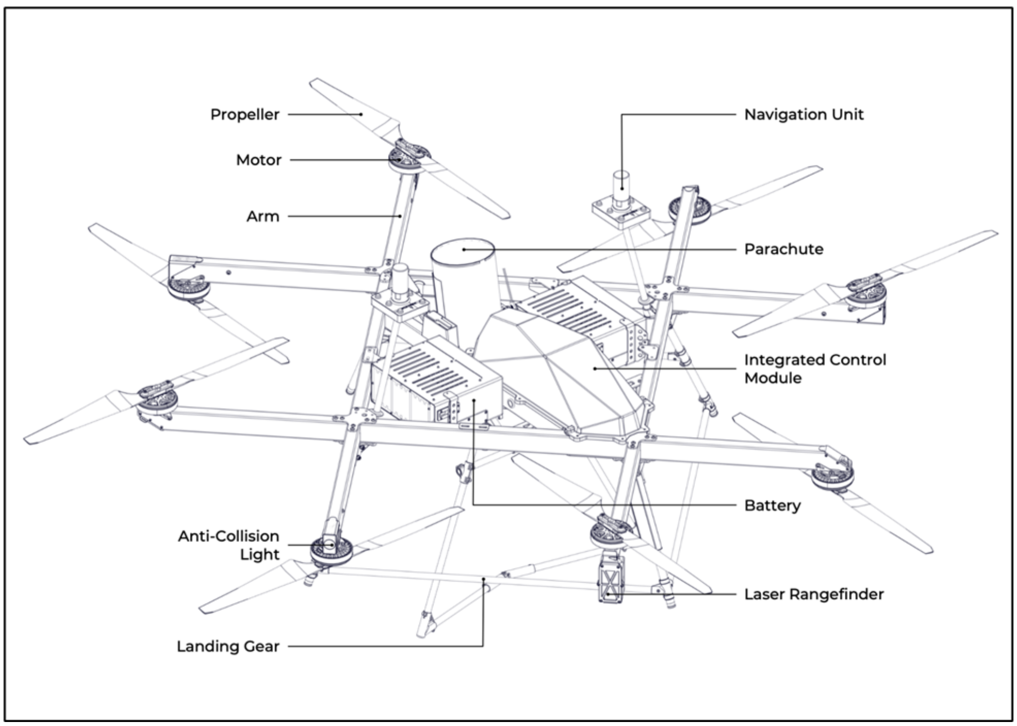


Figure 3. Flytrex FTX Sky II UA Diagram

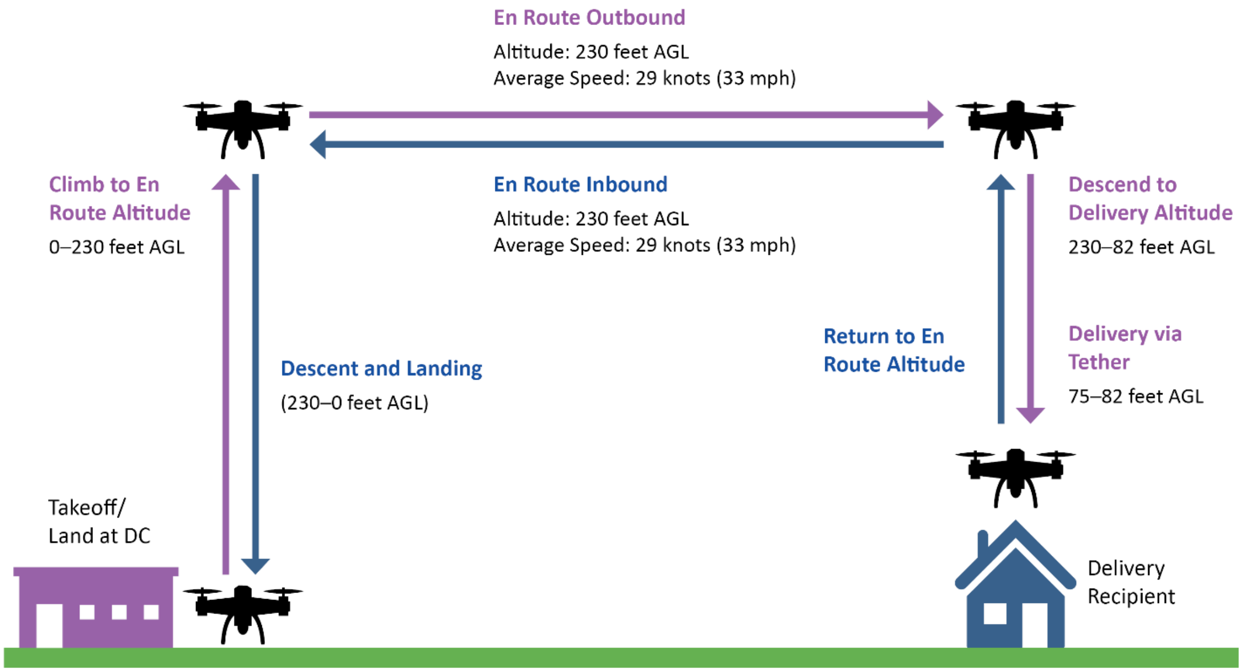


Figure 4. Typical Flight Profile

ATTACHMENTS C AND D

List of Historic Properties

List of Historic Districts

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.	Westove r 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
05001401	Baker-Carmichael House	226 E. Pearl St.	Granbury	Hood
100007355	Granbury Elementary School	126 N. Michigan St.	Granbury	Hood
78002956	Wright-Henderson-Duncan House	703 Spring St.	Granbury	Hood

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, & 14161430 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
74002080	Hood County Courthouse Historic District	Courthouse Square, bounded by Bridge St., Pearl St., and Houston St.	Granbury	Hood

APPENDIX E
Tribal Consultation

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

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

Transmitted via e-mail and mail: durrellcooper05@gmail.com

RE: Invitation for Government-to-Government Tribal Consultation for Drone Package Delivery Operations in Texas

Dear Chairman Cooper:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) to authorize commercial Unmanned Aircraft Systems (UAS) operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 (Part 135) in the state of Texas. The FAA is the lead federal agency for government-to-government consultation for the proposed project. Causey Aviation Unmanned, LLC, doing business as Causey (CAU), is the proponent of the project. We wish to solicit your views regarding potential effects on tribal interests in the area.

The primary purpose of government-to-government consultation is to ensure that Federally-Recognized Tribes are given the opportunity to provide meaningful and timely input regarding proposed FAA actions that uniquely or significantly affect the Tribes. This policy is provided in Federal Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*; Presidential Memorandum, *Uniform Standards for Tribal Consultation*; DOT Order 5301.1A, *Department of Transportation Tribal Consultation Policy and Procedures*; and FAA Order 1210.20, *American Indian and Alaska Native Tribal Consultation Policy and Procedures*.

Consultation Initiation

With this letter, the FAA seeks input concerning any Tribal lands or sites of religious or cultural significance that may be affected by the proposed operation. Early identification of Tribal concerns, or known properties of traditional, religious, and/or cultural importance, will allow the FAA to consider ways to avoid or minimize potential impacts to Tribal resources. We are available to discuss the details of the proposed project with you. The FAA previously consulted the Apache Tribe of Oklahoma on a similar proposal for CAU to conduct drone package deliveries in Granbury and Rowlett, Texas on October 27, 2022. No sites were identified by your Tribe during the previous consultation.

Proposed Activity Description

The FAA is preparing an Environmental Assessment (EA) to assess the potential environmental impacts of the FAA's actions of authorizing commercial package delivery operations using drones in the Dallas-Fort Worth (DFW) area under Part 135. Since 2019, the FAA has been issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing new or amended Part 135 air carrier Operations Specifications as the operative approval. For your reference, the project description used for consultation under Section 106 is enclosed with this letter.

Confidentiality

We understand that you may have concerns about the confidentiality of information on areas or resources of traditional, religious, and/or cultural importance to your Tribe. We are available to discuss these concerns and develop procedures to ensure the confidentiality of such information is maintained.

FAA Contact Information

Your timely response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. In addition, we respectfully request your response in the event that the Apache Tribe of Oklahoma would like to consult with the FAA in a government-to-government relationship about this proposal. Please contact Dr. Shelia Neumann via e-mail at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter in this government-to-government consultation.

Sincerely,

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

Enclosure:
Attachment A – Section 106 Consultation Package

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

RE: Initiation of Section 106 Consultation for Drone Package Delivery Operations in Texas

The Federal Aviation Administration (FAA) is currently evaluating the Causey Aviation Unmanned, LLC (CAU) proposal to conduct expanded drone package delivery operations in the Dallas-Fort Worth (DFW), Texas area. CAU must obtain approval from the FAA prior to expanding its operations by operating the Flytrex FTX-M600P and Sky II drones in DFW, Texas. 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 (NHPA) (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 this area. The FAA intends to complete consultation for Section 106 of the NHPA concurrently with the NEPA process.

Project Description

CAU proposes to continue transporting small consumer goods via drone delivery in the communities they already serve (i.e., Granbury and Rowlett, Texas) and expand its operations to include the DFW metropolitan area using the Flytrex FTX-M600P and Sky II drones (see **Attachment A**). The drones would take off from a distribution center and quickly rise to a cruising altitude of 230 feet above ground level (AGL). The Flytrex FTX-M600P drone weighs approximately 33.4 pounds and can transport a small package up to about 5.73 pounds. The Sky II drone weighs approximately 34.2 pounds and can transport a small package up to about 8.8 pounds. The drones have a service radius of approximately 8.5 miles round trip. Once at the delivery site, the drone hovers in place at an altitude of 75 to 82 feet AGL and lowers the package to the ground using a tethered mechanism. Once the package has been delivered, the drone flies back to the distribution center at roughly the same altitude.

CAU proposes to operate a maximum of 500 deliveries per day from each distribution center, with each flight taking a package to a customer delivery address before returning. There is variability in the number of flights per day based on customer demand and weather conditions. Initially, CAU expects to fly much less than the maximum of 500 deliveries per day from each distribution center and gradually increase deliveries to the proposed level as consumer demand increases. Flights would occur up to 365 days per year, with operations being conducted between the hours of 8 a.m. and 10 p.m.

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 Texas State Historic Preservation Officer (SHPO) showed the APE would be limited to areas near DFW, Texas. This expansion extends through the similarly, densely populated or congested regions of the DFW area. The enclosed map (see **Attachment A**) shows the proposed APE in detail.

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 is focusing its identification efforts on above-ground historic properties.

Consultation

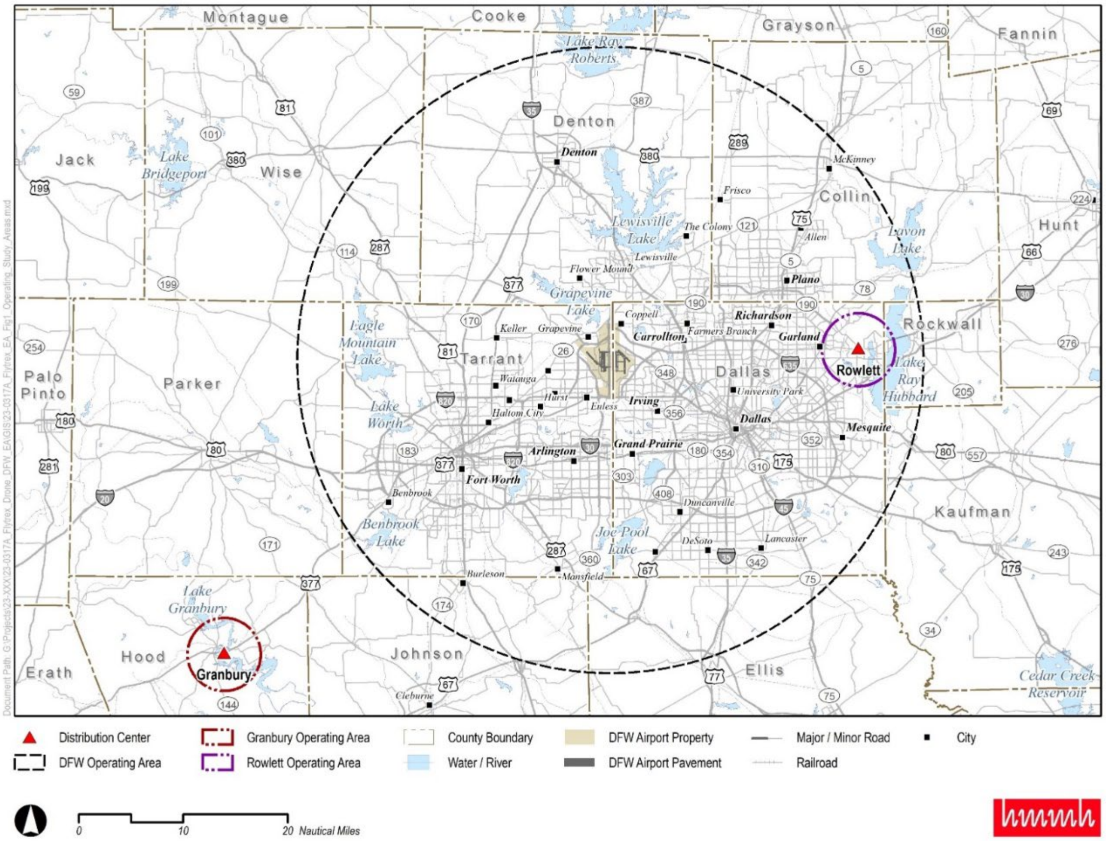
The FAA previously consulted the Apache Tribe of Oklahoma on October 27, 2022, regarding a similar proposal for CAU to conduct drone package deliveries in Granbury and Rowlett, Texas (see **Attachment B)**. The FAA is now soliciting the opinion of the tribes concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operations 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 Dr. Shelia Neumann via email at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter.

Sincerely,

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

Enclosures:
Attachment A – Proposed Area of Potential Effects
Attachment B – Previous Tribal Consultation

Attachment A – Proposed Area of Potential Effects



U.S. Department
of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Chairman Bobby Komardley
Apache Tribe of Oklahoma
P.O. Box 1330
Anadarko, OK 73005

Dear Chairman Komardley:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Rowlett, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
The FAA has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Rowlett, TX (see attached operations area map). Upon reaching the delivery point, the UAS lowers to a delivery altitude of 65 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the UAS then ascends back to 230 feet AGL. The purpose is for package delivery, consisting of 52 projected daily delivery flight operations in the next 12 months, and 71 in 24 months that will be distributed within delivery zones located within the proposed operating areas. Flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. The dimension of the UAS area defines the Area of Potential Effect (APE). The UAS delivery area will have a radius of 2 nautical miles centered on a distribution center located at 3805 Industrial Street, Rowlett, TX 75088. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the Distribution Center.

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. Based

on a review of the route modifications as well as our increasing knowledge with respect to the level of environmental impacts from drone operations, FAA has determined that this new approval has no potential to effect historic properties. FAA expects that drone operations will continue to grow and that we all will continue to learn more about this emerging technology. FAA would be amenable to trying to answer any questions you may have generally on this new technology. 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 comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Chairman Bobby Komardley
Apache Tribe of Oklahoma
P.O. Box 1330
Anadarko, OK 73005

Dear Chairman Komardley:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Granbury, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
The FAA has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Granbury, TX (see attached operations area map). Upon reaching the delivery point, the UAS lowers to a delivery altitude of 65 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the UAS then ascends back to 230 feet AGL. The purpose is for package delivery, consisting of 57 projected daily delivery flight operations in the next 12 months, and 77 in 24 months that will be distributed within delivery zones located within the proposed operating areas. Flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. The dimension of the UAS area defines the Area of Potential Effect (APE). The UAS delivery area will have a radius of 2 nautical miles centered on a distribution center located at 1201 Water's Edge Drive, Granbury, TX 76048. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the Distribution Center.

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. Based

on a review of the route modifications as well as our increasing knowledge with respect to the level of environmental impacts from drone operations, FAA has determined that this new approval has no potential to effect historic properties. FAA expects that drone operations will continue to grow and that we all will continue to learn more about this emerging technology. FAA would be amenable to trying to answer any questions you may have generally on this new technology. 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 comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

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

Transmitted via e-mail and mail: bgonzalez@mycaddonation.com

RE: Invitation for Government-to-Government Tribal Consultation for Drone Package Delivery Operations in Texas

Dear Chairman Gonzalez:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) to authorize commercial Unmanned Aircraft Systems (UAS) operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 (Part 135) in the state of Texas. The FAA is the lead federal agency for government-to-government consultation for the proposed project. Causey Aviation Unmanned, LLC, doing business as Causey (CAU), is the proponent of the project. We wish to solicit your views regarding potential effects on tribal interests in the area.

The primary purpose of government-to-government consultation is to ensure that Federally-Recognized Tribes are given the opportunity to provide meaningful and timely input regarding proposed FAA actions that uniquely or significantly affect the Tribes. This policy is provided in Federal Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*; Presidential Memorandum, *Uniform Standards for Tribal Consultation*; DOT Order 5301.1A, *Department of Transportation Tribal Consultation Policy and Procedures*; and FAA Order 1210.20, *American Indian and Alaska Native Tribal Consultation Policy and Procedures*.

Consultation Initiation

With this letter, the FAA seeks input concerning any Tribal lands or sites of religious or cultural significance that may be affected by the proposed operation. Early identification of Tribal concerns, or known properties of traditional, religious, and/or cultural importance, will allow the FAA to consider ways to avoid or minimize potential impacts to Tribal resources. We are available to discuss the details of the proposed project with you.

Proposed Activity Description

The FAA is preparing an Environmental Assessment (EA) to assess the potential environmental impacts of the FAA's actions of authorizing commercial package delivery operations using drones in the Dallas-Fort Worth (DFW) area under Part 135. Since 2019, the FAA has been issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing new or amended Part 135 air carrier Operations

Specifications as the operative approval. For your reference, the project description used for consultation under Section 106 is enclosed with this letter.

Confidentiality

We understand that you may have concerns about the confidentiality of information on areas or resources of traditional, religious, and/or cultural importance to your Tribe. We are available to discuss these concerns and develop procedures to ensure the confidentiality of such information is maintained.

FAA Contact Information

Your timely response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. In addition, we respectfully request your response in the event that the Caddo Nation of Oklahoma would like to consult with the FAA in a government-to-government relationship about this proposal. Please contact Dr. Shelia Neumann via e-mail at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter in this government-to-government consultation.

Sincerely,

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

CC: Mr. Jonathan Rohrer
Tribal Historic Preservation Officer

Enclosure:
Attachment A – Section 106 Consultation Package

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

Mr. Jonathan Rohrer, Tribal Historic Preservation Officer
Caddo Nation of Oklahoma
P.O. Box 487
Binger, Oklahoma 73009

Transmitted via e-mail and mail: jrohrer@mycaddonation.com

RE: Initiation of Section 106 Consultation for Drone Package Delivery Operations in Texas

Dear Mr. Rohrer:

The Federal Aviation Administration (FAA) is currently evaluating the Causey Aviation Unmanned, LLC (CAU) proposal to conduct expanded drone package delivery operations in the Dallas-Fort Worth (DFW), Texas area. CAU must obtain approval from the FAA prior to expanding its operations by operating the Flytrex FTX-M600P and Sky II drones in DFW, Texas. 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 (NHPA) (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 this area. The FAA intends to complete consultation for Section 106 of the NHPA concurrently with the NEPA process.

Project Description

CAU proposes to continue transporting small consumer goods via drone delivery in the communities they already serve (i.e., Granbury and Rowlett, Texas) and expand its operations to include the DFW metropolitan area using the Flytrex FTX-M600P and Sky II drones (see **Attachment A**). The drones would take off from a distribution center and quickly rise to a cruising altitude of 230 feet above ground level (AGL). The Flytrex FTX-M600P drone weighs approximately 33.4 pounds and can transport a small package up to about 5.73 pounds. The Sky II drone weighs approximately 34.2 pounds and can transport a small package up to about 8.8 pounds. The drones have a service radius of approximately 8.5 miles round trip. Once at the delivery site, the drone hovers in place at an altitude of 75 to 82 feet AGL and lowers the package to the ground using a tethered mechanism. Once the package has been delivered, the drone flies back to the distribution center at roughly the same altitude.

CAU proposes to operate a maximum of 500 deliveries per day from each distribution center, with each flight taking a package to a customer delivery address before returning. There is variability in the number of flights per day based on customer demand and weather conditions. Initially, CAU expects to fly much less than the maximum of 500 deliveries per day from each distribution center and gradually increase deliveries to the proposed level as consumer demand increases. Flights would occur up to 365 days per year, with operations being conducted between the hours of 8 a.m. and 10 p.m.

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 Texas State Historic Preservation Officer (SHPO) showed the APE would be limited to areas near DFW, Texas. This expansion extends through the similarly, densely populated or congested regions of the DFW area. The enclosed map (see **Attachment A**) shows the proposed APE in detail.

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 is focusing its identification efforts on above-ground historic properties.

Consultation

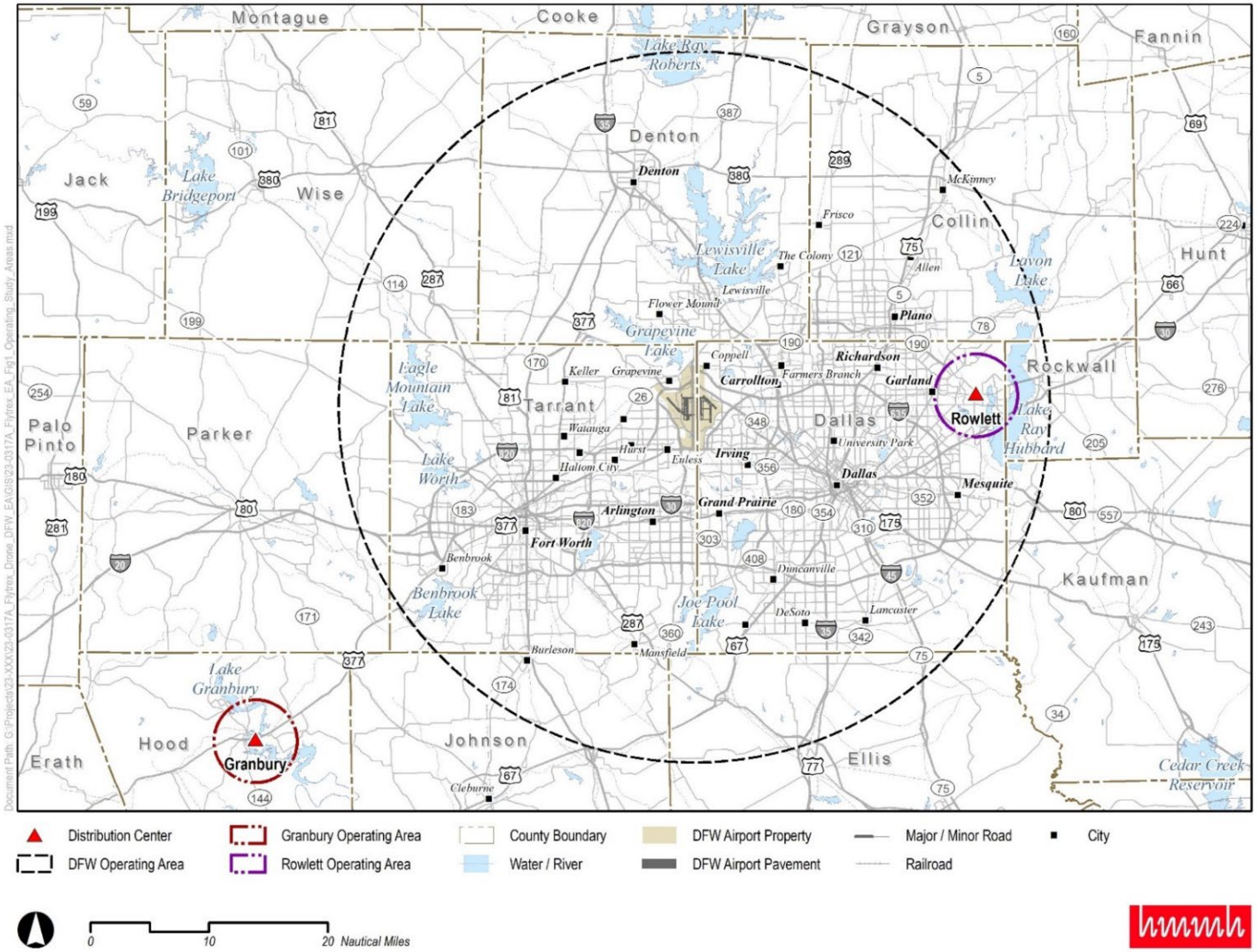
The FAA is now soliciting the opinion of the tribes concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operations area. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. If you have any questions or need additional information, please contact Dr. Shelia Neumann via email at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter.

Sincerely,

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

Attachment A – Proposed Area of Potential Effects

Attachment A – Proposed Area of Potential Effects



U.S. Department
of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

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

Transmitted via e-mail and mail: chuck-hoskin@cherokee.org

RE: Invitation for Government-to-Government Tribal Consultation for Drone Package Delivery Operations in Texas

Dear Principal Chief Hoskin:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) to authorize commercial Unmanned Aircraft Systems (UAS) operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 (Part 135) in the state of Texas. The FAA is the lead federal agency for government-to-government consultation for the proposed project. Causey Aviation Unmanned, LLC, doing business as Causey (CAU), is the proponent of the project. We wish to solicit your views regarding potential effects on tribal interests in the area.

The primary purpose of government-to-government consultation is to ensure that Federally-Recognized Tribes are given the opportunity to provide meaningful and timely input regarding proposed FAA actions that uniquely or significantly affect the Tribes. This policy is provided in Federal Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*; Presidential Memorandum, *Uniform Standards for Tribal Consultation*; DOT Order 5301.1A, *Department of Transportation Tribal Consultation Policy and Procedures*; and FAA Order 1210.20, *American Indian and Alaska Native Tribal Consultation Policy and Procedures*.

Consultation Initiation

With this letter, the FAA seeks input concerning any Tribal lands or sites of religious or cultural significance that may be affected by the proposed operation. Early identification of Tribal concerns, or known properties of traditional, religious, and/or cultural importance, will allow the FAA to consider ways to avoid or minimize potential impacts to Tribal resources. We are available to discuss the details of the proposed project with you. In 2022, the FAA consulted with your tribe for input on a similar proposal for CAU to conduct drone package deliveries in Rowlett, Texas. No sites were identified by your Tribe during the previous consultation. The Cherokee Nation indicated no objection to the project as long as the Tribe was contacted if conditions change and/or items of cultural significance are discovered. The Cherokee Nation also requested that the FAA conduct appropriate inquiries with other pertinent

Tribes regarding historic and prehistoric resources, which the FAA did and continues to do through government-to-government consultation with other Tribes.

Proposed Activity Description

The FAA is preparing an Environmental Assessment (EA) to assess the potential environmental impacts of the FAA's actions of authorizing commercial package delivery operations using drones in the Dallas-Fort Worth (DFW) area under Part 135. Since 2019, the FAA has been issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing new or amended Part 135 air carrier Operations Specifications as the operative approval. For your reference, the project description used for consultation under Section 106 is enclosed with this letter.

Confidentiality

We understand that you may have concerns about the confidentiality of information on areas or resources of traditional, religious, and/or cultural importance to your Tribe. We are available to discuss these concerns and develop procedures to ensure the confidentiality of such information is maintained.

FAA Contact Information

Your timely response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. In addition, we respectfully request your response in the event that the Cherokee Nation would like to consult with the FAA in a government-to-government relationship about this proposal. Please contact Dr. Shelia Neumann via e-mail at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter in this government-to-government consultation.

Sincerely,

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

CC: Ms. Elizabeth Toombs
Tribal Historic Preservation Officer

Enclosures:
Attachment A – Section 106 Package

U.S. Department
of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

Ms. Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation
P.O. Box 948
Tahlequah, Oklahoma 74465

Transmitted via e-mail and mail: Elizabeth-toombs@cherokee.org

RE: Initiation of Section 106 Consultation for Drone Package Delivery Operations in Texas

Dear Ms. Toombs:

The Federal Aviation Administration (FAA) is currently evaluating the Causey Aviation Unmanned, LLC (CAU) proposal to conduct expanded drone package delivery operations in the Dallas-Fort Worth (DFW), Texas area. CAU must obtain approval from the FAA prior to expanding its operations by operating the Flytrex FTX-M600P and Sky II drones in DFW, Texas. 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 (NHPA) (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 this area. The FAA intends to complete consultation for Section 106 of the NHPA concurrently with the NEPA process.

Project Description

CAU proposes to continue transporting small consumer goods via drone delivery in the communities they already serve (i.e., Granbury and Rowlett, Texas) and expand its operations to include the DFW metropolitan area using the Flytrex FTX-M600P and Sky II drones (see **Attachment A**). The drones would take off from a distribution center and quickly rise to a cruising altitude of 230 feet above ground level (AGL). The Flytrex FTX-M600P drone weighs approximately 33.4 pounds and can transport a small package up to about 5.73 pounds. The Sky II drone weighs approximately 34.2 pounds and can transport a small package up to about 8.8 pounds. The drones have a service radius of approximately 8.5 miles round trip. Once at the delivery site, the drone hovers in place at an altitude of 75 to 82 feet AGL and lowers the package to the ground using a tethered mechanism. Once the package has been delivered, the drone flies back to the distribution center at roughly the same altitude.

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Area of Potential Effects

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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 is focusing its identification efforts on above-ground historic properties.

Consultation

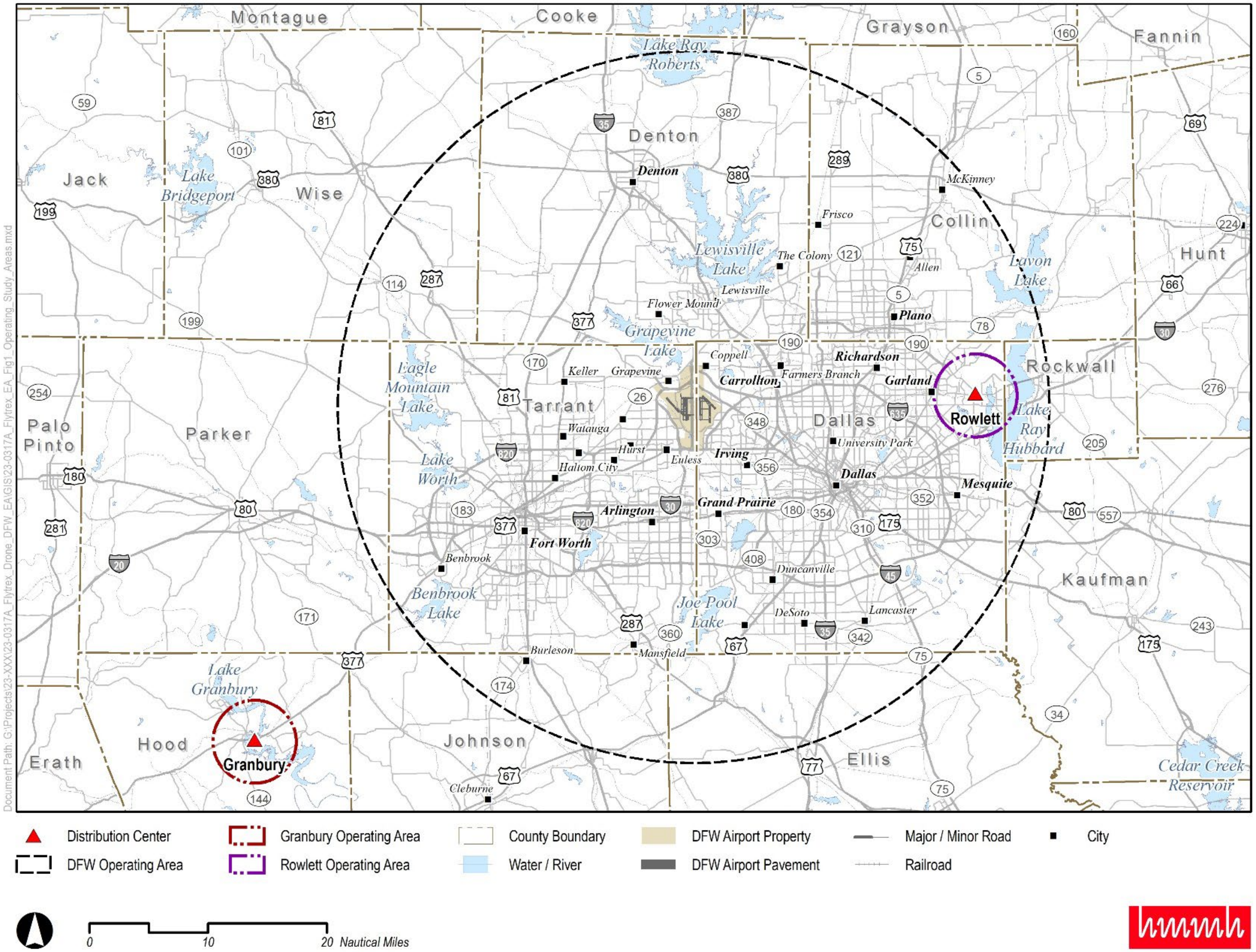
The FAA previously consulted Cherokee Nation on October 27, 2022, regarding a similar proposal for CAU to conduct drone package deliveries in Rowlett, Texas (see **Attachment B**). The FAA is now soliciting the opinion of the tribes concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operations 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 Dr. Shelia Neumann via email at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter.

Sincerely,

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

Enclosures:
Attachment A – Proposed Area of Potential Effects
Attachment B – Previous Tribal Consultation

Attachment A – Proposed Area of Potential Effects



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CHEROKEE NATION®
P.O. Box 948 • Tahlequah, OK 74465-0948
918-453-5000 • www.cherokee.org

Chuck Hoskin Jr.
Principal Chief
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Bryan Warner
Deputy Principal Chief
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November 30, 2022

Mike Millard
Federal Aviation Administration
AFS-800
800 Independence Avenue, SW
Washington, D.C. 20591

Re: Unmanned Aircraft System Operation Area in Rowlett, Texas

Mr. Mike Millard:

The Cherokee Nation (Nation) is in receipt of your correspondence about **Unmanned Aircraft System Operation Area**, and appreciates the opportunity to provide comment upon this project. Please allow this letter to serve as the Nation's interest in acting as a consulting party to this proposed project.

The Nation maintains databases and records of cultural, historic, and pre-historic resources in this area. Our Historic Preservation Office (Office) reviewed this project, cross referenced the project's legal description against our information, and found instances where this project is within close proximity to such resources. These resources, however, are outside the Area of Potential Effects (APE). Thus, this Office does not object to the project proceeding as long as the following stipulations are observed:

1) The Nation requests that Federal Aviation Administration (FAA) re-contact this Office if there are any changes to the scope of or activities within the APE;

2) The Nation requests that the FAA halt all project activities immediately and re-contact our Offices for further consultation if items of cultural significance are discovered during the course of this project; and

3) The Nation requests that the FAA conduct appropriate inquiries with other pertinent Tribal and Historic Preservation Office regarding historic and prehistoric resources not included in the Nation's databases or records.

If you require additional information or have any questions, please contact me at your convenience. Thank you for your time and attention to this matter.

Wado,

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation Tribal Historic Preservation Office
elizabeth-toombs@cherokee.org
918.453.5389

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

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

Transmitted via e-mail and mail: mark.woommavovah@comanchenation.com

RE: Invitation for Government-to-Government Tribal Consultation for Drone Package Delivery Operations in Texas

Dear Chairman Woommavovah:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) to authorize commercial Unmanned Aircraft Systems (UAS) operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 (Part 135) in the state of Texas. The FAA is the lead federal agency for government-to-government consultation for the proposed project. Causey Aviation Unmanned, LLC, doing business as Causey (CAU), is the proponent of the project. We wish to solicit your views regarding potential effects on tribal interests in the area.

The primary purpose of government-to-government consultation is to ensure that Federally-Recognized Tribes are given the opportunity to provide meaningful and timely input regarding proposed FAA actions that uniquely or significantly affect the Tribes. This policy is provided in Federal Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*; Presidential Memorandum, *Uniform Standards for Tribal Consultation*; DOT Order 5301.1A, *Department of Transportation Tribal Consultation Policy and Procedures*; and FAA Order 1210.20, *American Indian and Alaska Native Tribal Consultation Policy and Procedures*.

Consultation Initiation

With this letter, the FAA seeks input concerning any Tribal lands or sites of religious or cultural significance that may be affected by the proposed operation. Early identification of Tribal concerns, or known properties of traditional, religious, and/or cultural importance, will allow the FAA to consider ways to avoid or minimize potential impacts to Tribal resources. We are available to discuss the details of the proposed project with you. The FAA previously consulted the Comanche Nation on a similar proposal for CAU to conduct drone package deliveries in Granbury and Rowlett, Texas on October 27, 2022 (see **Attachment B**). No sites were identified by your Tribe during the previous consultation.

Proposed Activity Description

The FAA is preparing an Environmental Assessment (EA) to assess the potential environmental impacts of the FAA's actions of authorizing commercial package delivery operations using drones in the Dallas-Fort Worth (DFW) area under Part 135. Since 2019, the FAA has been issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing new or amended Part 135 air carrier Operations Specifications as the operative approval. For your reference, the project description used for consultation under Section 106 is enclosed with this letter.

Confidentiality

We understand that you may have concerns about the confidentiality of information on areas or resources of traditional, religious, and/or cultural importance to your Tribe. We are available to discuss these concerns and develop procedures to ensure the confidentiality of such information is maintained.

FAA Contact Information

Your timely response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. In addition, we respectfully request your response in the event that the Comanche Nation would like to consult with the FAA in a government-to-government relationship about this proposal. Please contact Dr. Shelia Neumann via e-mail at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter in this government-to-government consultation.

Sincerely,

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

CC: Ms. Martina Minthorn
Tribal Historic Preservation Officer

Enclosure:
Attachment A Section 106 Consultation

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

Ms. Martina Minthorn, Tribal Historic Preservation Officer
Comanche Nation
P.O. Box 908
Lawton, Oklahoma 73502

Transmitted via e-mail: martina.minthorn@comanchenation.com

RE: Initiation of Section 106 Consultation for Drone Package Delivery Operations in Texas

Dear Ms. Minthorn:

The Federal Aviation Administration (FAA) is currently evaluating the Causey Aviation Unmanned, LLC (CAU) proposal to conduct expanded drone package delivery operations in the Dallas-Fort Worth (DFW), Texas area. CAU must obtain approval from the FAA prior to expanding its operations by operating the Flytrex FTX-M600P and Sky II drones in DFW, Texas. 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 (NHPA) (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 this area. The FAA intends to complete consultation for Section 106 of the NHPA concurrently with the NEPA process.

Project Description

CAU proposes to continue transporting small consumer goods via drone delivery in the communities they already serve (i.e., Granbury and Rowlett, Texas) and expand its operations to include the DFW metropolitan area using the Flytrex FTX-M600P and Sky II drones (see **Attachment A**). The drones would take off from a distribution center and quickly rise to a cruising altitude of 230 feet above ground level (AGL). The Flytrex FTX-M600P drone weighs approximately 33.4 pounds and can transport a small package up to about 5.73 pounds. The Sky II drone weighs approximately 34.2 pounds and can transport a small package up to about 8.8 pounds. The drones have a service radius of approximately 8.5 miles round trip. Once at the delivery site, the drone hovers in place at an altitude of 75 to 82 feet AGL and lowers the package to the ground using a tethered mechanism. Once the package has been delivered, the drone flies back to the distribution center at roughly the same altitude.

CAU proposes to operate a maximum of 500 deliveries per day from each distribution center, with each flight taking a package to a customer delivery address before returning. There is variability in the number of flights per day based on customer demand and weather conditions. Initially, CAU expects to fly much less than the maximum of 500 deliveries per day from each distribution center and gradually increase deliveries to the proposed level as consumer demand increases. Flights would occur up to 365 days per year, with operations being conducted between the hours of 8 a.m. and 10 p.m.

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 Texas State Historic Preservation Officer (SHPO) showed the APE would be limited to areas near DFW, Texas. This expansion extends through the similarly, densely populated or congested regions of the DFW area. The enclosed map (see **Attachment A**) shows the proposed APE in detail.

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 is focusing its identification efforts on above-ground historic properties.

Consultation

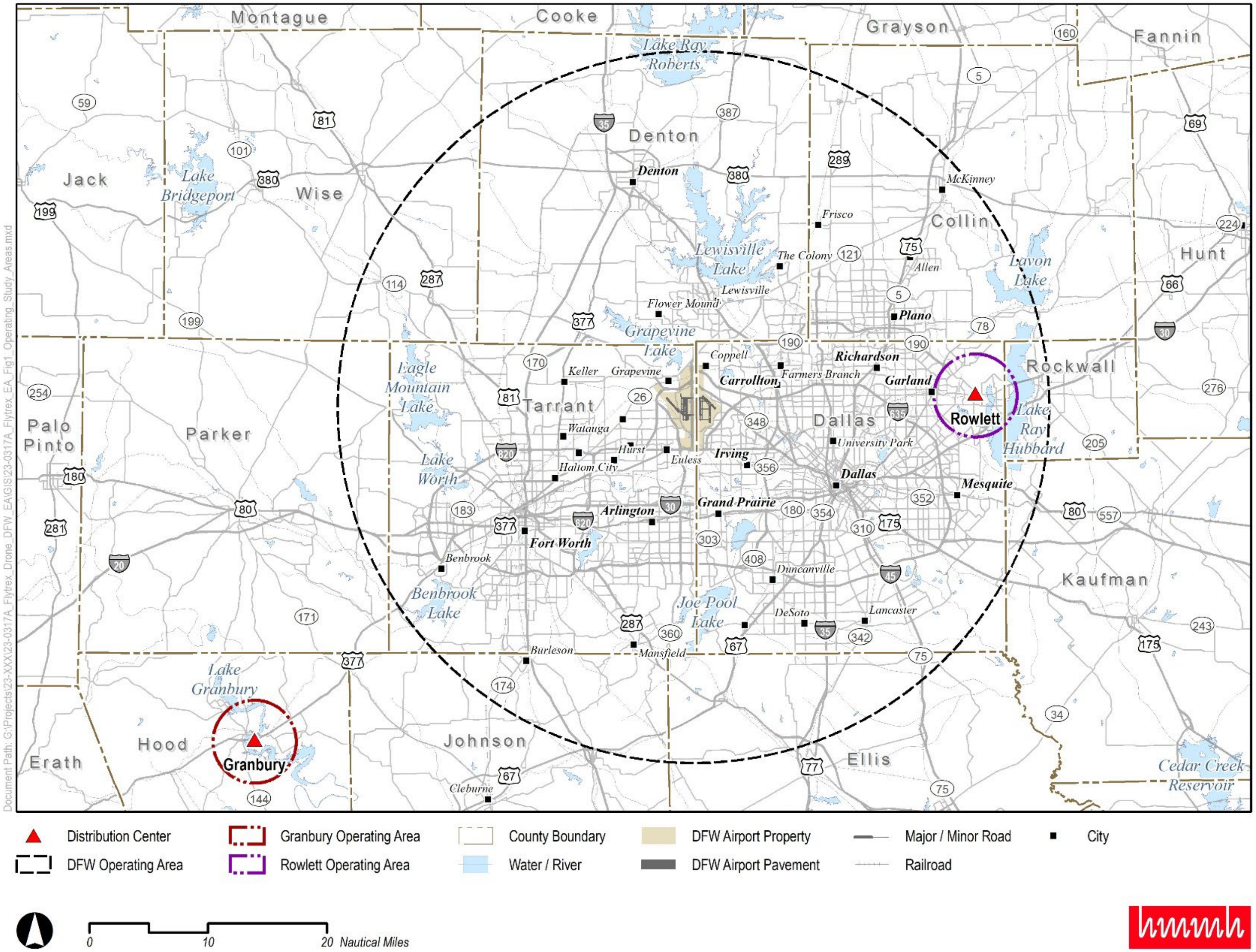
The FAA previously consulted the Comanche Nation on October 27, 2022, regarding a similar proposal for CAU to conduct drone package deliveries in Granbury and Rowlett, Texas (see **Attachment B)**. The FAA is now soliciting the opinion of the tribes concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operations 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 Dr. Shelia Neumann via email at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter.

Sincerely,

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

Enclosures:
Attachment A – Proposed Area of Potential Effects
Attachment B – Previous Tribal Consultation

Attachment A – Proposed Area of Potential Effects



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

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

Dear Chairman Woommavovah:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Granbury, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
The FAA has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Granbury, TX (see attached operations area map). Upon reaching the delivery point, the UAS lowers to a delivery altitude of 65 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the UAS then ascends back to 230 feet AGL. The purpose is for package delivery, consisting of 57 projected daily delivery flight operations in the next 12 months, and 77 in 24 months that will be distributed within delivery zones located within the proposed operating areas. Flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. The dimension of the UAS area defines the Area of Potential Effect (APE). The UAS delivery area will have a radius of 2 nautical miles centered on a distribution center located at 1201 Water's Edge Drive, Granbury, TX 76048. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the Distribution Center.

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. Based

on a review of the route modifications as well as our increasing knowledge with respect to the level of environmental impacts from drone operations, FAA has determined that this new approval has no potential to effect historic properties. FAA expects that drone operations will continue to grow and that we all will continue to learn more about this emerging technology. FAA would be amenable to trying to answer any questions you may have generally on this new technology. 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 comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

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

Dear Chairman Woommavovah:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Rowlett, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
The FAA has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Rowlett, TX (see attached operations area map). Upon reaching the delivery point, the UAS lowers to a delivery altitude of 65 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the UAS then ascends back to 230 feet AGL. The purpose is for package delivery, consisting of 52 projected daily delivery flight operations in the next 12 months, and 71 in 24 months that will be distributed within delivery zones located within the proposed operating areas. Flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. The dimension of the UAS area defines the Area of Potential Effect (APE). The UAS delivery area will have a radius of 2 nautical miles centered on a distribution center located at 3805 Industrial Street, Rowlett, TX 75088. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the Distribution Center.

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. Based

on a review of the route modifications as well as our increasing knowledge with respect to the level of environmental impacts from drone operations, FAA has determined that this new approval has no potential to effect historic properties. FAA expects that drone operations will continue to grow and that we all will continue to learn more about this emerging technology. FAA would be amenable to trying to answer any questions you may have generally on this new technology. 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 comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

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

Transmitted via e-mail and mail: MBell@coushatta.org

RE: Invitation for Government-to-Government Tribal Consultation for Drone Package Delivery Operations in Texas

Dear Chairman Cernek:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) to authorize commercial Unmanned Aircraft Systems (UAS) operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 (Part 135) in the state of Texas. The FAA is the lead federal agency for government-to-government consultation for the proposed project. Causey Aviation Unmanned, LLC, doing business as Causey (CAU), is the proponent of the project. We wish to solicit your views regarding potential effects on tribal interests in the area.

The primary purpose of government-to-government consultation is to ensure that Federally-Recognized Tribes are given the opportunity to provide meaningful and timely input regarding proposed FAA actions that uniquely or significantly affect the Tribes. This policy is provided in Federal Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*; Presidential Memorandum, *Uniform Standards for Tribal Consultation*; DOT Order 5301.1A, *Department of Transportation Tribal Consultation Policy and Procedures*; and FAA Order 1210.20, *American Indian and Alaska Native Tribal Consultation Policy and Procedures*.

Consultation Initiation

With this letter, the FAA seeks input concerning any Tribal lands or sites of religious or cultural significance that may be affected by the proposed operation. Early identification of Tribal concerns, or known properties of traditional, religious, and/or cultural importance, will allow the FAA to consider ways to avoid or minimize potential impacts to Tribal resources. We are available to discuss the details of the proposed project with you. In 2022, the FAA consulted with your Tribe for input on a similar proposal for CAU to conduct drone package deliveries in Granbury and Rowlett, Texas. No sites were identified by your Tribe during the previous consultation.

Proposed Activity Description

The FAA is preparing an Environmental Assessment (EA) to assess the potential environmental impacts of the FAA's actions of authorizing commercial package delivery operations using drones in the Dallas-Fort Worth (DFW) area under Part 135. Since 2019, the FAA has been issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing new or amended Part 135 air carrier Operations Specifications as the operative approval. For your reference, the project description used for consultation under Section 106 is enclosed with this letter.

Confidentiality

We understand that you may have concerns about the confidentiality of information on areas or resources of traditional, religious, and/or cultural importance to your Tribe. We are available to discuss these concerns and develop procedures to ensure the confidentiality of such information is maintained.

FAA Contact Information

Your timely response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. In addition, we respectfully request your response in the event that the Coushatta Tribe of Louisiana would like to consult with the FAA in a government-to-government relationship about this proposal. Please contact Dr. Shelia Neumann via e-mail at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter in this government-to-government consultation.

Sincerely,

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

CC: Mr. Dakota John
Tribal Historic Preservation Officer

Enclosure:
Attachment A — Section 106 Consultation Package

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

Mr. Dakota John, Tribal Historic Preservation Officer
Coushatta Tribe of Louisiana
P.O. Box 818
Elton, Louisiana 70532

Transmitted via e-mail: dakotajohn@coushatta.org

RE: Initiation of Section 106 Consultation for Drone Package Delivery Operations in Texas

Dear Mr. John:

The Federal Aviation Administration (FAA) is currently evaluating the Causey Aviation Unmanned, LLC (CAU) proposal to conduct expanded drone package delivery operations in the Dallas-Fort Worth (DFW), Texas area. CAU must obtain approval from the FAA prior to expanding its operations by operating the Flytrex FTX-M600P and Sky II drones in DFW, Texas. 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 (NHPA) (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 this area. The FAA intends to complete consultation for Section 106 of the NHPA concurrently with the NEPA process.

Project Description

CAU proposes to continue transporting small consumer goods via drone delivery in the communities they already serve (i.e., Granbury and Rowlett, Texas) and expand its operations to include the DFW metropolitan area using the Flytrex FTX-M600P and Sky II drones (see **Attachment A**). The drones would take off from a distribution center and quickly rise to a cruising altitude of 230 feet above ground level (AGL). The Flytrex FTX-M600P drone weighs approximately 33.4 pounds and can transport a small package up to about 5.73 pounds. The Sky II drone weighs approximately 34.2 pounds and can transport a small package up to about 8.8 pounds. The drones have a service radius of approximately 8.5 miles round trip. Once at the delivery site, the drone hovers in place at an altitude of 75 to 82 feet AGL and lowers the package to the ground using a tethered mechanism. Once the package has been delivered, the drone flies back to the distribution center at roughly the same altitude.

CAU proposes to operate a maximum of 500 deliveries per day from each distribution center, with each flight taking a package to a customer delivery address before returning. There is variability in the number of flights per day based on customer demand and weather conditions. Initially, CAU expects to fly much less than the maximum of 500 deliveries per day from each distribution center and gradually increase deliveries to the proposed level as consumer demand increases. Flights would occur up to 365 days per year, with operations being conducted between the hours of 8 a.m. and 10 p.m.

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 Texas State Historic Preservation Officer (SHPO) showed the APE would be limited to areas near DFW, Texas. This expansion extends through the similarly, densely populated or congested regions of the DFW area. The enclosed map (see **Attachment A**) shows the proposed APE in detail.

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 is focusing its identification efforts on above-ground historic properties.

Consultation

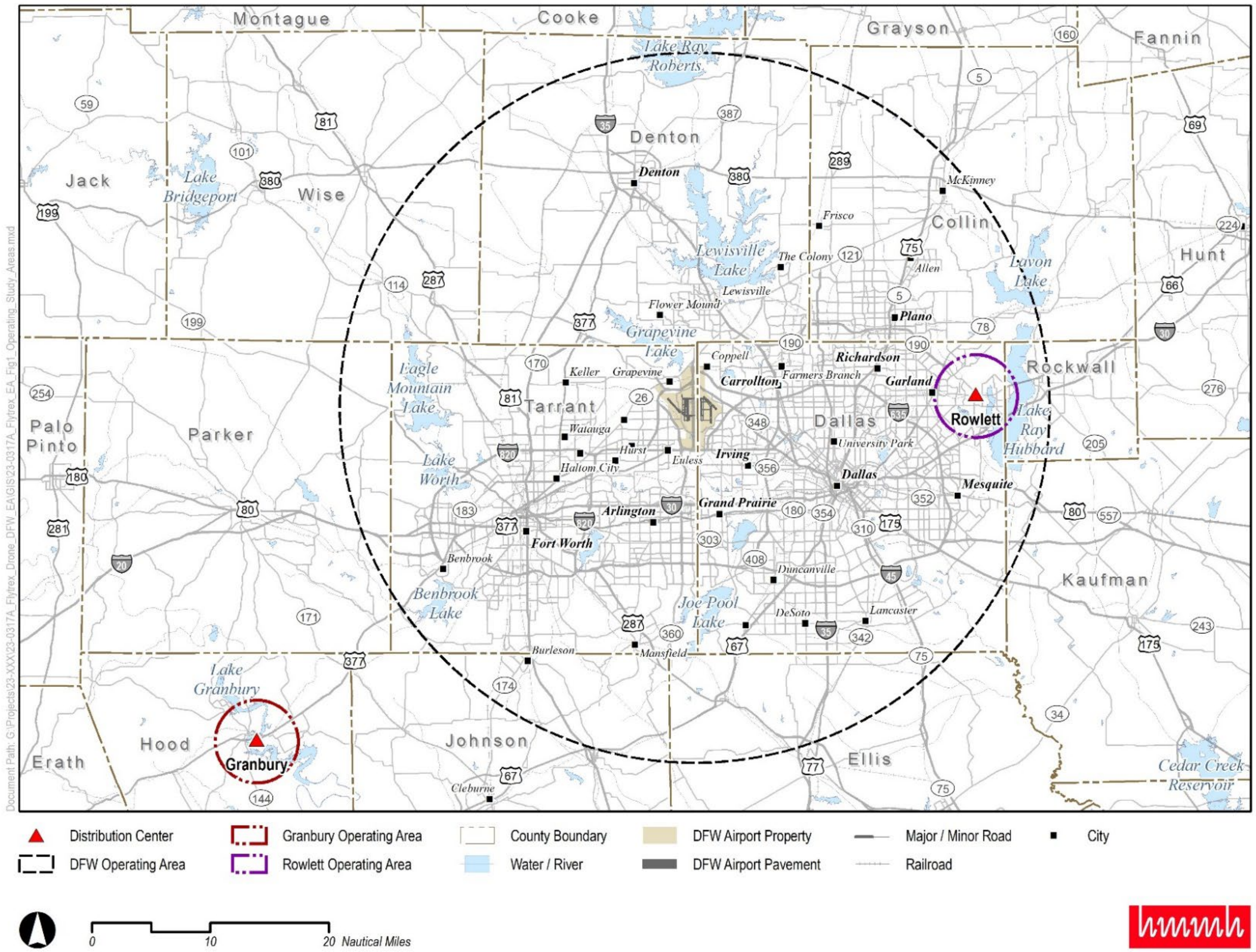
The FAA previously consulted the Coushatta Tribe of Louisiana on October 27, 2022, regarding a similar proposal for CAU to conduct drone package deliveries in Granbury and Rowlett, Texas (see **Attachment B**). The FAA is now soliciting the opinion of the tribes concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operations 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 Dr. Shelia Neumann via email at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter.

Sincerely,

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

Enclosures:
Attachment A – Proposed Area of Potential Effects
Attachment B – Previous Tribal Consultation

Attachment A – Proposed Area of Potential Effects



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U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

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

Dear Chairman Cernek:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Rowlett, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
The FAA has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Rowlett, TX (see attached operations area map). Upon reaching the delivery point, the UAS lowers to a delivery altitude of 65 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the UAS then ascends back to 230 feet AGL. The purpose is for package delivery, consisting of 52 projected daily delivery flight operations in the next 12 months, and 71 in 24 months that will be distributed within delivery zones located within the proposed operating areas. Flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. The dimension of the UAS area defines the Area of Potential Effect (APE). The UAS delivery area will have a radius of 2 nautical miles centered on a distribution center located at 3805 Industrial Street, Rowlett, TX 75088. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the Distribution Center.

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. Based

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If you have any comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

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

Dear Chairman Cerneck:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Granbury, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
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Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

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

Transmitted via e-mail and mail: ddotson@delawarenation-nsn.gov

RE: Invitation for Government-to-Government Tribal Consultation for Drone Package Delivery Operations in Texas

Dear President Dotson:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) to authorize commercial Unmanned Aircraft Systems (UAS) operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 (Part 135) in the state of Texas. The FAA is the lead federal agency for government-to-government consultation for the proposed project. Causey Aviation Unmanned, LLC, doing business as Causey (CAU), is the proponent of the project. We wish to solicit your views regarding potential effects on tribal interests in the area.

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Consultation Initiation

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Proposed Activity Description

The FAA is preparing an Environmental Assessment (EA) to assess the potential environmental impacts of the FAA's actions of authorizing commercial package delivery operations using drones in the Dallas-Fort Worth (DFW) area under Part 135. Since 2019, the FAA has been issuing air carrier certificates to

UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing new or amended Part 135 air carrier Operations Specifications as the operative approval. For your reference, the project description used for consultation under Section 106 is enclosed with this letter.

Confidentiality

We understand that you may have concerns about the confidentiality of information on areas or resources of traditional, religious, and/or cultural importance to your Tribe. We are available to discuss these concerns and develop procedures to ensure the confidentiality of such information is maintained.

FAA Contact Information

Your timely response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. In addition, we respectfully request your response in the event that the Delaware Nation would like to consult with the FAA in a government-to-government relationship about this proposal. Please contact Dr. Shelia Neumann via e-mail at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter in this government-to-government consultation.

Sincerely,

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

CC: Ms. Carissa Speck
Director of Historic Preservation

Enclosure:
Attachment A — Section 106 Consultation Package

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

Ms. Carissa Speck, Director of Historic Preservation
Delaware Nation
P.O. Box 825
Anadarko, Oklahoma 73005

Transmitted via e-mail and mail: cspeck@delawarenation-nsn.gov

RE: Initiation of Section 106 Consultation for Drone Package Delivery Operations in Texas

Dear Ms. Speck:

The Federal Aviation Administration (FAA) is currently evaluating the Causey Aviation Unmanned, LLC (CAU) proposal to conduct expanded drone package delivery operations in the Dallas-Fort Worth (DFW), Texas area. CAU must obtain approval from the FAA prior to expanding its operations by operating the Flytrex FTX-M600P and Sky II drones in DFW, Texas. 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 (NHPA) (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 this area. The FAA intends to complete consultation for Section 106 of the NHPA concurrently with the NEPA process.

Project Description

CAU proposes to continue transporting small consumer goods via drone delivery in the communities they already serve (i.e., Granbury and Rowlett, Texas) and expand its operations to include the DFW metropolitan area using the Flytrex FTX-M600P and Sky II drones (see **Attachment A**). The drones would take off from a distribution center and quickly rise to a cruising altitude of 230 feet above ground level (AGL). The Flytrex FTX-M600P drone weighs approximately 33.4 pounds and can transport a small package up to about 5.73 pounds. The Sky II drone weighs approximately 34.2 pounds and can transport a small package up to about 8.8 pounds. The drones have a service radius of approximately 8.5 miles round trip. Once at the delivery site, the drone hovers in place at an altitude of 75 to 82 feet AGL and lowers the package to the ground using a tethered mechanism. Once the package has been delivered, the drone flies back to the distribution center at roughly the same altitude.

CAU proposes to operate a maximum of 500 deliveries per day from each distribution center, with each flight taking a package to a customer delivery address before returning. There is variability in the number of flights per day based on customer demand and weather conditions. Initially, CAU expects to fly much less than the maximum of 500 deliveries per day from each distribution center and gradually increase deliveries to the proposed level as consumer demand increases. Flights would occur up to 365 days per year, with operations being conducted between the hours of 8 a.m. and 10 p.m.

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 Texas State Historic Preservation Officer (SHPO) showed the APE would be limited to areas near DFW, Texas. This expansion extends through the similarly, densely populated or congested regions of the DFW area. The enclosed map (see **Attachment A**) shows the proposed APE in detail.

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 is focusing its identification efforts on above-ground historic properties.

Consultation

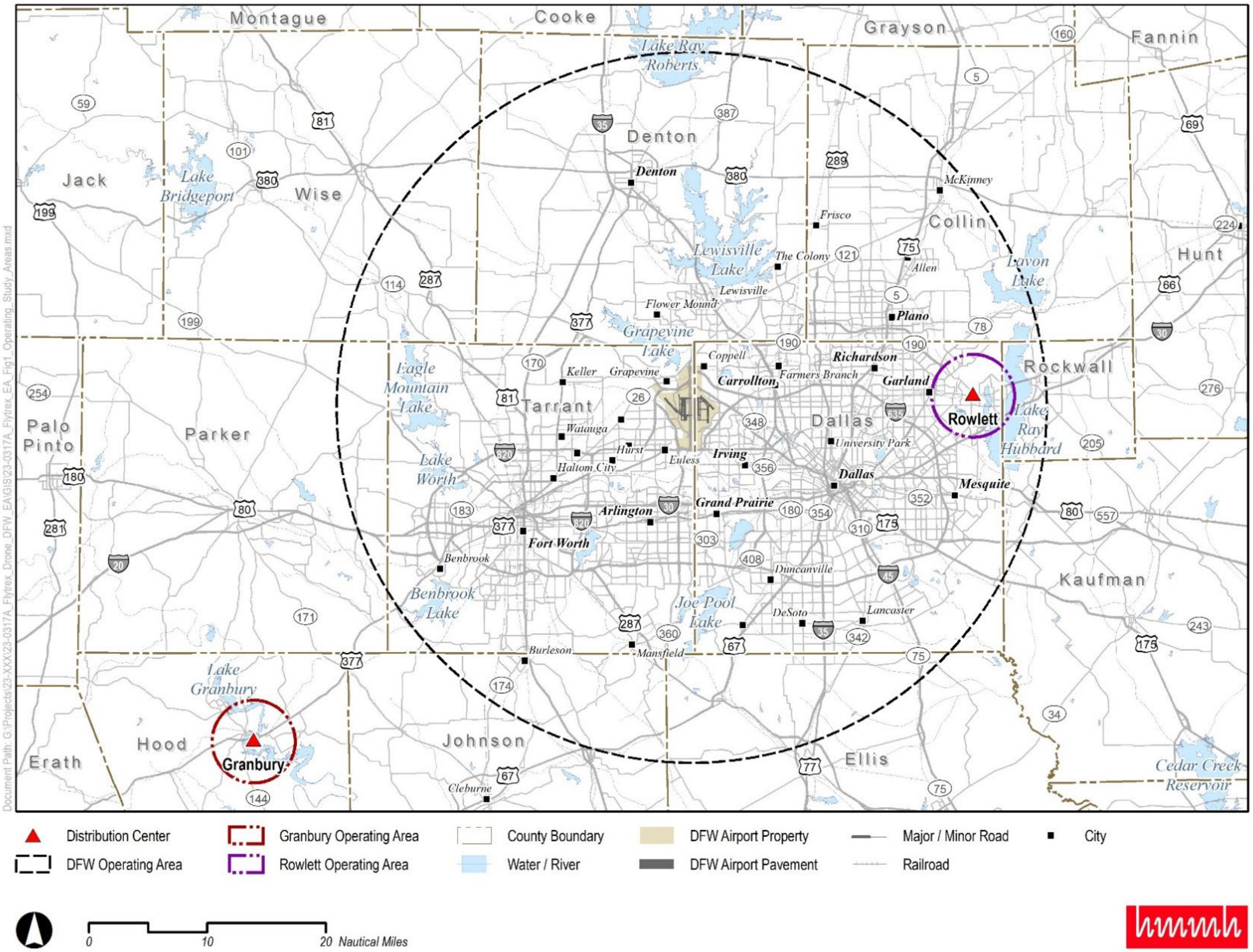
The FAA is now soliciting the opinion of the tribes concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operations area. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. If you have any questions or need additional information, please contact Dr. Shelia Neumann via email at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter.

Sincerely,

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

Enclosure:
Attachment A – Proposed Area of Potential Effects

Attachment A – Proposed Area of Potential Effects



U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

Principal Chief David Hill
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, Oklahoma 74447

Transmitted via e-mail and mail: dhill@muscogeenation.com

RE: Invitation for Government-to-Government Tribal Consultation for Drone Package Delivery Operations in Texas

Dear Principal Chief Hill:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) to authorize commercial Unmanned Aircraft Systems (UAS) operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 (Part 135) in the state of Texas. The FAA is the lead federal agency for government-to-government consultation for the proposed project. Causey Aviation Unmanned, LLC, doing business as Causey (CAU), is the proponent of the project. We wish to solicit your views regarding potential effects on tribal interests in the area.

The primary purpose of government-to-government consultation is to ensure that Federally-Recognized Tribes are given the opportunity to provide meaningful and timely input regarding proposed FAA actions that uniquely or significantly affect the Tribes. This policy is provided in Federal Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*; Presidential Memorandum, *Uniform Standards for Tribal Consultation*; DOT Order 5301.1A, *Department of Transportation Tribal Consultation Policy and Procedures*; and FAA Order 1210.20, *American Indian and Alaska Native Tribal Consultation Policy and Procedures*.

Consultation Initiation

With this letter, the FAA seeks input concerning any Tribal lands or sites of religious or cultural significance that may be affected by the proposed operation. Early identification of Tribal concerns, or known properties of traditional, religious, and/or cultural importance, will allow the FAA to consider ways to avoid or minimize potential impacts to Tribal resources. We are available to discuss the details of the proposed project with you.

Proposed Activity Description

The FAA is preparing an Environmental Assessment (EA) to assess the potential environmental impacts of the FAA's actions of authorizing commercial package delivery operations using drones in the Dallas-Fort Worth (DFW) area under Part 135. Since 2019, the FAA has been issuing air carrier certificates to

UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing new or amended Part 135 air carrier Operations Specifications as the operative approval. For your reference, the project description used for consultation under Section 106 is enclosed with this letter.

Confidentiality

We understand that you may have concerns about the confidentiality of information on areas or resources of traditional, religious, and/or cultural importance to your Tribe. We are available to discuss these concerns and develop procedures to ensure the confidentiality of such information is maintained.

FAA Contact Information

Your timely response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. In addition, we respectfully request your response in the event that the Muscogee (Creek) Nation would like to consult with the FAA in a government-to-government relationship about this proposal. Please contact Dr. Shelia Neumann via e-mail at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter in this government-to-government consultation.

Sincerely,

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

CC: Mr. Turner Hunt
Tribal Historic Preservation Officer

Enclosure:
Attachment A – Section 106 Consultation Package

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

Mr. Turner Hunt, Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, Oklahoma 74447

Transmitted via e-mail and mail: thunt@muscogeenation.com

RE: Initiation of Section 106 Consultation for Drone Package Delivery Operations in Texas

Dear Mr. Hunt:

The Federal Aviation Administration (FAA) is currently evaluating the Causey Aviation Unmanned, LLC (CAU) proposal to conduct expanded drone package delivery operations in the Dallas-Fort Worth (DFW), Texas area. CAU must obtain approval from the FAA prior to expanding its operations by operating the Flytrex FTX-M600P and Sky II drones in DFW, Texas. 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 (NHPA) (36 CFR § 800.16(y)). The purpose of this letter is to initiate Section 106 consultation with the Muscogee (Creek) Nation and to solicit your views regarding potential effects on Tribal interests in this area. The FAA intends to complete consultation for Section 106 of the NHPA concurrently with the NEPA process.

Project Description

CAU proposes to continue transporting small consumer goods via drone delivery in the communities they already serve (i.e., Granbury and Rowlett, Texas) and expand its operations to include the DFW metropolitan area using the Flytrex FTX-M600P and Sky II drones (see **Attachment A**). The drones would take off from a distribution center and quickly rise to a cruising altitude of 230 feet above ground level (AGL). The Flytrex FTX-M600P drone weighs approximately 33.4 pounds and can transport a small package up to about 5.73 pounds. The Sky II drone weighs approximately 34.2 pounds and can transport a small package up to about 8.8 pounds. The drones have a service radius of approximately 8.5 miles round trip. Once at the delivery site, the drone hovers in place at an altitude of 75 to 82 feet AGL and lowers the package to the ground using a tethered mechanism. Once the package has been delivered, the drone flies back to the distribution center at roughly the same altitude.

CAU proposes to operate a maximum of 500 deliveries per day from each distribution center, with each flight taking a package to a customer delivery address before returning. There is variability in the number of flights per day based on customer demand and weather conditions. Initially, CAU expects to fly much less than the maximum of 500 deliveries per day from each distribution center and gradually increase deliveries to the proposed level as consumer demand increases. Flights would occur up to 365 days per year, with operations being conducted between the hours of 8 a.m. and 10 p.m.

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 Texas State Historic Preservation Officer (SHPO) showed the APE would be limited to areas near DFW, Texas. This expansion extends through the similarly, densely populated or congested regions of the DFW area. The enclosed map (see **Attachment A**) shows the proposed APE in detail.

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 is focusing its identification efforts on above-ground historic properties.

Consultation

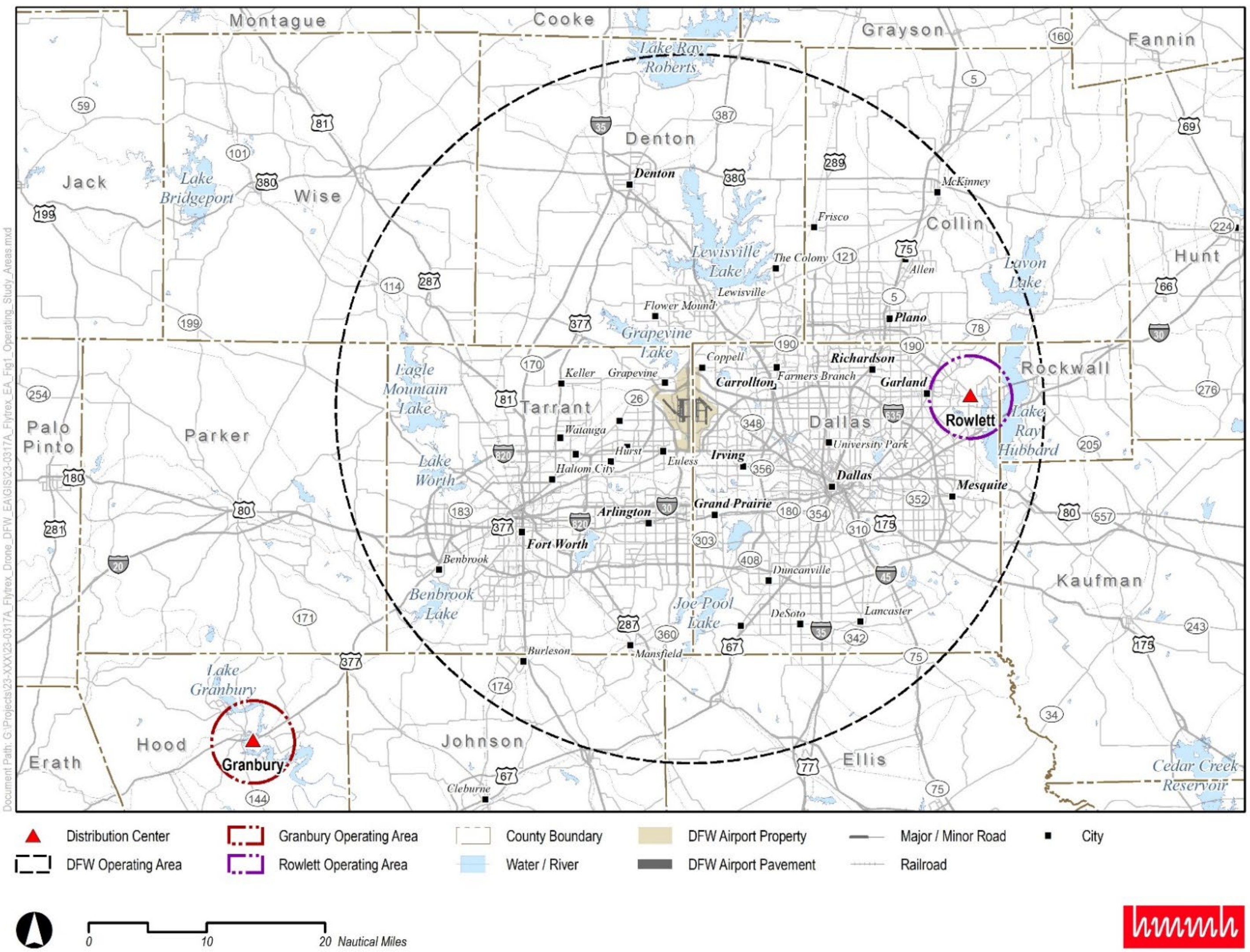
The FAA is now soliciting the opinion of the tribes concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operations area. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. If you have any questions or need additional information, please contact Dr. Shelia Neumann via email at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter.

Sincerely,

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

Enclosure:
Attachment A – Proposed Area of Potential Effects

Attachment A – Proposed Area of Potential Effects



U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

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

Transmitted via e-mail and mail: rmartin@tonkawatribe.com

RE: Invitation for Government-to-Government Tribal Consultation for Drone Package Delivery Operations in Texas

Dear President Martin:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) to authorize commercial Unmanned Aircraft Systems (UAS) operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 (Part 135) in the state of Texas. The FAA is the lead federal agency for government-to-government consultation for the proposed project. Causey Aviation Unmanned, LLC, doing business as Causey (CAU), is the proponent of the project. We wish to solicit your views regarding potential effects on tribal interests in the area.

The primary purpose of government-to-government consultation is to ensure that Federally-Recognized Tribes are given the opportunity to provide meaningful and timely input regarding proposed FAA actions that uniquely or significantly affect the Tribes. This policy is provided in Federal Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*; Presidential Memorandum, *Uniform Standards for Tribal Consultation*; DOT Order 5301.1A, *Department of Transportation Tribal Consultation Policy and Procedures*; and FAA Order 1210.20, *American Indian and Alaska Native Tribal Consultation Policy and Procedures*.

Consultation Initiation

With this letter, the FAA seeks input concerning any Tribal lands or sites of religious or cultural significance that may be affected by the proposed operation. Early identification of Tribal concerns, or known properties of traditional, religious, and/or cultural importance, will allow the FAA to consider ways to avoid or minimize potential impacts to Tribal resources. We are available to discuss the details of the proposed project with you. The FAA previously consulted with the Tonkawa Tribe of Indians of Oklahoma on a similar proposal for CAU to conduct drone package deliveries in Granbury and Rowlett, Texas on October 27, 2022. No sites were identified by your Tribe during the previous consultation.

Proposed Activity Description

The FAA is preparing an Environmental Assessment (EA) to assess the potential environmental impacts of the FAA's actions of authorizing commercial package delivery operations using drones in the Dallas-Fort Worth (DFW) area under Part 135. Since 2019, the FAA has been issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing new or amended Part 135 air carrier Operations Specifications as the operative approval. For your reference, the project description used for consultation under Section 106 is enclosed with this letter.

Confidentiality

We understand that you may have concerns about the confidentiality of information on areas or resources of traditional, religious, and/or cultural importance to your Tribe. We are available to discuss these concerns and develop procedures to ensure the confidentiality of such information is maintained.

FAA Contact Information

Your timely response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. In addition, we respectfully request your response in the event that the Tonkawa Tribe of Indians of Oklahoma would like to consult with the FAA in a government-to-government relationship about this proposal. Please contact Dr. Shelia Neumann via e-mail at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter in this government-to-government consultation.

Sincerely,

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

Enclosures:
Attachment A – Section 106 Consultation Package

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

RE: Initiation of Section 106 Consultation for Drone Package Delivery Operations in Texas

The Federal Aviation Administration (FAA) is currently evaluating the Causey Aviation Unmanned, LLC (CAU) proposal to conduct expanded drone package delivery operations in the Dallas-Fort Worth (DFW), Texas area. CAU must obtain approval from the FAA prior to expanding its operations by operating the Flytrex FTX-M600P and Sky II drones in DFW, Texas. 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 (NHPA) (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 this area. The FAA intends to complete consultation for Section 106 of the NHPA concurrently with the NEPA process.

Project Description

CAU proposes to continue transporting small consumer goods via drone delivery in the communities they already serve (i.e., Granbury and Rowlett, Texas) and expand its operations to include the DFW metropolitan area using the Flytrex FTX-M600P and Sky II drones (see **Attachment A**). The drones would take off from a distribution center and quickly rise to a cruising altitude of 230 feet above ground level (AGL). The Flytrex FTX-M600P drone weighs approximately 33.4 pounds and can transport a small package up to about 5.73 pounds. The Sky II drone weighs approximately 34.2 pounds and can transport a small package up to about 8.8 pounds. The drones have a service radius of approximately 8.5 miles round trip. Once at the delivery site, the drone hovers in place at an altitude of 75 to 82 feet AGL and lowers the package to the ground using a tethered mechanism. Once the package has been delivered, the drone flies back to the distribution center at roughly the same altitude.

CAU proposes to operate a maximum of 500 deliveries per day from each distribution center, with each flight taking a package to a customer delivery address before returning. There is variability in the number of flights per day based on customer demand and weather conditions. Initially, CAU expects to fly much less than the maximum of 500 deliveries per day from each distribution center and gradually increase deliveries to the proposed level as consumer demand increases. Flights would occur up to 365 days per year, with operations being conducted between the hours of 8 a.m. and 10 p.m.

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 Texas State Historic Preservation Officer (SHPO) showed the APE would be limited to areas near DFW, Texas. This expansion extends through the similarly, densely populated or congested regions of the DFW area. The enclosed map (see **Attachment A**) shows the proposed APE in detail.

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 is focusing its identification efforts on above-ground historic properties.

Consultation

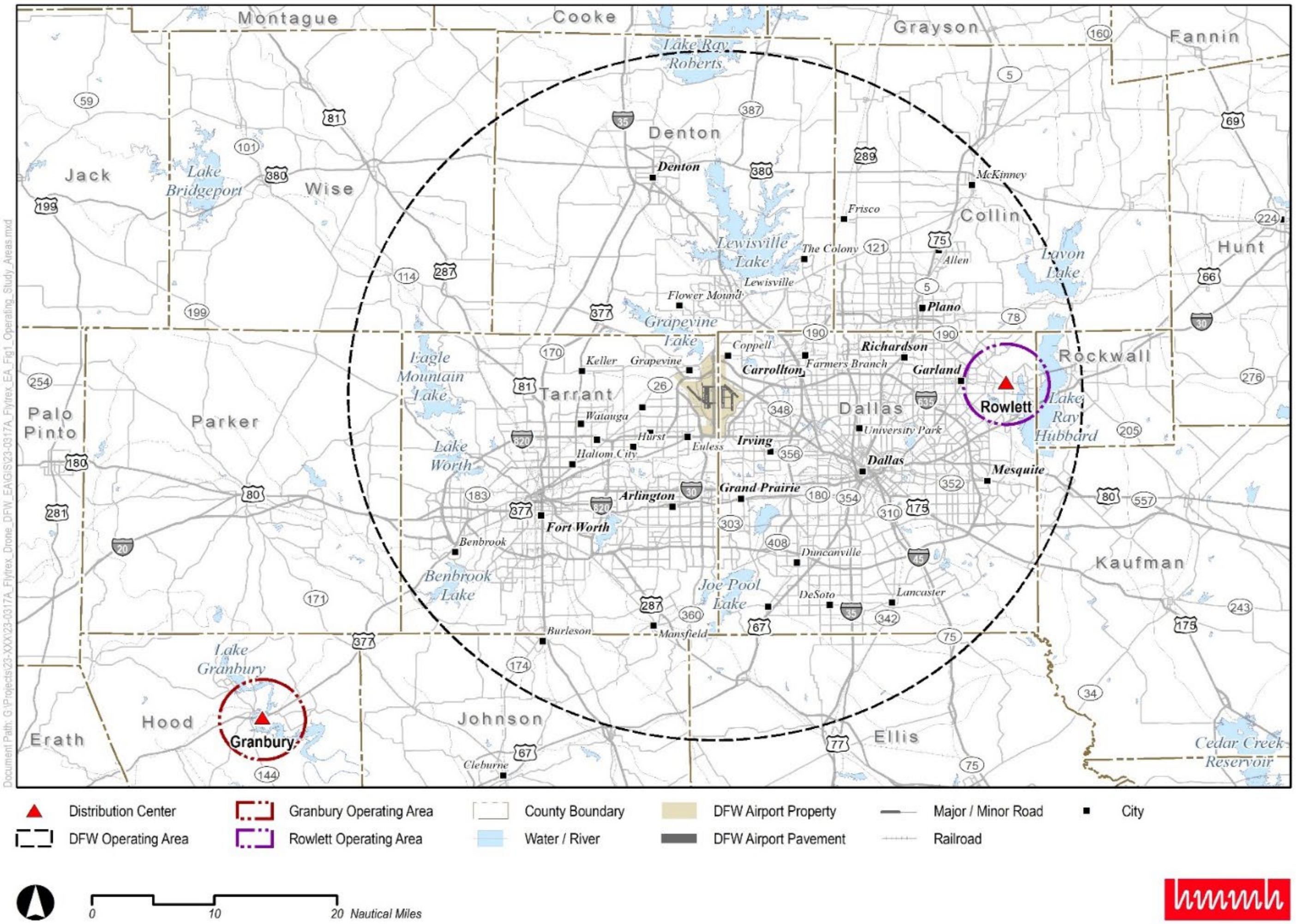
The FAA previously consulted the Tonkawa Tribe of Indians of Oklahoma on October 27, 2022, regarding a similar proposal for CAU to conduct drone package deliveries in Granbury and Rowlett, Texas (see **Attachment B**). The FAA is now soliciting the opinion of the tribes concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operations 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 Dr. Shelia Neumann via email at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter.

Sincerely,

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

Enclosures:
Attachment A – Proposed Area of Potential Effects
Attachment B – Previous Tribal Consultation

Attachment A – Proposed Area of Potential Effects



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

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

Dear President Martin:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Rowlett, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
The FAA has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Rowlett, TX (see attached operations area map). Upon reaching the delivery point, the UAS lowers to a delivery altitude of 65 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the UAS then ascends back to 230 feet AGL. The purpose is for package delivery, consisting of 52 projected daily delivery flight operations in the next 12 months, and 71 in 24 months that will be distributed within delivery zones located within the proposed operating areas. Flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. The dimension of the UAS area defines the Area of Potential Effect (APE). The UAS delivery area will have a radius of 2 nautical miles centered on a distribution center located at 3805 Industrial Street, Rowlett, TX 75088. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the Distribution Center.

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. Based

on a review of the route modifications as well as our increasing knowledge with respect to the level of environmental impacts from drone operations, FAA has determined that this new approval has no potential to effect historic properties. FAA expects that drone operations will continue to grow and that we all will continue to learn more about this emerging technology. FAA would be amenable to trying to answer any questions you may have generally on this new technology. 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 comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

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

Dear President Martin:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Granbury, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
The FAA has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Granbury, TX (see attached operations area map). Upon reaching the delivery point, the UAS lowers to a delivery altitude of 65 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the UAS then ascends back to 230 feet AGL. The purpose is for package delivery, consisting of 57 projected daily delivery flight operations in the next 12 months, and 77 in 24 months that will be distributed within delivery zones located within the proposed operating areas. Flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. The dimension of the UAS area defines the Area of Potential Effect (APE). The UAS delivery area will have a radius of 2 nautical miles centered on a distribution center located at 1201 Water's Edge Drive, Granbury, TX 76048. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the Distribution Center.

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. Based

on a review of the route modifications as well as our increasing knowledge with respect to the level of environmental impacts from drone operations, FAA has determined that this new approval has no potential to effect historic properties. FAA expects that drone operations will continue to grow and that we all will continue to learn more about this emerging technology. FAA would be amenable to trying to answer any questions you may have generally on this new technology. 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 comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

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

Transmitted via e-mail and mail: terri.parton@wichitatribe.com

RE: Invitation for Government-to-Government Tribal Consultation for Drone Package Delivery Operations in Texas

Dear President Parton:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) to authorize commercial Unmanned Aircraft Systems (UAS) operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 (Part 135) in the state of Texas. The FAA is the lead federal agency for government-to-government consultation for the proposed project. Causey Aviation Unmanned, LLC, doing business as Causey (CAU), is the proponent of the project. We wish to solicit your views regarding potential effects on tribal interests in the area.

The primary purpose of government-to-government consultation is to ensure that Federally-Recognized Tribes are given the opportunity to provide meaningful and timely input regarding proposed FAA actions that uniquely or significantly affect the Tribes. This policy is provided in Federal Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*; Presidential Memorandum, *Uniform Standards for Tribal Consultation*; DOT Order 5301.1A, *Department of Transportation Tribal Consultation Policy and Procedures*; and FAA Order 1210.20, *American Indian and Alaska Native Tribal Consultation Policy and Procedures*.

Consultation Initiation

With this letter, the FAA seeks input concerning any Tribal lands or sites of religious or cultural significance that may be affected by the proposed operation. Early identification of Tribal concerns, or known properties of traditional, religious, and/or cultural importance, will allow the FAA to consider ways to avoid or minimize potential impacts to Tribal resources. We are available to discuss the details of the proposed project with you. In 2022, the FAA consulted with your Tribe for input on a similar proposal for CAU to conduct drone package deliveries in Rowlett, Texas. No sites were identified by your Tribe during the previous consultation.

Proposed Activity Description

The FAA is preparing an Environmental Assessment (EA) to assess the potential environmental impacts of the FAA's actions of authorizing commercial package delivery operations using drones in the Dallas-Fort Worth (DFW) area under Part 135. Since 2019, the FAA has been issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing new or amended Part 135 air carrier Operations Specifications as the operative approval. For your reference, the project description used for consultation under Section 106 is enclosed with this letter.

Confidentiality

We understand that you may have concerns about the confidentiality of information on areas or resources of traditional, religious, and/or cultural importance to your Tribe. We are available to discuss these concerns and develop procedures to ensure the confidentiality of such information is maintained.

FAA Contact Information

Your timely response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. In addition, we respectfully request your response in the event that the Wichita and Affiliated Tribes of Oklahoma would like to consult with the FAA in a government-to-government relationship about this proposal. Please contact Dr. Shelia Neumann via e-mail at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter in this government-to-government consultation.

Sincerely,

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

CC: Ms. Robin Williams
Tribal Historic Preservation Officer

Enclosure:
Attachment A — Section 106 Consultation

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

April 22, 2024

Ms. Robin Williams, Tribal Historic Preservation Officer
Wichita and Affiliated Tribes of Oklahoma
P.O. Box 729
Anadarko, Oklahoma 73005

Transmitted via e-mail and mail: robin.williams@wichitatribe.com

RE: Initiation of Section 106 Consultation for Drone Package Delivery Operations in Texas

Dear Ms. Williams:

The Federal Aviation Administration (FAA) is currently evaluating the Causey Aviation Unmanned, LLC (CAU) proposal to conduct expanded drone package delivery operations in the Dallas-Fort Worth (DFW), Texas area. CAU must obtain approval from the FAA prior to expanding its operations by operating the Flytrex FTX-M600P and Sky II drones in DFW, Texas. 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 (NHPA) (36 CFR § 800.16(y)). The purpose of this letter is to initiate Section 106 consultation with the Wichita and Affiliated Tribes and to solicit your views regarding potential effects on Tribal interests in this area. The FAA intends to complete consultation for Section 106 of the NHPA concurrently with the NEPA process.

Project Description

CAU proposes to continue transporting small consumer goods via drone delivery in the communities they already serve (i.e., Granbury and Rowlett, Texas) and expand its operations to include the DFW metropolitan area using the Flytrex FTX-M600P and Sky II drones (see **Attachment A**). The drones would take off from a distribution center and quickly rise to a cruising altitude of 230 feet above ground level (AGL). The Flytrex FTX-M600P drone weighs approximately 33.4 pounds and can transport a small package up to about 5.73 pounds. The Sky II drone weighs approximately 34.2 pounds and can transport a small package up to about 8.8 pounds. The drones have a service radius of approximately 8.5 miles round trip. Once at the delivery site, the drone hovers in place at an altitude of 75 to 82 feet AGL and lowers the package to the ground using a tethered mechanism. Once the package has been delivered, the drone flies back to the distribution center at roughly the same altitude.

CAU proposes to operate a maximum of 500 deliveries per day from each distribution center, with each flight taking a package to a customer delivery address before returning. There is variability in the number of flights per day based on customer demand and weather conditions. Initially, CAU expects to fly much less than the maximum of 500 deliveries per day from each distribution center and gradually increase deliveries to the proposed level as consumer demand increases. Flights would occur up to 365 days per year, with operations being conducted between the hours of 8 a.m. and 10 p.m.

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 Texas State Historic Preservation Officer (SHPO) showed the APE would be limited to areas near DFW, Texas. This expansion extends through the similarly, densely populated or congested regions of the DFW area. The enclosed map (see **Attachment A**) shows the proposed APE in detail.

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 is focusing its identification efforts on above-ground historic properties.

Consultation

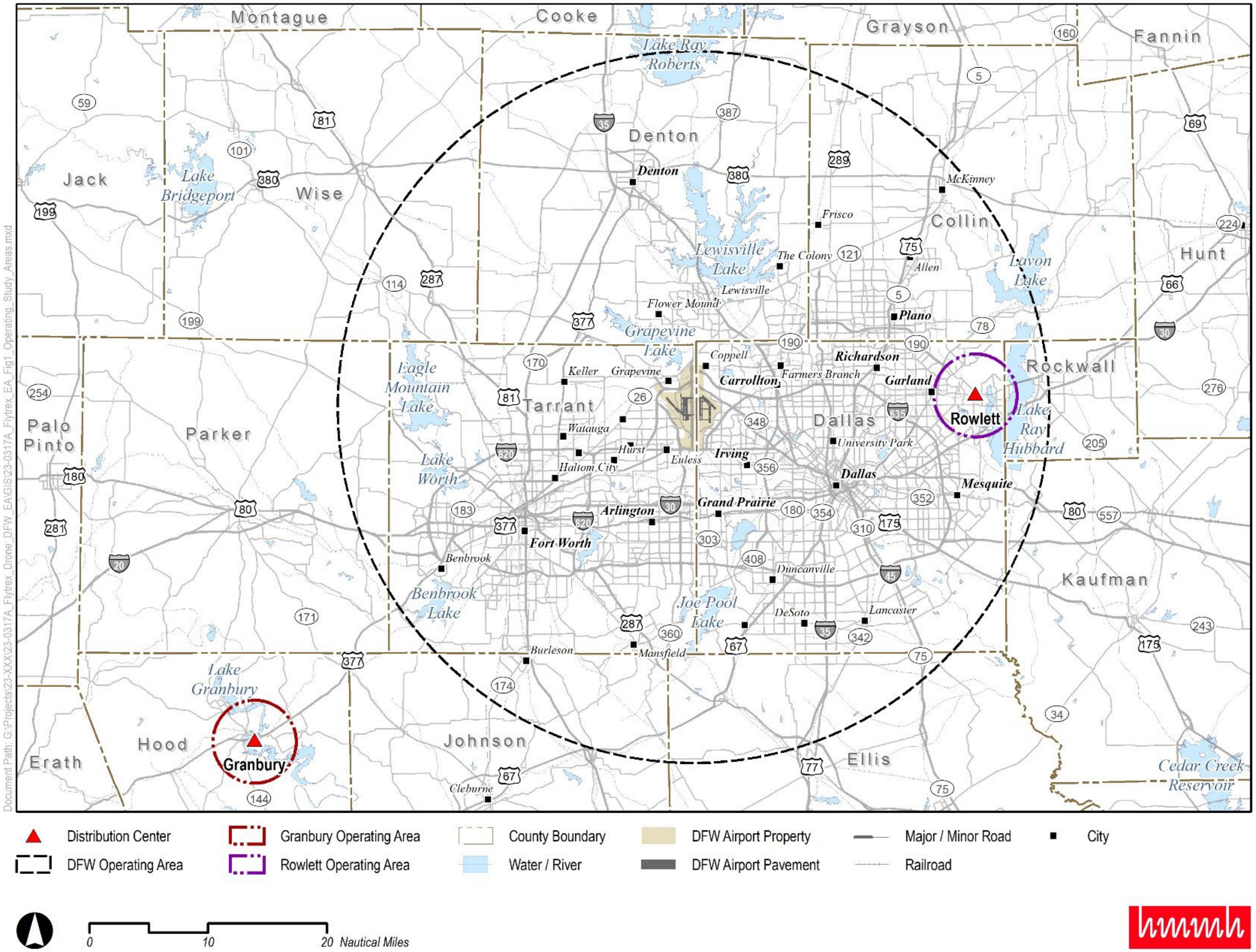
The FAA previously consulted Wichita and Affiliated Tribes of Oklahoma on a similar proposal for CAU to conduct drone package deliveries in Rowlett, Texas on October 27, 2022 (see **Attachment B**). The FAA is now soliciting the opinion of the tribes concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operations 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 Dr. Shelia Neumann via email at 9-faa-drone-environmental@faa.gov within 30 days of receipt of this letter.

Sincerely,

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

Enclosure:
Attachment A – Area of Potential Effects
Attachment B – Previous Tribal Consultation

Attachment A – Area of Potential Effects



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

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

Dear President Parton:

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption, or Operations Specifications for an Unmanned Aircraft System (UAS) operation area in Rowlett, TX. We wish to solicit your views regarding potential effects on tribal interests in the area.

Proposed Activity Description
The FAA has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

The UAS operation will be flown by an unmanned aircraft weighing 33 lbs., including a 6.6 lb. payload, at approximately 230 feet Above Ground Level (AGL) in Rowlett, TX (see attached operations area map). Upon reaching the delivery point, the UAS lowers to a delivery altitude of 65 feet AGL where it uses a wire/cable to lower the package to the ground. After the package has safely reached the ground, the UAS then ascends back to 230 feet AGL. The purpose is for package delivery, consisting of 52 projected daily delivery flight operations in the next 12 months, and 71 in 24 months that will be distributed within delivery zones located within the proposed operating areas. Flights will occur primarily Mon-Sun, with operating hours from 8 am until 10 pm. The dimension of the UAS area defines the Area of Potential Effect (APE). The UAS delivery area will have a radius of 2 nautical miles centered on a distribution center located at 3805 Industrial Street, Rowlett, TX 75088. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the Distribution Center.

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. Based

on a review of the route modifications as well as our increasing knowledge with respect to the level of environmental impacts from drone operations, FAA has determined that this new approval has no potential to effect historic properties. FAA expects that drone operations will continue to grow and that we all will continue to learn more about this emerging technology. FAA would be amenable to trying to answer any questions you may have generally on this new technology. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation.

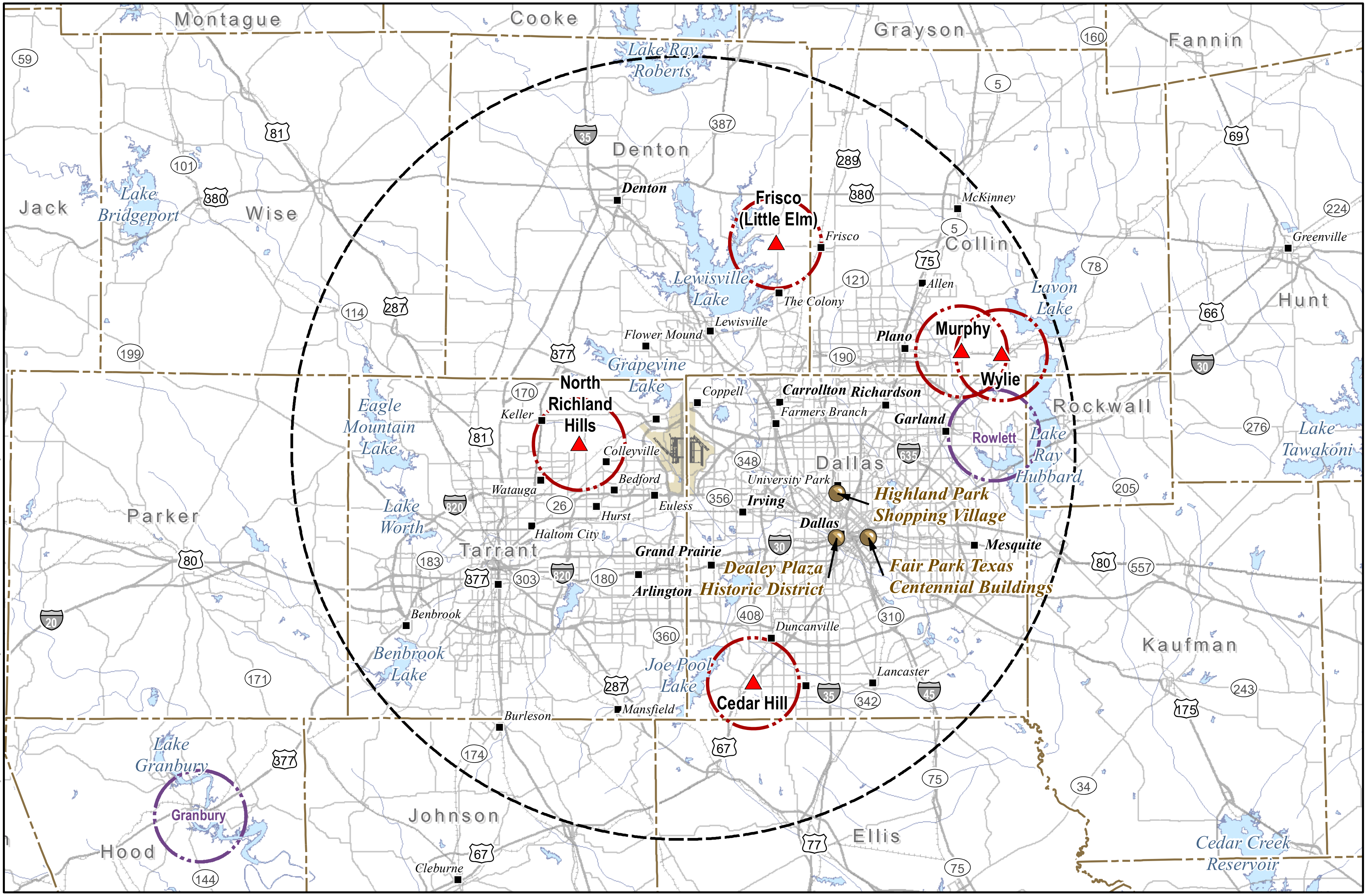
If you have any comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Enclosure

APPENDIX F
Section 4(f) Properties Managed by National Park Service



Distribution Center (DC) Location	Distribution Center (DC) Service Area	DFW Airport Property	County Boundary
DFW Operating Area	Granbury and Rowlett Operating Areas	DFW Airport Pavement	Water / River
Major / Minor Road	National Historic Landmark	Railroad	City

0 10 20 Nautical Miles

Document Path: G:\Projects\23-XXX\23-0317A_Flytrex\23-0317A_Flytrex_Drone_DFW_EA\GIS\23-0317A_Flytrex_EA_FigX_NPS_Resources.mxd

APPENDIX G
FAA Cumulative Effects Memorandum

DFW Part 135 Operations - Cumulative Impacts

The purpose of this memo is to provide a summary of information available to the FAA as related to proposed Part 135 drone package delivery operations[1] for various operators within the DFW metro area. This information should be used by the FAA and individual operators/applicants to inform their cumulative impacts analysis conducted as part of the development of their NEPA documents. This information serves as the basis for the past, present, and reasonably foreseeable future actions. This memo also includes a figure that displays the study area considered for cumulative impacts in each NEPA document for the DFW metro area and the timeframe considered for reasonably foreseeable future actions.

Definition of Effects/Impacts

The Council on Environmental Quality defines effects or impacts as “changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and include the following: (1) Direct effects, which are caused by the action and occur at the same time and place. (2) Indirect effects, which are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. (3) Cumulative effects, which are 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. (4) Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effects will be beneficial.”[2]

FAA Order 1050.1F states that an EA or EIS must address cumulative impacts by evaluating the “incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, whether Federal or non-Federal. If the proposed action would cause significant incremental additions to cumulative impacts, an EIS is required.”[3] The FAA defines

[1] It is anticipated that Part 107 operations currently underway will transition to Part 135 operations in the future. Therefore, the Part 135 operations described in this document include existing Part 107 operations

[2] See 40 CFR § 1508.1

[3] See Section 4-2.d(3) of FAA Order 1050.1F

past, present, and reasonably foreseeable future actions in Section 15.1 of the FAA *1050.1F Desk Reference*.[4, 5]

"***Past actions*** are actions that occurred in the past and may warrant consideration in determining the environmental impacts of an action. The FAA has discretion to determine whether, and to what extent, information about the specific nature, design, or present impacts of a past action are useful for the analysis of the impacts of the proposed action and alternative(s). Present impacts of past actions that are relevant and useful are those that may have a significant cause-and-effect relationship with the direct and indirect impacts of the proposed action and alternative(s).

Present actions are any other actions that are occurring in the same general time frame as the proposal…Such actions may have traffic, noise, or other environmental concerns that should be considered in conjunction with those that would be generated by the proposed action and alternative(s) under consideration.

Reasonably foreseeable future actions are actions that may affect projected impacts of a proposal and are not remote or speculative…An action may be reasonably foreseeable even in the absence of a specific proposal."

The CEQ defines "reasonably foreseeable" actions as "sufficiently likely to occur such that a person of ordinary prudence would take it into account in reaching a decision."[6]

Past, Present, and Reasonably Foreseeable Future Actions

Past actions include Part 107 small UAS operations which limit activities to occur within visual line of sight (VLOS). It should be noted that Part 107 operations would include those operations conducted under a waiver to the Part 107 regulations, including beyond visual line of sight (BVLOS) operations.

Present actions include approved Part 135 operations, which include 27 approved hubs operating at up to 400 daily operations per hub.

Reasonably foreseeable actions include proposed actions for multiple operators that have applied for approvals to conduct drone package deliveries in the DFW metro area and expansion of one operator. The timeframe to be considered in evaluating cumulative effects should extend through 2027 since the operators have provided projections for the next 30 to 36 months. As proposed by other operators, reasonably foreseeable actions include up to 185 additional hubs operating between 400 and 500 operations per day per hub.

---

[4] See Section 15.1 of FAA 1050.1F Desk Reference (v2), February 2020

[5] See also CEQ Guidance on *Considering Cumulative Effects Under the National Environmental Policy Act*, January 1997

[6] See 40 CFR § 1508.1(ii)

Together, the past, present, and reasonably foreseeable actions total a maximum of 212 hubs in the study area, which would generate up to an annual average daily (AAD) total of 88,840 package deliveries within the study area. The geographic footprint of the study area to be evaluated for cumulative impacts is shown in **Figure 1**. Out of the 212 proposed hub locations, 50 specific sites are either currently in operation or have been identified as prospective hub locations by the various Part 135 applicants.

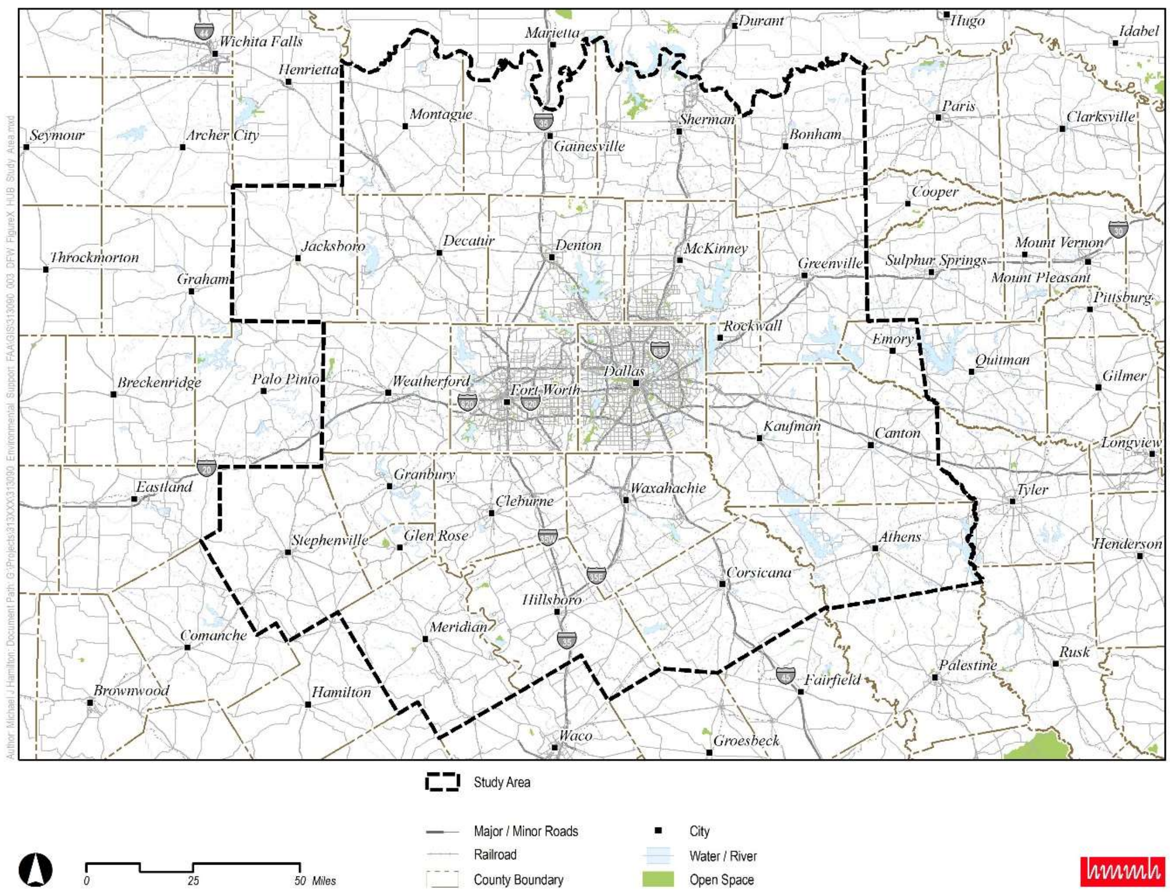


Figure 1. Geographic Study Area for Cumulative Effects in DFW Metro Area

FAA analysis of prospective hub siting areas concluded that siting 100% of the existing and proposed hub locations is not feasible without overlap in the land area accessible from the hub locations (i.e., the delivery ranges of the proposed UA). It should be noted that overlap does not necessarily mean that there will be adverse impacts to environmental resource categories. The degree to which all of the different operators would operate within areas of shared airspace is entirely dependent on the operators, their specific business use cases, and their ability to deconflict with one another in the overlapping delivery areas with shared customers.

Information shared by various operators indicates that some would try to minimize overlap in their own hubs' delivery ranges while others plan to allow for inter-hub flights and therefore may plan for overlap within their own operations. In cases where a single operator's hubs would have overlapping delivery ranges, most operators have stated they do not expect such circumstances to have additive effects that would result in increased package deliveries to those areas. The primary reason given for this is that the services provided by different hubs would generally be redundant, or at least similar, and, as such, customer demand for those services would be unaffected by the number of hubs within delivery range of the same area. In cases where different operators' hubs would have overlapping delivery ranges, some additive effect could occur within those areas depending on customer demand for the various types of package delivery services being provided by each operator. From a business perspective, it is anticipated that operators would make every effort to minimize overlapping operations with other operators to the extent practicable.

Based on input provided by the various operators, the FAA does not anticipate AAD deliveries within any contiguous area of airspace accessible from multiple hubs to exceed the sum of each individual operator's proposed AAD deliveries from a single hub. The sum of the proposed single hub AAD deliveries for all current DFW area Part 135 operators and applicants is 1,728.

Cumulative Noise Exposure

For instances where the proposed drone package delivery 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 drone package delivery operations occurring in the vicinity of an airport and where one drone operator's flight activity areas may overlap with those of other drone 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 that an increase in noise would be considered significant if the following conditions are met:

> *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 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." It should also be noted that these criteria apply only to cases where the noise level changes occur over land uses that are considered noise sensitive. **Figure 2** 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.

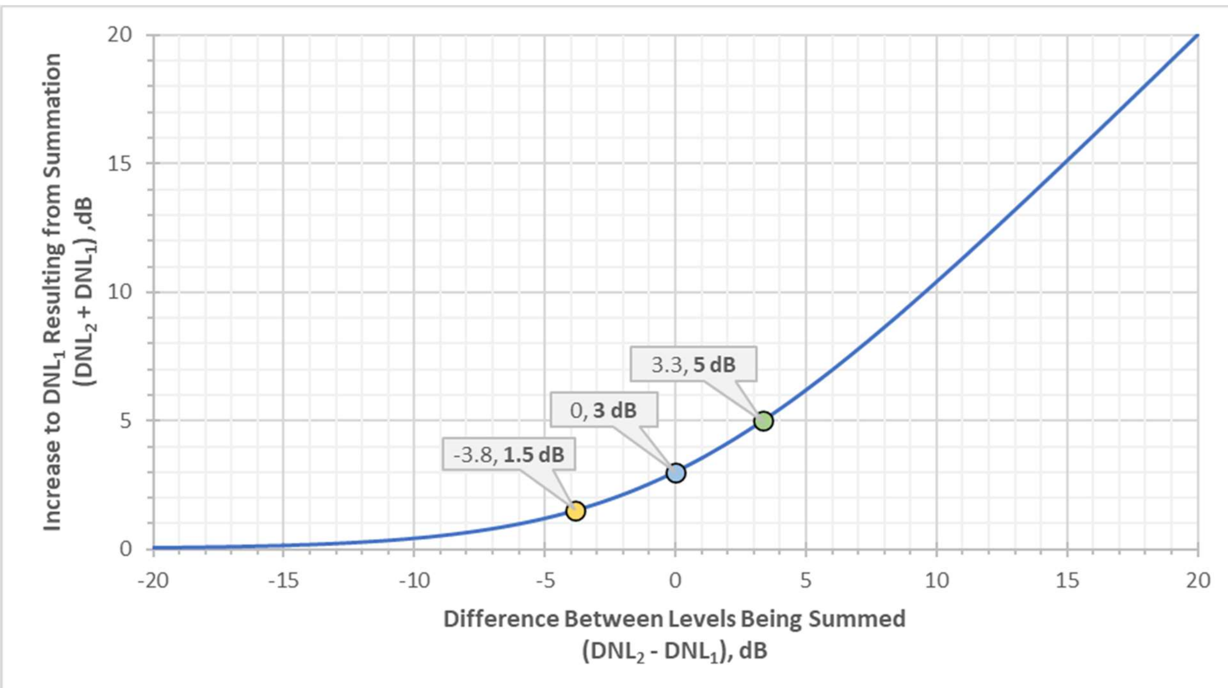


Figure 2. dB Increase Resulting from DNL Summation

Potential increases to DNL resulting from cumulative aviation noise effects can be evaluated with **Figure 2** 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.

DFW Metro Area Cumulative Noise Evaluation

The FAA has evaluated whether significant cumulative noise impacts would occur from the proposed package delivery operations. This evaluation is based on the minimum cumulative drone package delivery noise level that could result in a +1.5 dB change when combined with existing airport noise to generate new areas of 65 dB DNL (i.e., an increase from 63.5 dB DNL to 65 dB DNL). As indicated in Figure 3, when a noise level that is equal to or greater than -3.8 dB from the existing noise level is combined with the existing noise, the resultant increase is 1.5 dB or more. This gives a drone noise threshold of 59.7 dB DNL for significant cumulative noise impact when considering drone package delivery operations in proximity to airports where the airport associated DNL is 63.5 dB. If total drone noise is less the 59.7 dB DNL, then cumulative noise increases would be less than +1.5 dB DNL and no significant noise impacts would occur.

Because the exact location of the 63.5 dB DNL contour from an airport will generally not be identifiable without conducting an airport noise study, the FAA has undertaken a review of available airport noise data to identify generalized characteristics regarding airport DNL extents. Through this review, the FAA concluded that airport noise levels outside of the surface areas of airport-controlled airspace are less than 60 dB DNL. Based on this, the threshold of 59.7 dB DNL would apply only when drone package delivery activity occurs within the surface areas of airport-controlled airspace, as the airport noise level of 63.5 dB DNL would only be encountered when within that airspace. Outside of the surface areas of airport-controlled airspace, airport noise would be less than 60 dB DNL, and drone noise levels could be somewhat higher before any potential for significant impacts could exist.

En route flight, in which the drone is transiting between the hub and delivery location, is the phase of package delivery operations where there is the greatest potential for cumulative noise exposure from multiple drone operators. It is expected that for air traffic deconfliction, hubs would generally be sited at least 1,000 ft from another, at which point hub noise would dissipate to a level where only the associated en route noise is of concern. If hubs are sited within less than 1,000 feet from one another, it’s unlikely that any noise sensitive land use would exist in between them since hubs would typically be sited within commercially zoned areas. Delivery noise is expected to be limited by individual customer demand, as any particular residential customer location is expected to receive, at most, only a very small portion of any hub’s daily capacity. Exceptions to this may occur in cases where a drone operator is delivering packages exclusively to a small number of locations on a recurring basis, such as with lab samples and medical supplies on a medical campus, but those cases would generally not occur over land use types where levels below 65 dB DNL are required to be considered compatible with aviation noise.

Based on the available drone noise data for current DFW area Part 135 applicants, the FAA projects that en route DNL for 1,728 AAD deliveries would be in the range of 56-58 dB DNL. Final drone noise data for some applicants is being collected and evaluated, so only an approximate projection for cumulative en route DNL can be made at this time. Based on the projected en route noise range being less than 59.7 dB DNL, the FAA does not anticipate that significant cumulative noise impacts would result from the proposed Part 135 drone package delivery operations occurring within the study area. Furthermore, the projected en route DNL is based on all 1,728 deliveries passing over the same point on the ground. As this is an unlikely real-world occurrence, the projected cumulative en route DNL should be considered a conservative estimate of potential noise exposure.

To avoid the potential for cumulative impacts to result from sitting hubs within the vicinity of airports, operators would adhere to the following guidelines:

- When siting hubs within the surface area of airport-controlled airspace, operators would maintain a standoff distance from any noise sensitive land use that is at least equivalent to the extent of the hub's 55 dB DNL.
- When siting hubs outside the surface area of airport-controlled airspace, operators would maintain a standoff distance from any noise sensitive land use that is at least equivalent to the extent of the hub's 60 dB DNL.

These standoff distances would ensure any noise increases resulting from combined airport and hub noise would remain less than +1.5 dB.

Summary and Conclusions

Based upon the FAA's analysis of areas where hubs would likely be sited, locating 100% of the existing and proposed hub locations is not feasible without overlap in the land area accessible from the hub locations (i.e., the delivery ranges of the proposed UA). It should be noted that <u>overlap does not necessarily mean that there will be adverse impacts to environmental resource categories.</u> However, cumulative effects are expected to occur where delivery routes overlap. The resource categories anticipated to experience cumulative effects include noise, visual, and biological resources, with noise being the primary concern based on overlap in delivery routes. The level of cumulative effects would vary depending on the amount of overlap.

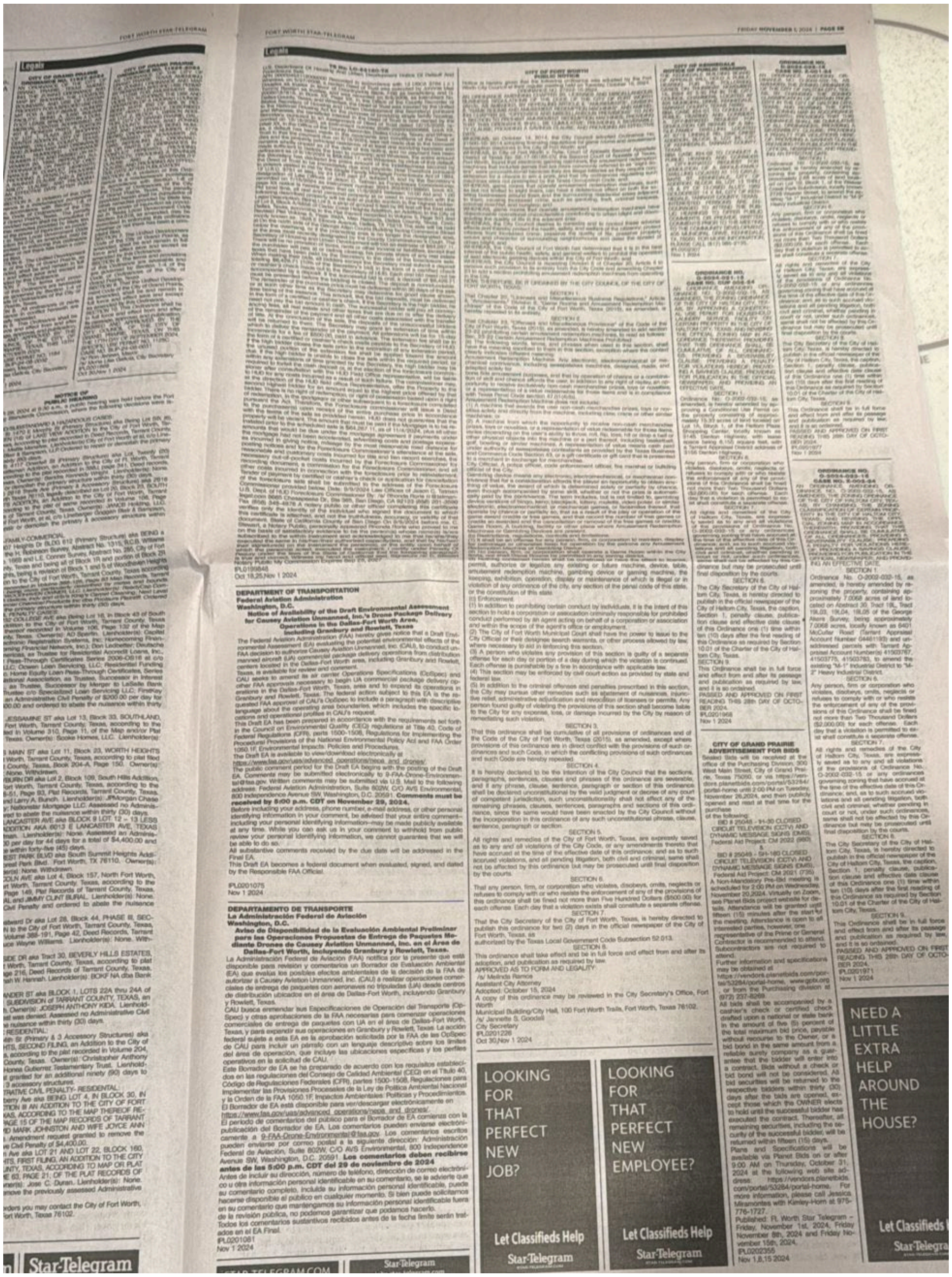
The degree to which all of the different operators would operate within areas of shared airspace is dependent on the operators, their specific business use cases, and their ability to deconflict with one another in overlapping areas. Each operator is responsible for coordinating with other operators in the same geographic area to avoid significant cumulative effects.

FAA's analysis has determined that the cumulative impacts are not expected to exceed thresholds for significance in any environmental resource categories.

APPENDIX H

Public Comments

Public Notice – Fort Worth Star Telegram (English)



DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, D.C.

Notice of Availability of the Draft Environmental Assessment for Causey Aviation Unmanned, Inc.'s Drone Package Delivery Operations in the Dallas-Fort Worth Area, Including Granbury and Rowlett, Texas

The Federal Aviation Administration (FAA) hereby gives notice that a Draft Environmental Assessment (EA) evaluating the potential environmental effects of the FAA decision to authorize Causey Aviation Unmanned, Inc. (CAU), to conduct unmanned aircraft (UA) commercial package delivery operations from distribution centers located in the Dallas-Fort Worth area, including Granbury and Rowlett, Texas, is available for review and comment.

CAU seeks to amend its air carrier Operations Specifications (OpSpec) and other FAA approvals necessary to begin UA commercial package delivery operations in the Dallas-Fort Worth, Texas, area and to expand its operations in Granbury and Rowlett, Texas. The federal action subject to this EA is the requested FAA approval of CAU's OpSpec to include a paragraph with descriptive language about the operating area boundaries, which includes the specific locations and operational profiles in CAU's request.

This Draft EA has been prepared in accordance with the requirements set forth in the Council on Environmental Quality (CEQ) regulations at Title 40, Code of Federal Regulations (CFR), parts 1500-1508, Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act and FAA Order 1050.1F, Environmental Impacts: Policies and Procedures.

The Draft EA is available to view/download electronically at https://www.faa.gov/uas/advanced_operations/nepa_and_drones/.

The public comment period for the Draft EA begins with the posting of the Draft EA. Comments may be submitted electronically to 9-FAA-Drone-Environmental@faa.gov. Written comments may be submitted via U.S. Mail to the following address: Federal Aviation Administration, Suite 802W, C/O AVS Environmental, 800 Independence Avenue SW, Washington, D.C. 20591. **Comments must be received by 5:00 p.m. CDT on November 29, 2024.**

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.

All substantive comments received by the due date will be addressed in the Final EA.

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

IPL0201075
Nov 1 2024

Public Notice – Dallas Observer (English)

/dallasobserver

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration Washington, D.C.

THE STATE OF TEXAS

Notice of Availability of the Draft Environmental Assessment for Causey Aviation Unmanned, Inc.'s Drone Package Delivery Operations in the Dallas-Fort Worth Area, including Granbury and Rowlett, Texas

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All substantive comments received by the due date will be addressed in the Final EA.

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

Public Notice – AlDia (Spanish)

www.aldiadallas.com MIÉRCOLES 6 DE NOVIEMBRE DE 2024 AL DÍA - 11A

Clasificados

aldiadallas.com Teléfono: 469-977-3700 Fax: 469-977-3601

Avisos legales

DEPARTAMENTO DE TRANSPORTE
La Administración Federal de Aviación
Washington, D.C.

Aviso de Disponibilidad de la Evaluación Ambiental Preliminar para las Operaciones Propuestas de Entrega de Paquetes Mediante Drones de Causey Aviation Unmanned, Inc. en el Área de Dallas-Fort Worth, incluyendo Granbury y Rowlett, Texas.

La Administración Federal de Aviación (FAA) notifica por la presente que está disponible para revisión y comentarios un Borrador de Evaluación Ambiental (EA) que evalúa los posibles efectos ambientales de la decisión de la FAA de autorizar a Causey Aviation Unmanned, Inc. (CAU) a realizar operaciones comerciales de entrega de paquetes con aeronaves no tripuladas (UA) desde centros de distribución ubicados en el área de Dallas-Fort Worth, incluyendo Granbury y Rowlett, Texas.

CAU busca enmendar sus Especificaciones de Operación del Transporte (OpSpec) y otras aprobaciones de la FAA necesarias para comenzar operaciones comerciales de entrega de paquetes con UA en el área de Dallas-Fort Worth, Texas, y para expandir sus operaciones en Granbury y Rowlett, Texas. La acción federal sujeta a esta EA es la aprobación solicitada por la FAA de las OpSpec de CAU para incluir un párrafo con un lenguaje descriptivo sobre los límites del área de operación, que incluye las ubicaciones específicas y los perfiles operativos en la solicitud de CAU.

Este Borrador de EA se ha preparado de acuerdo con los requisitos establecidos en las regulaciones del Consejo de Calidad Ambiental (CEQ) en el Título 40, Código de Regulaciones Federales (CFR), partes 1500-1508, Regulaciones para Implementar las Provisiones Procesales de la Ley de Política Ambiental Nacional y la Orden de la FAA 1050.1F, Impactos Ambientales: Políticas y Procedimientos.

El Borrador de EA está disponible para ver/descargar electrónicamente en https://www.faa.gov/uas/advanced_operations/nepa_and_drones/.

El período de comentarios del público para el Borrador de EA comienza con la publicación del Borrador de EA. Los comentarios pueden enviarse electrónicamente a 9 FAA Drone Environmental@faa.gov. Los comentarios escritos pueden enviarse por correo postal a la siguiente dirección: Administración Federal de Aviación, Suite 802W, C/O AVS Environmental, 800 Independence Avenue SW, Washington, D.C. 20591. **Los comentarios deben recibirse antes de las 5:00 p.m. CDT del 29 de noviembre de 2024**

Antes de incluir su dirección, número de teléfono, dirección de correo electrónico u otra información personal identificable en su comentario, se le advierte que su comentario completo, incluida su información personal identificable, puede hacerse disponible al público en cualquier momento. Si bien puede solicitarnos en su comentario que mantengamos su información personal identificable fuera de la revisión pública, no podemos garantizar que podamos hacerlo.

Todos los comentarios sustantivos recibidos antes de la fecha límite serán tratados en el EA Final.

NUEVAS SOLICITUDES DE DART

COMPENSATION STUDY SERVICES P-2089264	REBUILT RADIATOR ASSEMBLY B-2083525
MISC LRV BRAKE AND COUPLER PARTS B-2079453	SHOCK ABSORBERS (FRONT & REAR) B-2085876
MISCELLANEOUS RAIL PROPULSION PARTS B-2082249	REBUILT COMPRESSOR ASSEMBLIES B-2089082

Dallas Area Rapid Transit (DART ha emitido o espera emitir estas solicitudes dentro de los próximos 30 a 60 días.

Cuando se emitan, las solicitudes se publicarán en **DART.org/procurement**

Las solicitudes emitidas estarán disponibles desde la fecha de emisión hasta la fecha de cierre identificada dentro de la solicitud.

DART Procurement Administration, Psupport@DART.org, (214) 749-2701.

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Comisión de Calidad Ambiental de Texas

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PUBLIC COMMENTS AND FAA RESPONSES

COMMENT #1

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

November 19, 2024

Shelia S. Neumann, Ph.D., P.E
Environmental Protection Specialist
Unmanned Aircraft Systems (UAS)/NEPA
Federal Aviation Administration
Washington, D.C

Via: **E-mail**

Re: **TCEQ NEPA Request #2025-036. DRONE PACKAGE DELIVERY OPERATIONS IN THE DALLAS-FORT WORTH AREA, INCLUDING GRANBURY AND ROWLETT, TEXAS. Dallas and Hood County.**

Dear Ms. Neumann,

The Texas Commission on Environmental Quality (TCEQ) has reviewed the above-referenced project and offers the following comments:

The proposed action is located in Dallas and Hood County, which is designated nonattainment for the 2008 eight-hour ozone National Ambient Air Quality Standard (NAAQS) with a classification of severe and designated nonattainment for the 2015 eight-hour ozone NAAQS with a classification of serious; therefore, federal Clean Air Act, §176(c) general conformity requirements apply. Per federal general conformity regulations at 40 CFR §93.153, a conformity demonstration may be required when the total projected direct and indirect volatile organic compounds (VOC) and nitrogen oxides (NOX) emissions—precursor pollutants that lead to the formation of ozone—from an applicable federal action are equal to or exceed the de minimis emissions level of 50 tons per year (tpy) for ozone NAAQS serious nonattainment areas and 25 tpy for severe nonattainment areas.

For emissions analyses conducted to determine general conformity applicability, the TCEQ recommends using a methodology consistent with the requirements at 40 CFR §93.159. According to the information provided, emissions from this proposed action are expected to be de minimis.

The Office of Water has no comments at this time.

Any debris or waste disposal should be at an appropriately authorized disposal facility.

Thank you for the opportunity to review this project. If you have any questions, please contact the agency NEPA coordinator at (512) 239-5538 or NEPA@tceq.texas.gov

Sincerely,

Ryan Vise,
Division Director
External Relations

P.O. Box 13087 • Austin, Texas 78711-3087 • 512-239-0010 • tceq.texas.gov

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FAA Response:

Thank you for your comments.

COMMENT #2

From: noreply@thc.state.tx.us <noreply@thc.state.tx.us>
Sent: Friday, November 22, 2024 2:06 PM
To: 9-FAA-Drone-Environmental (FAA) <9-FAA-Drone-Environmental@faa.gov>; reviews@thc.state.tx.us
Subject: Notice of Availability (NOA) for the Draft Environmental Assessment (EA) for Causey Aviation Unmanned

CAUTION: This email originated from outside of the Federal Aviation Administration (FAA). Do not click on links or open attachments unless you recognize the sender and know the content is safe.

TEXAS HISTORICAL COMMISSION
real places telling real stories

Re: Project Review under Section 106 of the National Historic Preservation Act
THC Tracking #202502938
Date: 11/22/2024
Notice of Availability (NOA) for the Draft Environmental Assessment (EA) for Causey Aviation Unmanned Dallas-Fort Worth Texas Metropolitan Area and Gran

Description: Notice of Availability (NOA) for the Draft Environmental Assessment (EA) for Causey Aviation Unmanned (CAU) Inc. for Part 135 package delivery operations.

Dear Client:
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

- THC/SHPO concurs with information provided.
- 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.

Archeology Comments

- No historic properties affected. However, if cultural materials are encountered during construction or disturbance activities, work should cease in the immediate area; work can continue where no cultural materials are present. Please contact the THC's Archeology Division at 512-463-6096 to consult on further actions that may be necessary to protect the cultural remains.
- THC/SHPO concurs with information provided.

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,

Rebecca Shelton

for Joseph Bell, State Historic Preservation Officer
Executive Director, Texas Historical Commission

Please do not respond to this email.

FAA RESPONSE:

Thank you for your comments.

COMMENT #3

TEXAS PARKS & WILDLIFE

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November 22, 2024

Ms. Shelia S. Neumann
Environmental Protection Specialist
Unmanned Aircraft Systems (UAS)/NEPA
General Aviation & Commercial Branch AFS-752
Emerging Technologies Division
Office of Safety Standard, Flight Standards Service
Federal Aviation Administration
By email: 9-FAA-Drone-Environmental@faa.gov

RE: Draft Environmental Assessment for Causey Aviation Unmanned, Inc. Proposed Drone Package Delivery Operations in the Dallas-Fort Worth Area, including Granbury and Rowlett, Texas. Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise Counties.

Dear Ms. Shelia S. Neumann:

The U.S. Department of Transportation Federal Aviation Administration (FAA) provided the draft Environmental Assessment (EA) evaluating the potential environmental effects of the FAA decision to approve Causey Aviation Unmanned, Inc (CAU) to conduct unmanned aircraft (UA) commercial package delivery from distribution centers located in the Dallas-Fort Worth (DFW) area, including Granbury and Rowlett, Texas.

Project Description

CAU is seeking to amend its air carrier Operation Specifications (OpSpec) and other FAA approvals necessary to begin beyond visual line-of-sight (BVLOS) UA commercial package delivery operations in DFW and to expand its operations in Granbury and Rowlett. The proposed DFW operating area is circular in shape with an approximate radius of 35 miles from a center point near the DFW International Airport.

As part of the OpSpec amendment request CAU seeks to expand delivery to new locations in DFW metro area, extend its delivery radius from 2 nautical miles (NM) to 3.5 NM (approximately 4 statute miles) from the Granbury and Rowlett distribution centers (DCs), continue operating from Granbury and Rowlett DCs, and add up to 30 additional DCs within the DFW metro area within three years. The amendment would also expand the number of average daily operations to a maximum of 500 deliveries per day per DC, operating seven days per week, including holidays, between the hours of 8 am and 10 pm. Each DC would contain charging pads for up to 20 drones. The EA indicates that the proposed project involves minimal infrastructure, and no ground disturbance or habitat modification would occur.

Five of the 30 proposed DCs in DFW have been identified and include locations in Cedar Hill, Frisco/Little Elm, Murphy, North Richland Hills, and Wylie at the following locations:

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512.389.4800
www.tpwd.texas.gov

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DC	Latitude	Longitude
Cedar Hill	32.59428	-96.9372
Frisco/Little Elm	33.15611	-96.8926
Murphy	33.01417	-96.6137
North Richland Hills	32.90247	-97.1961
Wylie	33.00902	-96.553

The UAs have a delivery range of 8.5 miles round trip. The DCs would be in commercial areas, such as shopping centers, movie theaters, large retail stores, and other non-residential areas. CAU must submit additional DC locations to FAA for additional NEPA review prior to beginning operations.

The UA would typically operate at an altitude of 230 feet above ground level (AGL) while en route to and from delivery locations. At a delivery location, the UA would descend vertically to a delivery hover of 75 to 82 feet AGL and lower a package to the ground for delivery. Once a package has been lowered to the ground, the UA would ascend vertically to a cruise altitude and depart the delivery area en route back to the DC, using a cruise airspeed of 33 miles per hour.

TPWD Review

Under Texas Parks and Wildlife Code (PWC) Section 12.0011(b)(2) and (b)(3), TPWD has authority to provide recommendations and informational comments that will protect fish and wildlife resources to local, state, and federal agencies that approve, license, or construct developmental projects or make decisions affecting those resources. TPWD is providing input on this proposed project to facilitate the incorporation of beneficial management practices (BMP) during construction and operation that may assist the project proponent in minimizing impacts to the state's natural resources. Pursuant to PWC Section 12.0011(b)(2) and (b)(3), TPWD offers the following comments and recommendations concerning this project.

Federal Law

Federal Law: Endangered Species Act (ESA)

Federally listed animal species and their habitat are protected from take on any property by the Endangered Species Act (ESA). Take of a federally listed species can be allowed if it is incidental to an otherwise lawful activity and must be permitted in accordance with Section 7 or 10 of the ESA. Take of a federally listed species or its habitat without allowance from the U.S. Fish and Wildlife Service (USFWS) is a violation of the ESA.

The EA includes a Section 7 consultation with the USFWS which concurs with the FAA determination that the project, as proposed, *may affect, but is not likely to adversely affect* the federal endangered golden-cheeked warbler (*Setophaga chrysoparia*) and whooping crane (*Grus americana*) and proposed endangered tricolored bat (*Perimyotis subflavus*) pursuant to the ESA. The FAA determination indicates that any effects would be

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discountable (extremely unlikely to occur) or insignificant (not able to be meaningfully measured, detected, or evaluated). This is based on 1) operations occurring mostly in an urban environment, 2) the altitude at which the UA flies in the en route phase (230 feet AGL), 3) the expected low sound levels experienced by a golden-cheeked warbler and whooping crane, 4) any increase in ambient sound levels would be short in duration, 5) the low probability of a golden-cheeked warbler or whooping crane occurring in the action area, and 6) the low likelihood of the UA striking a warbler or whooping crane.

Although little preferred habitat occurs within the study area because many juniper and oak woodlands have been cleared for urbanization and agriculture in the DFW area, the USFWS did indicate in the Section 7 consultation that a small number of golden-cheeked warblers have been reported during the breeding season in 2023 in Dallas County. This is indication that the warbler may be utilizing the Ashe juniper and oak woodlands that remain in Dallas County primarily in the area near Cedar Hill, at the northern extent of the Balcones Escarpment. The EA indicates that if present in the action area, individual golden-cheeked warblers would not likely experience multiple overflights of a UA due to the mobility of the birds. TPWD notes that if golden-cheeked warblers are returning to the juniper and oak woodlands of the Cedar Hill area for nesting, birds would be less mobile.

In the Balcones Escarpment area near Cedar Hill, Texas, suitable habitats for the golden-cheeked warbler occur in parks and reserves, such as the Dogwood Canyon Audubon Center, Cedar Hill State Park, U.S. Army Corps of Engineers Joe Pool Lake Project, Cedar Mountain – Dallas County Nature Preserve, and Cedar Ridge Preserve. Based on Figure 6 of the EA, a portion of the Cedar Hill DC service area west of HWY 67 and near Joe Pool Lake contains the above-named properties where undeveloped areas may provide suitable habitat for the golden-cheeked warbler.

> **Recommendation:** To minimize potential disturbance to nesting golden-cheeked warblers, TPWD recommends CAU avoid or minimize flight paths over suitable juniper and oak woodland nesting habitat for the golden-cheeked warbler. TPWD recommends CAU coordinate directly with each entity managing the parks and preserves in the Balcones Escarpment to identify appropriate avoidance areas or No Fly Zones (NFZ) during the nesting season.

Federal Law: Migratory Bird Treaty Act

The Migratory Bird Treaty Act prohibits taking, attempting to take, capturing, killing, selling, purchasing, possessing, transporting, and importing of migratory birds, their eggs, parts, or nests, except when specifically authorized by the Department of the Interior. This protection applies to most native bird species.

The EA indicates that migratory birds can be found within the study area and acknowledges that birds may display disturbance behaviors toward drones, such as fleeing or attacking behaviors, but indicates there would be no significant impacts to migratory bird species due to the cruising altitude of the overflights and the minimal anticipated noise and visual impacts from the action.

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Recommendation: Because bird interactions with drones are not well documented, TPWD recommends CAU report bird interactions with the UAs to TPWD and USFWS Migratory Bird Office at (505) 248-7882, on an annual basis, if interactions occur. Reports should include dates, identify the bird by species, identify damage to the UA, identify injury or death to the bird, and provide a location of the interaction, when such data is obtainable. Data obtained from reports may indicate a need for adjustments to flight paths or timing to reduce impacts on avian wildlife.

Recommendation: To minimize potential disturbance to nesting, foraging, and roosting birds, unnecessary flights should be avoided over woodlands and other undeveloped lands within the proposed operating area, when feasible. Undeveloped lands within public parks and recreation areas have less likelihood of future development and offer habitat for breeding birds, and TPWD recommends that CAU avoid or minimize flights over undeveloped areas of public parks and nature reserves.

Federal Law: Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA) prohibits anyone, without a permit issued by the Secretary of the Interior, from taking bald eagles *(Haliaeetus leucocephalus)* and golden eagles *(Aquila chrysaetos)*, including their parts, nests, or eggs. The BGEPA provides criminal penalties for persons who, take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof. The BGEPA defines take to include pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb.

The EA indicates that no bald eagle nests have been documented by state or local resource agencies within the operating area, but that bald eagles have been observed and documented in flight and perching in the operating area via online resources, such as iNaturalist.

Comment: Please note that the iNaturalist online resource includes a filtering option, and the user can input "nest" into the Description/Tag box to identify the results that include reference to a nest. Some of the photographs show an eagle on a nest, which confirms nesting is known in the DFW operating area.

The EA indicates that, 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, then incidental take of a bald eagle is unlikely to occur, and no permit is needed.

To avoid impacts to bald eagles, CAU implements typical best management practices related to monitoring for bald eagle nests, integrating multiple strategies and resources, including periodically checking online tools such as iNaturalist to identify eagle nests that may occur in the operating area, as well as communicating with the bird watching community to identify nests. CAU personnel will also be educated on the visual identification of bald eagle nests, which are conspicuous. If the drone operator identifies a bald eagle nest or is notified of the presence of a nest, CAU will establish an avoidance area to provide a 1,000- foot vertical and horizontal separation distance between the

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vehicle's flight path and the nest. This avoidance area will be maintained until the end of the breeding season (December 1 through August 31 in the study areas) or until a qualified biologist indicates the nest has been vacated. For each new site being considered for a DC, CAU requires the identification of bald eagle nesting so that the sites and appropriate buffers can be added as no fly zones. CAU will report any bald eagle nests and/or mitigative efforts to the USFWS Region 2 Migratory Bird Permit Office if a nest is observed.

TPWD notes that the breeding and nesting season for bald eagles in Texas is approximately late October into June, with peak hatching in January.

> **Recommendation:** Because eagles are known to nest in the operating area and because eagles will utilize the same nest from year to year, or build a replacement nest very close to the initial nest, TPWD recommends CAU incorporate nest avoidance areas with the intention to avoid the nest in subsequent breeding and nesting seasons or until the nest is no longer present such as when the nest falls apart or the nest tree falls.

> **Recommendation:** TPWD recommends consultation with USFWS Region 2 Migratory Bird Permit Office for input regarding adequacy of the monitoring plan and to ensure compliance with BGEPA.

Parks, Nature Preserves, and Recreational Areas

The EA includes a Section 4(f) of the U.S. Department of Transportation Act evaluation to ensure that the project protects significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites.

The EA concludes that there would be no physical use of Section 4(f) resources, including public parks, because there would not be any physical occupation or alternation of a Section 4(f) property. The FAA determined that infrequent UA overflights as described in the proposed action are not considered a constructive use of any Section 4(f) resource and would not cause substantial impairment to any of the Section 4(f) resources in the operating areas. As discussed in Section 3.3, *Noise and Noise-Compatible Land Use*, and the EA's Appendix C, the EA indicates the proposed operations would not result in significant noise levels at any location in the operating areas.

As described in Section 3.7, *Visual Effects*, the EA indicates that some public parks could be valued for aesthetic attributes within the operating areas, and that CAU proposes to minimize overflights of areas with large open-air gatherings of people which may include properties covered under Section 4(f). To minimize overflights of these properties, CAU creates "limited fly zones" via route planning software, which ensures that each route integrates and respects the restrictions entered into the database, including Section 4(f) properties, which can be automatically avoided based on time of day and other factors. Based on FAA requirements to minimize overflights of open-air gatherings of people and an expected low number of proposed flights per day spread throughout the operating area, FAA finds that the proposed alternative is not expected to affect the visual character of the area, will not substantially contrast with the visual resources within the operating areas, and will not block or obstruct the view of visual resources. The EA states that any

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visual effects are expected to be similar to the existing air traffic in the vicinity of the operating area. FAA concludes that the proposed action is not expected to result in significant visual effects at any location in the operating areas.

The EA concludes that noise and visual effects from CAU's occasional overflights are not expected to diminish the activities, features, or attributes of the Section 4(f) resources that contribute to their significance or enjoyment. Therefore, the FAA has determined that there would be no significant impacts to Section 4(f) resources as a result of the no action and proposed action alternatives.

Although the FAA finds that the project would not cause impairment to park resources, TPWD finds that the user experience at some parks could be adversely affected by overflights of campgrounds, day use areas, primitive camping sites, boating or fishing areas, and natural areas, such as in the viewshed of hiking trails.

> **Recommendation:** To avoid disturbance and visual nuisance impacts to wildlife and park users, TPWD recommends avoiding flights over nature preserves, parklands, and recreational areas. If flights over nature preserves, parklands, and recreational areas are required, TPWD recommends coordinating with the managing entity to ensure that flight paths are thoughtfully placed to minimize visual nuisance and disturbances.

<u>Cedar Hill State Park and Ray Roberts Lake State Park</u>

The operating area includes the following two TPWD managed State Parks: Cedar Hill State Park and Ray Roberts Lake State Park.

> **Comment:** TPWD prefers that overflights and deliveries be avoided at TPWD State Parks to avoid conflict with State Park user experiences. If overflights cannot be avoided, TPWD requests that overflights avoid campgrounds, primitive campsites, day use areas, and trails. TPWD requests CAU coordinate directly with TPWD State Parks Division regarding any proposed overflight locations over a TPWD State Park to ensure that overflights lengths are minimized and located to minimize impacts on parks user experiences or wildlife. Regarding deliveries, TPWD requests CAU coordinate directly with TPWD State Parks Division to strategize on avoiding delivery locations within a State Park or to potentially identify specified delivery sites within a State Park, if approved by TPWD. Once CAU establishes a DC in the range of a State Park, such as the proposed Cedar Hill DC, continued open communication with TPWD will enable CAU and TPWD to identify thoughtfully placed operations that can be adjusted as needed to address unforeseen needs or issues. For coordination regarding TPWD State Parks, please coordinate with Chris True, Regional Director, Region 6 State Parks – Northeast Texas at (940) 902-7440 or Chris.True@tpwd.texas.gov.

<u>TPWD Private Lands and Public Hunting Program</u>

TPWD manages the Ray Roberts Lake Public Hunting Lands (PHL) under a license agreement with USACE to maintain native wildlife populations and habitats through

Ms. Shelia S. Neumann
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wildlife habitat management and public hunting. The Public Hunting Areas Interactive Map identifies the location of public hunting lands which are updated annually and can be found on the TPWD Website at https://tpwd.texas.gov/huntwild/hunt/public/. TPWD review indicates that a portion of CAU's operating area includes some Ray Roberts Lake PHL at the periphery of the operating area.

> **Recommendation:** TPWD recommends that overflights and deliveries be avoided at TPWD PHL during open hunting seasons to avoid conflict with hunter experiences. TPWD recommends reviewing the TPWD PHL map and annual hunting season dates on an annual basis to ensure that new PHL are avoided. For more information regarding the PHL program, please coordinate with Kevin Mote, Private Lands and Public Hunting Program Director at (512) 217-2779.

Thank you for thoughtful consideration of the fish and wildlife resources of Texas. If you have any questions, please contact me at Karen.Hardin@tpwd.texas.gov, (903) 644-6155 cell, or (903) 322-5001 office.

Sincerely,

Karen B Hardin

Karen B. Hardin
Environmental Review Biologist
Ecological and Environmental Planning Program
Wildlife Division

kbh/53114

FAA RESPONSE:

FAA/CAU acknowledge under Texas Parks and Wildlife Code (PWC) Section 12.0011(b)(2) and (b)(3) that TPWD has authority to provide recommendations and informational comments that will protect fish and wildlife resources to local, state, and federal agencies that approve, license, or construct developmental projects or make decisions affecting those resources. The recommendations and informational comments provided were received as constructive in nature and appreciated.

CAU seeks to minimize potential disturbance to golden-cheeked warblers and will make efforts to minimize flight paths over areas suitable for golden-cheeked warblers to nest.

CAU will coordinate with entities managing the parks and preserves in the Balcones Escarpment to identify appropriate avoidance areas during the nesting season of golden-cheeked warblers. If a reportable incident occurs due to bird interactions with the UAs, CAU will report strikes to the FAA and comply with FAA reporting requirements in accordance with Form FAA 5200-7 – Bird and Other Wildlife Strike Report.

Flight paths are planned and optimized to prioritize reduction of ground risk. CAU's route planning software prepares optimized flight paths between the distribution center to each designated delivery site. The software minimizes overflying sensitive properties such as nature preserves, parklands, recreational areas, undeveloped lands and potential habitat, through the creation of "limited fly zones" which can be automatically avoided based on the time of day and other factors. The software integrates all indicated restrictions and limitations when determining flight paths. When feasible, CAU will attempt to minimize potential disturbance to nesting, foraging, and roosting birds.

CAU implements typical best management practices related to monitoring for bald eagle nests, including periodically checking online tools, such as iNaturalist, to identify eagle nests that may occur in the operating areas, as well as communication with the bird watching community to identify nests. If CAU identifies a bald eagle nest or is notified of the presence of a nest, CAU will establish an avoidance area to provide a 1,000-foot vertical and horizontal separation distance between the drone's flight path and the nest. CAU will maintain this avoidance area until the end of the breeding season (December 1 through August 31 in the study area) or until a qualified biologist indicates the nest has been vacated.

CAU will regularly report monitoring and avoidance measures to Texas Parks & Wildlife and the USFWS Region 2 Migratory Bird Permit Office. As stated in the EA, CAU personnel will also be educated in the visual identification of Bald Eagle nests, which are typically very conspicuous, to aid in timely incorporation of nest avoidance areas.

To date, CAU has not had any bird strikes related to their operations.

CAU deliveries are typically conducted at residential or business addresses. Currently, none of the CAU distribution center locations are located within 5 miles of a Texas State Park. When a new operating area overlaps with property within the boundaries of a Texas State Park, CAU will attempt to minimize impacts on parks user experiences or wildlife through integrating the appropriate flight limitations into its route planning software, and coordinate with TPWD State Parks if necessary.

CAU will consider including public hunting lands when assessing locations for new distribution centers and, if included, may evaluate the feasibility of avoiding overflights and deliveries at TPWD public hunting lands during certain time periods.

COMMENT #4:

SMALL UAV
COALITION
A Partnership for Safety & Innovation

Draft Environmental Assessment – Causey Aviation Unmanned, Inc.

Drone Package Delivery Operations in DFW Metro Area

Comments of Small UAV Coalition

November 26, 2024

filed with 9-FAA-Drone-Environmental@faa.gov

The Small UAV Coalition ("Coalition") is pleased to provide comments in support of the FAA's draft Environmental Assessment ("EA") for drone package delivery operations by Causey Aviation Unmanned, Inc. ("Causey") in the Dallas-Ft. Worth, Texas metropolitan area. The "major federal action" triggering review under the National Environmental Policy Act ("NEPA") is the FAA's amendment of an air carrier's Operations Specifications ("OpSpecs").

In 2023, the FAA issued a Record of Decision ("ROD") and Finding of No Significant Impact ("FONSI") to Causey for operations in Granbury (77 daily flights) and Rowlett (71 daily flights), Texas, up to two nautical miles ("NM") from each distribution center ("DC"), using the Flytrex M600P drone.

This draft EA addresses these locations and two new locations in the DFW metro area – Frisco and Little Elm, and North Richland Hills – and up to 30 additional distribution centers over the next three years, performing up to total of 500 operations per day. Each DC will have charging pads for up to 20 drones. Causey also seeks to add the Flytrex Sky II platform, weighing 34.2 lbs. with a package weight limit of 8.8 lbs., and to extend the radius from each distribution center to 3.5 NM. These flights would operate at 230 feet Above Ground Level ("AGL") en route, and lower to 75-83 feet AGL for a tethered delivery.

Causey pledges to avoid flying over or near open-air gatherings of people and Section 4(f) resources; to fly at least 150 feet from noise-sensitive areas, where the existing noise impact is 55 DNL and at least 83 feet from an area with an impact of 60 DBL; and to avoid operating near schools.

The Coalition supports the FAA's conclusion in this draft EA as well as in other previous environmental assessments authorizing drone package delivery operations that no detailed analysis is necessary for nine of the 17 environmental review areas:

- air quality and climate
- coastal resources
- farmlands
- hazardous materials, solid waste, and pollution prevention
- land use
- natural resources and energy supply
- socioeconomic impacts and children's environmental health and safety risks
- visual effects
- water resources (wetlands, floodplains, surface waters, and groundwater)

Indeed, drone package delivery will reduce greenhouse gas emissions and energy use, as well as enhance the economy, and serve a broader range of people in different socioeconomic strata or with limited mobility options. Using drones for delivery can potentially replace millions of car trips, which would not only eliminate hundreds of thousands of tons of vehicular CO_2 emissions but also reduce traffic congestion and accidents caused by surface transportation. Beyond delivery, drones already offer a safer alternative to critical business and government activities like infrastructure inspection, precision agriculture, and emergency response.

Given these benefits, it is not surprising that an increasing number of counties and localities, including in the Dallas-Ft Worth metropolitan area, have been receptive to drone delivery.

The Coalition supports the FAA's determination that drone delivery operations do not result in a significant impact on noise, visual effects, historic, architectural, archeological, and cultural resources, DOT section 4(f) resources, waters (wild &

scenic rivers), biological resources (wildlife), environmental justice, and cumulative impacts from noise and to biological resources.

The Coalition has reviewed the noise impacts analysis in the draft. The FAA concluded that "any noise increases associated with activity at DCs should not exceed the significance impacts threshold for noise." Noise impacts for the en route and delivery phases of flight were lower than the impacts at the distribution centers.

The Coalition agrees with the draft EA's statement that drone operations will bring environmental justice benefits over operations that require a car or truck to pick up a package from a store.

> Drone package deliveries would provide additional access to small goods, such as groceries and medicine, which could present a positive effect on low-income and minority communities where individuals may not have reliable access to personal vehicles and/or other modes of transportation. For these reasons, the Proposed Action may result in a benefit to low-income and minority communities by providing additional and on-demand access to small goods.
>
> The Proposed Action would not create impacts that exceed thresholds of significance in other environmental impacts, nor would it generate impacts on the physical or natural environment that affect an EJ population in a way that the FAA determines are unique to the EJ population and significant to that population.

Accordingly, the Coalition supports the FAA's draft EA and urges the FAA to issue a FONSI.

Respectfully submitted,

Greg S Walden

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FAA RESPONSE:

Thank you for your comments.