Draft Programmatic Environmental Assessment

FAA-Recognized Identification Areas (FRIAs) under the Remote Identification of Unmanned Aircraft Final Rule (14 CFR Part 89)

March 2023

United States Department of Transportation
Federal Aviation Administration

Washington, D.C.

[This page intentionally left blank]

Cover Image: Academy of Model Aeronautics

DEPARTMENT of TRANSPORTATION
Federal Aviation Administration
Washington, D.C.

Notice of Availability of the Draft Programmatic Environmental Assessment for FAA-Recognized Identification Areas (FRIAs)

The Federal Aviation Administration (FAA) hereby gives Notice of Availability (NOA) for this Draft Programmatic Environmental Assessment (PEA) that analyzes and discloses the potential environmental impacts associated with the approval of FRIA locations, pursuant to the National Environmental Policy Act. FRIAs may be established in accordance with Title 14 Code of Federal Regulation (CFR) Part 89. A FRIA is a defined geographic area where unmanned aircraft can be flown without remote identification equipment. Both the unmanned aircraft and the pilot must be located within the FRIA's boundaries throughout the operation. In addition, the pilot of the unmanned aircraft must be able to see it at all times throughout the duration of the flight. Only FAA-recognized Community Based Organizations and educational institutions such as primary and secondary schools, trade schools, colleges, and universities are eligible to request the establishment of a FRIA. If the FAA approves the establishment of a FRIA, the approval will be valid for 48 calendar months.

The environmental impacts of approving these limited, location-specific areas for the operation of unmanned aircraft have been considered in a manner consistent with the provisions of the National Environmental Policy Act (NEPA), as amended (42 U.S.C. 4321-4347), the regulations of the Council on Environmental Quality (40 CFR parts 1500-1508), and FAA Order 1050.1F, Environmental Impacts: Policies and Procedures. Based on the analysis described in this PEA, the FAA has preliminarily 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 FAA intends for this PEA to create efficiencies by establishing a framework that can be used for "tiering," where appropriate, to project-specific actions that require additional analysis. As decisions on specific applications are made, to the extent additional NEPA analysis is required, environmental review will be conducted to supplement the analysis set forth in this PEA.

The public comment period for the Draft PEA begins with the issuance of the NOA on the Federal Register at https://www.federalregister.gov/ and lasts 30 days. The FAA encourages all interested parties to provide comments concerning the scope and content of the Draft PEA.

The Draft PEA is available to view/download electronically at https://www.faa.gov/uas/advanced_operations/nepa_and_drones/

Comments may be directed in writing to 9-FAA-Drone-Environmental@faa.gov. Please reference the Draft FRIA PEA in the email subject line when sending comments.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment – including your personal identifying information – will be made publicly available.

Posted: April 3, 2023

Responsible FAA Official:

Dave Menzimer
Manager, General Aviation Operations Section
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

[This page intentionally left blank]

Contents

Table of Figures

Appendices

1.0 INTRODUCTION

1.1 Overview

The National Environmental Policy Act of 1969 (NEPA), 42 United States Code (U.S.C.) § 4321 *et seq*., requires Federal agencies to consider the potential environmental impacts of proposed Federal actions. The Council on Environmental Quality (CEQ) has issued implementing regulations at 40 CFR parts 1500-1508. The Federal Aviation Administration (FAA) has established a process to ensure compliance with the provisions of NEPA through FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* (Order 1050.1F).

The CEQ regulations encourage consideration and evaluation of common actions in a programmatic manner to gain efficiencies. The CEQ regulations also encourage program-level environmental analysis when projects are similar to each other and have similar impacts. The FAA is preparing this Programmatic Environmental Assessment (PEA) in accordance with the CEQ regulations and CEQ's December 18, 2014 guidance on the effective use of programmatic NEPA reviews to evaluate the environmental impacts resulting from the agency approving applications of eligible entities to establish FAA-recognized identification areas (FRIAs). FRIAs are locations where people can operate unmanned aircraft (UA) without remote identification.[1]

This document will help to ensure consistent and timely environmental evaluations for FRIA applications, and avoid unnecessary duplication and repetition in evaluating the potential environmental impacts of FRIA location approvals. The FAA has developed this program-level review using a consistent framework and methodology, which supports the analyses, documentation, and decisions of subsequent project-level actions. This PEA addresses the overall environmental effects of UA operating in FRIAs. It covers actions that will be taken nationwide and is broad in scope. It may not assess in detail some of the potential significant issues that could be raised at individual FRIA locations. Detailed information about some of the potential FRIA locations is not currently available. While the FAA expects the majority of requests to establish FRIA locations to correlate with existing locations of hobbyist clubs associated with the Academy of Model Aeronautics, and educational institutions such as JROTC schools, not all eligible entities[2] are yet known to the FAA. Eligible entities may include organizations who do not currently operate UA at a specific location, but which may be formed in the future and would also be eligible to establish FRIAs. Therefore, this PEA makes assumptions about some unknowns using best available information and, where appropriate, professional expertise.

The FAA will conduct reviews of individual requests to establish FRIAs to ensure that they reflect the environmental impacts and assumptions set forth in this document. As such, some individual FRIA locations may require additional environmental analysis and documentation. However, any subsequent environmental review may be tiered from the PEA, requiring the environmental review to focus only on the specific issue at the FRIA location that falls outside the review of this PEA. The FAA will conduct an

[1] The Remote ID Rule became effective on April 21, 2021, except that Subpart C covering the process for community-based organizations to submit applications to establish FRIA locations became effective on September 16, 2022. In addition, UA manufacturers must comply with the relevant Remote ID requirements by September 16, 2022, and all UA pilots must meet the operating requirements of Part 89 by September 16, 2023. This means that, by September 16, 2023, UA operators must fly either a standard remote identification UA or a UA equipped with a broadcast module, or must limit their operation of a non-compliant UA to an established FRIA location.

[2] Eligible entities include FAA-recognized community-based organizations and educational institutions including primary and secondary educational institutions, Junior Reserve Officers' Training Corps (JROTC) programs, trade schools, colleges, and universities. 14 CFR 89.205.

additional focused environmental analysis in accordance with 40 CFR §§ 1501.11 (tiering), 1501.12 (incorporation by reference), and 1508.1(ff). If the PEA addresses in sufficient detail impacts raised by a particular application then no additional review would be necessary.

Pursuant to 14 CFR Part 89, herein referred to as the Remote ID Rule, the FAA has established a process under which it will receive for consideration and action applications from eligible entities to establish a FRIA. The FAA has discretion to approve or deny an application to establish a FRIA as set forth in subpart C of the Remote ID Rule. These approvals are a major Federal action under NEPA (40 CFR 1508.1(q)). This PEA describes this major Federal action and the potential environmental impacts resulting from it.

1.2 Background

Through the FAA Modernization and Reform Act of 2012, Public Law No. (P.L.). 112-95, § 333 (49 U.S.C. § 44807), Congress tasked the FAA with integrating unmanned aircraft systems (UAS) into the national airspace system (NAS). As a result, the FAA authorized certain UA to operate in the NAS pursuant to 49 U.S.C. § 44809 and 14 CFR Part 107.[3] Under these existing operating authorities, UA may be operated throughout the United States provided those operations comply with existing legal requirements. The UA types operated in the NAS include fixed-wing, helicopters, and multicopters, which may be equipped with an electric motor, gas engine, or turbine engine.[4]

In 2021, the FAA issued the Remote ID Rule, which can best be analogized as digital license plates for UA. The rule imposed remote identification requirements on UA operating in the NAS. These requirements can be met in one of three ways: (1) operating a standard remote identification UA; (2) operating a UA equipped with a remote identification broadcast module; or (3) operating at a FRIA. These compliance mechanisms are set forth in Figure 1, below:

[3] Part 107 is only applicable to UA that weigh less than 55 pounds at takeoff. To fly a UA that exceeds the maximum weight limit of Part 107 or if the UA mission includes a non-waivable rule, operators may apply for an exemption in accordance with 14 CFR Part 11 and 49 U.S.C. § 44807.

[4] The term UA includes conventional model aircraft. Some larger model aircraft (termed "giant scale") may be operated in FRIAs, but these are far less common than UA weighing less than 55 pounds.

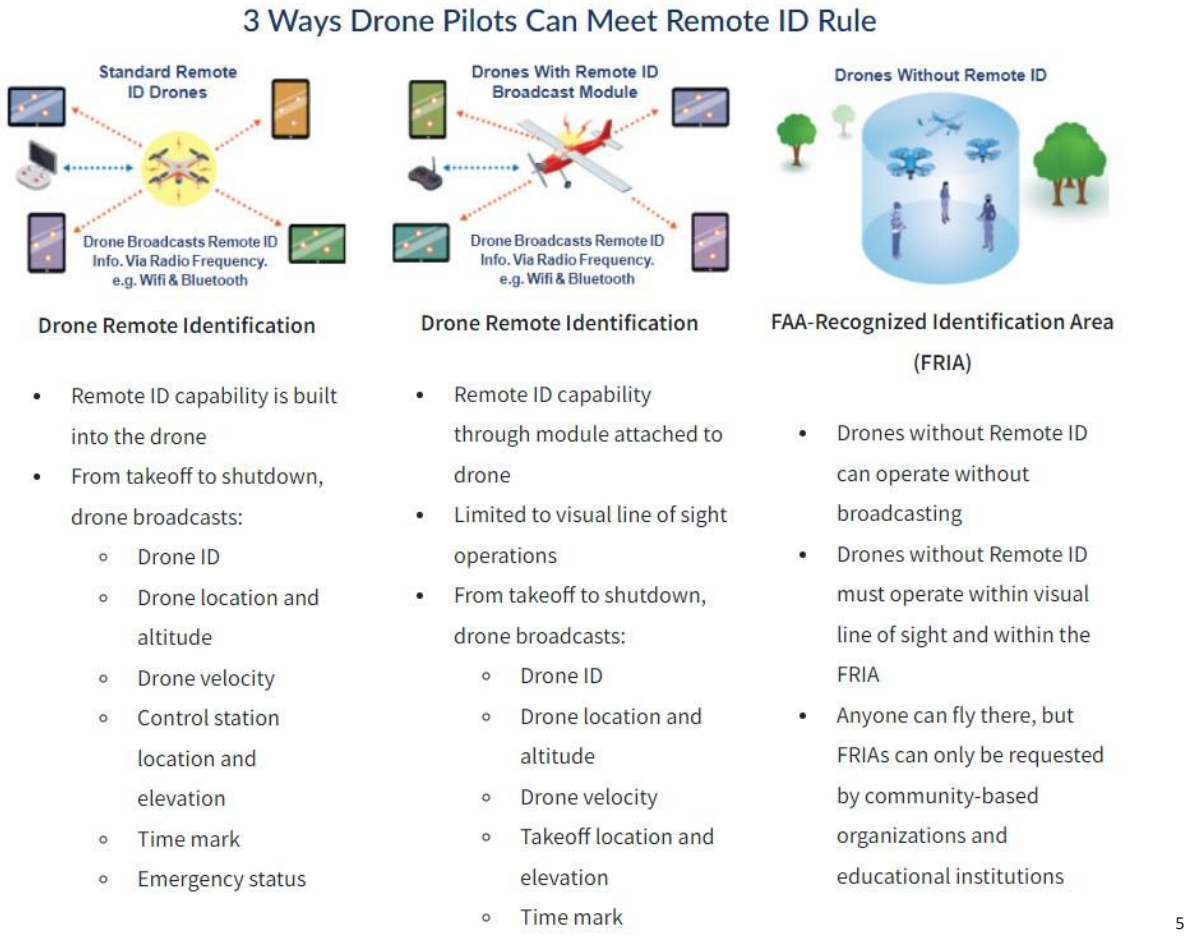


Figure 1 *Three Ways that Drone Pilots Can Meet the Remote ID Rule*

The Remote ID Rule set forth two key deadlines for UA flying in the NAS. First, starting September 16, 2022, the FAA requires that most new UA be manufactured with remote identification. Second, starting September 16, 2023, UA operators will be required to ensure their UA are remote identification compliant or operate at a FRIA; the latter of which is the subject of this PEA. UA with remote identification can continue to operate nationally pursuant to FAA regulation without any change. UA without Remote ID may be operated within FRIA boundaries as long as the UA remain within the operator's visual line of sight (VLOS) and neither the operator nor the UA travel beyond the FRIA's boundaries.

Subpart C of the Remote ID Rule established a path through which eligible entities may seek approval from the FAA to establish FRIAs where UA operators who are unable or unwilling to equip their aircraft with remote identification may continue to operate. Subpart C also provides accommodations for FAA-recognized community-based organizations (CBOs) to request locations where individuals, particularly recreational flyers of UA without remote identification may operate. Educational institutions may also request to establish FRIA locations where science, technology, engineering, and math (STEM) curricula and workforce development programs may operate UA not equipped with remote identification. The FAA expects that the vast majority of UA will comply with remote identification requirements, thereby

[5] Figure available: https://www.faa.gov/uas/getting_started/remote_id

limiting the need for FRIAs. However, the FAA estimates that it may receive more than 4,000 FRIA applications by the full Remote ID Rule compliance date of September 16, 2023.

This PEA does not include an analysis of temporary use events such as air shows or drone racing events as the FAA is not planning to approve FRIAs for temporary use events. This PEA analyzes the potential environmental impacts of the FAA approving applications to establish FRIAs, those involving both existing and new flying locations:

- Existing Locations: This category comprises: (a) locations with active UA operations currently being used by educational institutions, including Junior Reserve Officer Training Corps (JROTC) programs and post-secondary institutions with UAS-related course offerings, and (b) locations with active UA operations currently used by existing or prospective CBOs, including the Academy of Model Aeronautics (AMA)[6] and non-AMA member organizations.

  UA operators in these areas may operate fixed-wing, helicopter, and multicopter UA equipped with an electric motor, piston engine, or turbine engine. It is expected that AMA locations that are established as a FRIA location would continue to permit these operations. The FAA anticipates that the reasonably foreseeable maximum operational capacity at existing CBO locations will remain the same. Similarly, the FAA anticipates that the VLOS boundaries of these locations, existing UA operations, UA types, and operating characteristics will remain static. Based on information provided by the AMA, the FAA estimates that approximately 2,500 existing locations associated with the AMA may request FRIAs between September 2022 and September 2023. In addition, the FAA estimates that an additional 100 locations at which UA operations currently take place but which are not associated with the AMA may also seek FRIA establishments during the same time period.

  The educational locations are likely to be on landscaped property owned by educational institutions, such as sport fields and stadiums, parking lots, or other open lots. The FAA anticipates that existing average annual operations will remain the same. Similarly, the FAA anticipates that the boundaries of these locations, UA types, and operating characteristics remain static. Based on the Regulatory Impact Analysis prepared by the FAA in conjunction with the Remote ID Rule, it is anticipated that, between September 2022 and September 2023, educational institutions may request to establish FRIAs at approximately 1,800 locations where UA are currently operated.

[6] The FAA estimates that AMA members comprise approximately 95 percent of the recreational flyer community in the United States.

 [7]

Figure 2 *Remote Controlled Aircraft Flying Location*

 [8]

Figure 3 *Ned Brown Model Airplane Flying Field at Busse Woods, Illinois*

[7] Figure available: https://www.rc-airplane-world.com/
[8] Figure available: https://www.rc-airplane-world.com/

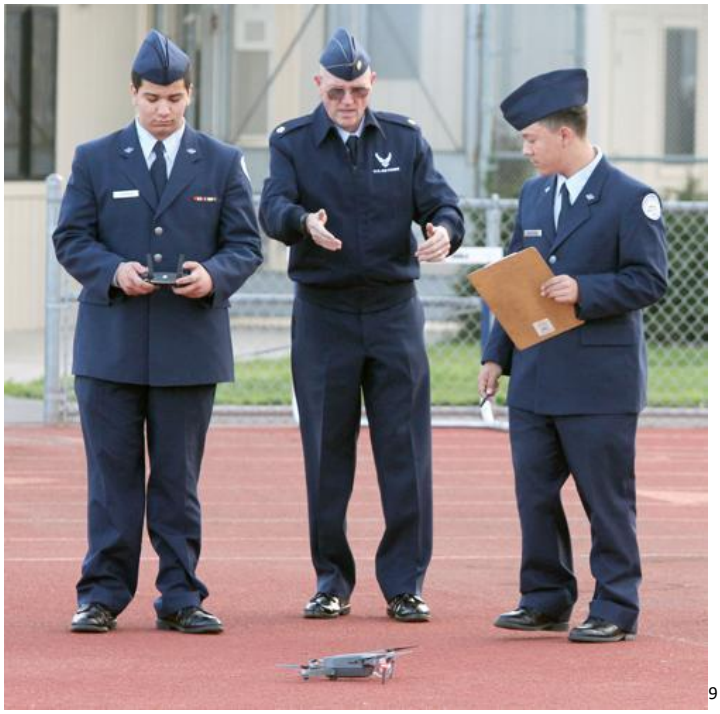
 [9]

***Figure 4** JROTC Cadets at Track Stadium*

- New Locations: This category comprises proposed FRIA locations that are not currently being used by an educational institution or CBO to operate UA, but where UA operators may already be operating in the area in compliance with existing operating authorities. Based on information provided by AMA, the FAA estimates that approximately 80-85 new locations may seek FRIAs annually between September 2022 and September 2027. The FAA also anticipates that non-AMA member organizations recognized by the FAA as a CBO may seek to establish approximately four new FRIAs annually between September 2022 and September 2027. As with existing educational locations, the FAA anticipates that these locations would be established on landscaped school-owned property and likely to be located on open lots. It is also possible that the locations may be established on property otherwise being used for an aviation-related use or where UA currently operate in compliance with legal requirements. The FAA anticipates that educational institutions may establish as many as 625 new FRIAs between September 2022 and September 2027. This assumption is informed by changes in STEM curricula being offered in primary and secondary school.

The Proposed Action in this PEA is the FAA's determination whether to approve applications for FRIA establishments. The FAA approval of a FRIA only relates to its location and airspace activities in the NAS. It does not approve construction or other infrastructure development. The FAA's decision regarding a FRIA is dependent on whether: (1) an eligible entity[10] submitted the application; and (2) whether the application satisfies the criteria established in 14 CFR § 89.215.[11] The analysis of environmental impacts is an important and integral part of the FAA's decision whether to approve or deny the application.

[9] Figure available: https://www.ttownmedia.com/tracy_press/our_town/drone-pilot-class-lifts-off/article_88208cc6-129e-11e8-93c7-3747ffe7c8cf.html

[10] Eligible entities are defined in 14 CFR 89.205.

[11] In considering an application to establish a FRIA, the FAA may consider the four following criteria:

If the FAA approves a request to establish a FRIA, it will be valid for 48 calendar months from the date of approval. To renew the FRIA, the holder must submit a request for renewal no later than 120 days before the expiration date.[12] Any desire to change a FRIA's geographic boundaries must be sent to the FAA for review.[13]

In this document, the FAA integrated the review process required under other potentially applicable environmental and cultural resource statutes, such as Section 106 of the National Historic Preservation Act (NHPA) and Section 7 of the Endangered Species Act (ESA). This PEA provides the public and the FAA Responsible Official with the information to understand and evaluate the potential environmental consequences of the proposed action and alternative. The FAA Responsible Official will consider the ability of each alternative to meet the purpose and need prior to determining whether to issue a Finding of No Significant Impact (FONSI) or a notice of intent to prepare an Environmental Impact Statement (EIS).

(a) The existence of any FAA established flight or airspace restriction limiting the operation of unmanned aircraft systems, such as special use airspace designations under Part 73 of this chapter, temporary flight restrictions issued under Part 91 of this chapter, or any other special flight rule, restriction or regulation in this chapter limiting the operation of unmanned aircraft systems in the interest of safety, efficiency, national security and/or homeland security, which overlaps with the proposed FAA-recognized identification area;
(b) The safe and efficient use of airspace by other aircraft;
(c) The safety and security of persons or property on the ground; and
(d) The need for an FAA-recognized identification area in the proposed location and proximity of other FAA-recognized identification areas.

These criteria are not exhaustive. The FAA may take other considerations into account.

[12] FRIA duration and renewal requirements are found in 14 CFR 89.225

[13] See amendment requirements in 14 CFR 89.220(b)

2.0 PURPOSE AND NEED

The FAA has prepared this PEA to evaluate the potential environmental impacts associated with the determination whether to approve or deny applications to establish FRIAs (the Proposed Action). As required by FAA Order 1050.1F, an environmental assessment must include a discussion of the underlying purpose and need for the Proposed Action. This includes a discussion of the problem that the Proposed Action is intended to resolve (need) and what the FAA plans to achieve by implementing the Proposed Action (purpose).

The purpose of the Proposed Action is to provide for locations where UA may operate without remote identification. Beginning on the Remote ID Rule operational compliance date (September 16, 2023), FRIAs will be the primary location where UA 0.55 pounds and over may operate without remote identification unless otherwise authorized by the Administrator (14 CFR 89.115(b)). While the FAA anticipates that most operators will comply with the Remote ID Rule through use of either a standard remote identification UA or a UA equipped with a remote identification broadcast module, some operators -- such as those operating amateur or home-built UA lacking remote identification – will only be able to conduct UA operations within the boundaries of a FRIA. CBOs may request a FRIA to accommodate recreational flyers who are unable to equip their UA with remote identification. In addition, to encourage participation in aviation for educational purposes, such as STEM programs, the Remote ID Rule provides that educational institutions, including institutions of primary and secondary education, trade schools, JROTCs, colleges, and universities may also apply to establish a FRIA. In addition to recreation and education, FRIAs may be used to support workforce development training.

The need for the Proposed Action is to ensure the safety and security of the NAS by ensuring that UA are able to operate safely alongside other users of the NAS, and to provide regulatory relief to those who are not able to come into compliance with the Remote ID Rule by operating a standard remote identification UA or a UA equipped with a remote identification broadcast module.

3.0 PROPOSED ACTION AND NO ACTION ALTERNATIVE

Two alternatives are evaluated in this PEA: The Proposed Action and the No Action Alternative. No other action alternatives are evaluated because the proposed action is the only available alternative that meets the purpose and need to approve FRIAs in accordance with the Remote ID Rule. Decisions about whether individual applications meet the approved FRIA criteria and program objectives would be made on location-specific proposals as they are submitted to the FAA for action.

3.1 Proposed Action

The Proposed Action under consideration in this PEA is the determination whether to approve applications to establish FRIAs, which are locations identified by the applicant where the FAA would permit UA operations without remote identification, provided that the UA is within an operator's visual line of sight and both the UA and the operator remain within the boundaries of the approved area. In addition, operators of UA with remote identification may also operate at FRIA locations pursuant to regulations generally applicable to UA operators. Many of the FRIA establishments will be sought for AMA flying clubs and other CBOs.

The FAA has a regulatory duty to consider all applications for a FRIA. After taking into consideration the criteria set forth in 14 CFR 89.215, and reviewing the proposed FRIA location, the FAA will approve or deny an application. The approval of a FRIA application relates to its location and would allow remote pilots to operate UA not equipped with remote identification only within the FRIA boundaries. UA without remote identification would be prohibited in airspace beyond the boundary of an established FRIA. The approval of a FRIA does not extend to land disturbance, construction, or any other infrastructure development that a private entity may carry out.

3.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be implemented (the FAA would not approve a FRIA application and consequently a FRIA would not be established). Recreational flyers would still be permitted to operate UA under 0.55 pounds maximum gross operating weight pursuant to 49 U.S.C. 44809 without obtaining FAA certification or operating authority. FAA regulations at 14 CFR Part 107 set forth the requirements for safe and secure flight and enabled remote pilots to decide whether, when, and how often to operate over people, over moving vehicles, or at night. It aligned UA operations to the regulatory scheme of General Aviation (GA) operating under Visual Flight Rules (VFR), found in 14 CFR Part 91. Part 107 permits operators holding a remote pilot certificate with a small UAS rating to conduct UA operations at groundspeeds at or below 100 mph, an altitude below 400 feet above ground level (AGL), and within line of sight of a visual observer(s).

Ownership and operations of UA are distributed throughout the country, with denser ownership and use in more densely populated parts of the country. Following the FAA's issuance of the Part 107 rule and amendments, the FAA's 2020 forecasts determined that approximately 1.32 million UA distinctly identified as recreational aircraft were owned at the end of 2019, and estimated that ownership rates would continue to grow annually at approximately 6 percent per annum before plateauing at approximately 1.5 million UA as the pace of falling prices diminishes and early adopters of UA begin to experience limits in their experiments, or as eagerness plateaus. In addition to recreational UA operations, the FAA registration data shows that 385,000 commercial UA were registered by the end of 2019 and such operations are expected to increase under Part 107.

If the FAA does not approve an application to establish a FRIA, the vast majority of UA operations expected in that area would still be enabled through alternate methods. For example, UA operators have publicly stated that many models and types of UA can comply with the requirements of the Remote ID Rule via a software update or through the installation of an after-market broadcast module. Therefore, the FAA expects that the vast majority of the UA will comply with the Remote ID Rule to operate throughout the NAS in accordance with existing regulations and requirements, and will not need the regulatory relief through FRIAs. Alternatively, if their proposed FRIA location is not approved, operators of UA without remote identification would need to shift their operations to an approved FRIA location or cease operations altogether.

4.0 AFFECTED ENVIRONMENT and ENVIRONMENTAL CONSEQUENCES

This chapter presents nationwide information on existing environmental conditions and evaluates the potential environmental effects of the alternatives being considered. This PEA measures "effect" as a noticeable change caused by FRIA approvals at existing and new UA flying locations. The degree of change is estimated by measuring the difference between the baseline conditions and the effects that result from the designation of the FRIA. As stated in 40 CFR § 1508.1(g), effects include direct, indirect, and cumulative effects. The terms "effect" and "impact" are used interchangeably in this document.

Effects are changes to the human environment from the proposed action or alternatives that are reasonably foreseeable. 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.

Direct effects are caused by the action and occur at the same time and place. Indirect effects are defined as "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" (40 CFR § 1508.1(g)(2)).

Once an effect is identified, a determination is made whether an impact is significant. NEPA reviews require consideration of both the potentially affected environment and degree of the impact evaluated (40 CFR § 1501.3). Significance varies with the setting of the proposed action, and should consider the degree of effects across both time (short vs. long-term effects) and space (local vs. regional scale). Under CEQ regulations, the purpose of an EA is to determine whether a proposed action has potentially significant impacts, thus triggering preparation of a detailed EIS.

This chapter also describes conditions and procedures for tiered site-specific environmental review where needed. The FAA will evaluate issues specific to individual FRIA approvals that may have aspects beyond the scope of the environments and potential environmental effects reviewed in this PEA. That evaluation will utilize information from FRIA applicants to complete additional analysis that may include review of resources such as U.S. Fish and Wildlife Service (USFWS) official species lists, noise exposure calculations, and input from relevant agencies and experts.

4.1 Environmental Impact Categories

This section provides a description of the environmental resources that could 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 impact on these resources (40 CFR § 1502.15). The study area for each resource is the entire area within the proposed FRIA location boundaries where FRIA applications are anticipated by the FAA, as discussed in Chapter 3 in this PEA. Not all of these locations are currently known to the FAA. As required by FAA Order 1050.1F, this PEA presents an evaluation of impacts for the environmental impact categories listed below.

- Air Quality
- Biological Resources (Wildlife)
- Climate

- Department of Transportation Act, Section 4(f) Resources
- Noise and Compatible Land Use
- Visual Effects (including Light Emissions)

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

- Regulatory Setting
- Affected Environment
- Environmental Consequences

EAs are intended to be concise documents that focus on aspects of the human environment that may be affected by the proposed action. As stated in Chapter 3, the primary difference between what would occur under the proposed action and the no action alternative is that UA operating in a FRIA would be approved to operate without Remote ID broadcasting, while UA outside of a FRIA would be required to broadcast Remote ID information as specified under 14 CFR Part 89. Under the proposed action, the frequency of drone operations and the number of drones used in a proposed FRIA location would not be expected to increase as compared to the no action alternative. Given the nature of the proposed action and the size of the study area, the description of the affected environment is provided at a high level.

4.2 Resources Not Analyzed in Detail

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

- **Biological Resources (Fish and Plants)** – The proposed action does not involve development or disturbance of any land or aquatic habitat. Any overflight of these resources would not affect them. The terrestrial areas where remote pilots will stand while operating UA are already disturbed or landscaped. Any landing and recovery of a UA (either on purpose or accident) beyond the areas where remote pilots will be standing and operating their UA would have little, if any, impact on vegetation due to the relatively small size of the UA and the infrequency with which accidental or emergency landings would occur. Therefore, the proposed action would not affect aquatic and plant resources.
- **Coastal Resources** – 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 (CZMP). The designation of a FRIA is an air safety approval relating to Remote ID broadcasting, and the approval of a FRIA designation does not extend to ground operations that would occur under the proposed action or the no action alternative. Therefore, the proposed action would not affect coastal resources.
- **Farmlands** – The proposed action will not involve the development or disturbance of any land regardless of use, nor would it have the potential to convert any farmland to non-agricultural uses. Therefore, the proposed action would not affect farmlands.
- **Hazardous Materials, Solid Waste, and Pollution Prevention** – The proposed action will not result in any construction or development or any physical disturbances of the ground. Additionally, UA are typically made from recoverable materials that can be properly managed at the end of their operating lives. The FAA has found that proposed FRIA sites are typically not

located at Environmental Protection Agency (EPA) Superfund sites, and even if a FRIA were to be located at a Superfund site, there would be no ground disturbance and therefore no effects to any contaminated sites including Superfund sites. Therefore, the potential for impacts in relation to hazardous materials, solide waste, and pollution prevention is not anticipated.

- **Historical, Architectural, Archaeological, and Cultural Resources** – The proposed action does not involve development or disturbance of any land. The proposed action may result in minor, infrequent, and short-term visual and auditory effects at resources near proposed FRIA locations. However, most FRIA locations already exist as established flying locations and there will be little or no changes in operations as a result of a FRIA approval. The FAA has determined that the proposed action (or undertaking) does not have the potential to cause effects to historic properties, assuming historic properties were located near a proposed FRIA site. As noted above, the proposed action involves temporary, infrequent and short-term drone operations above FRIA locations where UA are currently authorized to operate. Accordingly, the proposed action would not have the potential to cause effects to historic or tribal cultural resources.

- **Land Use** – The proposed action will not involve any changes to existing, planned, or future land uses at proposed FRIA sites. Therefore, the FAA finds that there will be no effects to land use.

- **Natural Resources and Energy Supply –** The proposed action will not require the need for unusual natural resources and materials, or those in short supply. Most UA at a proposed FRIA location will be battery powered, and fuel-powered UA will not consume enough fuel to affect natural resources or energy supply. Therefore, the proposed action would not affect natural resources and energy supply.

- **Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks** – The proposed action will 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. Therefore, the proposed action would not result in socioeconomic impacts.

  The proposed action does not involve the development or disturbance of any land. The proposed action only designates that UA may fly at the location without Remote ID broadcasting. Most of these sites are already operating as UA flying locations and there will be little or no change in operations as a result of a FRIA approval. The proposed action would not result in effects that would be predominately or uniquely borne by a minority or low-income population. Therefore, the proposed action does not have the potential to result in impacts that disproportionately adversely affect a minority or low-income population.

  Executive Order (EO) 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, requires federal agencies to ensure that children do not suffer disproportionately from environmental or safety risks. The proposed action will not 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. Some FRIAs will be designated at educational sites, but the types of activities occurring at a flying location will not cause negative environmental health or safety risks to children whether the location receives a FRIA approval or not.

- **Water Resources (Wetlands, Floodplains, Surface Waters, Groundwater, and Wild and Scenic Rivers)** – The proposed action does not authorize or involve any ground-disturbing activities and would therefore not encroach upon areas designated as navigable waters, wetlands, or floodplains. Any overflight of these resources would not affect them. The proposed action would not 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 proposed action would not involve activities that would withdraw groundwater from underground aquifers or reduce infiltration or recharge to ground water resources through the introduction of new impervious surfaces. The proposed action does not have the potential to disrupt the free-flowing character of any designated wild and scenic rivers and Nationwide Rivers Inventory (NRI) segments. Therefore, the proposed action would not affect wetlands, floodplains, surface waters, groundwater, or wild and scenic rivers.

4.3 Air Quality

4.3.1 Regulatory Setting

National Ambient Air Quality Standards

Under the Clean Air Act, the EPA has established National Ambient Air Quality Standards (NAAQS) for pollutants of concern known as "criteria pollutants" (40 CFR Part 50). The criteria pollutants are carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than or equal to 10 microns aerodynamic diameter (PM_{10}), fine particulate matter less than or equal to 2.5 microns aerodynamic diameter ($PM_{2.5}$), and sulfur dioxide (SO_2). The NAAQS represent the maximum levels of air pollution that are considered acceptable, with an adequate margin of safety, to protect public health (Primary Standards) and welfare (Secondary Standards). Short-term standards (1-, 3-, 8-, and 24-hour averaging periods) are established for pollutants contributing to acute health effects, while long-term standards (quarterly and annual averages) are established for pollutants contributing to chronic health effects.

Areas that are and have historically been in compliance with the NAAQS are designated by EPA as attainment areas. Areas that violate a NAAQS are designated as nonattainment areas. Areas that have transitioned from nonattainment to attainment are designated as maintenance areas and are required to adhere to maintenance plans to ensure continued attainment.

Hazardous Air Pollutants

In addition to the ambient air quality standards for criteria pollutants, regulations exist for hazardous air pollutants (HAPs) emitted from stationary sources. The National Emission Standards for Hazardous Air Pollutants, established by EPA under the Clean Air Act, regulate 188 HAPs for stationary sources based on available control technologies (40 CFR Parts 61 and 63). The majority of HAPs are volatile organic compounds (VOCs).

HAPs emitted from mobile sources are called Mobile Source Air Toxics (MSATs). MSATs are compounds emitted from highway vehicles and non-road equipment which are known or suspected to cause cancer or other serious health and environmental effects. In 2001, the EPA issued its first MSAT Rule, which identified 21 compounds as being HAPs that required regulation.[14] A subset of six of these MSAT compounds were identified as having the greatest influence on health and included benzene, 1,3-

[14] Environmental Protection Agency. 66 FR 5009, January 18, 2001. Available: https://www.govinfo.gov/content/pkg/FR-2001-01-18/pdf/01-2.pdf. Accessed: February 3, 2023.

butadiene, formaldehyde, acrolein, acetaldehyde, and diesel particulate matter. The EPA issued a second MSAT Rule in February 2007, which generally supported the findings in the first rule and provided additional recommendations of compounds having the greatest impact on health.[15] The rule also identified several engine emission certification standards that must be implemented.

General Conformity

The EPA General Conformity Rule (40 CFR 93 Subpart B) ensures that the actions taken by federal agencies in nonattainment and maintenance areas conform to a state's plan to meet the NAAQS. The General Conformity Rule applies to federal actions occurring in nonattainment or maintenance areas. It provides that a federal agency cannot issue a permit for or support an activity unless the agency determines that the action will conform to the most recent EPA-approved State Implementation Plan. This means that projects using federal funds or requiring federal approval must not:

1. Cause or contribute to any new violation of a NAAQS;

2. Increase the frequency or severity of any existing violation; or

3. Delay the timely attainment of any standard, interim emission reduction, or other milestone.

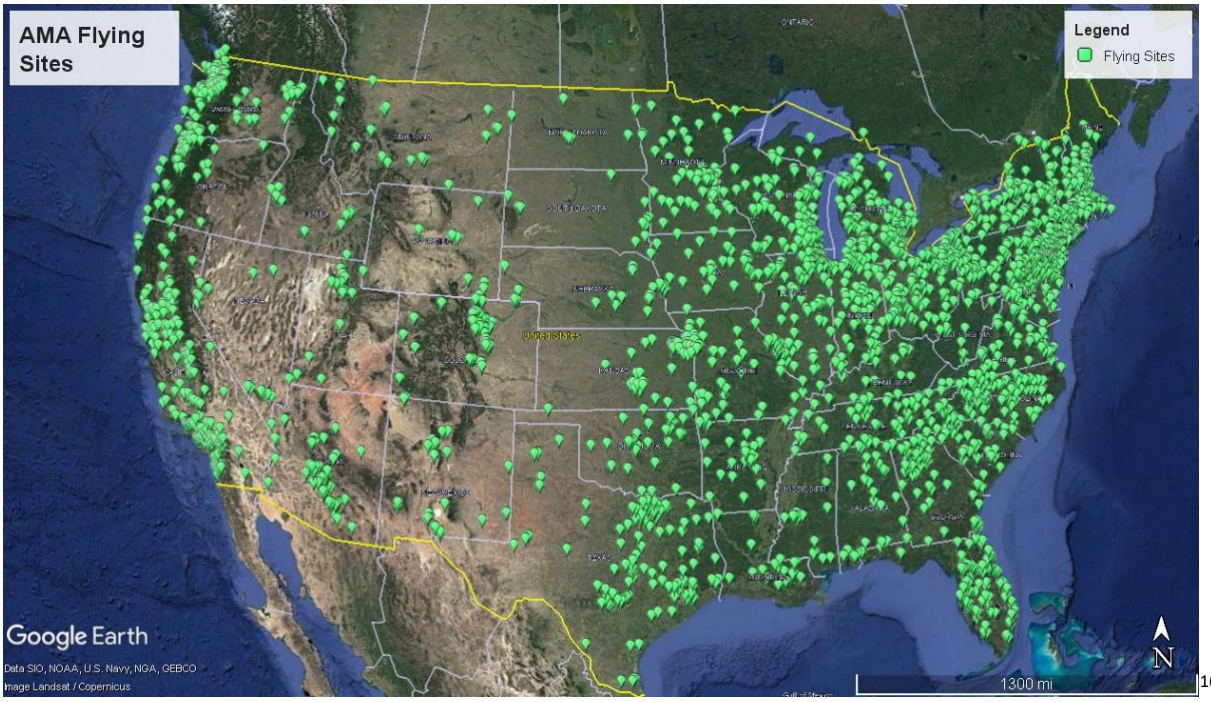
A conformity applicability analysis is the first step of a conformity evaluation and assesses if a federal action must be supported by a conformity determination. This is typically done by quantifying applicable direct and indirect emissions that are proposed to result from a federal action. Direct emissions are those that are caused by or initiated by the federal action and occur at the same time and place as the action. Indirect emissions are those caused by the federal action, but occur later in time and/or removed in distance from the action. The emissions change due to the project (the net emissions) is compared to the *de minimis* threshold specified in the General Conformity Rule for each pollutant. If the results of the applicability analysis indicate that the net emissions would not exceed the *de minimis* emission thresholds applicable to the Proposed Action, then the conformity evaluation process is completed. If emissions of one or more applicable pollutants exceed a *de minimis* threshold, then the project must demonstrate conformity under one of the methods prescribed by the General Conformity Rule.

4.3.2 Affected Environment

Because of the wide dispersal of established and future flying locations that may be affected by FRIA approvals, and the complexity of resources potentially affected, it is not possible to provide a detailed comprehensive description of locally affected environments in this PEA. Instead, this chapter characterizes resources in general terms.

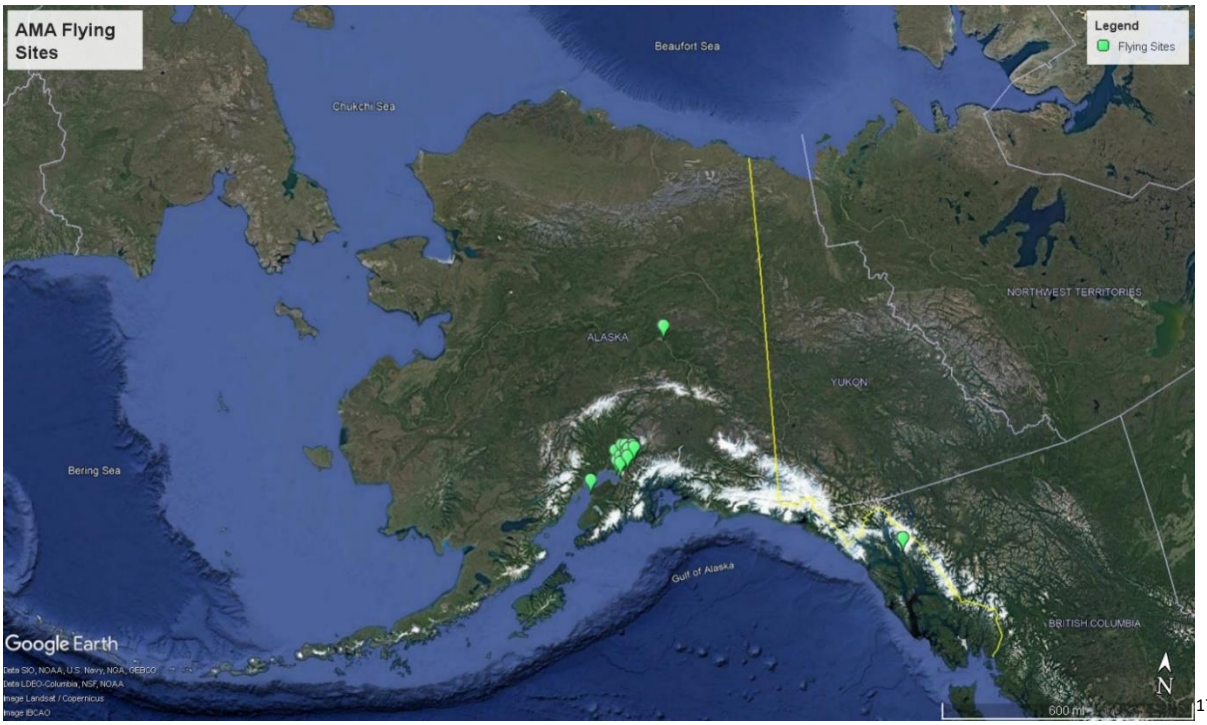
As shown in Figures 1 through 6, existing CBO and educational flying locations can be found in all 50 states. These sites have small footprints where the UA must be kept within line of sight. Even in the most densely concentrated regions of flying locations, such as the Northeastern U.S., a person would not be likely to encounter a flying location unless they are actively seeking to do so.

[15] Environmental Protection Agency. 66 FR 8428, February 26, 2007. Available: https://www.govinfo.gov/content/pkg/FR-2007-02-26/pdf/E7-2667.pdf. Accessed: February 3, 2023.



[16]

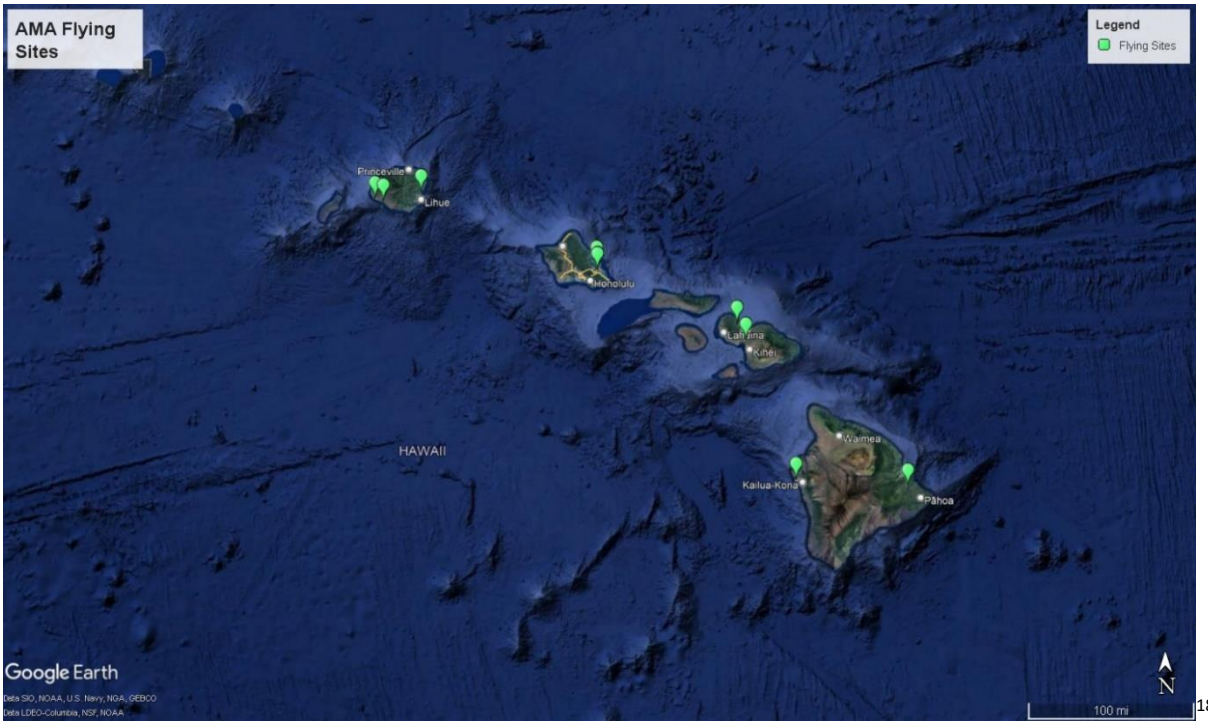
Figure 5 *Distribution of AMA Club Locations in the Continental U.S.*



[17]

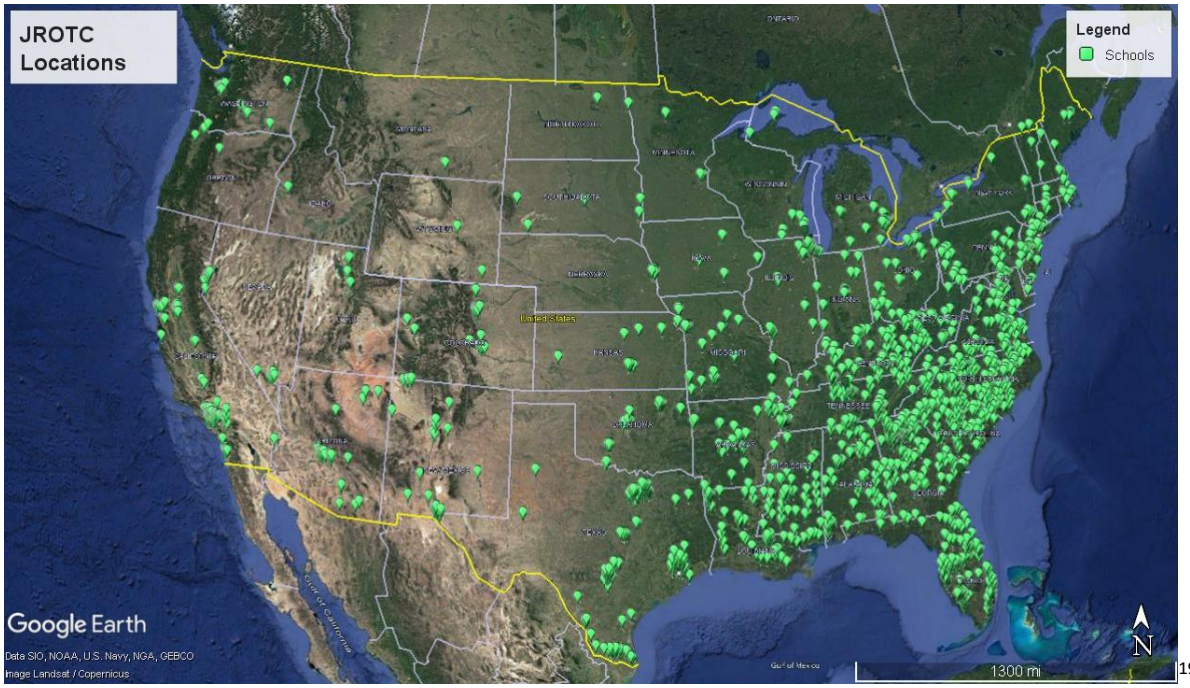
Figure 6 *Distribution of AMA Club Locations in Alaska*

[16] Image: Google Earth, as modified by the FAA.
[17] Image: Google Earth, as modified by the FAA.



[18]

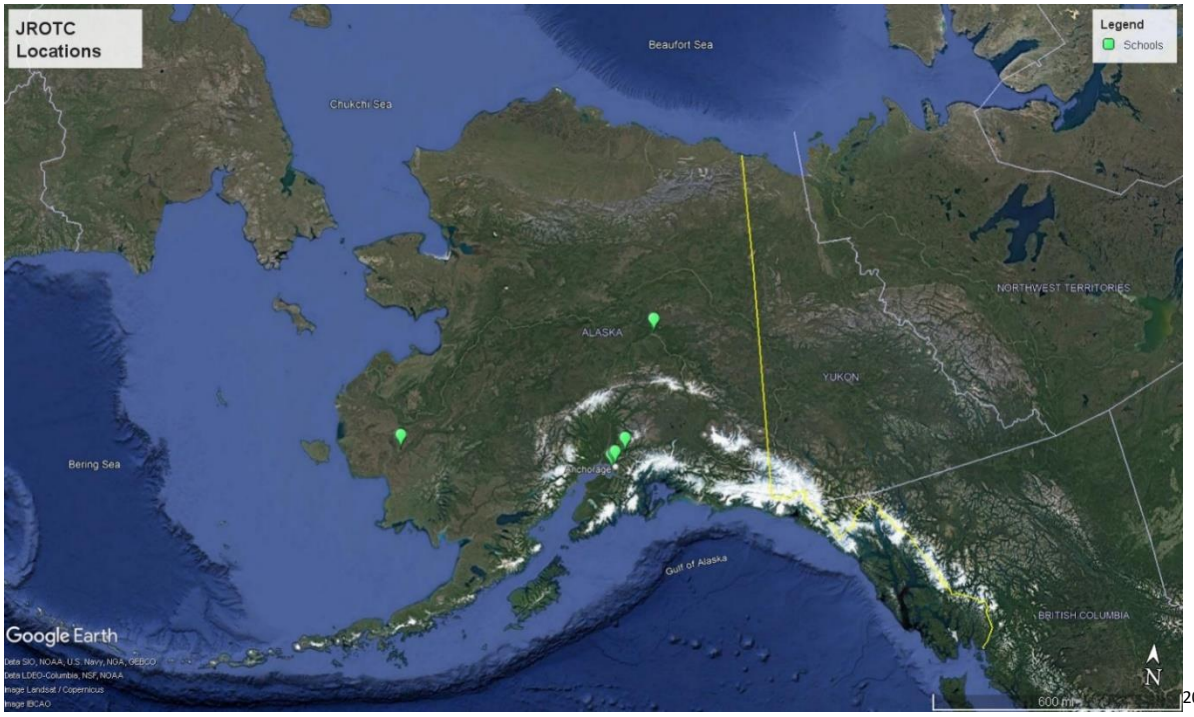
Figure 7 *Distribution of AMA Club Locations in Hawaii*



[19]

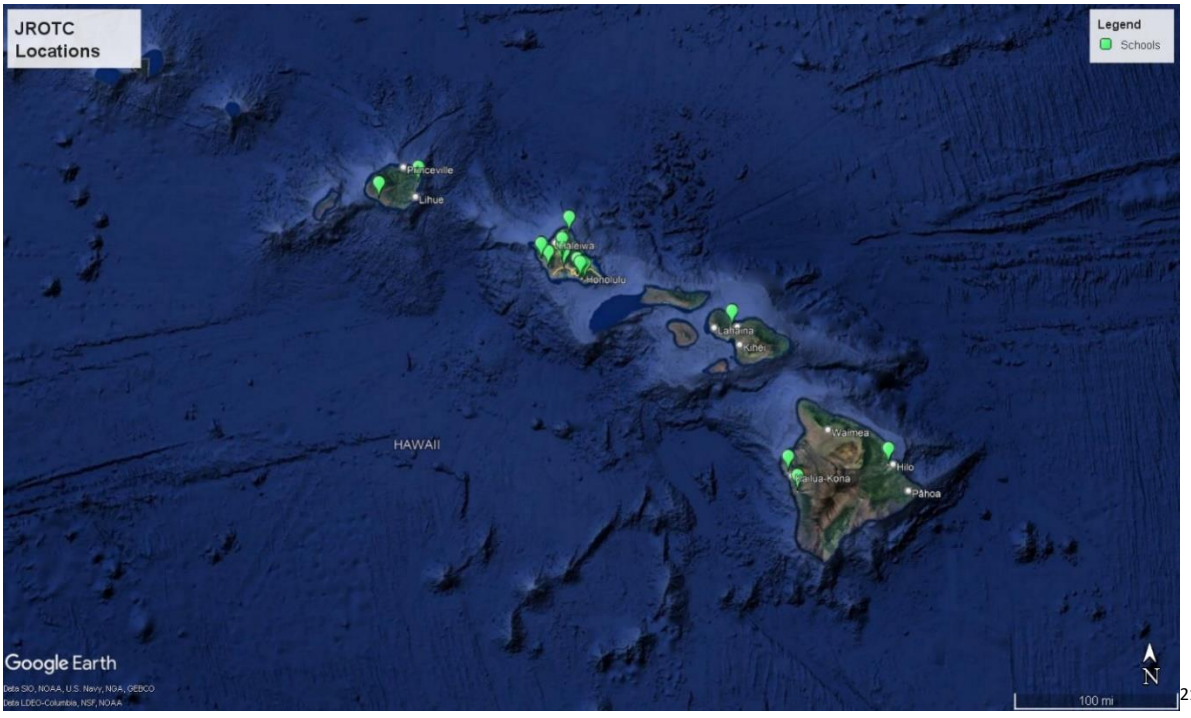
Figure 8 *Distribution of JROTC School Locations in the Continental U.S.*

[18] Image: Google Earth, as modified by the FAA.
[19] Image: Google Earth, as modified by the FAA.



[20]

Figure 9 *Distribution of JROTC School Locations in Alaska*



[21]

Figure 10 *Distribution of JROTC School Locations in Hawaii*

[20] Image: Google Earth, as modified by the FAA.
[21] Image: Google Earth, as modified by the FAA.

The affected environment at flying locations seeking a FRIA approval typically will include landscaped grassy areas, paved areas, gravel, forest edges, recreational parks, airports, and agricultural areas, typically in suburban or rural settings. Existing air emissions may come from fuel-powered UA operating at the flying location, as well as surrounding manmade sources. While many FRIA locations would be located in non-attainment or maintenance areas, the FAA anticipates that a majority of FRIA locations would not be located in nonattainment or maintenance areas based on the geographic dispersal of UA flying locations around the U.S.[22]

4.3.3 Environmental Consequences

An evaluation of air emissions impacts involves a comparison of current and future proposed air emissions at UA flying locations, and a determination of the extent to which the alternatives may cause an increase in air emissions if a FRIA designation is approved. There is the potential for an air emissions impact to occur when an activity directly or indirectly results in regulated air emissions.

Proposed Action Alternative

Under the proposed action, the FAA anticipates that there would be no change in baseline conditions due to the generally enabled activities permitted by 49 U.S.C. 44809 and 14 CFR parts 107. As described in the Air Emissions Technical Report (Appendix A), air emissions from UA operations at FRIA locations would not cause significant impacts to air quality because it is not possible for UA operations to contribute to an exceedance of any regulatory standard.

The air emissions analysis was conducted based on a representative set of recreational UA and applying EPA emissions factors for similar engine types, assuming conservative (e.g. longer duration) flight times for the UA. Annual emissions from each UA were compared to worst case EPA *de minimis* thresholds for each criteria pollutant at both new and existing flying locations. The analysis is based on direct emissions associated with UA operations.

For the analysis, the potential of exceeding the NAAQS was determined by estimating potential UA engine emissions using conservative assumptions and comparing them to worst-case EPA *de minimis* thresholds for significance. The analysis evaluated various commonly-used engine types and estimated the number of hours of operation it would take to exceed the worst-case *de minimis* thresholds. In lieu of specific aircraft model engine emission factors, the EPA Motor Vehicle Emission Simulator (MOVES) non-road model was used to assign similar engine types within its database to the various common UA engine types to generate emissions factors for NAAQS criteria pollutants, assuming gasoline usage for fuel. The hours of operation per year needed for a worst-case hypothetical engine to exceed *de minimis* thresholds was determined. The worst-case *de minimis* thresholds (the lowest de minimis thresholds by pollutant based on attainment designation), represent emission quantities of a NAAQS-regulated pollutant, or its applicable precursors, over which the Proposed Action in a EPA designated nonattainment or maintenance area may cause or contribute to a new or continued violation of the NAAQS. Annual emissions below the *de minimis* are considered not significant and are presumed to not exceed the NAAQS.

The results of the analysis show that exceeding the *de minimis* thresholds for nearly all pollutants, assuming worst-case engine ratings and emission factors, would require total annual engine operating hours greater than the 8,760 total hours in a year for all pollutants except the maximum engine horsepower (HP) case for VOCs. Even for the maximum HP engine case for VOCs, the estimated hours to

[22] Map of counties designated “nonattainment”. Available: https://www3.epa.gov/airquality/greenbook/mapnpoll.html. Accessed: February 3, 2023.

exceed the worst-case VOC threshold are 8,208 hours per year, which is highly unlikely to occur in real world circumstances.

For FRIAs approved at an existing flying location, the FAA anticipates that there would be no change in existing conditions due to the generally enabled activities permitted by 14 CFR Part 107 and the location-specific limitations on UA operations and UA operators in Part 89. Furthermore, it is expected that most recreational operators of UA would bring their non-compliant aircraft into compliance either by the Remote ID deadline or sometime after. Potential decreases in flight activity, assuming non-compliant operators cease flying, following the September 2023 compliance deadline would be temporary and negligible. As such, the Proposed Action would not result in substantive changes to activity levels and their associated pollutant emissions at existing flying locations. Emissions from operations at FRIAs established at existing locations would not cause significant impacts to air quality, and it is improbable for UA operations to contribute to an exceedance of any regulatory standard.

For FRIAs designated at newly established flying locations, the FAA anticipates a de minimis change in existing conditions due to the presence of generally enabled activities permitted by 14 CFR Part 107 and the minor changes expected in UA operators' behavior due to location-specific limitations on UA operations and UA operators in Part 89. A temporary concentration of activity may occur at new locations that previously did not experience multiple operators within a confined area; however, the cumulative nature of these operations would still not trigger anything other than a negligible change to pollutant emissions. As such, the Proposed Action would not result in substantive changes to activity levels and their associated pollutant emissions at new flying locations. Emissions from operations at FRIAs at newly established flying locations would not cause significant impacts to air quality.

Additionally, the FAA anticipates that transportation emissions from UA operators' traveling to/from FRIA locations would not generate significant impacts because, due to the temporary presence of these vehicles in the area, their emissions would not accrue to levels that would result in significant impacts to air quality and the environment.

In summary, since the emissions individually and collectively are below the worst-case *de minimis* thresholds, it can be concluded that the operation of UA would "not cause a significant air quality impact, since it is unlikely the pollutant emissions analyzed would exceed a NAAQS." This conclusion applies to both existing and new flying locations, and at existing and reasonably foreseeable activity levels. Therefore, there would be no significant impact to air quality.

No Action Alternative

Under the no action alternative, UA activities at CBO and educational institution flying locations would still occur. If the FAA does not approve an application to establish a FRIA, the vast majority of UA operations expected in that area would still be enabled. As described in Chapter 3, UA operators would be permitted to operate their aircraft under 14 CFR Part 107 and 49 U.S.C. 44809 at flying locations without obtaining FAA certification or operating authority; the main difference is that the UA would need to comply with Remote ID requirements. At both existing and new locations seeking a FRIA approval, there will be minimal or no change in air emissions as a result of the no action alternative; therefore, no new impacts will occur.

4.4 Biological Resources (Wildlife)

4.4.1 Regulatory Setting

Biological resources include 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.

Special Status Species

The Endangered Species Act of 1973 [16 U.S.C. § 1531 et seq.] requires the evaluation of all federal actions to determine whether a proposed 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 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 the proposed action would be likely to jeopardize the continued existence of a federally-listed threatened or endangered species, or would be likely to result in the destruction or adverse modification of federally-designated critical habitat. An action need not involve a threat of extinction to federally listed species to meet the NEPA standard of significance. Lesser impacts including impacts on non-listed or special status species could also constitute a significant impact.

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 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").

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 § 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]

4.4.2 Affected Environment

The distribution and abundance of terrestrial vegetation and wildlife species are heavily influenced by available habitat. Available habitats vary significantly across the United States and its territories even within short distances. Vegetation and wildlife resources vary widely depending on location. These resources include native and non-native plant species (vegetation) and native and non-native or migratory animal species (wildlife) and their habitats. Common, broadly classified ecosystems include deserts, grasslands, scrub, woodlands and forests, aquatic zones, wetlands, and riparian areas. Examples of broad, naturally occurring ecosystems include old growth coniferous forests in the Pacific Northwest, long-leaf pine forests of the lower eastern seaboard, and undisturbed areas within the southwestern deserts.

Because terrestrial and aquatic vegetation and wildlife vary widely depending on location, they are discussed in general terms in this PEA. Flying locations that may seek FRIA approvals are located across the United States, and providing baseline information for all vegetation and wildlife resources that could be affected by specific project sites is beyond the scope of this PEA. Existing biological resources at flying locations seeking FRIA approval are representative of biological resources across the U.S., with established flying locations throughout the country, and occupying a number of different ecoregions.[24] Species of birds, mammals, reptiles, amphibians, fish, and microorganisms – and their supporting habitat – present on project sites will vary considerably from site to site. Additionally, some wildlife species are present year-round on sites whereas others are present only temporarily (e.g., migration route or nesting).

Biological resource habitats at FRIA locations vary widely from developed suburban areas with little or no natural habitat to rural areas with more undisturbed natural habitats in the immediate vicinity. The range of habitats can support a wide variety of wildlife, including amphibians, reptiles, birds, insects, and mammals. Examples of typical wildlife that may be found at flying locations include a variety of rodents (e.g., mice, squirrels, rats, beavers, voles), doves, crows, sparrows, raptors, waterfowl, bear, deer, bobcat, coyotes, turtles, frogs, lizards, snakes, butterflies, and beetles.

Habitats over which the UA would directly fly are typically already developed with existing infrastructure where habitat would range from little to no natural habitat (e.g., paved surfaces) to regularly maintained herbaceous and low shrub habitat (e.g., mowed grassy areas). These areas would likely have less wildlife diversity due to the limited habitat types compared to the areas surrounding the flying locations, which could be more diverse in habitat and wildlife. Despite the variety of habitats and wildlife at flying locations, the primary wildlife that UA affect are anticipated to be avian species, primarily birds, due to the potential direct interactions with these species while in flight.

Flying locations are typically located on private property in more rural and agricultural settings. Site boundaries are typically determined by line-of-sight limitations but also include environmental aspects, such as unprotected property or roadways. CBO flying locations (both new and existing) are also typically in more rural and agricultural settings, on private property, and away from neighborhoods and

[23] U.S. Fish and Wildlife Service. 2007. National Bald Eagle Management guidelines. Available: https://fws.gov/migratorybirds/pdf/management/nationalbaldeaglenanagementguidelines.pdf. Accessed: February 4, 2022.

[24] Ecoregions are areas where ecosystems (and the type, quality, and quantity of environmental resources) are generally similar. Available: https://www.epa.gov/eco-research/ecoregions. Accessed: January 5, 2023.

other populated areas. Most of these flying locations are AMA clubs with existing UA operations. Educational institution flying locations (both new and existing) are typically on landscaped grounds or pavement, and typically in more rural and suburban settings. These sites are typically used by STEM classes during school hours and after school hours. Some flying locations may be established at local airports and public parks. Figures 7 through 10 are representative of the existing environment in typical flying locations that may request a FRIA approval.


[25]

Figure 11 *Typical Environment in CBO Flying Location*


[26]

Figure 12 *Typical Environment in CBO Flying Location*

[25] Image: Academy of Model Aeronautics.
[26] Image: Academy of Model Aeronautics.

 [27]

Figure 13 *Typical Environment in CBO Flying Location*

 [28]

Figure 14 *Typical Environment in Educational Institution Flying Location*

[27] Image: Academy of Model Aeronautics.
[28] Image: Academy of Model Aeronautics.

Special Status Species

Special status species are those species for which state or federal agencies provide an additional level of protection by law, regulation, or policy. Included in this category are federally listed species that are protected under the ESA, species considered as candidates for such listing, bald and golden eagles (protected by the Bald and Golden Eagle Protection Act), and those species that are state-listed as threatened, endangered, or of special concern, or otherwise protected by federal or state laws. Special status species are broadly distributed throughout the United States. Special status avian species (birds, bats, flying insects) would likely be at greatest risk from UA operations. Examples of federally listed threatened and endangered avian species include the Red-cockaded Woodpecker, Piping Plover, Bachman's Warbler, Gray Bat, and Miami Blue Butterfly. As shown in Table 1-1, the current USFWS list of threatened and endangered species includes 1,481 animal species and 939 plant species in the United States.

Table 1-1 ESA Protected Species List (as of October 14, 2022)[29]

Threatened and Endangered Animals	
Species Group	**Number**
Amphibians	48
Arachnids	16
Birds	345
Clams	126
Corals	24
Crustaceans	30
Fishes	211
Insects	99
Mammals	383
Reptiles	145
Snails	54
Grand Total	**1,481**

Threatened and Endangered Plants	
Group	**Number**
Conifers and Cycads	4
Ferns and Allies	37
Flowering Plants	896
Lichens	2
Grand Total	**939**

ESA candidate species are plants and animals for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

The MBTA protects 1,093 migratory birds across the United States from capture, pursuit, hunting, or removal from natural habitat.[30] Migratory bird species include those that nest in the United States and Canada during the summer and then migrate to and from the tropical regions of Mexico, Central and South America, and the Caribbean for the non-breeding season. A variety of birds protected under the MBTA could occur in or around flying locations where UA are flown.

The USFWS also identifies birds of conservation concern (BCC), which are migratory and non-migratory bird species not already listed under the ESA that represent the highest avian conservation priorities. The BCC list is based on an assessment of several factors, including population abundance trends,

[29] USFWS Environmental Conservation Online System (ECOS): Available: https://ecos.fws.gov/ecp/. Accessed: October 14, 2022.
[30] U.S. Fish and Wildlife Service. *85 FR 21282*, April 16, 2020. Available: https://www.govinfo.gov/content/pkg/FR-2020-04-16/pdf/2020-06779.pdf. Accessed: February 6, 2023.

threats on breeding and nonbreeding grounds and size of breeding and nonbreeding ranges. A total of 134 individual bird species on the Continental United States were listed in the BCC 2021 report; just over half of these species are land birds.[31] Examples of BCC include the Mountain Plover, Red Knot, Reddish Egret, Eastern Whip-poor Will, and Snowy Owl.

The USFWS estimates that there are a minimum of 10 billion migratory birds that breed in North America, with fall populations on the order of 20 billion.[32] Alaska supports the greatest number of birds followed by Texas. Not surprisingly, states with larger land areas support a greater number of birds than smaller states. Of the just over 700 species of breeding birds known to occur in the United States, more than 400 species (over 50 percent) are passerines (also called perching birds or songbirds) and are considered migratory. These species include long-distance migrants that migrate between South and North America, for example, as well as local migrants that migrate within the boundaries of the United States. Because passerines are more likely to be found on land, the types of birds occurring at or near flying locations are predominantly passerine species.

The migratory habits of birds are highly variable among and within individual species but can be classified into several general categories.[33] Short distance migrants include those species that may wander locally, winter near a small portion of the breeding range, or move to different elevations, for example. Medium distance migrants may move distances of one to several states. Birds may move only as far as is needed to take advantage of local food and shelter resources. These are considered partial migrants and represent the most common types of migration patterns. Most of the North American birds, including shorebirds, some hawks, and passerines (e.g., thrushes, orioles, warblers, hummingbirds, and tanagers) are in this category. Long distance migrants, or complete migrants, include those species that breed in North America and completely leave their breeding range to spend the winter in more southern latitudes. Some long distance migrants have been known to migrate great distances; for example, the Red Knot, which breeds in the Canadian Arctic and winters in Tierra del Fuego in southern South America approximately 9,300 miles away. Another form of migration is called irruptive migration, where the patterns are not seasonally or geographically dependent but, instead, are highly dependent upon availability of food resources. Just as the distance of migration is highly variable, the routes taken can also be specific to species, subspecies and populations. Four general major flyways (Atlantic, Mississippi, Central and Pacific) have been recognized. This terminology, however, oversimplifies most avian migratory patterns. General routes of migration typically conform closely to major topographical features such as large river systems or mountain chains.

Generally, migration follows a north-south orientation, although there can be an east-west component such that elliptically shaped round-trip patterns can occur. Some species may migrate along a narrow band, particularly those species that are habitat-limited, such as shorebirds which may consistently use the same stopover points each year. For example, the Delaware Bay is renowned for its importance to hungry north-bound shorebirds that stop there to feed on horseshoe crab eggs. For many species of songbirds, migration is along a broad front where the width may be species-specific. Other avian species have converging routes where the path of migration can become constricted to align with land masses. The peninsula of New Jersey functions this way to funnel many individuals of many species together.

[31] U.S. Fish and Wildlife Service. Birds of Conservation Concern 2021. Table 4. Available: https://www.fws.gov/sites/default/files/documents/birds-of-conservation-concern-2021.pdf. Accessed: February 6, 2023.
[32] U.S. Fish and Wildlife Service. Migratory Bird Mortality: Many Human-Caused Threats Afflict our Bird Populations (2002). Available: https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1363&context=usfwspubs. Accessed: February 6, 2023.
[33] Kerlinger P. *How Birds Migrate*. Mechanicsburg, PA Stackpole Books. 228 pp.

Banding and modern radar studies provide much of the data used in understanding migration patterns, including location, abundance, and timing.

Geographically relevant staging (stopover) areas provide important foraging opportunities and shelter where migratory birds can rest and add fat reserves prior to continuing on their migration route. For example, many undeveloped areas along the Gulf coast are important stopover locations for the high numbers of north-bound songbirds that land there after crossing the Gulf of Mexico in the spring. They provide high quality and ecologically important habitat necessary for bird survival during migration, breeding, and wintering seasons. The locations of these areas are well known by state wildlife agencies and USFWS.

Bald Eagles occur throughout the United States, and Golden Eagles can occur throughout the United States but are more common in the western half of the country. Golden Eagles are typically found in open country in the vicinity of hills, cliffs, and bluffs; they are known to be sensitive to human activity and are known to avoid developed areas.[34]

4.4.3 Environmental Consequences

An evaluation of impacts to biological resources involves a comparison of current and future proposed conditions and a projection of the extent to which the alternatives might alter the current flora and fauna, migratory birds, threatened and endangered species, and designated critical habitat.

A significant impact on biological resources would occur if the USFWS or NMFS determines that the action would likely jeopardize the continued existence of a federally listed threatened or endangered species, or would result in the destruction or adverse modification of federally designated critical habitat. The FAA has not established a significance threshold for unlisted species. Factors to consider when assessing the significance of potential impacts on unlisted species include whether the action would have the potential for:

- A long-term or permanent loss of unlisted plant or wildlife species (e.g., extirpation of the species from a large project area, such as from a new commercial service airport)
- Adverse impacts on special status species or their habitats
- Substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or their populations
- 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 for population maintenance

Proposed Action Alternative

The primary impacts related to FRIA approvals would include noise and visual effects, and potential collisions with wildlife. The presence of UA and humans can disturb nearby wildlife through visual and noise effects, resulting in potential displacement and altered behavioral responses. Displacement can affect normal foraging, migratory, and breeding behaviors, and could also reduce survival and productivity because animals might need to expend more energy to locate replacement habitat, which may have fewer resources and be of lower value. In addition, wildlife that is less familiar with new

[34] U.S. Fish and Wildlife Service. Golden Eagle. Available: https://www.fws.gov/species/golden-eagle-aquila-chrysaetos. Accessed: February 6, 2023.

habitat areas might be more susceptible to predation, which could limit survival of offspring or adults. Increased noise levels could result in fright responses (e.g., flushing or escaping) or increased communications, such as louder or more extended periods of birdsong or begging vocalizations from young birds. Significant noise occurrences could cause birds to abandon their nests with the subsequent demise of young.

Wildlife responses would vary depending on the species, the types of UA present, the UA's proximity to wildlife and flight patterns, and weather. UA and human presence would likely cause the greatest visual and noise effects at FRIA locations and immediate surroundings. However, one study found that in most instances, small UA within four meters of birds did not cause a behavioral response.[35] Based on the FAA's understanding of the current use of flying locations, noise disruptions are short-term and temporary as these events are infrequent and short in duration. UA would not linger in a particular location for long periods of time and would move past wildlife quickly. In addition, UA are already authorized to operate at flying locations that may seek a FRIA approval, and there will be no change in the affected environment (i.e. environmental baseline) as a result of a FRIA approval. Given the infrequent and short duration that visual and noise disturbances would have at any given location, and that no permanent displacement would occur, impacts to wildlife under the proposed action alternative are not anticipated to have significant impacts.

Wildlife collisions can occur from the use of UA, which can result in injury or death of wildlife. Collisions between birds and aircraft are well documented and is an issue that airport and air transportation agencies take very seriously (due to flight safety issues); however, these collisions are estimated to account for a small percentage of all bird deaths per year, and there are very few documented collisions between UA and birds.[36] [37] As such, collisions from UA are not anticipated to have significant impacts on birds. If a UA collides with a flying insect, it would, in most cases, result in death of the insect. However, most insects produce high numbers of offspring multiple times during the year. Therefore, the small number of insect strikes that may occur is not likely to result in any significant impacts on flying insect species. Of all the types of aircraft in the NAS, UA are the least likely to pose a collision risk to avian species due to their much smaller size and slower speeds compared to helicopters and fixed-wing aircraft. As stated previously, operations at flying locations nearly always occur during daytime hours, and therefore, crepuscular and nocturnal wildlife (e.g., bats) are not anticipated to be affected by collisions.

Therefore, because there is no change in the environmental baseline at existing flying sites, potential impacts from FRIA approvals on wildlife would not be significant. At new flying sites requesting a FRIA approval, the FAA will conduct further site-specific analysis to determine whether any wildlife or critical habitat could be affected.

Special Status Species

Impacts on threatened and endangered species were classified using the following terminology, as defined under the ESA:

[35] Vas, E., A. Lescroel, O. Duriez, G. Boguszewski, and D. Gremillet. 2015. Approaching Birds with Drones: First Experiments and Ethical Guidelines. Biology Letters (The Royal Society). Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4360097/. Accessed: August 25, 2022.
[36] FAA. 2022. FAA Wildlife Strike Database. Available: https://wildlife.faa.gov/home. Accessed: August 25, 2022.
[37] USFWS. Threats to Birds: Collisions-Aircraft. Available: https://www.fws.gov/story/threats-birds-collisions-aircraft. Accessed: August 25, 2022.

- **No effect** – would be determined if a proposed action would not affect a listed species or designated critical habitat.
- **May affect/not likely to adversely affect** – would be determined if impacts on listed species are discountable (i.e., extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated) or completely beneficial.
- **May affect/likely to adversely affect** – would be determined when an adverse effect on a listed species occurs as a direct or indirect result of proposed actions and the effect is neither discountable nor completely beneficial.
- **Likely to jeopardize proposed species/adversely modify critical habitat** – would be determined if the USFWS identified situations in which actions could jeopardize the continued existence of a listed species or adversely modify habitat critical to a species within or outside of the project area.

Impact types and mechanisms on threatened and endangered species would be the same as those described above for wildlife, except threatened and endangered species may be more sensitive or vulnerable to impacts. However, it is anticipated that potential visual, noise, and collision impacts would not be significant or result in population-level effects for the same reasons described above.

At both existing and new FRIA locations, impacts to threatened and endangered species and critical habitat would be expected to stay the same once a FRIA is approved, as there would be no real change in the environmental baseline. Therefore, the FAA has determined that FRIA approvals would have *no effect* on threatened and endangered species.

In addition, UA operators at CBO and educational institution locations would be expected to be aware of any known sensitive wildlife and habitat within the area, and avoid such locations at times when it could disturb protected species. UA operators at FRIA locations would be required to comply with all federal, state, and local permitting requirements for the protection of special status species (e.g., Bald and Golden Eagle Protection Act).

During the FRIA application approval process, if the FAA determines that the establishment of a FRIA is likely to jeopardize the continued existence of proposed threatened and endangered species or result in destruction or adverse modification of proposed critical habitats, the FAA would coordinate with the appropriate USFWS office, and a tiered environmental assessment (EA) could be required if effects to threatened and endangered species may occur, of if the destruction or adverse modification of habitat cannot be avoided. Resource avoidance for specific FRIA approvals may occur for resources such as critical habitat for threatened or endangered species, special habitat management units, sensitive species areas, and important breeding, roosting or foraging areas. Buffer distances are typically established through consultation with the regulatory agency to avoid an 'incidental take' by disturbance or harassment of protected species, such as those protected under ESA and the Bald and Golden Eagle Protection Act.

Federally listed endangered and threatened species, state-listed species, and migratory birds may occur at FRIA sites. However, since the baseline affected environment includes existing UA operations, there will be little, if any, change to analyze for the affected environment. Additionally, there will be no changes to terrestrial or aquatic environments. UA operations at these flying locations will be within a relatively small limited operating area and are not expected to impact critical lifecycles of wildlife species or their ability to survive.

The FAA's analysis finds that the proposed action is 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., 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.

No Action Alternative

Under the no action alternative, no new impacts will occur to vegetation/flora, wildlife/fauna and rare, threatened and/or endangered species. The no action alternative will not result in any construction-related habitat disturbances. The no action alternative assumes that a FRIA would not be approved, but that UA operators may still fly at the proposed site using Remote ID broadcast technology. If a FRIA application is rejected, no new effects to threatened and endangered species would occur. Consequently, there will be no new impacts to biological resources as a result of the no action alternative.

4.5 Climate

4.5.1 Regulatory Setting

FAA Order 1050.1F requires consideration of potential climate impacts. The FAA has not established a significance threshold for climate effects, and has not identified any factors to consider in making a significance determination for greenhouse gas (GHG) emissions.

4.5.2 Affected Environment

The affected environment for GHG emissions is the global climate because the incremental contribution to global GHGs from each instance when the FAA approves a proposed action cannot be accurately translated into the potential effect it might have on global climate change or the local or regional effects resulting from that incremental contribution. Furthermore, the FAA does not expect the direct or indirect effects from the proposed action to contribute to the temperature and weather effects of global climate change as compared to the overall effect of the aviation sector on global climate change.

4.5.3 Environmental Consequences

The FAA's Air Quality Assessment for FRIAs (Appendix A) calculated annual emissions from each UA, including CO2 emissions. The analysis is based on direct emissions associated with UA operations. Indirect emissions associated with automobile trips were not included; however, emissions associated with these trips are not expected to significantly affect the results and conclusions in the analysis.

Currently, electric engines are the primary type of propulsion used at UA flying locations, and that is expected to remain true for locations seeking a FRIA establishment. UAs with gas or turbine engines, which emit small quantities of GHGs, may also operate within FRIAs; however, the existence and

operation of such UA are not expected to be substantial. UA with combustion engines are likely to occur at lower activity levels than electric-powered UA as they tend to be less common.

Proposed Action Alternative

The Air Quality Assessment for FRIAs shows that the emissions would be extremely small in the context of regional, national, and global emissions. The proposed action alternative would not result in substantive changes to activity levels and their associated GHG emissions at new and existing flying locations. Therefore, GHG emissions from UA operations at new and existing FRIA locations would not cause significant impacts to climate.

No Action Alternative

The no action alternative would not result in substantive changes to activity levels and their associated GHG emissions at new and existing flying locations. The no action alternative assumes that a FRIA would not be approved, but that UA operators may still fly at the location using Remote ID broadcast technology. If a FRIA application is rejected, no new substantial GHG emissions are expected to occur. Consequently, there will be no new impacts to climate as a result of the no action alternative.

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

4.6.1 Regulatory Setting

Section 4(f) of the U.S. Department of Transportation (DOT) Act of 1966 (now codified at 49 U.S.C. § 303) protects significant publicly owned and accessible parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites. Section 4(f) provides that the Secretary of Transportation may approve a transportation program or project requiring the *use* of publicly owned land of a public park, recreation area, or wildlife or waterfowl refuge of national, state, or local significance, or land of an historic site of national, state, or local significance, only if there is no feasible and prudent alternative to using that land and the program or project includes all possible planning to minimize harm resulting from the *use*.

A Section 4(f) *use* would occur if the proposed action would involve a physical *use* of Section 4(f) property through purchase of land or a permanent easement, physical occupation of a portion or all of the property, or alteration of structures or facilities on the property. Another type of physical *use,* known as *temporary occupancy,* results when a transportation project results in activities that require a temporary easement, right-of-entry, project construction, or another short-term arrangement involving a Section 4(f) property. A *temporary occupancy* is considered a Section 4(f) *use* unless all the conditions listed in Appendix B, Paragraph 2.2.1 of FAA Order 1050.1F and the Section 4(f) regulations at 23 CFR 773.13(d) are satisfied:

- Duration must be temporary, i.e., less than or equal to the time needed for construction of the project, and there should be no change in ownership of the land;
- Scope of the work must be minor, i.e., both the nature and the magnitude of the changes to the Section 4(f) property are minimal;
- There are no anticipated permanent adverse physical impacts, nor will there be interference with the protected activities, features, or attributes of the property, on either a temporary or permanent basis;

- The land being used must be fully restored, i.e., the property must be returned to a condition which is at least as good as that which existed prior to the project; and
- There must be documented agreement of the official(s) with jurisdiction over the Section 4(f) resource regarding the above conditions.

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

Use, within the meaning of Section 4(f), includes not only the physical taking of such property, but also *constructive use*. The concept of *constructive use* is that a project that involves no actual physical use of a Section 4(f) property via permanent incorporation or *temporary occupancy*, but may still, by means of noise, air pollution, water pollution, or other proximity-related impacts, substantially impair important features, activities, or attributes associated with the Section 4(f) property. Substantial impairment occurs only when the protected activities, features, or attributes of the Section 4(f) property that contribute to its purpose and significance are substantially diminished. This means that the value of the Section 4(f) property, in terms of its prior purpose and significance, is substantially reduced or lost.

Procedural requirements for complying with Section 4(f) are set forth in DOT Order 5610.1C, *Procedures for Considering Environmental Impacts*. The FAA also uses Federal Highway Administration (FHWA) regulations (23 CFR part 774) and FHWA guidance (e.g., Section 4(f) Policy Paper) when assessing potential impacts on Section 4(f) properties. These requirements are not binding on the FAA; however, the FAA may use them as guidance to the extent relevant to FAA projects. More information about DOT Act, Section 4(f) can be found in Chapter 5 of the FAA Order 1050.1F Desk Reference.[38]

4.6.2 Affected Environment

Section 4(f) properties include parks and recreational areas of national, state, or local significance that are both publicly owned and open to the public; publicly owned wildlife refuges of national, state, or local significance that are open to the public; and historic sites of national, state, or local significance in public or private ownership regardless of whether they are open to the public. Due to the nationwide scope of the proposed action, Section 4(f) properties likely are located in the study area.

The FAA has determined that some existing flying locations have been established in state and local public parks, although it is assumed that these operators have approval from the park authority in order to conduct their activities within the park. UA flying activities in public parks would generally be located away from other activities or protected areas within the park.

The FAA has not found any existing flying locations at historic sites or wildlife refuges, and this would not be expected to change in the future since the relevant authorities overseeing historic sites and wildlife refuges are not likely to approve a UA flying location at these types of properties.

[38] FAA. 1050.1F Desk Reference. Available: https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/poli cy/faa_nepa_order/desk_ref/.

4.6.3 Environmental Consequences

Impacts on Section 4(f) properties would be significant if the proposed action involves more than a minimal physical use of a Section 4(f) resource or constitutes a constructive use based on an FAA determination that the project would substantially impair the Section 4(f) resource.

Proposed Action Alternative

The FAA has determined that infrequent UA overflights as described in the proposed action will 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. There will be no physical use of Section 4(f) resources. Noise and visual effects from occasional UA overflights are not expected to diminish the activities, features or attributes of the resources that contribute to their significance or enjoyment. Additionally, based on the FAA's analysis, there will be no change in the environmental baseline as a result of FRIA approvals. Therefore, the proposed action would not result in significant impacts to Section 4(f) resources.

No Action Alternative

Under the no action alternative, impacts to Section 4(f) resources would be expected to stay the same. The no action alternative is not expected to result in significant impacts to Section 4(f) properties from UA use because, if a FRIA application is denied, the CBO or educational institution would be likely to continue using the flying location for UA operations (only with the use of Remote ID broadcasting). As there would be no apparent change in the environmental baseline, there would be no significant impacts as a result of the no action alternative.

4.7 Noise and Noise-Compatible Land Use

4.7.1 Regulatory Setting

Aircraft noise is often the most noticeable environmental effect associated with any aviation project. Several federal laws, including the Aviation Safety and Noise Abatement Act of 1979, as amended (49 U.S.C. §§ 47501-47507) regulate aircraft noise. Through 14 CFR Part 36, the FAA regulates noise from aircraft.

FAA Order 1050.1F, Appendix B, Paragraph B-1.3 requires the FAA to identify the location and number of noise sensitive areas that could be significantly impacted by aircraft 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 metric is a single value representing the logarithmically

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

4.7.2 Affected Environment

The ambient (or background) sound level in the study area varies and depends on the current land use at and in the immediate vicinity of the proposed FRIA location. For example, the ambient sound level in a rural area is lower than the ambient sound level near a highway or on the grounds of an airport. Existing sound sources in the study area range from natural sounds (wind, animal calls, thunder) to anthropogenic sources associated with commercial and residential land uses (e.g., vehicles, farm equipment, lawn mowers, railroads, construction equipment, aircraft).

Sources and levels of noise at existing UA flying locations are representative of rural and suburban areas across the nation. Existing sources of noise that can be heard around sites would include road traffic, rail traffic, aircraft overflights, air cooling and heating systems, back-up generators, manufacturing, home activities and natural sounds such as bird vocalizations, running water, and wind. On a daily basis, suburban areas are more likely to exhibit higher ambient noise levels resulting from highway traffic (70 to 90 A-weighted decibels (dBA)), construction noise (90 to 120 dBA), and outdoor conversations (e.g., small/large groups of people) (60 to 90 dBA).[39]

Figure 7 shows typical existing ambient DNL ranging from a small-town residential area to a downtown city. According to the figure, which was produced by the FAA, many of the remote areas in the study area are expected to have a DNL less than 50 dBA, while urban areas are expected to have a DNL as high as 80 dBA.

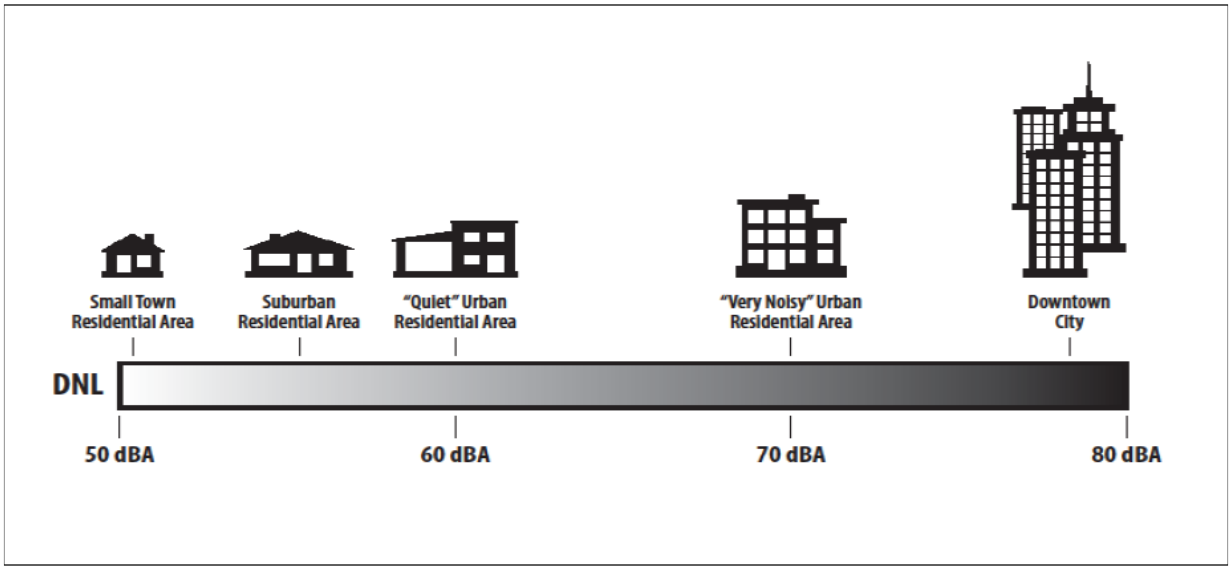


Figure 15 *Typical Day-Night Average Sound Levels*

4.7.3 Environmental Consequences

Human perception of noise depends on a number of factors, including overall noise level, number of noise events, the extent of audibility above the ambient sound level, and acoustic frequency content

[39] A-weighting approximates the frequency response of human hearing.

(pitch). UA noise generally has high acoustic frequency content, which can often be more discernable from other typical noise sources.

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 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.

Proposed Action Alternative

To ensure that noise would not cause a significant impact to any residential land use or other noise sensitive resources within or adjacent to flying locations seeking a FRIA approval, the FAA initiated an analysis of the potential noise exposure that could result from the proposed action. The noise analysis methodology detailed in Appendix B was used to calculate DNL for various operational counts and aircraft types.

The number of flight events and associated flight time required for UA to generate noise levels at or above DNL 65 dB was estimated using available noise measurement data for small (i.e., under 55 pounds) fixed-wing and multicopter UA. The results of the analysis show that, for the measured UA, the number of Average Annual Day (AAD) flight events and associated flight times required to produce DNL 65 dB at a fixed receiver location within a flight area is generally much higher than what would be likely or practically possible to occur in foreseeable real-world conditions.

Collection of additional noise data and further noise analysis may be warranted to evaluate the potential for noise exposure impacts at flying locations expected to have a substantial portion of flight activity from helicopter UA and/or multicopters with gas or turbine engines, and for flying locations expected to have frequent activity by any UA heavier than 55 pounds. However, significant noise impacts are unlikely to result in any case given that the FAA anticipates that the implementation of the Remote ID rule, and FRIAs to accommodate operation of UA without remote ID, to have a very little effect on the overall level of activity occurring at existing or new flying locations.

Based on expected UA operations at proposed FRIA flying locations, which typically involves one UA in the air at a time, with operations lasting a few hours per day up to seven days per week, the proposed action's estimated DNL is less than DNL 65 dB (see the Noise Analysis Report in Appendix B). Additionally, the proposed action would not increase noise exposure levels by DNL 1.5 dB within a DNL 65 dB noise exposure corridor. Therefore, the proposed action would not result in significant noise impacts.

No Action Alternative

Under the no action alternative, noise levels will continue at current levels at existing sites. No localized or regional changes to noise are expected. Some flying locations where a FRIA application is rejected may see an overall noise reduction under the no action alternative, as some remote pilots could move to approved FRIA locations when they wish to fly without Remote ID broadcasting. The no action alternative is not expected to result in significant noise impacts given the average sound levels of the UA, the short duration of operations, and the number of daily operations at any given flying location. Consequently, impacts to noise as a result of the no action alternative would not result in significant noise impacts.

4.8 Visual Effects

4.8.1 Regulatory Setting

Visual resources and visual character impacts deal with the extent to which the proposed action would result in visual impacts to resources in the operating area. Visual impacts can be difficult to define and evaluate because the analysis is generally subjective, but are normally related to the extent that 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 landscapes where proposed FRIA sites are located.

Visual resources include buildings, sites, traditional cultural properties, and other natural or manmade landscape features that are visually important or have unique characteristics. In unique circumstances, the nighttime sky may be considered a visual resource. Visual character refers to the overall visual makeup of the existing environment where the project would be located. For example, areas near densely populated locations generally have a visual character that could be defined as urban, whereas less developed areas could have a visual character defined by the surrounding landscape features, such as open grass fields, forests, mountains, and deserts.

Some visual resources are protected under federal, state, or local regulations. Protected visual resources generally include, but are not limited to, federal, state, or local scenic roadways/byways; National Scenic Areas; scenic easements; trails protected under the National Trails System Act or similar state or local regulations; biological resources; and features protected under other federal, state, or local regulations. More information about visual resources and visual effects can be found in Chapter 13 of the FAA Order 1050.1F Desk Reference.[40]

4.8.2 Affected Environment

The affected environment includes a variety of urban, suburban, and rural areas, including areas that may have sensitive visual resources. The immediate affected environment, however, is the common viewscape of the established flying location and immediate surroundings where UA operations already occur, resulting in similar direct visual environments nationwide.

Visual and aesthetic resources are the natural and man-made features that constitute an area's visual character. They include the landscape character (what is seen), visual sensitivity (human preferences and values regarding what is seen), scenic integrity (degree of intactness and wholeness in landscape character), and landscape visibility (relative distances of seen areas) of a geographically defined viewshed. Visual resources generally refer to the urban environment, whereas aesthetic resources typically refer to natural and scenic areas. The visual and aesthetic characteristics of a location depend on whether the area is a remote, rural, or urban setting. In a remote or rural setting, the landscape tends to be dominated by naturally occurring landforms and vegetation. Although naturally occurring visual resources dominate rural areas, some signs of human activity are likely to be present and may also contribute to the aesthetics. Examples include houses, agricultural fields, fences, barns, highways, communications towers, power lines, and lighthouses. Remote areas may have no visible man-made structures. Within an urban setting, natural features that may be present include parks and other green spaces, waterfalls, and ponds.

[40] FAA.1050.1F Desk Reference. Available: https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/poli cy/faa_nepa_order/desk_ref/.

Effects to aesthetic and visual resources deal broadly with the extent to which development contrasts with the existing environment, architecture, historic or cultural setting, or land use. Evaluating the visual and aesthetic qualities of an area is a subjective process because the value an observer places on specific landscape features varies depending upon the values and attitudes of the observer. Visual intrusions may also have an impact on some traditional cultural practices. Regardless of the subjective nature of assessing visual and aesthetic qualities of an area, landforms, water surfaces, vegetation, and man-made features can generally be considered characteristic of an area if they are inherent to the composition and function of the landscape

4.8.3 Environmental Consequences

The FAA has not established a significance threshold for light emissions or visual resources/visual character. Factors to consider when assessing the significance of potential visual effects include the degree to which the action would have the potential to:

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

Proposed Action Alternative

Under the proposed action, UA operations would generally occur during the daytime and therefore would not involve light emissions. The proposed action would not result in construction or a change in land use and would not affect the visual character of flying locations and adjacent properties. Due to the relatively small size of UA, views from the ground would likely be possible within half a mile, and may be obscured by trees, houses, or other structures due to the low altitudes where the UA operate. Additionally, since UA are already authorized to fly in these locations, there would be no change in the environmental baseline as a result of FRIA approvals. Therefore, no increased impacts to visual resources would result from the proposed action. Any impacts to visual resources under the proposed action would be similar to the no action alternative. Therefore, the proposed action would not result in significant visual effects.

No Action Alternative

Under the no action alternative, impacts to visual resources would be expected to stay the same. The no action alternative is not expected to result in significant impacts to visual resources or visual character from UA operations and vehicle use or foot traffic. Activities at flying locations generally take place during daytime hours and would not result in significant light emissions impacts.

4.9 Summary of Potential Impacts under the Proposed Action

Table 4-1 Summary of Potential Impacts

Environmental Impact Category	Significance Threshold	Anticipated Environmental Impacts
Air Quality	The action would cause pollutant concentrations to exceed one or more of the NAAQS, as established by the Environmental Protection Agency under the Clean Air Act, for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations.	The FAA's analysis finds that approving FRIAs at UA flying locations would not: • Cause or contribute to any new violation of a NAAQS; • Increase the frequency or severity of any existing violation; or • Delay the timely attainment of any standard, interim emission reduction, or other milestone.
Biological Resources (including fish, wildlife, and plants)	The USFWS or NMFS determines that the action would be likely to jeopardize the continued existence of a federally listed threatened or endangered species, or would result in the destruction or adverse modification of federally designated critical habitat. The FAA has not established a significance threshold for non-listed species.	The FAA's analysis finds that approving FRIAs at UA flying locations would not cause: • A long-term or permanent loss of unlisted plant or wildlife species, i.e., extirpation of the species from a large project area (e.g., a new commercial service airport); • Adverse impacts to special status species (e.g., 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 for population maintenance.
Climate	The FAA has not established a significance threshold for climate effects, and has not identified factors to consider in making a significance determination for GHG emissions. One factor that may be considered is the potential effects of the proposed action on	The FAA's analysis finds that approving FRIAs at UA flying locations would not result in substantive changes to activity levels and their associated GHG emissions at new and existing flying locations. Therefore, GHG emissions from UA operations at new and existing FRIA locations would

	climate change as indicated by its GHG emissions.	not cause significant impacts to climate.
Department of Transportation Act, Section 4(f)	The action involves more than a minimal *physical use* of a Section 4(f) resource or constitutes a *constructive use* based on an FAA determination that the aviation project would substantially impair the Section 4(f) resource. Resources that are protected by Section 4(f) are publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance; and publicly or privately owned land from an historic site of national, state, or local significance. Substantial impairment occurs when the activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished.	The FAA's analysis has determined that infrequent UA overflights as described in the proposed action will not cause substantial impairment to Section 4(f) resources and would not be considered a constructive use of any Section 4(f) resource. There will be no physical use of Section 4(f) resources. Noise and visual effects from occasional UA overflights are not expected to diminish the activities, features or attributes of the resources that contribute to their significance or enjoyment. Additionally, based on the FAA's analysis, there will be no change in the environmental baseline as a result of FRIA approvals.
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.	The FAA's analysis finds that noise levels at UA flying locations, including those seeking FRIA approvals, will not increase 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.
Visual Resources	The FAA has not established a significance threshold for visual effects. 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	The FAA's analysis finds that FRIA approvals will not: • Create annoyance or interfere with normal activities from light emissions; • Affect the visual character of the area due to the light emissions, including the importance, uniqueness,

	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.	and aesthetic value of the affected visual resources; • Affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources; • Contrast with the visual resources and/or visual character in the study area; or • Block or obstruct the views of visual resources, including whether these resources would still be viewable from other locations.

5.0 CUMULATIVE IMPACTS

The CEQ NEPA-implementing regulations define cumulative effects as "effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time." (40 CFR § 1508.1(g)(3)) As discussed in Chapter 4, it is anticipated that the proposed action will not impact several environmental impact categories (see Section 4.1) and will result in minimal impacts on others. Under the proposed action, UA operations would occur infrequently and typically at locations where flying locations already exist and where those operations are not expected to change as compared to the no action alternative. The proposed action's potential to contribute to cumulative impacts on any resource is limited to any other operations that might occur at the location at the same time the UA are flying. Given the nature of the proposed action, the locations where UA operations would occur, and the minimal expected impacts of the proposed action, there is no potential for the proposed action, when combined with other past, present, or reasonably foreseeable actions, to result in cumulative impacts.

6.0 LIST OF PREPARERS and CONTRIBUTORS

Table 6-1 lists the principal preparers, reviewers, and contributors to this EA.

Table 6-1 List of Preparers and Contributors

Name and Affiliation	Years of Industry Experience	EA Responsibility
Mike Millard, Flight Standards, FAA Aviation Safety	41	Flight Standards Environmental Specialist and Document Review
Christopher Couture, FAA Aviation Safety	16	Environmental Science and Document Preparation/Review
John Picciano, UAS Integration Office, FAA Aviation Safety	15	Program Management and Document Review
Krystyna Bednarczyk, FAA Office of Environment and Energy	24	NEPA Subject Matter Expert, Biological Resources, and Document Review
Susumu Shirayama, FAA Office of Environment and Energy	22	Noise Analysis and Document Review
Christopher Hobbs, FAA Office of Environment and Energy	25	Noise Analysis and Document Review
Contractor Contributors		
Jodi Jones, FAA Aviation Safety, PrimCorp, LLC.	13	NEPA Subject Matter Expert, Research, and Document Review
Brad Thompson, FAA Aviation Safety, Science Applications International Corporation (SAIC)	8	NEPA Subject Matter Expert, Research, and Document Review
Brandon L. Robinette, Federal Programs, HMMH, Inc.	18	Noise Analysis Subject Matter Expert
Sarah Brammell, NEPA/Environmental Specialist, Blue Wing Environmental, LLC	20	NEPA Subject Matter Expert, Biological Resources
Jackie Tyson, Cultural Resources Specialist, New South Associates, Inc.	12	Cultural Resources Specialist, Document Review
Philip M. DeVita, Federal Programs, HMMH, Inc.	34	Air Quality Analysis
Heather Wylie, Federal Programs, HMMH, Inc.	11	Air Quality Analysis

Appendix A

Air Emissions Technical Appendix

Air Quality Assessment of Unmanned Aircraft

In Support of the FAA-Recognized Identification Areas Programmatic Environmental Assessment

HMMH Report No. 313090.002 001-1
March 23, 2023

Prepared for:

Federal Aviation Administration

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

This page intentionally left blank.

Air Quality Assessment of Unmanned Aircraft

In Support of the FAA-Recognized Identification Areas Programmatic Environmental Assessment

HMMH Report No. 313090.002 001-1
March 23, 2023

Prepared for:

Federal Aviation Administration

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

Prepared by:

Heather Wylie
Phil DeVita
Brandon Robinette

HMMH
700 District Avenue, Suite 800
Burlington, MA 01803
T 781.229.0707

This page intentionally left blank.

Contents

Tables

This page intentionally left blank.

1 Introduction and Background

The Federal Aviation Administration (FAA) is implementing Subpart C, FAA-Recognized Identification Areas (FRIA), of Title 14 of the Code of Federal Regulations (CFR) Part 89, Remote Identification of Unmanned Aircraft (Remote ID Rule) 86 FR 4390 (Jan. 15, 2021). Subpart C established a path through which eligible entities may seek approval from the FAA to establish a FRIA. After the Remote ID Rule is fully effective, unmanned aircraft (UA) equipped with remote identification technology can continue to operate nationally under existing regulations. All UA pilots required to register their aircraft must operate in accordance with the Remote ID Rule beginning September 16, 2023. The Remote ID Rule requires UA to be equipped with remote identification at locations outside of FRIA locations.

This document describes the methodology used to evaluate the potential for air quality impacts from the operation of UA within FRIAs at both existing and new flying locations.

Conservative assumptions and FAA and United States Environmental Protection Agency (EPA) methodologies were used to determine potential air quality impacts against EPA significance emission thresholds. An emissions analysis was conducted based on a representative set of recreational UA and applying EPA emission factors for similar-type engines, assuming conservative (e.g., longer duration) flight times. Annual emissions from each UA were compared to worst-case EPA *de minimis* thresholds for each criteria pollutant at both new and existing flying locations. The analysis is based on direct emissions associated with UA operations. Indirect emissions associated with automobile trips were not included; however, emissions associated with these trips are not expected to significantly affect the results and conclusions in the analysis.

This page intentionally left blank.

2 Regulatory

Under the National Environmental Policy Act (NEPA), federal agencies are required to conduct an environmental review of "proposed major Federal actions significantly affecting the quality of the human environment" and consider alternatives to the proposed actions, including the no action alternative (42 U.S.C. § 4332(c)). According to the FAA's NEPA implementing guidance (FAA Order 1050.1F), impacts to air quality must be considered as part of the environmental analysis under NEPA. Potential effects of the Proposed Action are evaluated against the National Ambient Air Quality Standards (NAAQS), as promulgated by the EPA under the federal Clean Air Act (CAA).

2.1 National Ambient Air Quality Standards

The EPA currently regulates six criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM), and lead (Pb). Particulate matter is divided into two particle size categories: coarse particles with a diameter less than 10 micrometers (PM_{10}) and fine particles with a diameter of less than 2.5 micrometers ($PM_{2.5}$).

Table 2-1 shows the primary and secondary NAAQS for the criteria pollutants. Section 176(c) of the CAA states that federal agencies cannot engage, support, or provide financial assistance for licensing, permitting, or approving any project that could cause or contribute to the severity and/or number of violations of the NAAQS, or could inhibit the expeditious attainment of these standards.

Table 2-1. National Ambient Air Quality Standards

Pollutant	Averaging Time	Primary Standards	Secondary Standards
CO	8 hours	9 parts per million (ppm)	None
	1 hour	35 ppm	None
Pb	Rolling 3-month average	0.15 micrograms (µg) /cubic meter of air (m^3)	Same as Primary
NO_2	Annual Arithmetic Mean	0.053 ppm (100 µg/m^3)	Same as Primary
	1 hour	0.100 ppm Note 2	None
O_3	8 hours (2015 standard)Note 4	0.070 ppm	Same as Primary
$PM_{2.5}$	Annual Arithmetic Mean	12 µg/m^3 Note 1	15 µg/m^3
	24 hours	35 µg/m^3	Same as Primary
PM_{10}	24 Hours	150 µg/m^3 Note 1	Same as Primary
SO_2	1 hour	75 parts per billion (ppb) Note 3	None
	3 hours	None	0.5 ppm

Source: U.S. EPA NAAQS, https://www.epa.gov/criteria-air-pollutants/naaqs-table
Notes:

1. For PM_{10}, the 24-hour standard not to be exceeded more than once per year on average over 3 years. For $PM_{2.5}$, the 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or are less than the standard.

2. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010).

3. Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

4. EPA updated the NAAQS for O_3 to strengthen the primary 8-hour standard to 0.07 ppm on October 1, 2015. An area will meet the standard if the fourth-highest maximum daily 8-hour ozone concentration per year, averaged over 3 years is equal to or less than 70 ppb.

2.2 EPA-Designated Attainment Status

The standards in Error! Reference source not found.**2-1** apply to the concentration of a pollutant in outdoor ambient air. If the air quality in a geographic area is equal to or better than the national standard, the EPA will typically designate the region as an "attainment area." An area where air quality does not meet the national standard is typically designated by the EPA as a "nonattainment area." Once the air quality in a nonattainment area improves to the point where it meets the standards and the additional requirements outlined in the CAA, the EPA can redesignate the area to attainment upon approval of a Maintenance Plan, and these areas are then referred to as "maintenance areas." Each state is required to prepare a State Implementation Plan (SIP) that outlines measures that regions within the state will implement to attain the applicable air quality standard in nonattainment areas for applicable criteria air pollutants, and to maintain compliance with the applicable air quality standard in maintenance areas. The status and severity of pollutant concentrations in a particular area will impact the types of measures a state must take to reach attainment with the NAAQS. The EPA must review and approve each state's SIP to ensure the proposed measures are sufficient to either attain or maintain compliance with the NAAQS within a set period of time.

The Clean Air Act Amendments (CAAA) of 1990 require states to make recommendations to the EPA regarding the attainment status of all areas within their borders when the EPA finalizes an update to any NAAQS. Under its CAAA authority, the EPA further classifies nonattainment areas for some pollutants – such as ozone – based on the severity of the NAAQS violation as marginal, moderate, serious, severe, and extreme. To further improve the nation's air quality, the EPA lowered the ozone standard in 2015 to 0.070 parts per million (ppm). These attainment designations are important for comparing to appropriate EPA significance thresholds.

2.3 EPA Significant Thresholds

As provided in FAA Order 1050.1F, an action would cause a significant air quality impact if pollutant concentrations would exceed one or more of the NAAQS established by the EPA under the CAA, for any of the time periods analyzed, or would increase the frequency or severity of any such existing violations. Additionally, the CAA requires federal agencies such as the FAA to ensure their actions conform to the appropriate SIP. Conformity requires that a project or action adheres to the SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards. Federally funded and approved actions at airports are subject to the EPA's general conformity regulations. Revisions to the General Conformity Rule are codified under 40 CFR Parts 51 and 93, Subpart W, Revisions to the General Conformity Regulations, Final Rule (April 2010). The General Conformity Rule applies to all federal actions except for certain highway and transit programs which must comply with the Transportation Conformity Plans (40 CFR Part 93, Subpart A).

The General Conformity Rule includes annual emissions thresholds for nonattainment and maintenance areas that trigger the need for a General Conformity determination and defines projects that are typically excluded from General Conformity requirements. If General Conformity applies, an applicability analysis is performed to determine if a General Conformity Determination is required to demonstrate that the Proposed Action conforms to the approved SIP(s). A conformity determination is required if the total direct and indirect pollutant emissions resulting from a project are above the *de minimis* emissions threshold levels specified in the conformity regulations.[1] The *de minimis* thresholds represent emission quantities of a NAAQS-regulated pollutant, or its applicable precursors, over which a proposed action in a nonattainment or maintenance area may cause or contribute to a new or continued violation of the NAAQS. A conformity determination is not required if the differences in emissions between the Proposed Action and the No Action Alternative are below the applicable *de minimis* emission threshold levels, or if the Proposed Action is exempt or included in the FAA list of "presumed to conform activities."

The EPA *de minimis* emission thresholds for maintenance and nonattainment areas are summarized in **Table 2-2a** and **Table 2-2b.**

[1] US Environmental Protection Agency, General Conformity *De Minimis* Tables, https://www.epa.gov/general-conformity/de-minimis-tables (accessed June 4, 2019).

Table 2-2a. EPA *De Minimis* Tables, Nonattainment Areas (NAA)

Pollutant	Tons/year[1]
Ozone (VOC's or NO_X), Serious NAA's	50
Ozone (VOC's or NO_X), Severe NAA's	25
Ozone (VOC's or NO_X), Extreme NAA's	10
Ozone (VOC's or NO_X), Other ozone NAA's outside an ozone transport region	100
VOC, Other ozone NAA's inside an ozone transport region	50
NO_X, Other ozone NAA's inside an ozone transport region	100
Carbon Monoxide, All maintenance areas	100
SO_2 or NO_2, All NAA's	100
PM_{10}, Moderate NAA's	100
PM_{10}, Serious NAA's	70
$PM_{2.5}$ (direct emissions, SO_2, NO_X, VOC, and Ammonia), Moderate NAA's	100
$PM_{2.5}$ (direct emissions, SO_2, NO_X, VOC, and Ammonia), Serious NAA's	70
Pb, All NAA's	25

Source: https://www.epa.gov/general-conformity/de-minimis-tables

Note 1: 40 CFR 93.153(b)(1) For purposes of paragraph (b) of this section, these rates apply in nonattainment areas (NAA)

Table 2-3b. EPA *De Minimis* Tables, Maintenance Areas

Pollutant	Tons/year[1]
Ozone (NO_X), SO_2 or NO_2, All maintenance areas	100
Ozone (VOC's), Maintenance areas inside an ozone transport region	50
Ozone (VOC's), Maintenance areas outside an ozone transport region	100
Ozone (VOC's), Carbon monoxide: All maintenance areas	100
Ozone (VOC's), PM_{10}: All maintenance areas	100
Ozone (VOC's), $PM_{2.5}$ (direct emissions, SO_2, NO_X, VOC, and Ammonia)	100
Ozone (VOC's), All maintenance areas	100
Ozone (VOC's), Pb: All maintenance areas	25

Source: https://www.epa.gov/general-conformity/de-minimis-tables

Note 1: 40 CFR 93.153(b)(2) - For purposes of paragraph (b) of this section these rates apply in maintenance areas

As noted in **Table 2-2a** and **Table 2-2b**, pollutants' designated attainment does not have EPA *de minimis* thresholds. Therefore, as a conservative assumption for this analysis, the worst-case (i.e., lowest) EPA *de minimis* thresholds were used for each pollutant when comparing the emissions from UA engines in order to determine significance. The EPA worst-case *de minimis* thresholds to determine significant impacts under NEPA for each pollutant are shown in **Table 2-3**. The *de minimis* thresholds represent emission quantities of a NAAQS-regulated pollutant, or its applicable precursors, over which a proposed action in a nonattainment or maintenance area may cause or contribute to a new or continued violation of the NAAQS. In accordance with the FAA Environmental Desk Reference for Airport Actions, the Proposed Action can be determined to "not cause a significant air quality impact, since it is unlikely the

pollutant concentration analyzed would exceed a NAAQS."[2] This is demonstrated by showing the Proposed Action emissions would not exceed a *de minimis* pollutant emission threshold.

Table 2-4. Worst-Case EPA De Minimis Pollutant Emission Thresholds

Pollutants	Attainment Status (Severity)	Threshold (Tons/Year)
Carbon Monoxide (CO)	Maintenance	100
Nitrogen Dioxide (NO_2)	Extreme	100
Ozone (O_3) Nitrogen Oxides (NO_X)[1]	Extreme	10
Ozone (O_3) Volatile Organic Compounds (VOC)[1]	Extreme	10
Fine Particulate Matter (PM_{10}/$PM_{2.5}$)	Serious	70
Sulfur Dioxide (SO_2)	Maintenance	100

Source: EPA 2022, https://www.epa.gov/general-conformity/de-minimis-tables

Notes:
1. Following standard industry practice, ozone was evaluated by evaluating emissions of VOC and NO_x, which are precursors in the formation of ozone.

[2] FAA. Environmental Desk Reference for Airport Actions: Chapter 1. Available: https://www.faa.gov/sites/faa.gov/files/airports/environmental/environmental_desk_ref/desk-ref-chap1.pdf

This page intentionally left blank.

3 Methodology

The methodology and assumptions used to estimate the UA engine model emissions for comparison to EPA *de minimis* thresholds to determine significant air quality impacts from the operation of UA within FRIA at both existing and new flying locations is discussed in this section.

An internet search was conducted for various UA engines on the market, noting sizes and performance, along with engine speeds (rotations per minute). In lieu of model specific emission factors to estimate emissions, the latest version of the EPA MOVES model (Version 3.0.4)[3] was used to develop emission factors for similar-size engines. These engines were compared to equipment listed in the EPA MOVES nonroad database, and the Lawn/Garden category was found to be the most representative in terms of engine size and fuel usage. The EPA MOVES model was utilized since it is an approved emission model for similar engine types commonly used in UA, and it is used as an approved emission model for FAA NEPA analyses[4] for computing nonroad (e.g., chainsaws, lawn mower engines) emissions.

A second internet search was conducted to determine engine specifications for actual lawn and garden equipment on the market today. Based on this search, the following subset of the Lawn/Garden category appears to be a representative database of typical commonly used model aircraft engines:

- Lawn Mowers (residential)
- Lawn Mowers (commercial)
- Rotary Tillers < 6 horsepower (hp) (residential)
- Rotary Tillers < 6 hp (commercial)
- Chain Saws < 6 hp (residential)
- Chain Saws < 6 hp (commercial)
- Trimmers/Edgers/Brush Cutter (residential)
- Trimmers/Edgers/Brush Cutter (commercial)
- Leaf blowers/Vacuums (residential)
- Leaf blowers/Vacuums (commercial)
- Rear Engine Riding Mowers (residential)
- Rear Engine Riding Mowers (commercial)
- Front Mowers (commercial)
- Shredders < 6 hp (commercial)

The specifications for actual lawn and garden equipment were compared to engine specifications found for several various-sized UA engine specifications. For each UA engine, a lawn/garden engine with similar specifications was selected to be utilized in the analysis. **Table 3-1** shows the UA model engine and MOVES representative equipment that were used in the analysis based on that comparison.

[3] https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves

[4] https://www.faa.gov/sites/faa.gov/files/regulations_policies/policy_guidance/envir_policy/airquality_handbook/Air_Quality_Handbook_Appendices.pdf

Table 3-1. UA Model Engines and Representative Equipment from MOVES

Model Engine	MOVES Representative Equipment
DLE-120	Trimmers/Edgers/Brush Cutter (com)
DLE-130	Lawn Mowers (com)
DLE-170	Front Mowers (com)
DLE-20	Rotary Tillers < 6 hp (com)
DLE-20RA	Leaf blowers/Vacuums (com)
DLE-222	Front Mowers (com)
DLE-30	Leaf blowers/Vacuums (com)
DLE-35RA	Rotary Tillers < 6 hp (com)
DLE-40	Commercial Mowers (com)
DLE-55RA	Leaf blowers/Vacuums (com)
DLE-60	Leaf blowers/Vacuums (com)
DLE-61	Leaf blowers/Vacuums (com)
DLE-65	Leaf blowers/Vacuums (com)
DLE-85	Trimmers/Edgers/Brush Cutter (com)

For this analysis, the assumption was made that the engines utilized gasoline as fuel, which is common in both lawn and garden equipment and UA engines.

In order to run the MOVES model, it was required to select a geographic area. Based on a review of the Academy of Model Aeronautics (AMA) club database,[5] the Palm Beach Radio Control Association (based out of Palm Beach County, Florida) has the most members and is currently active. Therefore, the MOVES representative equipment for each model engine type used to develop the emission factors incorporates county-level data representative of Palm Beach County, Florida for criteria pollutants/precursors. A representative existing year of 2022 was assumed for MOVES and a conservative load factor of 1 (assumes a constant full throttle while operating) was assumed for this analysis.

Emissions were estimated using MOVES emission factors in grams per horsepower (g/hp-hour) for each engine type and were applied to the equipment size in hp and load factor. In order to estimate worst-case emissions, a hypothetical UA engine using an amalgamation of worst-case emissions factors across all pollutants was used. **Table 3-2** shows the MOVES emissions factors by engine (with their corresponding representative equipment from MOVES), along with the emissions factors utilized for a hypothetical worst-case engine for each pollutant.

[5] https://www.modelaircraft.org/club-finder

Table 3-2. Emissions Factors by UA Model Engine and Representative Equipment Type (g/hp-hr)

Model Engine	MOVES Representative Equipment	CO	NOx	SO2	PM10	PM2.5	VOC	CO2
DLE-120	Trimmers/Edgers/Brush Cutter (com)	263.512	1.981	0.006	0.120	0.111	4.132	1046.008
DLE-130	Lawn mowers (Com)	262.426	1.955	0.006	0.117	0.107	5.063	1046.454
DLE-170	Front Mowers (com)	261.105	1.955	0.006	0.111	0.102	8.493	1047.128
DLE-20	Rotary Tillers < 6 hp (com)	212.710	2.381	0.006	7.356	6.767	41.092	1062.673
DLE-20RA	Leafblowers/Vacuums (com)	219.121	2.381	0.006	7.540	6.937	43.165	1055.949
DLE-222	Front Mowers (com)	271.680	2.392	0.006	0.109	0.100	8.589	1050.155
DLE-30	Leafblowers/Vacuums (com)	219.121	2.381	0.006	7.540	6.937	43.165	1055.949
DLE-35RA	Rotary Tillers < 6 hp (com)	212.710	2.381	0.006	7.356	6.767	41.092	1062.673
DLE-40	Commercial Mowers (com)	2.603	4.249	0.002	0.272	0.264	0.815	588.030
DLE-55RA	Leafblowers/Vacuums (com)	246.192	5.522	0.005	8.075	7.429	51.406	766.267
DLE-60	Leafblowers/Vacuums (com)	246.192	5.522	0.005	8.075	7.429	51.406	766.267
DLE-61	Leafblowers/Vacuums (com)	246.192	5.522	0.005	8.075	7.429	51.406	766.267
DLE-65	Leafblowers/Vacuums (com)	246.192	5.522	0.005	8.075	7.429	51.406	766.267
DLE-85	Trimmers/Edgers/Brush Cutter (com)	263.512	1.981	0.006	0.120	0.111	4.132	1046.008
	Worst Case Engine Emissions Factors	**271.680**	**5.522**	**0.006**	**8.075**	**7.429**	**51.406**	**1062.673**

Because the annual hours of flight at any location (with or without a designated FRIA) cannot be exactly determined, a unit-analysis was conducted to see how many hours per year it would take to exceed the worst-case EPA *de minimis* thresholds using the emissions factors for a worst-case hypothetical engine.

The emissions for each model engine type were computed using the following equation:

Aircraft Model Engine Type emissions (tons per year (TPY)) = emission factor (grams per hp-hr) x size (hp) x load factor x hours per year x (1 pound/453.6 grams) x (1 ton /2000 pounds)

Aircraft model engine emission calculation spreadsheets are presented in **Section 7**.

This page intentionally left blank.

4 UA Model Engine Emission Results

Table 4-1 shows the worst-case engine emissions in tons per year per hour (TPY/hour) for both the maximum and average hp of the model engines from **Table 3-1**, each pollutants' *de minimis* threshold, and the hours per year needed to exceed the *de minimis* threshold for each pollutant. While there are no defined significance thresholds for aviation greenhouse gas (GHG) emissions, nor has FAA identified any factors to consider in making a significance determination for GHG emissions, GHG carbon dioxide (CO2) emissions are presented for informational purposes.

Using worst-case assumptions for engine hp and emission factors, **Table 4-1** shows that the hours estimated to exceed the EPA *de minimis* thresholds are much higher than the total annual hours in a year (8,760 hours) for all criteria pollutants except the maximum hp engine case for Volatile Organic Compounds (VOCs). Even for VOCs, assuming the worst-case engine horsepower rating (22 hp) and worst-case VOC emission factor (51.406 g/hp-hour), the estimated hours to exceed the worst-case VOC threshold are 8,208 hours per year, which at 94 percent of the hours in a year is highly unlikely to ever be reached in practice.

Table 4-1. Worst-Case UA Emissions and Hours Needed to Exceed De Minimis Threshold

Pollutant	Worse Case Engine Emissions (TPY/hr) Max hp (22 hp)	Worse Case Engine Emissions (TPY/hr) Avg hp (8 hp)	De Minimis Threshold (TPY)	Hours Needed to Exceed De Minimis Threshold (Max hp)	Hours Needed to Exceed De Minimis Threshold (Avg hp)
CO	6.44E-03	2.46E-03	100	15,531	40,615
NOx	1.31E-04	5.00E-05	10	76,410	199,822
SO2	1.53E-07	5.83E-08	100	655,451,826	1,714,083,401
PM10	1.91E-04	7.32E-05	70	365,770	956,531
PM2.5	1.76E-04	6.73E-05	70	397,576	1,039,708
VOC	1.22E-03	4.66E-04	10	8,208	21,465
CO2 Exhaust	2.28E-02	8.74E-03	--	--	--

This page intentionally left blank.

5 Summary of Results

Air quality emissions from various types of UA engines were estimated to evaluate potential air quality impacts from the Proposed Action. For this analysis, the potential of exceeding the EPA NAAQS was assessed by estimating UA aircraft engine emissions using conservative (e.g., longer duration and higher throttle) assumptions and comparing them to worst-case EPA *de minimis* thresholds for significance. The analysis evaluated various commonly used aircraft engine types and estimated the number of hours of operation it would take to exceed the worst-case *de minimis* thresholds. In lieu of specific aircraft model engine emission factors, the EPA MOVES nonroad model was used to assign similar engine types within its database to the various common model aircraft engine types to generate emission factors for NAAQS criteria pollutants, assuming gasoline usage for fuel and a 2022 MOVES existing emission year. In addition, the MOVES representative equipment for each model engine type used to develop the emission factors incorporated county-level data representative of Palm Beach County, Florida for both criteria pollutants/precursors and GHGs. Palm Beach County was chosen since it is home to the largest UA club that operates out of West Delray Regional Park. The hours of operation per year needed for a worst-case hypothetical engine to exceed *de minimis* thresholds was determined. The worst-case *de minimis* thresholds (the lowest *de minimis* thresholds by pollutant based on attainment designation), represent emission quantities of a NAAQS-regulated pollutant, or its applicable precursors, over which a Proposed Action in an EPA-designated nonattainment or maintenance area may cause or contribute to a new or continued violation of the NAAQS. Annual emissions below the *de minimis* are considered not significant and are presumed to not exceed the NAAQS.

The results show that exceeding the *de minimis* thresholds for nearly all pollutants, assuming worst-case engine ratings and emission factors, would require total annual engine operating hours greater than the 8,760 total hours in a year for all pollutants, except the maximum engine hp case for VOCs. Even for the maximum hp engine case for VOCs, the estimated hours to exceed the worst-case VOC threshold are 8,208 hours per year, which is highly unlikely to occur in real-world circumstances.

This page intentionally left blank.

6 Conclusions

6.1 Existing Flying Locations

For FRIAs designated at an existing flying site, the FAA anticipates there would be no change in existing conditions due to the generally enabled activities permitted by 14 CFR parts 107 and the location-specific limitations on UA operations and UA operators in part 89. Furthermore, it is expected that most recreational operators of UA would bring their non-compliant aircraft into compliance either by the Remote ID deadline or sometime after. Potential decreases in flight activity, assuming non-compliant operators cease flying, following the September 2023 compliance deadline would be temporary and negligible. As such, neither the Proposed Action nor the No Action Alternative would result in substantive changes to activity levels and their associated pollutant emissions at existing flying locations. Emissions from operations at FRIAs established at existing locations would not cause significant impacts to air quality, and it is improbable for UA operations to contribute to an exceedance of any regulatory standard.

6.2 New Flying Locations

For FRIAs designated at newly established flying locations, the FAA anticipates a de minimis change in existing conditions due to the presence of generally enabled activities permitted by 14 CFR parts 107 and the minor changes expected in UA operators' behavior due to location-specific limitations on UA operations and UA operators in part 89. A temporary concentration of activity may occur at new locations that previously did not experience multiple operators within a confined area; however, the cumulative nature of these operations would still not trigger anything other than a negligible change in pollutant emissions. As such, neither the Proposed Action nor the No Action Alternative would result in substantive changes to activity levels and their associated pollutant emissions at existing flying locations. Emissions from operations at newly established FRIA locations would not cause significant impacts to air quality, and it is improbable for sUAS operations to contribute to an exceedance of any regulatory standard.

In summary, since the emissions individually and collectively are below the worst-case *de minimis* thresholds (or in the case of VOCs are expected to be in a real-world application), it can be concluded that the operation of UA would "not cause a significant air quality impact, since it is unlikely the pollutant emissions analyzed would exceed a NAAQS." This conclusion applies to both existing and new flying locations, and at existing and reasonably foreseeable activity levels.

This page intentionally left blank.

7 Emission Calculation Spreadsheets

				MOVES3 Emission Factors (g/hp hr)						
Model Engine	MOVES Representative Equipment	HP	Eng Size (cc)	CO	NOx	SO2	PM10	PM2.5	VOC	CO2
DLE-120	Trimmers/Edgers/Brush Cutter (com)	12	120	263.512	1.981	0.006	0.120	0.111	4.132	1046.008
DLE-130	Lawn mowers (com)	13		262.426	1.955	0.006	0.117	0.107	5.063	1046.454
DLE-170	Front Mowers (com)	18		261.105	1.955	0.006	0.111	0.102	8.493	1047.128
DLE-20	Rotary Tillers < 6 HP (com)	3		212.710	2.381	0.006	7.356	6.767	41.092	1062.673
DLE-20RA	Leafblowers/Vacuums (com)	3		219.121	2.381	0.006	7.540	6.937	43.165	1055.949
DLE-222	Front Mowers (com)	22		271.680	2.392	0.006	0.109	0.100	8.589	1050.155
DLE-30	Leafblowers/Vacuums (com)	4		219.121	2.381	0.006	7.540	6.937	43.165	1055.949
DLE-35RA	Rotary Tillers < 6 HP (com)	4		212.710	2.381	0.006	7.356	6.767	41.092	1062.673
DLE-40	Commercial Mowers (com)	5		2.603	4.249	0.002	0.272	0.264	0.815	588.030
DLE-55RA	Leafblowers/Vacuums (com)	6		246.192	5.522	0.005	8.075	7.429	51.406	766.267
DLE-60	Leafblowers/Vacuums (com)	7		246.192	5.522	0.005	8.075	7.429	51.406	766.267
DLE-61	Leafblowers/Vacuums (com)	6		246.192	5.522	0.005	8.075	7.429	51.406	766.267
DLE-65	Leafblowers/Vacuums (com)	7		246.192	5.522	0.005	8.075	7.429	51.406	766.267
DLE-85	Trimmers/Edgers/Brush Cutter (com)	9		263.512	1.981	0.006	0.120	0.111	4.132	1046.008

		NONROAD Emissions (TPY per 1 hour)[1]						
Model Engine	MOVES Representative Equipment	CO	NOx	SO2	PM10	PM2.5	VOC	CO2 Exhaust
DLE-120	Trimmers/Edgers/Brush Cutter (com)	3.49E-03	2.62E-05	8.41E-08	1.59E-06	1.47E-06	5.47E-05	1.38E-02
DLE-130	Lawn mowers (Com)	3.76E-03	2.80E-05	9.12E-08	1.67E-06	1.54E-06	7.26E-05	1.50E-02
DLE-170	Front Mowers (com)	5.04E-03	3.77E-05	1.23E-07	2.13E-06	1.96E-06	1.64E-04	2.02E-02
DLE-20	Rotary Tillers < 6 HP (com)	5.86E-04	6.56E-06	1.77E-08	2.03E-05	1.86E-05	1.13E-04	2.93E-03
DLE-20RA	Leafblowers/Vacuums (com)	6.04E-04	6.56E-06	1.76E-08	2.08E-05	1.91E-05	1.19E-04	2.91E-03
DLE-222	Front Mowers (com)	6.44E-03	5.67E-05	1.51E-07	2.57E-06	2.37E-06	2.04E-04	2.49E-02
DLE-30	Leafblowers/Vacuums (com)	8.94E-04	9.71E-06	2.61E-08	3.08E-05	2.83E-05	1.76E-04	4.31E-03
DLE-35RA	Rotary Tillers < 6 HP (com)	9.61E-04	1.08E-05	2.91E-08	3.32E-05	3.06E-05	1.86E-04	4.80E-03
DLE-40	Commercial Mowers (com)	1.38E-05	2.25E-05	1.14E-08	1.44E-06	1.40E-06	4.31E-06	3.11E-03
DLE-55RA	Leafblowers/Vacuums (com)	1.49E-03	3.35E-05	2.81E-08	4.90E-05	4.50E-05	3.12E-04	4.65E-03
DLE-60	Leafblowers/Vacuums (com)	1.90E-03	4.26E-05	3.57E-08	6.23E-05	5.73E-05	3.97E-04	5.91E-03
DLE-61	Leafblowers/Vacuums (com)	1.63E-03	3.65E-05	3.06E-08	5.34E-05	4.91E-05	3.40E-04	5.07E-03
DLE-65	Leafblowers/Vacuums (com)	1.76E-03	3.96E-05	3.32E-08	5.79E-05	5.32E-05	3.68E-04	5.49E-03
DLE-85	Trimmers/Edgers/Brush Cutter (com)	2.47E-03	1.86E-05	5.96E-08	1.13E-06	1.04E-06	3.87E-05	9.80E-03

Note 1. Emissions calculations utilize a load factor of 1, for 1 aircraft, for 1 hour

		NONROAD Emissions (TPY) Per Hour							De Minimis Thresholds (TPY)						
Model Engine	HP	CO	NOx	SO2	PM10	PM2.5	VOC	CO2 Exhaust	CO	NOx	SO2	PM10	PM2.5	VOC	CO2 Exhaust
Worse-Case Engine - Max HP	22	6.44E-03	1.31E-04	1.53E-07	1.91E-04	1.76E-04	1.22E-03	2.28E-02	100	10	100	70	70	10	--
Worse-Case Engine – Avg HP	8	2.46E-03	5.00E-05	5.83E-08	7.32E-05	6.73E-05	4.66E-04	8.74E-03	100	10	100	70	70	10	--

		Hours Needed to Exceed De Minimis Threshold						
Model Engine	HP	CO	NOx	SO2	PM10	PM2.5	VOC	CO2 Exhaust
Worse-Case Engine - Max HP	22	15,531	76,410	655,451,826	365,770	397,576	8,208	--
Worse-Case Engine - Avg HP	8	40,615	199,822	1,714,083,401	956,531	1,039,708	21,465	--

Appendix B

Noise Analysis Report

Noise Assessment of Unmanned Aircraft

In support of the FAA-Recognized Identification Areas Programmatic Environmental Assessment

HMMH Report No. 313090.002 001-1g
March 23, 2023

Prepared for:

Federal Aviation Administration

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

This page intentionally left blank.

Noise Assessment of Unmanned Aircraft

In support of the FAA-Recognized Identification Areas Programmatic Environmental Assessment

HMMH Report No. 313090.002 001-1g
March 23, 2023

Prepared for:

Federal Aviation Administration

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

Prepared by:

Brandon Robinette

HMMH
700 District Avenue, Suite 800
Burlington, MA 01803
T 781.229.0707

This page intentionally left blank.

Contents

Figures

Tables

1 Introduction and Background

The Federal Aviation Administration (FAA) is implementing subpart C, FAA-Recognized Identification Areas (FRIA), of Title 14 of the Code of Federal Regulations (CFR) Part 89, Remote Identification of Unmanned Aircraft (Remote ID Rule) 86 FR 4390 (Jan. 15, 2021). Subpart C established a path through which eligible entities may seek approval from the FAA to establish a FRIA. After the Remote ID Rule is fully effective, unmanned aircraft (UA) equipped with remote identification technology can continue to operate nationally under existing regulations. All UA pilots required to register their aircraft must operate in accordance with the Remote ID Rule beginning September 16, 2023. The Remote ID Rule requires UA to be equipped with remote identification at locations outside of FRIA locations.

The FAA is evaluating whether the implementation of FRIAs could result in unmanned aircraft (UA) noise at or above the Day-Night Average Sound Level (DNL) 65 dB threshold for noise compatible land use. This document presents an analytical approach, and the associated results, for determining the numbers of flight events and time required for various types of UA operations to generate noise levels at or above DNL 65 dB.

The methodology proposed in this document provides quantitative guidance to the FAA in order to inform environmental decision making on UA noise exposure from the Proposed Action. The methods presented here are suitable for review of FAA 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 a nonstandard equivalent methodology under FAA Order 1050.1F, and as such, received written approval from the FAA's Office of Environment and Energy (AEE).[1]

Section 2 of this document describes two sets of noise measurements that form the basis of the noise assessment presented herein. Section 3 describes the data collected during those noise measurements. Section 4 presents the analysis methodology applied to the noise measurement data. Section 5 presents the estimated activity level that would be required to generate DNL 65 dB for various types of UA.

[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 Noise Measurement Descriptions

Two data sets form the basis for the noise assessment presented in this document. The primary data set consists of fixed-wing UA noise measurement data collected by the FAA at the Prince Georges County Radio Controlled (PGRC) Club[2] flying location in Upper Marlboro, MD on April 25, 2022[3]. The second data set consists of multicopter UA noise data collected by the U.S. Department of Transportation (USDOT) Volpe National Transportation System Center (Volpe) on July 15th and July 16th, 2019[4] at the Choctaw Nation of Oklahoma (CNO) Integrated Pilot Program (IPP) test site in Daisy, Oklahoma.

2.1 PGRC Club Noise Measurements

The PGRC measurement effort was coordinated with local members of Academy of Model Aeronautics (AMA) to capture noise from as many different UA types as possible in a single day. Various UA types were flown over a six-hour period, allowing for measurement of multiple flights from each aircraft type over the course of the day. The FAA categorized the UA measured according to general aircraft type and/or the engine used. All measured UA were fixed-wing aircraft. No helicopter or multicopter type UA were present for measurement. The categories of UA measured are presented in **Table 1**. For most UA categories, multiple UA (of the same category) were flown and captured in the noise measurements.

Table 1. PGRC Club Noise Measurement UA Categories

Source: FAA, 2022

UA Category	Description
Aerobat (Gas)	Propeller – 2-stroke chainsaw engine
Aerobat (Electric)	Propeller – electric engine
Big Engine	Propeller – 2-stroke chainsaw engine
Electric Sport	Propeller – electric engine sport plane
Small Glow Plug	Propeller – 2-stroke glow plug engine
Ducted Fan Electric	Ducted fan (F-16) – electric engine
Turbo Jets	Jet – 80 and 120 size turbo jet engines
Pylon Racer	Propeller – 2-stroke glow plug engine
Twin Engine	Propeller – twin 2-stroke DA engines

The PGRC Club noise measurements setup consisted of five total microphones placed at various locations around the facility property. **Figure 1** presents an aerial view of the site with the locations of the five microphones labeled as M1 through M5 and an oval indicating the area in which most flight activity generally occurs. Three tripod mounted microphones (M1, M2, M3) were placed within the designated flight area, one tripod mounted microphone (M4) was placed in the parking lot at the edge

[2] https://pgrcclub.com/

[3] Power Point presentation and noise measurement data files provided to HMMH by FAA on July 26, 2022

[4] *Noise Measurement Report: Unconventional Aircraft – Choctaw Nation of Oklahoma; July 2019, Measurement and Initial Noise Data Report – May 2020* accessible online at: https://rosap.ntl.bts.gov/view/dot/49647

of the facility property, and a spare microphone (M5) was placed on the ground adjacent to the facility runway. Due to its placement, microphone M5 data is not representative of noise levels that could be experienced by non-participants and as such the data is omitted from this report.

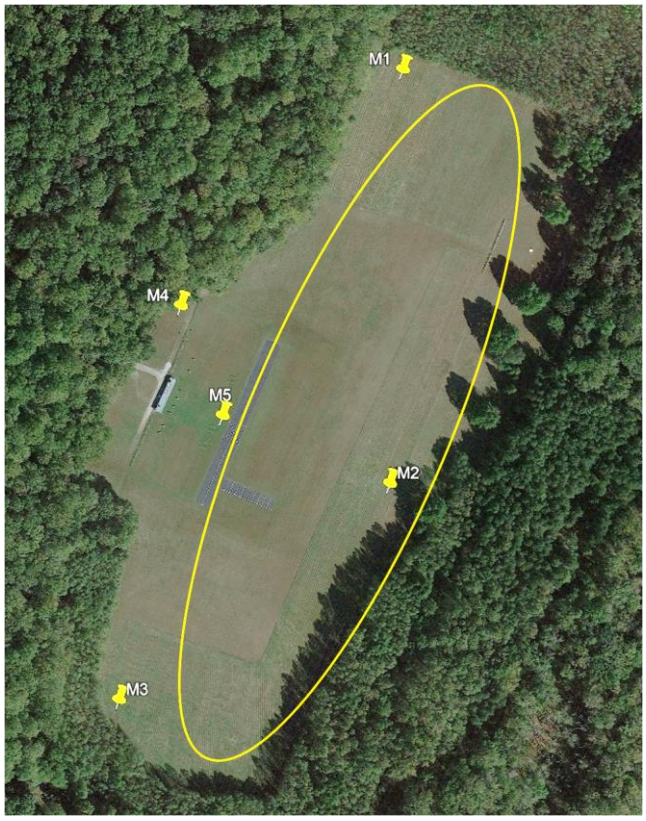


Figure 1. PGRC Club Noise Measurement Test Setup

Source: FAA, 2022

2.2 IPP CNO Volpe Noise Measurements

The IPP CNO noise measurement report (see footnote 4) is used as the source for multicopter noise data in this analysis, as no multicopters were operated during the noise measurements at the PGRC Club. The IPP CNO noise measurements captured data on four UA: three multicopters (DJI M200, Yuneec Typhoon, and Gryphon Dynamics GD28X) ranging from 5 to 45 pounds and a fixed-wing vehicle (Skywalker X-8) with a wingspan of about 7 feet. Measurements were conducted in a manner consistent with the existing noise certification requirements for light helicopters and small propeller-driven airplanes. Measurements were also taken with the vehicles operating on simulated missions unique to UA capabilities. Measured multicopter flight procedures covered vertical takeoff and landing operations, fast and slow (i.e., minimum and maximum engine power) level flyovers, and infrastructure inspection operations.

The IPP CNO measurement setup consisted of a total of three microphones placed under and adjacent to the UA flight path. Two microphones were placed on the center line directly under the flight path, an inverted ground plane microphone and a 4-foot-high pole-mounted microphone. An additional ground-

plane microphone was placed 20 feet west of the primary (center line) ground-plane microphone. **Figure 2** presents an aerial view of the site with the locations of the three microphones labeled.

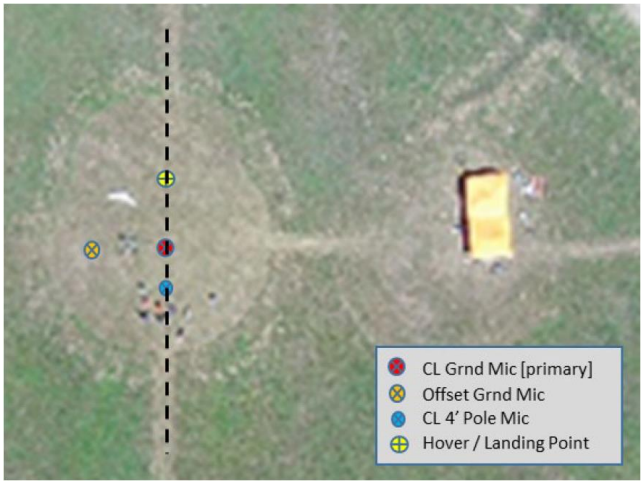


Figure 2. IPP CNPO Volpe Noise Measurement Test Setup

Source: Volpe, 2020

This document focusses solely on the noise data for the 45-pound GD28X. The GD28X, shown in Figure 3, was the heaviest UA measured at the CNO IPP site. The GD28X is an electrically powered octocopter (eight rotors) which can be flown at a maximum takeoff weight of 70 pounds, but for this test was limited to 45 pounds to comply with the FAA's Part 107 rule. The GD28X is over 4-and-a-half feet from rotor tip to rotor tip. Being the largest and noisiest of the three measured multicopters, the GD28X data provides a conservatively high representation of potential noise exposure for the multicopter category of UA.

Figure 3. Gryphon Dynamics GD28X

Source: Volpe, 2020

3 Noise Measurement Data

This section presents the resulting data for the PGRC Club and IPP CNO Volpe noise measurements. It should be noted that the two measurements were conducted for different purposes under different conditions. As such, the data available from each differs in terms of the manner of quantifying UA flight noise.

3.1 PGRC Club Noise Measurement Data

For the PGRC Club measurements, UA were operated in a manner consistent with typical recreational flying, wherein the positions of the aircraft during the measurement were unprescribed and generally random.

Table 2 presents the measured DNL for each aircraft category as well as the total DNL of all flight activity during the 6-hour measurement period. The location of microphone M2 was nearest to the general flight area, receiving the most direct overflights, and consequently measured the highest overall DNL and typically the highest DNL for each category.

Table 2. PGRC Club Noise Measurements DNL Results

Source: FAA, 2022

UA Category	Microphone M1 DNL (dB)	Microphone M2 DNL (dB)	Microphone M3 DNL (dB)	Microphone M4 DNL (dB)
Aerobat (Gas & Electric)	48	55	50	52
Big Engine	52	54	53	53
Electric Sport	25	30	28	30
Small Glow Plug	38	42	39	41
Ducted Fan Electric	15	27	24	26
Turbo Jets	40	41	41	42
Pylon Racer	35	41	38	38
Twin Engine	43	49	46	43
Ambient	34	35	34	41
Total DNL (All UA Activity)	**54**	**58**	**56**	**56**

Because microphone M2 was within the general flight area and experienced the most direct UA overflights, its data was selected for use in further analysis to assess potential UA noise exposure related to flight operations within FRIAs. Table 3 presents additional details on the noise data collected at M2. Thirty-eight individual UA flights were measured at M2 with the average duration of flights ranging from approximately five to ten minutes. The electric sport and aerobat UA produced the lowest and highest noise levels, respectively. The average A-weighted maximum sound level (L_{Amax}) ranged from 59.1 to 85.3 dBA and the average A-weighted Sound Exposure Level (L_{AE}) ranged from 71.8 to 99.1 dBA.

Table 3. PGRC Club Noise Measurements Additional Data for Microphone M2

Source: HMMH / FAA, 2022

UA Category	Number of Flights	Average Flight Duration (Min)	Average L_{Amax} (dB)	Average L_{AE} (dB)
Aerobat (Gas & Electric)	3	10.3	85.3	99.1
Big Engine	7	8.7	81.1	94.8
Electric Sport	6	7.0	59.1	71.8
Small Glow Plug	11	5.7	67.1	81.0
Ducted Fan Electric	2	4.7	62.7	73.5
Dfgsdfdsxcvbnm,Turbo Jets	3	6.8	74.4	85.8
Pylon Racer	2	4.6	76.1	87.0
Twin Engine	4	8.3	81.0	92.4

3.2 IPP CNO Volpe Noise Measurement Data

For the IPP CNO Volpe measurements, the test was designed to capture UA noise for individual types of UA operations (e.g., takeoff, landing, level overflight) wherein the position of each aircraft during the measurement was prescriptive. Each operation type was repeated multiple times with the UA flown in a consistent manner for each pass by the microphones. This document uses data from the centerline 4-foot pole-mounted microphone, as its mounting is the most representative of what a listener would experience during UA overflights. Table 4 presents the average L_{Amax} and L_{AE} as well as associated number of passes and average durations for flyovers and vertical takeoffs and landings. Table 4 also presents the average A-weighted Equivalent Continuous Sound Level (L_{Aeq}) for a 30-second hover.

Table 4. IPP CNO Volpe GD28x Noise Measurement Data for Centerline 4-Foot Pole-Mounted Microphone

Source: Volpe, 2020

GD28X Operation Type	Number of Passes	Average Flight Pass Duration (Sec)	Average L_{AE} Duration (Sec)	Average L_{Amax} (dB)	Average L_{AE} (dB)	L_{Aeq} (dB)
Slow Level Flyover (150 ft)	8	42	19	66.1	75.6	-
Fast Level Flyover (150 ft)	5	27	11	69.1	76.2	-
Vertical Takeoff then Depart (150 ft)	4	56	56	73.2	84.3	-
Arrive (150 ft) then Vertical Landing	4	71	71	72.8	86.7	-
Vertical Takeoff + Vertical Landing	4	127	-	-	88.7	-
Hover (4 ft)	4	30	-	-	-	76.4

Notes:
- Except for hovers, all data presented is for the centerline 4-foot pole (CLP) microphone. Hover data is from the Sideline Ground microphone.
- Hover measurements consisted of 30-second hovers with the UA pointed toward each cardinal direction.
- Data elements which are not applicable to particular operation types are denoted by "-".

Of the individual GD28X operation types measured, the L_{Amax} ranged from 66.1 to 73.2 dB and the L_{AE} ranged 75.6 to 86.7 dB. Noise levels for vertical takeoff plus vertical landing are calculated by the decibel addition of the individual takeoff and landing noise levels. Static hovers were measured with the vehicle

at 4 feet above ground level directed toward each of the four cardinal directions for 30-second intervals. The Volpe report states that Centerline Pole microphone data for the GD28X was not collected during hover due to issues with measurement hardware. Due to this data being unavailable, Sideline Ground microphone data is presented in Table 4 and used in subsequent analysis (instead of Centerline Pole data). The average L_{Aeq} for the four cardinal direction 30-second hovers was 76.4 dB.

4 Methodology for Data Analysis

The determination of activity thresholds for UA operations that would generate noise levels at or above DNL 65 dB is calculated by different methods, depending on whether the measured event is quantified in terms of L_{AE} or L_{Aeq}. Only static hover events are quantified in terms of L_{Aeq}. All other measured dynamic events utilized in this analysis are quantified in terms of L_{AE}. In all instances, the results in Section 5 are presented in terms of Average Annual Day (AAD) DNL effective daytime values for events or flight time. Effective daytime numbers of events or flight time is defined as follows in Equation 1.

$$N_{d\ eff} = N_d + (10 \times N_n) \quad (1)$$

Where:

- N_d= flight events or hover hours occurring during the daytime from 7:00 a.m. to 9:59 p.m.
- N_n= flight events or hover hours occurring during the nighttime from 10:00 p.m. to 6:59 a.m.

Equation 1 may be rearranged to calculate an equivalent result for all activity occurring during the nighttime period, i.e., where $N_d = 0$, as follows in Equation 1.1.

$$N_n = \frac{N_{d\ eff}}{10} \quad (1.1)$$

As such, the results in Section 5 may be converted to all nighttime activity equivalent values by dividing the presented value by 10.

Section 4.1 contains the L_{AE} methodology, Section 4.2 contains the L_{Aeq} methodology, Section 4.3 contains an aggregate methodology for determining $N_{d\ eff}$ for combined static and dynamic events, and Section 4.4 discusses the determination of the flight times associated with the resulting $N_{d\ eff}$.

4.1 Sound Exposure Level Methodology

Numbers of effective daytime flight events required to generate DNL 65 dB are calculated from the measured L_{AE} as follows in Equation 2.

$$Flight\ Events\ N_{d\ eff} = \frac{10^{\left(\frac{65}{10}\right)}}{10^{\left(\frac{L_{AE}-49.4}{10}\right)}} \quad (2)$$

4.2 Equivalent Continuous Sound Level Methodology

For vehicles hovering in place, the number of effective daytime hover hours required to generate DNL 65 dB are calculated from the measured L_{Aeq} as follows in Equation 3.

$$Hover\ Hours\ N_{d\ eff} = \frac{10^{\left(\frac{65}{10}\right)}}{10^{\left(\frac{L_{Aeq}}{10}\right)}} \times 24 \quad (3)$$

4.3 Aggregate Methodology

Static hover noise is combined with dynamic flight event noise utilizing a three-step process to determine $N_{d\ eff}$ flight events for the aggregate. In Step 1, the static hover L_{Aeq} for some fixed period of time in seconds, denoted as t, is converted to an equivalent L_{AE} as follows in Equation 4.

$$Hover\ L_{AE} = L_{Aeq} + 10\log_{10} t \quad (4)$$

In Step 2, the L_{AE} values for the static and dynamic events are added together by standard decibel addition as follows in Equation 5.

$$Combined\ L_{AE} = 10\log_{10}\left[\sum_{i}^{n} 10^{\left(\frac{L_{AE_i}}{10}\right)}\right] \quad (5)$$

The third and final step uses the output of Equation 5 as the input to Equation 2 to calculate the resultant $N_{d\ eff}$ for aggregate flight events to generate DNL 65 dB.

4.4 Flight Hours

Flight hours associated with the $N_{d\ eff}$ flight events to generate DNL 65 dB are also calculated. Associated flight hours are determined by multiplying the resulting $N_{d\ eff}$ by the average UA flight and event type durations presented in Table 4 and Table 5.

5 Noise Exposure Estimate Results

By application of the equations presented in Section 4 to the measurement data presented in Section 3, effective daytime Annual Average Daily (AAD) flight events and hours were calculated for DNL 65 dB.

5.1 PGRC Club Noise Assessment Results

For the fixed-wing UA measured at the PGRC Club, AAD $N_{d\ eff}$ flights ranged from approximately 33 to 18,000 per day, equating to a range of AAD $N_{d\ eff}$ flight hours between approximately 6 to 2,086 per day. Only 3 of the measured aircraft categories were calculated to produce DNL 65 dB in less than 24 hours of average daily flight time, the Aerobat at 5.7 hours, Big Engine at 13.3 hours, and Twin Engine at 21.6 hours. The three noisiest aircraft were all 2-stroke gas engine propeller driven planes that were the largest of the UA present for PGRC Club measurements. Figure 4 and Figure 5 present the results for the fixed-wing UA measured at the PGRC Club.

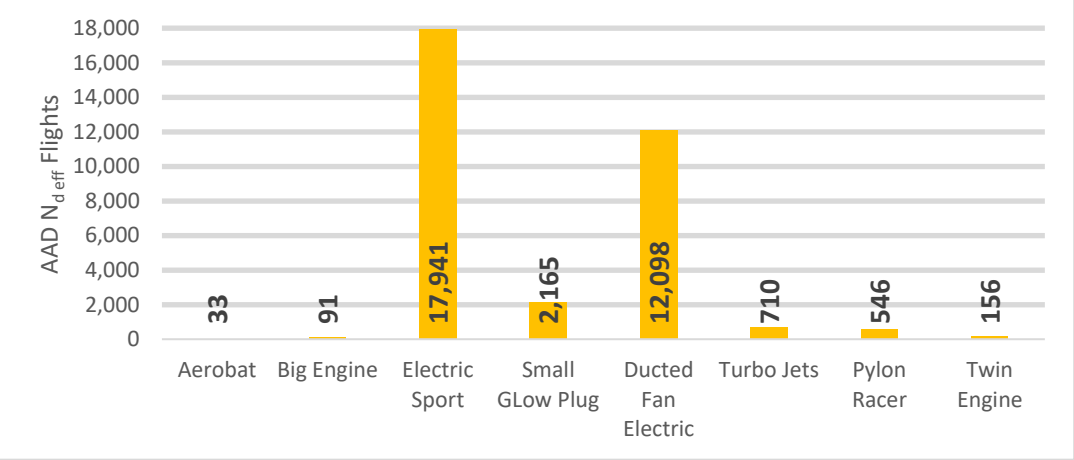


Figure 4. Fixed-wing UA AAD $N_{d\ eff}$ Flight Events for DNL 65 dB at Microphone M2

Source: HMMH

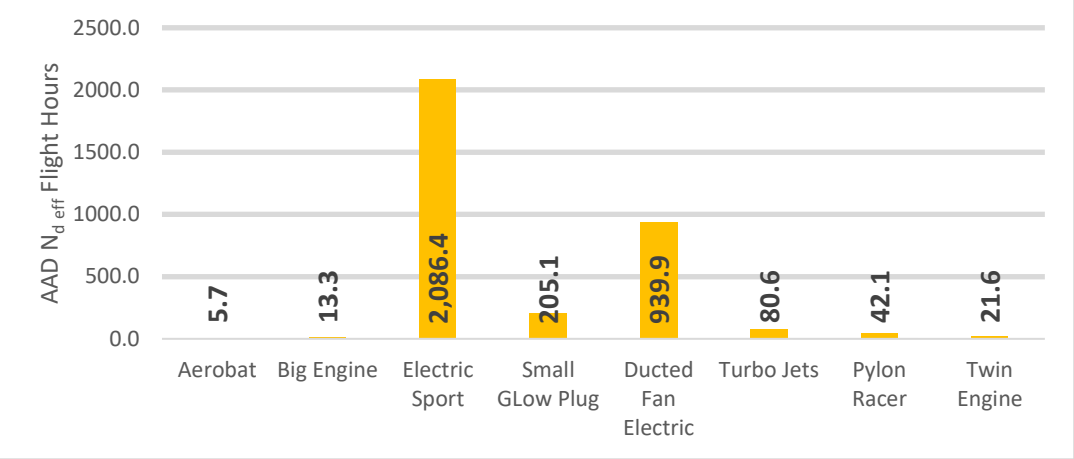


Figure 5. Fixed-wing AAD $N_{d\ eff}$ Flight Hours for DNL 65 dB at Microphone M2

Source: HMMH

5.2 IPP CNO Noise Assessment Results

For the GD28X multicopter UA measured at the CNO IPP site, AAD $N_{d\ eff}$ flights ranged from approximately 80 to 7,500 per day, equating to a range of AAD $N_{d\ eff}$ flight hours between approximately 4 to 88 per day. These ranges include event type sequences, like vertical landing plus hover plus vertical takeoff, that were not directly measured but estimated by combing the measured noise levels and associated durations of the individual component operations to approximate a broader range of potential flight activity. It should be noted that the UA when in hover and during vertical takeoff and landing is within approximately 30 feet of the microphone, making the results presented here representative of what would typically only be experienced by someone participating in the operation of the UA. Figure 6 and Figure 7 present the results for the GD28X multicopter UA measured at the IPP CNO site.

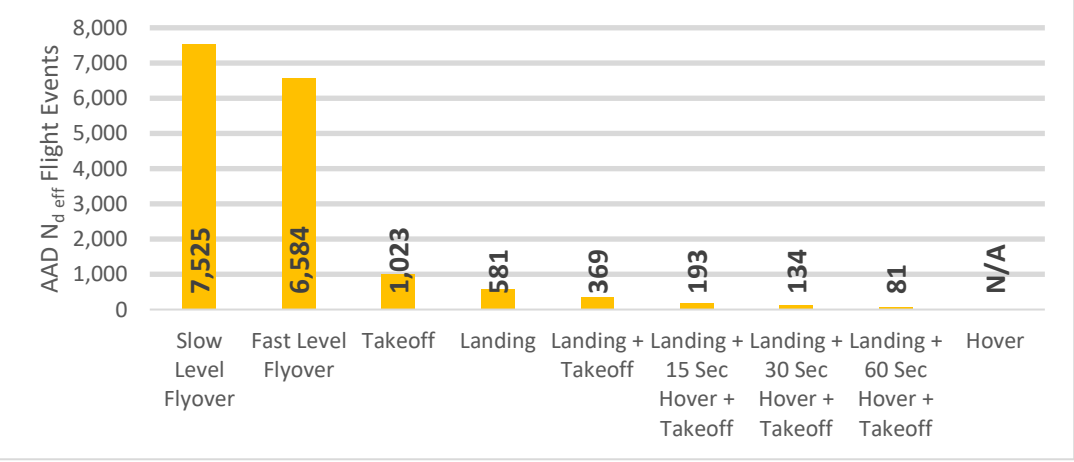


Figure 6. GD28X Multicopter AAD $N_{d\ eff}$ Flight Events for DNL 65 dB

Source: HMMH

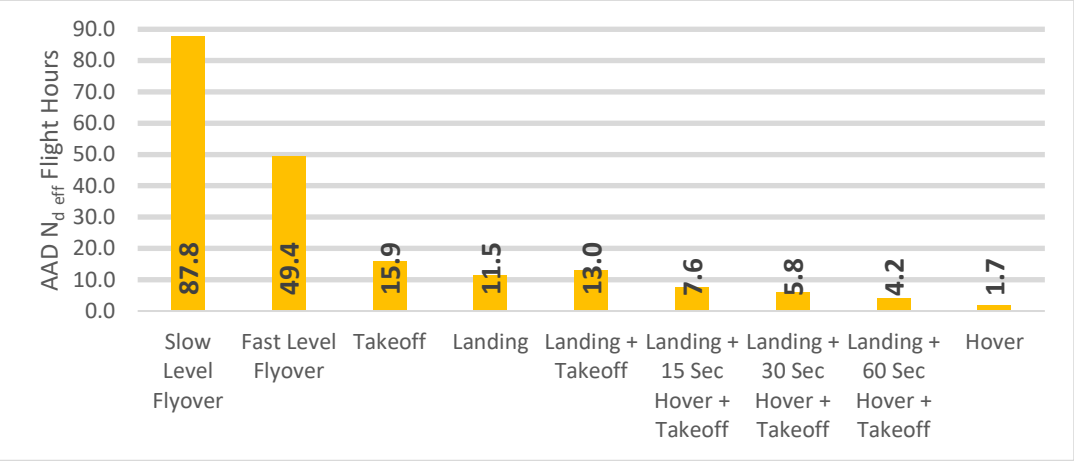


Figure 7. GD28X Multicopter AAD $N_{d\ eff}$ Flight Hours for DNL 65 dB

Source: HMMH

6 Conclusion

The number of flight events and associated flight time required for UA to generate noise levels at or above DNL 65 dB was estimated using available noise measurement data for small (i.e., under 55 pounds) fixed-wing and multicopter UA. The results of the analysis show that, for the measured UA, the number of AAD flight events and associated flight times required to produce DNL 65 dB at a fixed receiver location within a flight area is generally much higher than what would be likely or practically possible to occur in foreseeable real-world conditions.

6.1 Applicability of Noise Analysis Results to Potential UA Activity

As stated previously, FAA anticipates UA operations within FRIAs could include fixed-wing, helicopters, and multicopters equipped with an electric motor, gas engine, or turbine engine. As such, the noise data used for this analysis does not cover all UA types that could potentially operate within a FRIA. Table 5 presents an inventory of the UA types used for this analysis in the context of all potential UA types. The noise measurement data used for this analysis covers all engine types for fixed-wing UA and multicopter UA with electric engines. However, it does not include multicopter UA with gas or turbine engines, or any type of helicopter UA.

Table 5. Potential UA Types and Noise Measurement Data Used for Analysis

Source: HMMH

	Fixed Wing			Helicopter			Multicopter		
Aircraft/Engine Type	**Electric**	**Gas**	**Turbine**	**Electric**	**Gas**	**Turbine**	**Electric**	**Gas**	**Turbine**
Fixed Wing (PGRC Club Data)	**Y**	**Y**	**Y**	-	-	-	-	-	-
Aerobat	•	•		-	-	-	-	-	-
Big Engine		•		-	-	-	-	-	-
Electric Sport	•			-	-	-	-	-	-
Small Glow Plug		•		-	-	-	-	-	-
Ducted Fan	•			-	-	-	-	-	-
Turbo Jets			•	-	-	-	-	-	-
Pylon Racer	•	•		-	-	-	-	-	-
Twin Engine		•		-	-	-	-	-	-
Multi-copter (IPP CNO Volpe Data)	-	-	-	-	-	-	**Y**	**N**	**N**
Helicopter	-	-	-	**N**	**N**	**N**	-	-	-

Current multicopter UA primarily use electric engines and that is expected to remain true for the foreseeable future. While it is recognized that multicopter UA with gas or turbine engines could operate within FRIAs, the existence and operation of such UA is expected to be rare. Helicopter UA with all three engine types are currently operated by hobbyists and can be expected to operate within FRIAs, though

likely at lower activity levels than fixed-wing UA as they tend to be less common. While this analysis did not have available helicopter UA noise data for estimating threshold levels of flight activity to produce DNL 65 dB, the resulting ranges for the available data are likely to be representative of similarly sized helicopter UA given the representative spread of engine types and sizes present in the fixed-wing data and similarity/overlap of engines used across hobbyist UA.

Collection of additional noise data and further noise analysis may be warranted to evaluate the potential for noise exposure impacts at flying locations expected to have a substantial portion of flight activity from helicopter UA and/or multicopters with gas or turbine engines, and for flying locations expected to have frequent activity by any UA heavier than 55 pounds. However, significant noise impacts are unlikely to result in any case given that the FAA anticipates that the implementation of the Remote ID rule, and FRIAs to accommodate operation of UA without remote ID, to have a very little effect on the overall level of activity occurring at existing or new flying locations.

6.2 Existing Flying Locations

For FRIAs designated at an existing flying location, the FAA anticipates there would be no change in existing conditions due to the general ability to fly UA for recreation under 49 U.S.C § 44809. Furthermore, it is expected that most recreational operators of UA would bring their non-compliant aircraft into compliance either by the Remote ID deadline or sometime after. Potential decreases in flight activity, assuming non-compliant operators cease flying, following the September 2023 compliance deadline would be temporary and negligible. As such, neither the Proposed Action nor the No Action Alternative would result in substantive changes to activity levels and their associated noise exposure at existing flying locations.

6.3 New Flying Locations

For FRIAs designated at newly established flying locations, the FAA anticipates flight activity increases relative to existing conditions to be minor due to the presence of general ability to fly UA for recreation under 49 U.S.C § 44809. Resulting concentrations of activity occurring at new locations that previously did not experience multiple operators within a confined area would be temporary. As such, neither the Proposed Action nor the No Action Alternative would result in substantive changes to activity levels and their associated noise exposure at new flying locations.

Appendix C

Non-Standard Noise Methodology Memos

Federal Aviation Administration

Memorandum

Date: March 23, 2023

To: Don Scata, Noise Division Manager, Office of Environment and Energy (AEE-100)

MICHAEL JAY MILLARD Digitally signed by MICHAEL JAY MILLARD Date: 2023.03.23 08:44:42 -04'00'

From: Mike Millard, Flight Standards (AFS), General Aviation Operations Branch (AFS-830)

Subject: Programmatic Environmental Assessment (PEA) Noise Methodology Approval Request for FAA-Recognized Identification Areas (FRIAs) under the Remote Identification of Unmanned Aircraft Final Rule (14 CFR Part 89)

FAA Flight Standards Service (AFS) requests FAA Office of Environmental and Energy (AEE) Noise Division (AEE-100) approval of the noise methodology to be used for the Programmatic Environmental Assessment (PEA) for FAA-Recognized Identification Areas (FRIAs) under the Remote Identification of Unmanned Aircraft Final Rule, as described below.

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

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

Description of Aircraft and Proposed Operations

AFS is evaluating whether the implementation of FRIA approvals could result in unmanned aircraft (UA) noise at or above the thresholds of Day-Night Average Sound Level (DNL) 65 dB or an increase of 1.5 dB or greater within DNL 65 dB for noise compatible land use. A FRIA is a defined geographic area where unmanned aircraft can be flown without remote identification equipment. Both the UA and the pilot must be located within the FRIA's boundaries throughout the operation. In addition, the pilot of the unmanned aircraft must be able to see it at all times throughout the duration of the flight. Only FAA-recognized Community Based Organizations and educational institutions such as primary and secondary schools, trade schools, colleges, and universities are eligible to request the establishment of a FRIA. If the FAA approves the establishment of a FRIA, the approval will be valid for 48 calendar months.

To establish a FRIA, eligible entities must submit applications to the FAA for proposed locations. FAA approval of a FRIA only relates to its location, it does not approve construction or other infrastructure development. Following establishment, UA may be operated within FRIA boundaries without Remote ID technology as long as the UA remains within the operator's visual line of sight and neither the operator nor the UA travel beyond the boundaries. The UA operated at FRIAs may include fixed-wing, helicopters, and multicopters equipped with an electric motor, gas engine, or turbine engine.

The primary data set in the noise assessment consists of fixed-wing UA noise measurement data collected by the FAA at the Prince Georges County Radio Controlled (PGRC) Club flying location in Upper Marlboro, MD. The PGRC measurement effort was coordinated with local members of Academy of Model Aeronautics (AMA) to capture noise from as many different UA types as possible in a single day. Various UA types were flown over a six-hour period, allowing for measurement of multiple flights from each aircraft type over the course of the day consistent with typical operations of the UA. The FAA categorized the UA measured according to general aircraft type and/or the engine used and are summarized in Table 1 below. All measured UA were fixed-wing aircraft.

Table 1. Measured UA Categories and Engines

UA Category	Description
Aerobat (Gas)	Propeller – 2-stroke chainsaw engine
Aerobat (Electric)	Propeller – electric engine
Big Engine	Propeller – 2-stroke chainsaw engine
Electric Sport	Propeller – electric engine sport plane
Small Glow Plug	Propeller – 2-stroke glow plug engine
Ducted Fan Electric	Ducted fan (F-16) – electric engine
Turbo Jets	Jet – 80 and 120 size turbo jet engines
Pylon Racer	Propeller – 2-stroke glow plug engine
Twin Engine	Propeller – twin 2-stroke DA engines

The secondary data set in the noise assessment consists of multicopter UA noise data collected by the U.S. Department of Transportation (USDOT) Volpe National Transportation System Center (Volpe) at the Choctaw Nation of Oklahoma (CNO) Integrated Pilot Program (IPP) test site in Daisy, Oklahoma. The IPP CNO noise measurement report was used as the source for multicopter noise data in the noise analysis, as no multicopters were operated during the noise measurements at the PGRC Club. The IPP CNO noise measurements captured data on four UA: three multicopters (DJI M200, Yuneec Typhoon, and Gryphon Dynamics GD28X) ranging from 5 to 45 pounds and a fixed-wing vehicle (Skywalker X-8) with a wingspan of about 7 feet. Measurements were conducted in a manner consistent with the existing noise certification requirements for light helicopters and small propeller-driven airplanes. Measurements were also taken with the vehicles operating on simulated missions unique to UA capabilities. Measured multicopter flight procedures covered vertical takeoff and landing operations, fast and slow (i.e., minimum and maximum engine power) level flyovers, and infrastructure inspection operations.

The FAA expects UA operations at proposed FRIA flying locations would typically involve one UA in the air at a time, with operations lasting a few hours per day up to seven days per week. The numbers of flight events and associated flight time required for UA to generate noise levels at or above DNL 65 dB was estimated using available noise measurement data for small (i.e., under 55 pounds) fixed-wing and multicopter UA.

Noise Analysis Methodology

AFS requests use of the noise analysis methodology described in HMMH Report No. 313090.002 001-1 for the “Noise Assessment of Unmanned Aircraft in support of the FAA-Recognized Identification Areas Programmatic Environmental Assessment” dated March 3, 2023.

Federal Aviation Administration

Memorandum

Date: March 27, 2023

To: Mike Millard, Flight Standards (AFS), General Aviation Operations Branch, AFS-830

From: Don Scata, Manager, Noise Division, Office of Environment and Energy (AEE-100)

Digitally signed by DONALD S SCATA JR
Date: 2023.03.28 10:37:10 -04'00'

Subject: Programmatic Environmental Assessment (PEA) Noise Methodology Approval Request for FAA-Recognized Identification Areas (FRIAs) under the Remote Identification of Unmanned Aircraft Final Rule (14 CFR Part 89)

The Office of Environment and Energy (AEE) has reviewed the proposed non-standard noise modeling methodology to be used for FAA-Recognized Identification Areas (FRIAs) under the Remote Identification of Unmanned Aircraft Final Rule. This request is in support of a Programmatic Environmental Assessment (PEA) for the nationwide establishment of FRIAs.

The Proposed Action is to allow eligible entities such as primary and secondary schools, trade schools, colleges, and universities to submit applications to the FAA to allow for the establishment of FRIAs. A FRIA is a defined geographic area where UA can be flown without remote identification equipment. Once an application for establishment of a FRIA is approved by the FAA, eligible entities can fly UA without remote identification equipment provided the UA remains within the operator's visual line of sight and neither the operator nor the UA travel beyond the established FRIA boundaries. The UA operated at FRIAs may include fixed-wing, helicopters, and multicopters equipped with an electric motor, gas engine, or turbine engine. The FAA expects UA operations at proposed FRIA locations would typically involve one UA in the air at a time, with operations lasting a few hours per day up to seven days per week.

To evaluate the noise levels from the Proposed Action, the numbers of flight events and associated flight time required for UA to generate noise levels at or above DNL 65 dB was estimated using available noise measurement data for fixed-wing and multicopter UA. Noise measurement data for the noise analysis was based on two data sources. Fixed-wing UA noise measurements were based on measurements collected by the FAA at the Prince Georges County Radio Controlled (PGRC) Club in Upper Marlboro, MD, and multicopter UA noise measurements were collected by the U.S. Department of Transportation (USDOT) Volpe National Transportation System Center (Volpe) at the Choctaw Nation of Oklahoma (CNO) Integrated Pilot Program (IPP) test site in Daisy, Oklahoma, respectively.

As the FAA does not currently have a standard approved noise model for assessing UA, and in accordance with FAA Order 1050.1F, all non-standard noise analysis in support of the noise impact analysis for the National Environmental Policy Act (NEPA) must be approved by AEE. This letter serves as AEE's response to the method developed in HMMH Report No. 313090.002 001-1g for "Noise Assessment of Unmanned Aircraft In support of the FAA-Recognized Identification Areas Programmatic Environmental Assessment" dated March 23, 2023.

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

Appendix D

Acronyms and Abbreviations

Appendix D: Acronyms and Abbreviations

AAD - Average Annual Day

AGL - Above Ground Level

AMA - Academy of Model Aeronautics

BCC - Birds of Conservation Concern

CBOs - Community Based Organizations

CEQ - Council on Environmental Quality

CFR - Code of Federal Regulations

CO2 - Carbon Dioxide

CZMP - Coastal Zone Management Plan

dB - Decibel

dBA - A-weighted decibel

DNL - Day-Night Average Sound Level

DOT - Department of Transportation

EA - Environmental Assessment

EIS - Environmental Impact Statement

EO - Executive Order

EPA - Environmental Protection Agency

ESA - Endangered Species Act

FAA - Federal Aviation Administration

FHWA - Federal Highway Administration

FONSI - Finding of No Significant Impact

FRIAs - FAA-Recognized Identification Areas

GA - General Aviation

GHG - Greenhouse Gas

HAPs - Hazardous Air Pollutants

HP - Horsepower

JROTC - Junior Reserve Officer Training Corps

MOVES - Motor Vehicle Emission Simulator

MSATs - Mobile Source Air Toxics

NAAQS - National Ambient Air Quality Standards

NAS - National Airspace System

NEPA - National Environmental Policy Act

NHPA - National Historic Preservation Act

NMFS - National Marine Fisheries Service

NOA - Notice of Availability

NOAA - National Oceanic and Atmospheric Administration

NRI - Nationwide Rivers Inventory

P.L. - Public Law

PEA - Programmatic Environmental Assessment

STEM - Science, Technology, Engineering, and Math

U.S.C - United States Code

UA - Unmanned Aircraft

UAS - Unmanned Aircraft Systems

USFWS - United States Fish and Wildlife Service

VFR - Visual Flight Rules

VLOS - Visual Line of Sight

VOCs - Volatile Organic Compounds