Final Environmental Assessment and Finding of No Significant Impact/Record of Decision

Zipline International Inc.
Drone Package Delivery Operations in Pea Ridge, Arkansas and Surrounding Area

July 2022

United States Department of Transportation
Federal Aviation Administration

Washington, D.C.

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Cover Image: Zipline International Inc.

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

Notice of Availability of the Final Environmental Assessment and Finding of No Significant Impact/Record of Decision for Zipline International's Drone Package Delivery Operations in Pea Ridge, Arkansas, and the Surrounding Area

The Federal Aviation Administration (FAA) hereby gives Notice of Availability (NOA) for the Final Environmental Assessment (EA) and Finding of No Significant Impact/Record of Decision (FONSI/ROD) following the FAA's evaluation of the potential effects of the FAA decision to authorize Zipline International, Inc. to conduct unmanned aircraft (UA) commercial package delivery operations from one location, or "nest," in Pea Ridge, Arkansas.

Zipline is seeking to amend its Part 135 Air Carrier Operations Specifications (OpSpecs) to include package delivery operations from its nest in Pea Ridge to approved delivery locations in Benton and Carrol Counties in Arkansas, and to portions of McDonald and Barry counties in Missouri. The federal action subject to this EA is the requested FAA approval of Zipline's OpSpecs to include a paragraph with descriptive language about the operating area boundaries, which includes the specific locations and operational profile in Zipline's request.

The Final EA has been prepared in accordance with the requirements set forth in the Council on Environmental Quality (CEQ) regulations at Title 40, Code of Federal Regulations (CFR), parts 1500-1508, *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*. The Final EA reflects consideration of comments received during the public comment period for this EA, which was open from June 13, 2022 through June 27, 2022.

The Final EA and FONSI/ROD are available to view/download electronically at https://www.faa.gov/uas/advanced_operations/nepa_and_drones/

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

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Finding of No Significant Impact/Record of Decision
for
Final Environmental Assessment for Zipline International Inc.
Drone Package Delivery Operations
Pea Ridge, AR, and Surrounding Area

Introduction

The Federal Aviation Administration (FAA) prepared the attached Environmental Assessment (EA) to analyze the potential environmental impacts that may result from FAA's approval of the Part 135 air carrier Operations Specifications (OpSpecs) amendments and other approvals requested by Zipline International Inc. (Zipline) to begin commercial package delivery operations (described in more detail in the Proposed Action section below) in Pea Ridge, Arkansas and the surrounding area. The requested approvals would, among other things, add descriptive language to Zipline's OpSpecs about specific locations for the operating area boundaries. This approval would enable Zipline to begin unmanned aircraft (UA)[1] commercial package delivery operations in Pea Ridge, AR, and the surrounding area (operating boundaries are depicted in Figure 1 of the EA). The approval of Zipline's OpSpec amendments to include this new operating area and the other FAA approvals that are necessary for these operations are considered a major federal action subject to National Environmental Policy Act (NEPA) review requirements.

The FAA prepared the EA in accordance with the National Environmental Policy Act of 1969, as amended (42 United States Code [U.S.C.] § 4321 et seq.); Council on Environmental Quality's NEPA implementing regulations (40 Code of Federal Regulations [CFR] parts 1500 to 1508); FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*; and FAA Order 1050.1F Desk Reference.

After completing the EA and reviewing and analyzing available data and information on existing conditions and potential impacts, the FAA has determined the proposed action will not significantly affect the quality of the human environment. Therefore, the preparation of an Environmental Impact Statement is not required, and the FAA is issuing this Finding of No Significant Impact (FONSI) and

[1] Drone and UA may be used interchangeably.

Record of Decision (ROD). The FAA has made this determination in accordance with applicable environmental laws and regulations. The EA is incorporated by reference into and supports this FONSI/ROD.

Purpose and Need

The FAA has multiple approvals associated with Zipline's proposed initiation of commercial delivery operations in Pea Ridge and the surrounding area. The FAA amendment of Zipline's OpSpecs to add a new area of operations (as depicted in Figure 1 of the EA) is the approval that will ultimately enable UA commercial delivery operations in this area. Zipline's request for OpSpec amendments to add a new area of operations requires FAA review and approval.[2] The FAA has a statutory obligation to review Zipline's request to approve the OpSpecs and determine whether the issuance would affect safety in air transportation or air commerce and whether the public interest requires the amendment. After making this determination, the FAA must take an action on the OpSpecs amendment.

The purpose of Zipline's request is to begin its UA commercial delivery service in Pea Ridge and the surrounding area which, in its business judgment, Zipline has determined is an appropriate market for expanding commercial delivery service in the United States. Zipline's requested amendment is needed so Zipline can begin UA commercial delivery operations in Pea Ridge and the surrounding area.

See Section 1.3 of the EA for further information.

Proposed Action

In order for Zipline to be issued the amended OpSpecs under its Part 135 air carrier certificate, it must receive a number of approvals from the FAA, such as a waiver of 14 CFR 91.113(b) to enable beyond visual line of sight (BVLOS) operations and a Certificate of Waiver or Authorization (COA). Zipline has requested that the FAA amend the OpSpecs in its Part 135 air carrier certificate; this is the FAA approval that ultimately would enable operations for compensation or hire in Pea Ridge and the surrounding area. The proposed action is the FAA approval of an amendment to Zipline's B050 OpSpec, *Authorized Areas of En Route Operations, Limitations, and Provisions*, specifically a reference section titled Limitation, Provisions, and Special Requirements. The approval would include a paragraph with descriptive language about the operating area boundaries (depicted in Figure 1 of the attached EA),

[2] Zipline's Part 135 air carrier certificate was issued in June, 2022, after the release of the Draft Environmental Assessment for this action was published for public comment.

including the specific location and operational profile proposed in Zipline's request. The operating area is also the study area for the EA.

Zipline projects operating a maximum of approximately 20 flights per operating day from this nest location in the first year of operations. Zipline is planning to conduct deliveries to customers in 12 communities in the operating area, identified in Table 2-1 of the EA. The operating area, shaped like a polygon is, at its widest, approximately 45 miles east to west and 30 miles north to south, and the total approximate delivery area is 1,200 square miles. More than half of the operating area, approximately 676 square miles, is located in Missouri and encompasses nearly all of McDonald County and portions of Barry County. The remainder of the operating area, approximately 520 square miles, is located in Arkansas and encompasses roughly half of Benton County and a small portion, approximately 50 square miles, of Carroll County.

The proposed operations would occur during daylight hours up to seven days per week, with no flights on holidays. No nighttime operations are anticipated or requested under the proposed action.

The OpSpecs will restrict Zipline to the operating area identified in Figure 1 of the EA. Any future expansion beyond the authorization and limitations for the area of operations described in the B050 OpSpec, or beyond the current 1:1 pilot to aircraft ratio described in Zipline's A003 OpSpec, *Airplane/Aircraft Authorization*, will require additional OpSpec amendments from the FAA and will receive appropriate NEPA review at that time.

See Section 2.1 of the EA for further information.

Alternatives

Alternatives analyzed in detail in the EA include the proposed action and the no action alternative. Under the no action alterative, the FAA would not issue the approvals necessary, including the OpSpecs, to enable Zipline to begin its UA package delivery operations in Pea Ridge and the surrounding area. This alternative does not support the stated purpose and need.

See Section 2.2 of the EA for further information.

Environmental Impacts

The potential environmental impacts from the proposed action and no action alternative were evaluated in the attached EA for each of the environmental impact categories identified in FAA Order 1050.1.F. Section 3 of the attached EA describes the physical, natural, and human environment within

the project study area, and identifies those environmental impact categories that are not analyzed in detail, explaining why the proposed action would have no potential effects on those environmental impact categories. Those categories are Air Quality; Climate; Coastal Resources; Farmlands; Hazardous Materials, Solid Waste, and Pollution Prevention; Land Use; Natural Resources and Energy Supply; Socioeconomic Impacts and Children's Environmental Health and Safety Risks; Visual Effects (Light Emissions Only); Water Resources (Wetlands, Floodplains, and Groundwater).

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

- **Biological Resources (including Fish, Wildlife, and Plants), EA Section 3.2.** Biological resources include plant and animal species and their habitats, including special status species (federally listed or state-listed threatened or endangered species, species proposed for listing, species that are candidates for federal listing, marine mammals, and migratory birds) and environmentally sensitive or critical habitat. The Endangered Species Act (ESA) of 1973 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. Federal agencies are responsible for determining if an action "may affect" listed species or critical habitat, which determines whether formal or informal consultation with the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) is needed. If the FAA determines that the action will have no effect on listed species, consultation is not required. If the FAA determines that the action may affect listed species, consultation with the USFWS must be initiated.

  The Migratory Bird Treaty Act of 1918 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. The Bald and Golden Eagle Protection Act of 1940 prohibits anyone from "taking" a bald or golden eagle, including their parts, nests, or eggs, without a permit issued by the USFWS. The USFWS 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.

Additionally, the State of Arkansas identifies “Species of Greatest Conservation Need” that are species of wild animal native or once-native to Arkansas and determined by the states to require monitoring. The Arkansas Species of Greatest Conservation Need listed in this document have been recognized as needing additional conservation by the Arkansas Game & Fish Commission. The State of Missouri lists species considered to be threatened with extinction as endangered under the Wildlife Code of Missouri. The Missouri state species listed by the Missouri Department of Conservation include plants, mollusks, crustaceans, insects, fish, amphibians, reptiles, birds, and mammals. Under the Missouri state wildlife code, endangered is the only ranking status for listed species.

The proposed action will not involve ground construction or habitat modification, as the landing and take off location is in lot that is already developed. The operations will be taking place within airspace, and typically well above the tree line and away from sensitive habitats. The typical number of daily operations and altitude of the flights (generally between 130 to 400 feet above ground level, except for deliveries when the UA will descend to approximately 60 feet above ground level) are not expected to significantly influence wildlife in the area.

Bird species are expected to be most sensitive to disturbance from drones during the breeding season when they are protecting young in nests. The EA identifies several special status bird species that could breed in the study area, including the Bald Eagle (see the U.S. Fish and Wildlife Service Information for Planning and Consultation report, or IPaC report, in Appendix A of the EA). Zipline has agreed to a monitoring plan for Bald Eagle nests that integrates multiple strategies and resources. If Zipline identifies a Bald Eagle nest or is notified of the presence of a nest, Zipline will establish an avoidance area such that there is a 1,000 feet vertical and horizontal separation distance between a vehicle’s flight path and the nest. This avoidance area will be maintained until the end of the breeding season or until a qualified biologist indicates the nest has been vacated.

The Northern Long-eared Bat, a threatened bat species, the Gray Bat, an endangered species, the Indiana Bat, an endangered species, and the Ozark Big-eared Bat, an endangered species,

are mammals that have the potential to occur within the operating area. While these bat species may occur within the operating area, they are unlikely to encounter the aircraft as Zipline's proposed operations will be limited to daytime hours. In the event that flights do overlap with dawn or dusk bat emergence, bats may exhibit disturbance behaviors and change their flight paths to avoid drones. However, research also suggests that drones have "minimal impact on bat behavior" and do not appear to be disturbed by drones. While there are many known bat colonies and hibernacula within the study area, a significant colony location for Gray Bats was identified in the vicinity of the proposed action: the Crystal Cave in Bella Vista, AR. Zipline has agreed to establish a one-mile buffer around Crystal Cave in Bella Vista, AR, to be in effect from March 15 to October 1 when Gray bats are likely to use the cave for roosting. This is done through Zipline's flight planning software. The avoidance measure will help ensure that bats in the Crystal Cave colony will not be disturbed or struck as a result of the proposed action. As a result, the FAA has made a finding of no effect for Gray Bats and other bat species under the ESA. The FAA has also determined that the proposed action will cause no significant impacts to state-listed bat species due to the limited scale of operations and the altitude of overflights.

The proposed action will not involve ground construction or habitat modification and no impacts to fish, reptiles, or terrestrial mammal species are expected. The proposed action would not result in: extirpation of a species from the project area; adverse impacts to special status species or their habitats; substantial impacts to native species' habitats or their populations; or adverse impacts on any species' reproductive success rates, natural mortality rates, non-natural mortality, or ability to sustain the minimum population levels required. The FAA's analysis finds that the proposed action is not expected to cause any significant impacts to biological resources.

- **Department of Transportation (DOT) Act, Section 4(f) Resources, EA Section 3.3.** Section 4(f) of the DOT Act protects significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites. Section 4(f) states that, subject to exceptions for de minimis impacts[3]: "The Secretary may approve a transportation program or project requiring the use of [4(f) resources]…only if—(1) there is no prudent and feasible alternative to using that

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

land; and (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use." The term "use" includes both direct or physical and indirect or "constructive" impacts to Section 4(f) resources.

The FAA identified many properties that could meet the definition of a Section 4(f) resource within the operating area, including public parks and historic sites. Some Section 4(f) resources within the Arkansas side of the operating area include the Charlie Craig State Fish Hatchery, Indian Creek Park, Memorial Park (401 NE Martin Luther King Jr Pkwy, Bentonville, AR 72712), Tanyard Creek Nature Trail, and Pea Ridge National Military Park. Some Section 4(f) resources within the Missouri side of the operating area include the Buffalo Hills Natural Area, Big Sugar Creek State Park, Flag Spring Conservation Area, and Huckleberry Ridge Conservation Area.

There will be no physical use of Section 4(f) resources under the proposed action. The FAA has determined that infrequent UA overflights as described in the proposed action would not cause substantial impairment to Section 4(f) resources, and therefore would not be considered a constructive use of any Section 4(f) resource. As described in the Section 3.5 of the EA and the Noise Analysis Report (Appendix C of the EA), noise and visual effects from Zipline's occasional overflights are not expected to diminish the activities, features, or attributes of any resources in the study area. Additionally, Zipline identifies properties such as public parks and wildlife and waterfowl refuges in its flight planning system. Areas where open air gatherings of people typically occur, such as open air concert venues and school yards, will also be avoided through the use of Zipline's route planning software, which prepares an optimized flight path from the nest to each designated delivery site. The software ensures that each route integrates and respects all of the restrictions entered into the database, and that Section 4(f) properties can be automatically avoided based on the type of the resource, time of day, and other factors. There will be no significant impacts to Section 4(f) resources as a result of the proposed action.

- **Historical, Architectural, Archaeological, and Cultural Resources, EA Section 3.4.** Section 106 of the National Historic Preservation Act (NHPA) of 1966 [54 U.S.C. § 306108] requires federal agencies to consider the effects of their undertakings on properties listed or eligible for listing in the National Register of Historic Places (NRHP). This includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization that meets the NRHP criteria. Compliance with Section 106 requires consultation with the State Historic Preservation

Officer (SHPO) and applicable other parties, including Indian tribes. The FAA identified historic sites that were listed on the Arkansas and Missouri SHPO websites.

The FAA previously consulted with the Arkansas and Missouri SHPOs and with six Tribal Historic Preservation Officers (THPOs) for tribes that may potentially attach religious or cultural significance to resources in the APE for specific sample routes from the Pea Ridge nest instead of a broader area approval contemplated in this EA. The previous consultation included a letter to the Arkansas SHPO on June 15, 2021, where the Arkansas SHPO responded on July 7, 2021 concurring with FAA's determination that no historic properties would be adversely affected by the proposed project. The previous consultation also included a letter to the Missouri SHPO on June 15, 2021, where the Missouri SHPO responded on June 28, 2021 concurring with the FAA's determination that no historic properties would be affected by the proposed project. Additionally, in June 2021, the FAA consulted with the Apache Tribe, Caddo Nation, Delaware Nation, Delaware Tribe of Indians, Osage Nation and Seneca-Cayuga THPOs, and did not receive any responses or objections. As stated previously, while the SHPO and THPO outreach that the FAA conducted in 2021 was for specific sample routes from the Pea Ridge nest instead of a broader area approval, the UA flight characteristics and approximate number of operations will not be significantly different under the proposed action that is the subject of this EA; however, there will be more routes as Zipline conducts operations to approved delivery locations in 12 communities across the operating area. The UA flight characteristics and approximate number of operations will not be significantly different under the proposed action compared to the action previously consulted on; instead, the operations will be dispersed over a larger area and via more routes.

Based on the nature of potential UA effects on historic properties - namely limited to non-physical, reversible impacts - and the limited number of daily flights in conjunction with the FAA's noise exposure analysis discussed in Section 3.5 and attached in Appendix C, the FAA has determined that this undertaking has no potential to affect historic properties. Additionally, there would be no known effect on known cultural resources from this action. Therefore, the action will not have a significant impact to historic, architectural, archaeological, or cultural resources. While not required under 36 CFR § 800.3(a)(1), the FAA notified the Arkansas and Missouri SHPOs of the availability of the Draft EA on June 13, 2022. Although concurrence is not required under 36 CFR § 800.3(a)(1), on June 27, 2022, the Arkansas SHPO reponded to the

FAA's notice stating that the SHPO "still concurs with the finding of no adverse effect to historic properties pursuant to 36 CFR § 800.5(b)(1) as a result of this undertaking." (See Appendix B for the full correspondence).

- **Noise and Noise-Compatible Land Use, EA Section 3.5 and Appendix C.** The FAA has issued requirements for assessing aircraft noise in FAA Order 1050.1F, Appendix B. The FAA's required noise metric for aviation noise analysis is the yearly Day-Night Average Sound Level (DNL) metric. A significant noise impact is defined in Order 1050.1F as an increase in noise of DNL 1.5 decibel (dB) or more at or above DNL 65 dB DNL noise exposure or a noise exposure at or above the 65 dB level due to a DNL 1.5 dB or greater increase. The compatibility of existing and planned land uses with an aviation proposal is usually associated with noise impacts.

  The proposed action is not anticipated to result in any significant changes in the overall noise environment within the affected area. There is no construction and therefore no construction noise that will result from the proposed action. There are several airstrips and small airports in the study area, including the Bentonville Municipal Airport, but Zipline's operations are generally planned to avoid flying through established flight paths in controlled airspace around airports, and any noise from Zipline's operations would not be expected to add to the cumulative noise exposure around airports in the study area.

  The maximum noise exposure levels within the study area will occur at the nest site; where noise levels at or above DNL 45 dB would extend 50 feet to the northwest and southeast of the Pea Ridge nest, and 75 feet to the northeast and southwest of the nest, respectively. Based on these dimensions, the DNL 45 dB would remain almost entirely within the vicinity of the nest infrastructure on the Walmart property and is well below the FAA's threshold of DNL 65 dB for compatible land use. The extent of DNL 45 dB associated with nest operations is shown in Figure 4 of the Final EA. Additionally, the estimated noise exposure for en-route and delivery operations at locations away from the Pea Ridge nest would not exceed DNL 45 dB at any location within the study area.

  Based on FAA's noise analysis, the proposed action will not have a significant noise impact.

- **Environmental Justice, EA Section 3.6.** Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, Section 1-101 requires all federal agencies to the greatest extent practicable and permitted by law, to make achieving

environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

The low-income population in the study area at the census block group level was compared to the reference community, which is the percentage of low-income individuals residing within four counties: Barry, Benton, Carroll, and McDonald. Because the study area is within all or parts of the four counties listed, the FAA determined that it would be an appropriate geographical region for comparison. Based on census block data, obtained through the FAA's Aviation Environmental Design Tool (AEDT), the percentage of low-income individuals residing within the study area at the census block group level is approximately 10.8 percent as compared to 15.25 percent in the reference community. The reference community percentages are shown in Table 3-3 of the EA, and the FAA's AEDT analysis data is included in Appendix F of the EA.

The minority population in the study area at the census block group level was compared to the reference community, which is the percentage of minority individuals residing within the four counties. The reference community percentages are shown in Table 3-3. The percentage of minorities residing within the study area at the census block group level, approximately 23.3 percent, is slightly higher than that of the reference community, which is approximately 22.54 percent. Based on the analysis, the FAA determined that the percentage of minorities residing within study area was not meaningfully greater than the percentage of minorities residing within the reference community.

The proposed action will not result in adverse impacts in any environmental resource category. In particular, as noted in Section 3.5, *Noise and Noise-Compatible Land Use*, and the Noise Analysis Report in Appendix C, the UA's noise emissions could be perceptible in areas within the operating area, but will stay well below the level determined to constitute a significant impact. For these reasons, the proposed action would not result in a disproportionately high or adverse effect on a low-income or a minority population, nor would the action result in a significant environmental justice impact.

- **Visual Effects (Visual Resources and Visual Character), EA Section 3.7.** 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. Impacts to visual resources are not expected to be significant. The proposed action makes no changes to any landforms, or land uses, thus there would be no effect to the visual character of the area. The proposed action involves airspace operations that could result in visual impacts to sensitive areas where the visual setting is an important resource of the property. However, Zipline has confirmed to the FAA that it will generally not conduct operations over potentially sensitive properties during the scope of operations covered by this proposed action. Some of these properties are certain types of resources that could be valued for aesthetic, including visual, attributes, such as schools, sports arenas, outdoor recreation areas, and playgrounds. Further, the short duration that each UA flight could be seen from any particular resource in the operating area combined with the low number of proposed flights per day minimizes any potential for significant impacts. Accordingly, any potential impacts of the proposed action on visual resources and visual character will not be significant.

- **Water Resources (Surface Waters), EA Section 3.8.** Surface water resources generally consist of oceans, wetlands, lakes, rivers, and streams. The Clean Water Act (CWA) established the National Pollutant Discharge Elimination System (NPDES) program, which regulates the discharge of point sources of water pollution into waters of the United States and requires a permit under Section 402 of the CWA. Waters of the United States are defined by the CWA and are protected by various regulations and permitting programs administered by the Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers.

  The Wild and Scenic Rivers Act preserves certain river areas eligible to be included in a national system that possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values in free-flowing condition for the benefit and enjoyment of present and future generations. Rivers or river segments selected for inclusion on the National Wild and Scenic Rivers System (WSRS) are river systems, designated by Congress or the Secretary of the Interior, with outstandingly remarkable values (ORVs). Classifications are based on the degree of development present along the river, and whether the river is wild, scenic, or recreational. The Nationwide Rivers Inventory (NRI) are river segments identified by the National Park Service (NPS) as potential candidates for listing on the WSRS. Federal agencies

must seek to avoid or mitigate actions that would adversely affect designated Wild and Scenic Rivers and NRI river segments.

Approximately 24 square miles of surface waters occur within the operating area, or approximately two percent of the area, based on the EPA's Environmental Justice Screening and Mapping Tool (EJSCREEN) report for this proposed action (Appendix E). Surface waters include Beaver Lake, Lake Windsor, Lake Ann, Lake Avalon, Lake Norwood, Lake Loch Lomond, and Lake Brittany, in addition to rivers such as the Elk River and tributary streams that are also protected by the CWA.

There are three NRI river segments that occur within the operating area located in the southwest Missouri section of the study area: Shoal Creek, Big Sugar Creek, and Elk River. The NRI river segments are depicted in Figure 5 of the EA. There are no WSRS segments within the study area.

The proposed action would not be expected to result in significant impacts to surface water resources. There are no construction activities occurring under the proposed action that could impact surface waters. The potential likely source of surface water contamination on the UA, the aircraft's Lithium-ion battery packs, are not expected to detach from the aircraft. Further, the UA is not expected to become lost in the event of a water landing as Zipline is required to locate and secure any downed aircraft. For these reasons, the proposed action would not have the potential to exceed water quality standards established by federal, state, local, and tribal regulatory agencies; or contaminate public drinking water supply such that public health may be adversely affected.

Zipline's delivery flights will not overfly NRI river segments at an intensity that could cause any detrimental impacts to the values of these resources. Currently, UA operations can occur over these river segments under existing regulatory authorities. The FAA contacted the NPS Regional Rivers Coordinator in April 2022 for assistance in determining whether Zipline's overflights could potentially affect the recreational values of these three NRI segments. The NPS Regional Rivers Coordinator responded in May 2022 and confirmed that the proposed action will not preclude the listed NRI segments from being considered for inclusion in the WSRS. The FAA's outreach letter and NPS response letter are included in Appendix G of the EA. Zipline's limited overflights will not introduce any visual, audible, or other sensory intrusions that are out of character with

the river segments or alter their settings. Therefore, the potential for impacts to surface waters, including NRI river segments, are not significant.

Public Involvement and Coordination

The Draft EA was made available for public review. The public Notice of Availability (NOA) was distributed on June 13, 2022 to local interest groups, government officials, Section 4(f) resource authorities,[4] community points of contact as provided by Zipline, and the SHPO and THPO (see section 5.0 of the EA). The Draft EA was available on the FAA's website and was open for comment from June 13, 2022 through June 27, 2022. The FAA received several comments during the comment period for this EA. Appendix H in the EA contains the FAA's summary and response to timely comments.

Finding

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

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

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

[4] See Section 3.3.

Decision and Order

The FAA recognizes its responsibilities under NEPA, CEQ regulations, and its own directives. Recognizing these responsibilities, I have carefully considered the FAA's goals and objectives in reviewing the environmental aspects of the proposed action to approve Zipline's request to begin its UA commercial package delivery operations in Pea Ridge and the surrounding area. Based upon the above analysis, the FAA has determined that the proposed action meets the purpose and need.

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

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

Having carefully considered and being properly advised as to the anticipated environmental impacts of the proposal as described in the EA and the FONSI, under the authority delegated by the Administrator of the FAA, I find the OpSpec amendment, and other approvals necessary to enable Zipline's requested operations in Pea Ridge and the surrounding area is consistent with existing national environmental policies and objectives as set forth in Section 101 of NEPA and other applicable environmental requirements, and will not significantly affect the quality of the human environment or otherwise include any condition requiring consultation pursuant to Section 102(2)(C) of NEPA. I further find that the action is the type of action that does not require an Environmental Impact Statement under NEPA.

Issued on: July 14, 2022

DAVID M MENZIMER

Digitally signed by DAVID M MENZIMER
Date: 2022.07.14 15:36:43 -07'00'

David Menzimer
Aviation Safety
Manager, General Aviation Operations Branch
General Aviation and Commercial Division
Office of Safety Standards, Flight Standards Service

Right of Appeal

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

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1.0 PURPOSE AND NEED

1.1 Introduction

Zipline International Inc. (Zipline) is seeking to amend its air carrier Operations Specifications (OpSpecs) and other Federal Aviation Administration (FAA) approvals necessary to begin unmanned aircraft (UA) commercial package delivery operations from one hub, or "nest," location in Pea Ridge, Arkansas, using its 49.3-pound "Zip" UA.[1] Zipline projects operating a maximum of 20 delivery flights per operating day from the Pea Ridge nest based on the scope of the proposed action, discussed in Section 2.1. Zipline anticipates that operational demand could increase the number of delivery flights per day. Zipline started conducting test flights from the Pea Ridge nest in mid-2021 under Part 107 operating authorities. The proposed commercial delivery operations from the Pea Ridge nest would occur during daylight hours up to seven days per week, with no flights on holidays.[2] No nighttime operations are anticipated or requested under the proposed action. The approval of Zipline's amended OpSpecs to include this new operating area is considered a major federal action subject to environmental review requirements.

This Environmental Assessment (EA) is being prepared by the FAA to evaluate the potential environmental impacts that may result from FAA's approval of the proposed action, which would enable UA commercial delivery operations from a nest located in Pea Ridge, AR. The operating area, shaped like a polygon is, at its widest, approximately 45 miles east to west and 30 miles north to south, and the total approximate delivery area is 1,200 square miles. More than half of the operating area, approximately 676 square miles, is located in Missouri and encompasses nearly all of McDonald County and portions of Barry County. The remainder of the operating area, approximately 520 square miles, is located in Arkansas and encompasses roughly half of Benton County and a small portion, approximately 50 square miles, of Carroll County. The operating area, which is also the study area for this EA, is depicted in Figure 1 below (the study area).

The FAA has prepared this EA pursuant to the National Environmental Policy Act of 1969 (NEPA) [42 United States Code (U.S.C.) § 4321 et seq.] and its implementing regulations (40 Code of Federal Regulations (CFR) §§1500-1508)). Under NEPA, federal agencies are required to consider the environmental effects of proposed federal actions and to disclose to decision-makers and the interested public a clear and accurate description of the potential environmental impacts of proposed major federal actions. Additionally, under NEPA, federal agencies are required to consider the environmental effects of a proposed action, the reasonable alternatives to the proposed action, and a no action alternative (assessing the potential environmental effects of not implementing the proposed action). The FAA has established a process to ensure compliance with the provisions of NEPA through FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* and the FAA Order 1050.1F Desk Reference.

1.2 Background and Location

In 2012, Congress first charged the FAA with integrating unmanned aircraft systems (UAS) into the National Airspace System (NAS).[3] The FAA has engaged in a phased, incremental approach to integrating UAS into the NAS and continues to work toward full integration of UAS into the NAS. Part of that

[1] A nest is a ground based service area where UA are assigned and where flights originate and return.
[2] Daylight hours of operation include approximately ~30 min before sunrise to ~30 min after sunset.
[3] 49 U.S.C. 44802; FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, Sec. 332. 126 Stat. 11, 73 (2012).

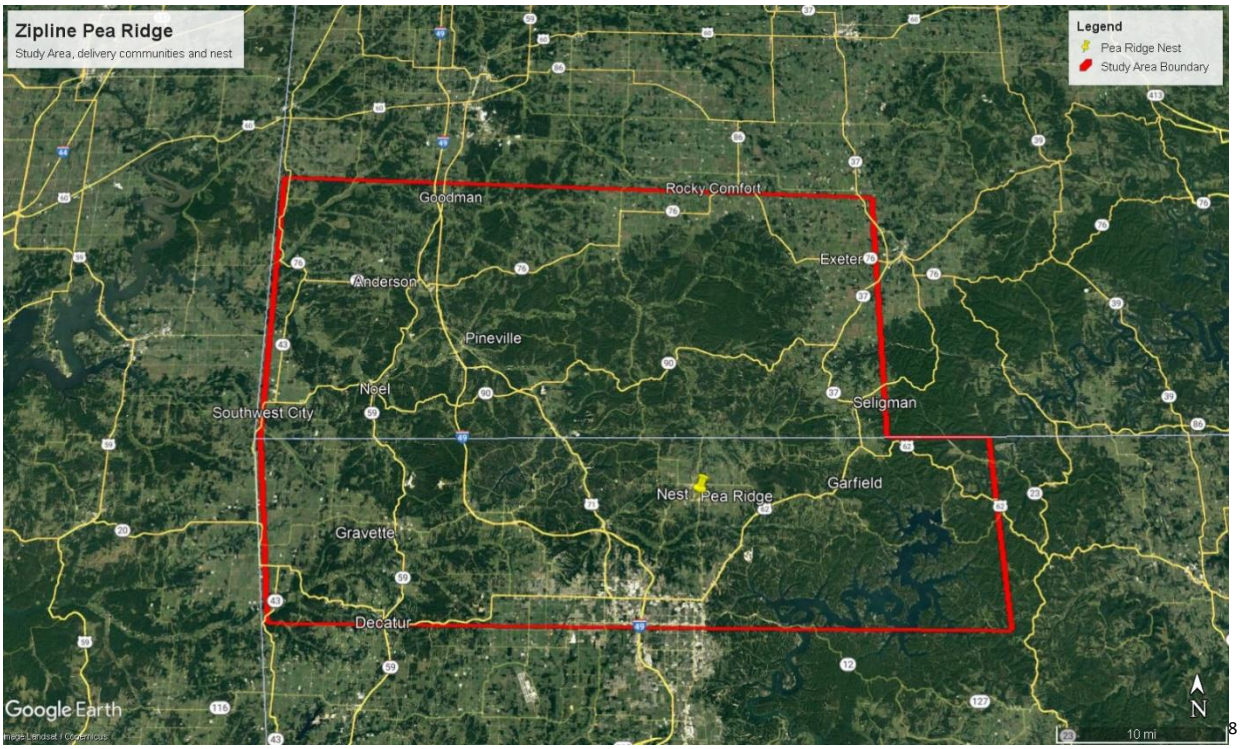
approach involves providing safety review and oversight of proposed operations to begin commercial UA delivery in the NAS.[4]

Over the past several years Zipline has been working under various FAA programs, including the UAS Integration Pilot Program (IPP),[5] the Partnership for Safety Plan (PSP) Program,[6] and the BEYOND program,[7] as well as the FAA's established processes to bring certificated commercial UA delivery into practice. Participants in these programs are among the first to prove their concepts, including package delivery by UA, through the use of current regulations and exemptions and waivers from some of these regulatory requirements.

In June 2022, Zipline received its Part 135 air carrier operating certificate from the FAA, which allows it to carry the property of another for compensation or hire beyond visual line of sight (BVLOS). The certificate contains a stipulation that operations must be conducted in accordance with the provisions and limitations specified in its OpSpecs. Zipline's current request for amended OpSpecs to specify a new area of operations, in conjunction with other related FAA approvals, such as a waiver of 14 CFR 91.113(b) to enable BVLOS operations and a Certificate of Waiver or Authorization (COA), would enable commercial delivery operations in the operating area.

A closer view of the Pea Ridge operating area, including Zipline's proposed 12 delivery communities within the operating area, is shown in Figure 1 and Table 2-1 below. The 12 delivery communities are Anderson, Garfield, Noel, Rocky Comfort, Decatur, Goodman, Pea Ridge, Seligman, Exeter, Gravette, Pineville, and Southwest City. The Pea Ridge operating area is outlined in red and the nest location is identified using the yellow pin. The western side of the operating area is bounded by the Oklahoma state line, and the northernmost boundary is bounded by the northern side of the McDonald County border in Missouri. The southernmost boundary is roughly parallel to U.S Route 62 and Highway 102 in Bentonville, AR. The easternmost boundary runs between Cassville and Exeter in Barry County, Missouri, and runs parallel to the western border of Carroll County, Arkansas. The operating area is the study area for the purposes of this EA.

[4] The terms UA and drone may be used interchangeably.
[5] The UAS IPP was announced on October 25, 2017 via a Presidential Memorandum, which has the force and effect of law on executive agencies. https://www.faa.gov/uas/programs_partnerships/completed/integration_pilot_program/
[6] https://www.faa.gov/uas/programs_partnerships/psp/
[7] https://www.faa.gov/uas/programs_partnerships/beyond/



[8]

Figure 1 Study Area Shown with Nest and 12 Delivery Communities

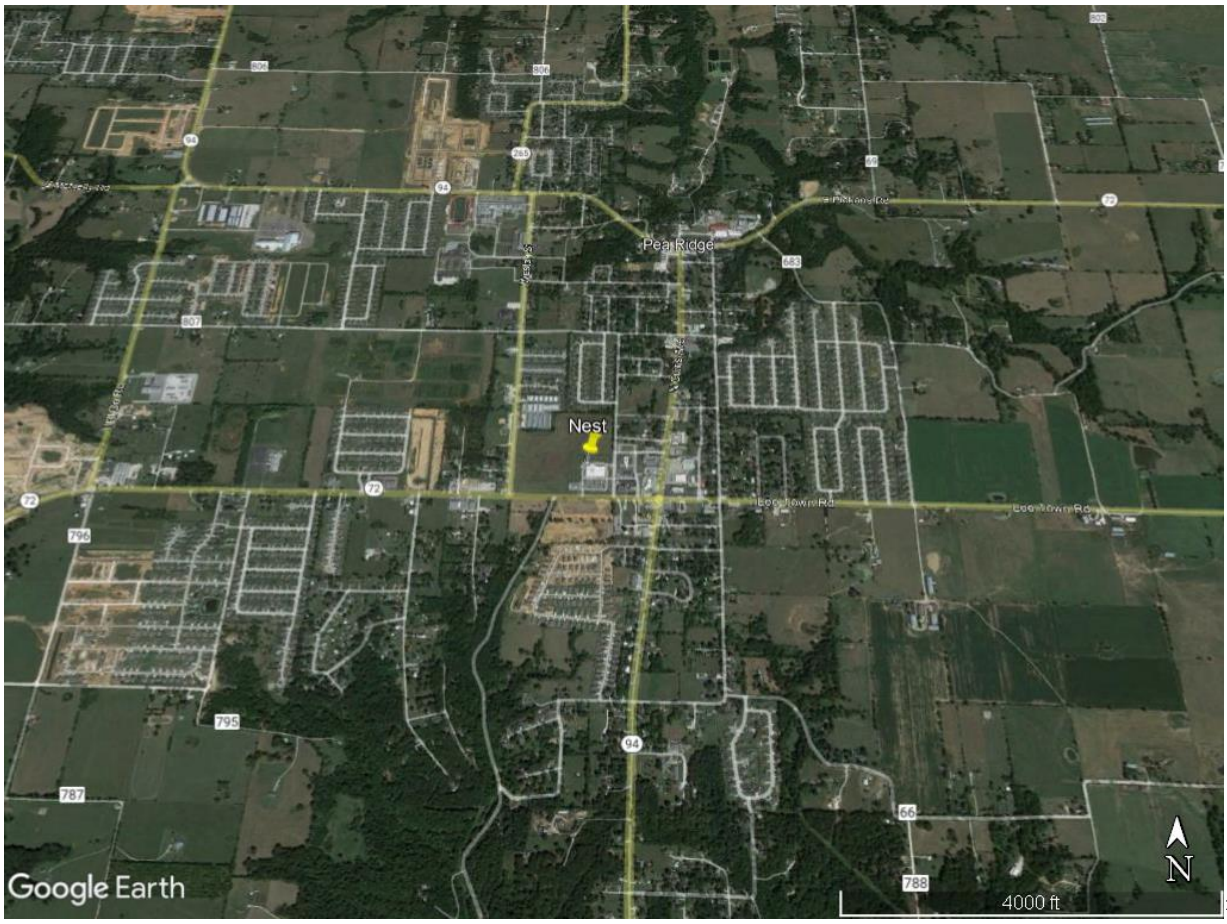
Zipline proposes to conduct deliveries from this nest location to vetted delivery sites such as medical centers, healthcare facilities, private homes, and commercial facilities.[9]

1.2.1 Nest Location

The nest is located in Pea Ridge, AR adjacent to the Walmart Neighborhood Market approximately seven miles northeast of Bentonville. The private property is zoned for commercial use. The nest site is also just to the west of several restaurants and other businesses and located near the intersection of Slack St/Highway 72 and N Curtis Ave/Highway 94. The properties adjacent to the nest are a mix of privately-owned agricultural, commercial, and residential. See Figures 2 and 3 below.

[8] Image: Google Earth, as modified by the FAA

[9] Each delivery site is pre-approved by Zipline to ensure that the area is capable of receiving deliveries.



[10]

Figure 2 Zipline's Nest Location in Pea Ridge, AR

[10] Image: Google Earth, as modified by the FAA

[11]

Figure 3 Closer View of Zipline's Nest Location in Pea Ridge, AR

1.3 Purpose and Need

As described in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, the Purpose and Need section of an EA briefly describes the underlying purpose and need for the proposed federal action. It presents the problem being addressed and describes what the FAA is trying to achieve with the proposed action.

1.3.1 FAA Purpose and Need

Zipline recently received its Part 135 air carrier certificate and is seeking to amend the necessary OpSpecs that are necessary to begin UA BVLOS commercial package delivery operations in Pea Ridge and the surrounding area. The FAA has multiple approvals, such as a waiver of 14 CFR 91.113(b) to enable BVLOS operations and a COA associated with the operations in the Pea Ridge region; however, the FAA issuance of the OpSpecs is the approval that will ultimately enable UA commercial delivery operations in this area. Zipline's request for amended OpSpecs to add a new area of operations requires FAA review and approval.

The FAA has a statutory obligation to review Zipline's request to amend the OpSpecs and determine whether the amendment would affect safety in air transportation or air commerce and the public

[11] Image: Google Earth, as modified by the FAA

interest requires the amendment. In general, Congress has charged the FAA with the safety of air commerce in the United States and to encourage the development of civil aeronautics. 49 U.S.C. §40104.

In addition, the FAA has specific statutory and regulatory obligations related to its issuance of a Part 135 certificate and the related OpSpecs, including OpSpec amendments. The FAA is required to issue an operating certificate to an air carrier when it "finds, after investigation, that the person properly and adequately is equipped and able to operate safely under this part and regulations and standards prescribed under this part." 49 U.S.C. §44705. An operating certificate also specifies "terms necessary to ensure safety in air transportation; and (2)…the places to and from which, and the airways of the United States over which, a person may operate as an air carrier." *Id*. Also included in air carrier certificate is a stipulation that the air carrier's operations must be conducted in accordance with the provisions and limitations specified in OpSpecs. 14 CFR §119.5 (g), (l). The regulations also specify that a Part 135 certificate holder may not operate in a geographical area unless its OpSpecs specifically authorize the certificate holder to operate in that area. 14 CFR 119.5(j). The regulations implementing Section 44705 specify that an air carrier's approved OpSpecs must include, among other things, "authorization and limitations for routes and areas of operations." 14 CFR §119.49(a)(6). An air carrier's OpSpecs may be amended at the request of an operator if the FAA "determines that safety in air commerce and the public interest allows the amendment." 14 CFR §119.51(a); see also 49 U.S.C. §44709. After making this determination, the FAA must take an action on the OpSpec amendment.

1.3.2 Zipline's Purpose and Need

The purpose of Zipline's request is to begin UA BVLOS commercial delivery service in Pea Ridge and the surrounding region, which, in its business judgment, Zipline has determined is an appropriate market for expanded operations. Zipline previously requested the FAA's approval for initial commercial delivery operations in an area to the north of Charlotte, North Carolina. Zipline's amended OpSpecs are needed so that Zipline can begin UA BVLOS commercial delivery operations from its Pea Ridge nest location. The approval will offer Zipline an opportunity to further assess the viability of the UA commercial delivery option under real world conditions and demonstrate that it can conduct operations safely and meet its compliance obligations. The approval could also help Zipline gauge public demand for UA commercial delivery services and evaluate whether scalable and cost-effective UA BVLOS delivery expansion is possible in this area. In addition, the approval could provide an opportunity to assess community response to commercial delivery operations in this area.

1.4 Public Involvement

The FAA created a Notice of Availability (NOA) with information about the EA and provided it to local interest groups, local government officials, public park authorities, the National Park Service, and the State Historic Preservation Officers (SHPOs) and Tribal Historic Preservation Officers (THPOs) discussed in this EA, and made the EA available to the general public on the FAA website. The NOA provided information about the proposed action and requested review and comments on this EA, which was published on the FAA website in June 2022 for a 14-day comment period. Interested parties were invited to submit comments on any environmental concerns relating to the proposed action to a specifically assigned email address. The FAA received several comments during the comment period for this EA, which was open from June 13, 2022 through June 27, 2022. Appendix H contains the FAA's summary and response to timely comments.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

In order for Zipline to conduct UA BVLOS commercial package deliveries in a new location, it must receive a number of approvals from FAA, such as a waiver of 14 CFR 91.113(b) to enable BVLOS operations and a COA. Further, Zipline has requested the FAA to amend its OpSpecs so that they can begin UA BVLOS commercial delivery operations in the operating area. Zipline received its Part 135 air carrier certificate in June 2022. The OpSpec amendment is the FAA action that ultimately would enable commercial delivery operations in the operating area, located in northwest Arkansas and southwest Missouri.

The B050 OpSpec, *Authorized Areas of En Route Operations, Limitations, and Provisions*, includes a reference section titled Limitations, Provisions, and Special Requirements. The FAA's approval of this OpSpec – including the paragraph in the OpSpec's reference section with descriptive language about the operating area boundaries, which includes the specific location and operational profile proposed in Zipline's request – is the proposed federal action for this EA. The OpSpecs will restrict Zipline to this particular location; any future expansion beyond the authorization and limitations for the area of operations described in the B050 OpSpec, or beyond the current 1:1 pilot to aircraft ratio described in Zipline's A003 OpSpec, *Airplane/Aircraft Authorization*, will require additional OpSpec amendments from the FAA and will receive appropriate NEPA review at that time.

Zipline anticipates that the proposed UA commercial delivery operations will be conducted to the 12 communities shown in Table 2-1. All of these communities fall within the study area as outlined in red in Figure 1.

Table 2-1 Anticipated Delivery Communities within Study Area

Anticipated Delivery Communities			
Anderson	Garfield	Noel	Rocky Comfort
Decatur	Goodman	Pea Ridge	Seligman
Exeter	Gravette	Pineville	Southwest City

Zipline projects operating a maximum of 20 delivery flights per operating day from the Pea Ridge nest based on the scope of the proposed action. Zipline anticipates that operational demand could increase the number of delivery flights per day. The operations would occur during daylight hours up to seven days per week, with no flights on holidays. The UA is capable of nighttime operations; however no nighttime deliveries are anticipated or requested under the proposed action. Delivery operations are anticipated to be distributed rather evenly across the 12 communities listed on Table 2-1.

The UA has a maximum takeoff weight of 46 pounds, including a maximum payload of 3.9 pounds. It is a fixed-wing drone that uses electric power from rechargeable lithium ion batteries. It is launched from a catapult system, and retrieved with a wire capture line. An image of the catapult launch system is shown in Appendix D, Figure 4. The aircraft includes a parachute safety system that can be deployed in cases of emergency.

After launch, Zipline's UA will rise to a cruising altitude between 130 feet and 400 feet above ground level (AGL) and follow a preplanned route to its delivery site. Aircraft will typically fly en-route between 250 feet and 400 feet AGL, and will always stay above 130 feet AGL except when descending to drop a package. The aircraft descends into its delivery loop and releases a package from approximately 60 feet

AGL. Packages are carried internally in the aircraft's fuselage, and are dropped by opening a set of payload doors on the aircraft. Packages fall under a small parachute. Zipline's aircraft will not touch the ground in any other place than the nest (except during emergency landings), since it remains aerial while conducting deliveries.

2.2 No Action Alternative

The alternative to the proposed action is the no action alternative, in which the FAA would not issue the approvals necessary to enable Zipline to conduct UA commercial package delivery operations in the operating area. Under the no action alternative, Zipline would still be authorized to conduct BVLOS package delivery flights under Part 107 operating authorities and waivers – as they are already conducting from the Pea Ridge nest – although these existing operations are limited in that they cannot be conducted for compensation or hire. This alternative does not support the stated purpose and need. However, it was retained as required by the Council on Environmental Quality (CEQ) regulations (40 CFR 1502.14(c)).

3.0 AFFECTED ENVIRONMENT and ENVIRONMENTAL CONSEQUENCES

This section provides a description of the environmental resources that would be affected by the proposed action, as required by the CEQ regulations and FAA Order 1050.1F. The level of detail provided in this section is commensurate with the importance of the impact on these resources (40 CFR § 1502.15). The study area for each resource is the entire area within the red-lined boundary of Figure 1 in this EA. As required by FAA Order 1050.1F, this EA presents an evaluation of impacts for the environmental impact categories listed below.

- Air Quality
- Biological Resources (including Fish, Wildlife, and Plants)
- Climate
- Coastal Resources
- Department of Transportation Act, Section 4(f) Resources
- Farmlands
- Hazardous Materials, Solid Waste, and Pollution Prevention
- Historical, Architectural, Archaeological, and Cultural Resources
- Land Use
- Natural Resources and Energy Supply
- Noise and Compatible Land Use
- Socioeconomic, Environmental Justice, and Children's Environmental Health and Safety Risks
- Visual Effects (Light Emissions)
- Water Resources (including Wetlands, Floodplains, Surface Waters, Groundwater, and Wild and Scenic Rivers)

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

- Regulatory Setting
- Affected Environment
- Environmental Consequences

3.1 Resources Not Analyzed in Detail

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

- **Air Quality and Climate** – The drone is battery-powered and will not generate emissions that could result in air quality impacts or climate impacts. Electricity consumed for battery charging at the nest and for overall nest operation will be minimal, especially for the limited scope of

these operations. Electricity consumed for the proposed action will come from the power grid, with an emergency generator at the nest location for backup.

- **Coastal Resources** –The proposed operation 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) since there are no coastal zones or shorelines in the area of operations.

- **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.

- **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. Therefore, the potential for impact in relation to hazardous materials, pollution prevention, and solid waste is not anticipated. Additionally, each Zipline UA is made from recoverable materials and will be properly managed at the end of its operating life in accordance with 14 CFR Part 43. There were no Superfund sites identified in the study area.

- **Land Use** – The proposed action will not involve any changes to existing, planned, or future land uses within the area of operations.

- **Natural Resources and Energy Supply –** The proposed action will not require the need for unusual natural resources and materials, or those in short supply. Zipline's aircraft will be battery powered and will not consume fuel resources.

- **Socioeconomic Impacts 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. 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. Additionally, Zipline's proposal includes avoiding operations near schools (Monday – Friday) during operational hours, which will help reduce the potential for environmental health or safety impacts to children.

- **Visual Effects (Light Emissions Only)** – The proposed action will not result in significant light emission impacts because flights will be limited to daylight only.

- **Water Resources (Wetlands, Floodplains, and Groundwater)** –The proposed operation will not result in the construction of facilities and would therefore not encroach upon areas designated as navigable waters or directly impact wetlands. The proposed operation will not encroach upon areas designated as a 100-year flood event area as described by the Federal Emergency Management Agency (FEMA). The proposed action will 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 does not involve land acquisition or ground disturbing activities that would withdraw groundwater from underground aquifers or reduce infiltration or recharge to ground water resources through the introduction of new impervious surfaces.

3.2 Biological Resources (Including Fish, Wildlife and Plants)

3.2.1 Regulatory Setting

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

Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973 [16 U.S.C. § 1531 et seq.] requires the evaluation of all federal actions to determine whether 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 U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) is needed. If the FAA determines that the action will have no effect on listed species, consultation is not required. If the FAA determines that the action may affect listed species, consultation with the USFWS must be initiated.

A significant impact to federally-listed threatened and endangered species would occur when the USFWS or NMFS determines that 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.

Migratory Birds

The Migratory Bird Treaty Act (16 U.S.C. §§ 703-712) protects migratory birds, including their nests, eggs, and parts, from possession, sale, purchase, barter, transport, import, export, and take. The USFWS is the federal agency responsible for the management of migratory birds as they spend time in habitats of the U.S. For purposes of the Migratory Bird Treaty Act, "take" is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 CFR § 10.12). The Migratory Bird Treaty Act applies to migratory birds identified in 50 CFR § 10.13 (defined hereafter as "migratory birds").

Bald and Golden Eagles

The Bald and Golden Eagle Protection Act prohibits anyone from "taking" a bald or golden eagle, including their parts, nests, or eggs, without a permit issued by the USFWS. Implementing regulations (50 CFR § 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.[16]

3.2.2 Affected Environment

This section describes the existing biological environment of the operating area. The operating area is in the Ozark Highlands ecoregion. This ecoregion is characterized by extreme biological diversity with distinct natural communities including forests, woodlands, savannas, glades, prairies, wetlands, and caves.[17] Important woodland and forest types include *Ozark Hardwood Forest and Woodland*, and *Ozark Oak-Pine and Pine Forest Woodland*.[18] Limestone glades occur within the study area, mainly in southwestern Missouri, and support an abdunance of insects, including pollinators, as well as reptiles and amphibians.[19] There are several types of karst communities that may occur in the study area, including terrestrial and aquatic cave systems.[20] In addition to numerous lakes, rivers, and creeks, the region is dotted with small ponds in pastures and natural areas that provide water for both wild animals and livestock.

The proposed action would take place over rural farmland, natural areas, and suburban and commercially-developed properties. These areas provide habitat for many of the more common and ubiquitous bird and mammal species in the region including: opossums; shrews and moles; bats; rabbits; woodchuck, squirrels, beaver, mice, voles, and other rodents; coyote, foxes, bear, raccoon, weasels, otter, mink, skunks, bobcat, and other carnivores; deer and elk; songbirds, waterfowl, and insects.[21]

Special Status Species

Federally Listed Species

The potential for impacts to federally-listed species was assessed using the USFWS Information for Planning and Consultation (IPaC) map tool and reports. The study area covered the entire operating area, outlined in red in Figure 1 of this EA. The IPaC report is included as Appendix A.

Based on the IPaC report, there are four ESA-listed bird species that could be present in the study area. The Piping Plover (*Charadrius melodus*), a threatened species, the Red Knot (*Calidris canutus rufa*), a threatened Species, the Eastern Black Rail (*Laterallus jamaicensis ssp. Jamaicensis*), a threatened species, and the Whooping Crane (*Grus americana*), an experimental population, non-essential (EXPN) species, are identified in the IPaC report. While federal agencies must not jeopardize the existence of an EXPN population, the USFWS has determined a non-essential population is not necessary for the

[16] 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.
[17] Nelson, Paul W. 2012. Fire-Adapted Natural Communities of the Ozark Highlands at the Time of European Settlement and Now. U.S. Department of Agriculture, Forest Service, Northern Research Station. Available: https://www.fs.usda.gov/treesearch/pubs/42133. Accessed: May 5, 2022.
[18] Conservation Department of Missouri. Show me Natural Communities. Available: https://mdc.mo.gov/sites/default/files/2020-12/Show-Me_NaturalCommunities.pdf. Accessed: May 5, 2022.
[19] iBid
[20] Missouri Department of Conservation. Caves and Karst. Available: https://mdc.mo.gov/discover-nature/habitats/caves-karst. Accessed: May 5, 2022.
[21] Missouri Department of Conservation. Field Guide. Available: https://mdc.mo.gov/field-guide/search?fgSpeciesType=1006. Accessed: May 5, 2022.

continued existence of the species and are only treated as threatened species on National Wildlife Refuge System or National Park Service property.[22]

The Northern Long-eared Bat (*Myotis septentrionalis*), a threatened bat species, the Gray Bat (*Myotis grisescens*), an endangered species, the Indiana Bat (*Myotis sodalis*) an endangered species, and the Ozark Big-eared Bat (*Corynorhinus* (*Plecotus) townsendii ingens*), an endangered species, are mammals listed in the IPaC report as potentially occuring in the operating area.

While there are many known bat colonies and hibernacula within the study area, a significant colony location for Gray Bats was identified in the vicinity of the proposed action: the Crystal Cave in Bella Vista, AR.

State Species of Concern

The Arkansas Game & Fish Commission lists species of greatest conservation need in their Wildlife Action Plan (the Plan).[23] The state species listed include amphibians, birds, crayfish, fish, insects, invertebrates, mammals, mussels, and reptiles. State species are ranked according to their conservation status as either critically imperiled, imperiled, or vunelerable. The FAA has determined that there are 42 birds and 18 mammals listed in the Plan that have the potential to occur within the study area. The list can be viewed in Table 3-1 below.

The Missouri Department of Conservation (MDC) lists species considered to be threatened with extinction as endangered under the *Wildlife Code of Missouri* and publishes the list in an annual report.[24] The state species listed include plants, mollusks, crustaceans, insects, fish, amphibians, reptiles, birds, and mammals. Under the Missouri state wildlife code, endangered is the only ranking status for listed species. The FAA has determined there are seven birds and six mammals listed in the report that have the potential to occur within the study area. This list can be viewed in Table 3-2 below.

Table 3-1 Arkansas Species of Greatest Conservation Need with the potential to occur in Study Area

State Status *	**Common Name (Scientific Name)**
Critically Imperiled Breeding Species (S1B)	Rafinesque's Big-Eared Bat (*Corynorhinus rafinesquii*)
	Long-tailed Weasel (*Mustela frenata*)
	Southeastern Bat (*Myotis austroriparius*)
	Little Brown Bat (*Myotis lucifugus*)
	Western Harvest Mouse (*Reithrodontomys megalotis*)
Critically Imperiled Nonbreeding Species (S1N)	Rafinesque's Big-Eared Bat (*Corynorhinus rafinesquii*)
Imperiled (S2)	Long-tailed Weasel (*Mustela frenata*)
Imperiled breeding species in Arkansas (S2B)	Southeastern Bat (*Myotis austroriparius*)

[22] Information for Planning and Consultation (IPaC) Listing Status. Available: https://ipac.ecosphere.fws.gov/status/list#:~:text=Experimental%20population%2C%20Non%2Dessential%20(,continued%20existence%20of%20the%20species. Accessed: May 4, 2022.
[23] Arkansas Game & Fish Commission. Revised 2015. Arkansas Wildlife Action Plan. Available: https://www.agfc.com/en/wildlife-management/awap/the-plan/. Accessed: February 18, 2022.
[24] Missouri Department of Conservation. 2021. Missouri Species and Communities of Conservation Concern Checklist. Available: https://education.mdc.mo.gov/sites/default/files/downloads/2021_SOCC.pdf. Accessed February 18, 2022.

Imperiled nonbreeding species in Arkansas (S2N)	Little Brown Bat (*Myotis lucifugus*)
Vulnerable (S3)	Western Harvest Mouse (*Reithrodontomys megalotis*)
Vulnerable breeding Species (S3B)	Rafinesque's Big-Eared Bat (*Corynorhinus rafinesquii*)
Vulnerable nonbreeding species in Arkansas (uncertain rank) (S3S4N)	Le Conte's Sparrow (*Ammodramus leconteii*)
Critically imperiled breeding, imperiled nonbreeding species (S1B, S2N)	Long-tailed Weasel (*Mustela frenata*)
Critically imperiled breeding species, critically imperiled nonbreeding species (uncertain rank) (S1B,S1S2N)	Southeastern Bat (*Myotis austroriparius*)
Critically imperiled breeding species (uncertain rank), apparently secure nonbreeding species (S1S2B,S4N)	Little Brown Bat (*Myotis lucifugus*)
Imperiled breeding, vulnerable nonbreeding species (S2B,S3N)	Western Harvest Mouse (*Reithrodontomys megalotis*)

State Status *	**Common Name (Scientific Name)**
Critically Imperiled (S1)	Ozark Big-eared Bat (*Corynorhinus townsendii ingens*)
	Ozark Pocket Gopher (*Geomys bursarius ozarkensis*)
	Eastern Small-Footed Bat (*Myotis leibii*)
	Indiana Bat (*Myotis sodalis*)
	Plains Harvest Mouse (*Reithrodontomys montanus*)
Critically Imperiled (uncertain rank) (S1S2)	Black-tailed Jackrabbit (*Lepus californicus*)
	Northern Long-eared Bat (*Myotis septentrionalis*)
	American Badger (*Taxidea taxus*)
Imperiled (S2)	Crawford's Gray Shreq (*Notiosorex crawfordi*)
	Eastern Harvest Mouse (*Reithrodontomys humulis*)
	Southeastern Shrew (*Sorex longirostris*)
Imperiled species (uncertain rank)(S2S3)	Gray Bat (*Myotis grisescens*)
	Eastern Spotted Skunk (*Spilogale putorius*)
Vulnerable (S3)	Rafinesque's Big-Eared Bat (*Corynorhinus rafinesquii*)
	Long-tailed Weasel (*Mustela frenata*)
	Southeastern Bat (*Myotis austroriparius*)
	Little Brown Bat (*Myotis lucifugus*)
	Western Harvest Mouse (*Reithrodontomys megalotis*)

*S1: Critically imperiled in Arkansas — at highest risk of extinction due to extreme rarity or steep population declines.
*S2: Imperiled in Arkansas — at high risk of extinction due to restricted range, few populations or steep population declines.
*S3: Vulnerable in Arkansas — at moderate risk of extinction due to a restricted range, few populations, recent and widespread declines.

Table 3-2 Missouri State Endangered Species List

Endangered Species	**Common Name (Scientific Name)**
Birds	American Bittern (*Botaurus lentiginosus*)
	Northern Harrier (*Circus hudsonius*)
	Snowy Egret (*Egretta thula*)

	Peregrine Falcon (*Falco peregrinus*)
	Swainson's Warbler (*Limnothlypis swainsonii*)
	Bachman's Sparrow (*Peucaea aestivalis*)
	Greater Prairie-chicken (*Tympanuchus cupido*)
Mammals	Ozark Big-eared Bat (*Corynorhinus townsendii ingens*)
	Black-tailed Jackrabbit (*Lepus californicus*)
	Gray Bat (*Myotis grisescens*)
	Northern Long-eared Bat (*Myotis septentrionalis*)
	Indiana Bat (*Myotis sodalis*)
	Plains Spotted Skunk (*Spilogale putorius interrupta*)

Migratory Birds

Migratory bird species found within the operating area will vary throughout the year. During certain weeks in the spring and fall, hundreds of species of songbirds, raptors, and waterfowl may potentially pass through the operating area. Additionally, several dozen species of birds may potentially nest in the operating area at certain times of the year.

The IPaC report identifies 13 Birds of Conservation Concern (BCC) that could occur in the operating area, along with information on the likelihood that they may be nesting in the area (see Appendix A). Habitat used by BCC species listed in the study area occurs in forests, grasslands, and aquatic environments.

The Bald Eagle (*Haliaeetus leucocephalus)* is not listed by USFWS as a BCC in the operating area; however, it is protected under the Bald and Golden Eagle Protection Act. Bald Eagles could nest near bodies of water such as the Elk River, Little Sugar Creek, and Beaver Lake in the operating area. The National Bald Eagle Management Guidelines state that aircraft should stay at least 1,000 feet from Bald Eagle nests during the breeding season unless the aircraft is operated by a trained wildlife biologist.[25]

3.2.3 Environmental Consequences

There will be no ground construction or habitat modification associated with the proposed action. The aircraft nest is in a location adjacent to a Walmart Neighborhood Market. Zipline's aircraft will not touch the ground in any other place than the nest (except during emergency landings), since it remains aerial while conducting deliveries.

The operations will be taking place within airspace, and typically well above the tree line and away from sensitive habitats. After launch, Zipline's UA will rise to a cruising altitude between 130 feet and 400 feet AGL and follow a preplanned route to its delivery site. The pre-planned route is optimized to avoid terrain and object obstructions, areas of high aircraft traffic, and areas where people may gather in large numbers such as highways, parks, and schools. Aircraft will stay above 130 feet AGL except when descending to drop a package. The aircraft descends into its delivery loop and releases a package from approximately 60 feet AGL. Packages are carried internally in the aircraft's fuselage, and are dropped by opening a set of payload doors on the aircraft. Packages fall under a small parachute, which limits terminal velocity, toward the package drop zone at approved delivery sites. The low number of daily operations and nature of the flights are not expected to significantly influence wildlife in the area.

[25] U.S. Fish and Wildlife Service. 2007. National Bald Eagle Management Guidelines. Available: https://www.fws.gov/sites/default/files/documents/national-bald-eagle-management-guidelines.pdf. Accessed: October 19, 2021.

Special Status Species

The federally threatened Northern Long-eared Bat, and federally endangered Gray Bat, Indiana Bat, and Ozark Big-eared Bat, as well as several state bat species of concern, have the potential to occur within the operating area. While these bat species may occur within the operating area, they are unlikely to encounter the aircraft as Zipline's proposed operations will be limited to daytime hours. In the event that flights do overlap with dawn or dusk bat emergence, bats may exhibit disturbance behaviors and change their flight paths to avoid drones.[26] For example, Gray Bats have been observed changing flight patterns in response to the presence of a drone hovering near roost sites.[27] However, research also suggests that drones have "minimal impact on bat behavior" and do not appear to be disturbed by drones.[28] Zipline has agreed to establish a one-mile buffer around Crystal Cave in Bella Vista, AR, to be in effect from March 15 to October 1 when Gray bats are likely to use the cave for roosting. This avoidance measure will help ensure that bats in the Crystal Cave colony will not be disturbed or struck as a result of the proposed action.

As a result, the FAA has made a finding of *no effect* for Northern Long-eared Bats, Gray Bats, Indiana Bats, and Ozark Big-eared Bats under the ESA. The FAA has also determined that the proposed action will cause no significant impacts to state bat species of concern.

Federally listed ESA bird species such as the Eastern Black Rail, Pipling Plover, and Red Knot, as well as state protected bird species may display disturbance behaviors towards drones, such as fleeing or attack maneuvers; however, due to the limited scale of operations and the altitude of overflights, no impacts to state protected bird species are expected.

The FAA sent an outreach letter to the USFWS on August 16, 2021, and received a response on August 25, 2021 concurring with FAA's no effect determination for ESA-listed species that were identified in the operating area on the iPaC report. In regards to the Gray Bat colony at Crystal Cave, the USFWS recommended a half-mile minimum buffer around the cave while it is in use from March 15 to October 1.

Migratory Birds

Zipline has stated to the FAA that it will monitor the operating area for any active Bald Eagle nests that may occur. Bald Eagle nests are typically very conspicuous, usually five to nine feet in diameter, with a vertical depth up to eight feet, and Zipline should be able to visually identify any nests that may be present in the area.[29] Online resources such as iNaturalist may also be used to identify Bald Eagle nests that may be active in the operating area. If Zipline identifies a Bald Eagle nest or is notified of the presence of a nest by a state regulator or naturalist group, Zipline will establish an avoidance area such that there is a 1,000 feet vertical and horizontal separation distance between the vehicle's flight path and the nest. This avoidance area will be maintained until the end of the breeding season (September 1 through July 31 in study area) or a qualified biologist indicates the nest has been vacated.[30]

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[26] Fewer bat passes are detected during small, commercial drone flights. Available: https://www.nature.com/articles/s41598-021-90905-0. Accessed: October 21, 2021

[27] V. Kuczynska, U.S. Fish and Wildlife Service Missouri Ecological Services Field Office. Personal communication, August 17, 2021.

[28] Autonomous drones are a viable tool for acoustic bat surveys. Available: https://www.biorxiv.org/content/10.1101/673772v1.full.pdf Accessed: October 21, 2021

[29] USFWS Midwest Region: Identification of Large Nests. Available: https://www.fws.gov/midwest/eagle/Nhistory/nest_id.html. Accessed: December 13, 2021

[30] See IPaC report in Appendix A for Bald Eagle breeding dates in the study area.

Due to the size of the operating area and proposed number of daily operations, occasional drone overflights between 130-400 feet AGL are not expected to impact critical lifecycles of wildlife species or their ability to survive.

Our 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.

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

3.3.1 Regulatory Setting

Section 4(f) of the Department of Transportation (DOT) Act [codified at 49 U.S.C. § 303(c)] protects significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites. Section 4(f) states that, subject to exceptions for de minimis impacts[31]: "The Secretary may approve a transportation program or project requiring the use of [4(f) resources]…only if—(1) there is no prudent and feasible alternative to using that land; and (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use."

The term "use" includes both direct or physical and indirect or "constructive" impacts to Section 4(f) resources. Direct use is the physical occupation or alteration of a Section 4(f) property or any portion of a Section 4(f) property. A constructive use does not require direct physical impacts or occupation of a Section 4(f) resource. A constructive use would occur when a proposed action would result in substantial impairment of a resource to the degree that the protected activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished. The determination of use must consider the entire property and not simply the portion of the property used for a proposed project.[32]

Section 4(f) resources where a quiet setting is a generally recognized feature or attribute receive special consideration. In assessing constructive use, FAA Order 1050.1F, Appendix B, page B-11, requires that the FAA "…must consult all appropriate federal, state, and local officials having jurisdiction over the affected Section 4(f) properties when determining whether project-related impacts would substantially

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

[32] Federal Highway Administration (FHWA) Section 4(f) Policy Paper. (Note: FHWA regulations are not binding on the FAA; however, the FAA may use them as guidance to the extent relevant to aviation projects.) Available: https://www.environment.fhwa.dot.gov/legislation/section4f/4fpolicy.pdf. Accessed: February 2, 2021

impair the resources." Parks, recreation areas, and wildlife and waterfowl refuges that are privately owned are not subject to Section 4(f) provisions.

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

3.3.2 Affected Environment

The FAA identified many properties that could meet the definition of a Section 4(f) resource within the operating area, including public parks and historic sites. Some Section 4(f) resources within the Arkansas side of the operating area include the Charlie Craig State Fish Hatchery, Indian Creek Park, Memorial Park (401 NE Martin Luther King Jr Pkwy, Bentonville, AR 72712), Tanyard Creek Nature Trail, and Pea Ridge National Military Park. Some Section 4(f) resources within the Missouri side of the operating area include the Buffalo Hills Natural Area, Big Sugar Creek State Park, Flag Spring Conservation Area, and Huckleberry Ridge Conservation Area.

There are several historic sites within the operating area as listed on the Arkasas and Missouri State SHPO websites; however, most of these are considered for architectural or other purposes that will not typically be affected by UA operations. Also, as discussed in Section 3.4, *Historical, Architectural, Archaeological, and Cultural Resources*, the FAA consulted with the Arkansas and Missouri SHPOs for Zipline's proposed operations to determine whether historic and traditional cultural properties would be affected by the proposed action. Both the Arkansas SHPO and the Missouri SHPO provided written responses in support of the FAA's determination that the proposed UA operations would not result in an effect on historic properties that would require additional consultation with them.

3.3.3 Environmental Consequences

There will be no physical use of Section 4(f) resources because there will be no construction on any Section 4(f) resource. The FAA has determined that infrequent UAS overflights as described in the proposed action are not considered a constructive use of any Section 4(f) resource, and will not cause substantial impairment to any of the Section 4(f) resources in the operating area. As described in Section 3.5, Noise and Noise-Compatible Land Use, and the Noise Analysis Report (Appendix C), the proposed operations will not result in significant noise levels at any location in the operating area. Noise and visual effects from Zipline's occasional overflights are not expected to diminish the activities, features, or attributes of the resources that contribute to their significance or enjoyment.

Additionally, Zipline identifies areas where open air gatherings of people typically occur, such as open air concert venues and school yards, and avoids these properties through the creation of static keep-out areas via Zipline's route planning software, which prepares an optimized flight path from the nest to each designated delivery site. The software ensures that each route integrates and respects all of the restrictions entered into the database, and including Section 4(f) properties, which can be automatically avoided based on the time of day and other factors. The FAA has determined that there will be no significant impacts to Section 4(f) resources as a result of the proposed action.

3.4 Historical, Architectural, Archaeological, and Cultural Resources

3.4.1 Regulatory Setting

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

Major steps in the Section 106 process include identifying the Area of Potential Effects (APE), identifying historic and cultural resources within the APE, consulting with the SHPO and any THPO that is identified as potentially having traditional cultural interests in the area, and determining the potential impacts to historic properties as a result of the action.

The FAA has not established a significance threshold for this impact category; however, the FAA has identified a factor to consider when evaluating the context and intensity of potential environmental impacts for historical, architectural, archeological, and cultural resources. A factor to consider in assessing significant impact is when an action would result in a finding of adverse effect through the Section 106 process. However, under 36 CFR § 800.8(a), a finding of adverse effect on a historic property does not necessarily result in a significance finding under NEPA.

3.4.2 Affected Environment

The APE for the proposed action is the entire operating area where Zipline is planning to conduct UA package deliveries, as shown in Figure 1 in this EA. The FAA identified historic sites that were listed on the Arkansas and Missouri SHPO websites, which includes NRHP-listed and -eligible properties as well as other properties of interest to the respective state.[33]

In an accordance with 36 CFR § 800.4(a)(1), the FAA consulted with the Arkansas and Missouri SHPOs and six THPOs for tribes that may potentially attach religious or cultural significance to resources in the APE. The FAA sent a consultation letter to the Arkansas SHPO on June 15, 2021 and received a response from the Arkansas SHPO on July 7, 2021 concurring with FAA's determination that no historic properties would be adversely affected by the proposed project. The FAA sent a consultation letter to the Missouri SHPO on June 15, 2021 and received a response from the Missouri SHPO on June 28, 2021 concurring with the FAA's determination that no historic properties would be affected by the proposed project. In June 2021, the FAA consulted with the Apache Tribe, Caddo Nation, Delaware Nation, Delaware Tribe of Indians, Osage Nation and Seneca-Cayuga THPOs, and did not receive any responses or objections.

The FAA's tribal and historic outreach letters are included as Appendix B.

While the SHPO and THPO outreach that the FAA conducted in 2021 was for specific sample routes from the Pea Ridge nest instead of a broader area approval, the UA flight characteristics and approximate number of operations will not be significantly different under the proposed action that is the subject of this EA; however, there will be more routes as Zipline conducts operations to approved delivery locations in 12 communities across the operating area.

[33] Arkansas Historic Preservation Program, Department of Parks, Heritage and Tourism GIS Web Service. Available: https://www.arcgis.com/home/item.html?id=e9040629adab4162bd21b7dde5a5702d. Accessed February 22, 2022;

3.4.3 Environmental Consequences

The nature of UA effects on historic properties is limited to non-physical, reversible impacts (i.e., the introduction of audible and/or visual elements). The limited number of daily flights that Zipline is proposing – initially 20 delivery operations per day in the first year of operations from the Pea Ridge nest – means that any historic or cultural resource would be subject to only a small number of overflights per day, if any.

Additionally, the FAA's noise exposure analysis for the proposed action concluded that noise levels would not exceed DNL 45 dB in any location within the study area other than the nest property. Based on a review of the information available, and the FAA's knowledge with respect to the level of environmental impacts from UAS operations, the FAA has determined that no historic properties will be adversely affected by the proposed operation. Additionally, based on outreach to the THPOs and SHPOs, there would be no known effect on known cultural resources from this action.

3.5 Noise and Noise-Compatible Land Use

3.5.1 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 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 thoise 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.

3.5.2 Affected Environment

The study area is approximately 1,200 square miles, and the estimated population within the area is roughly 173,000. The population density is approximately 140 persons per square mile.[34] The study area is depicted in Figure 1.

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

To ensure that noise would not cause a significant impact to any residential land use or noise sensitive resource within the study area, the FAA initiated an analysis of the potential noise exposure in the area that could result from implementation of the proposed action. Away from the actual nest property, the closest neighborhoods surrounding the nest location are likely to experience the highest noise levels as a result of the proposed action. This is due to noise from the catapult launch system, and the lower altitudes that the UA will be flying in this location during launch and recovery.

Noise Exposure

Utilizing the operational projections defined in Sections 1 and 2, the noise analysis methodology detailed in Appendix C was then used to the estimate DNL levels for the proposed Zipline Pea Ridge operations. Noise levels were calculated for each flight phase and are presented in the following three sub-sections:

- Noise Exposure for Nest Operations
- Noise Exposure for En-route Operations
- Noise Exposure for Delivery Operations

Noise Exposure for Nest Operations

Based on the anticipated average daily maximum number of deliveries provided by Zipline, the extent of DNL 45 dB associated with nest operations is shown in Figure 4 below. This region was determined based on a review of the layout of the Pea Ridge nest location including the orientation of launch and recovery equipment and using the noise level information presented in referencing Tables 2 and 3 of Appendix C.

[34] Environmental Protection Agency's (EPA) Environmental Justice Screening Tool (EJSCREEN). Available: https://www.epa.gov/EJScreen. Accessed: November 24, 2021

Figure 4 DNL 45 dB or Greater Noise Exposure at Pea Ridge Nest Location

Noise Exposure for En-route Operations

Based on the information provided by Zipline, it is anticipated that the UA will cruise at altitudes between 250 to 400 feet AGL at an airspeed of 50-56 knots during en-route flight. However to provide a conservative estimate for en-route noise exposure, the noise exposure was calculated assuming operations at 250 feet AGL and at an airspeed of 40 knots. The en-route noise exposure can be determined by referencing Table 4 of Appendix C. This analysis shows that en-route noise levels would not exceed DNL 45 dB in any location within the study area.

Noise Exposure for Delivery Operations

Due to the inherent uncertainty of the exact delivery site locations and characteristics, the noise analysis assumes that all deliveries will occur at a single delivery location within each delivery community in order to provide a conservative estimate of potential delivery noise exposure. Assuming Zipline's projected maximum number of 20 delivery flight operations per day (7,300 annual operations), distributed evenly over the 12 anticipated delivery communities shown on Table 2-1; an average of 1.66 daily deliveries to each community (approximately 608 annual deliveries) is expected. A conservative estimate of delivery noise exposure can then be determined by referencing Table 6 of Appendix C. This analysis shows that delivery noise levels would not exceed DNL 45 dB in any of the communities where Zipline anticipates providing deliveries.

Total Noise Exposure Results

The maximum noise exposure levels within the study area will occur at the nest site; where noise levels at the or above DNL 45 dB would extend 50 feet to the northwest and southeast of the Pea Ridge nest, and 75 feet to the northeast and southwest of the nest, respectively. Based on these dimensions, the DNL 45 dB would remain almost entirely within the vicinity of the nest infrastructure on the Walmart Neighborhood Market property and is well below the threshold of DNL 65 dB for compatible land use. Additionally, the estimated noise exposure for en-route and delivery operations at locations away from the Pea Ridge Nest would not exceed DNL 45 dB at any location within the study area. There are several airstrips and small airports in the study area, including the Bentonville Municipal Airport, but Zipline's operations are generally planned to avoid flying through established flight paths in controlled airspace around airports, and any noise from Zipline's operations would not be expected to add to the cumulative noise exposure around airports in the study area.

Based on the FAA's noise analysis, the proposed action will not have a significant impact.

3.6 Environmental Justice

3.6.1 Regulatory Setting

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, Section 1-101 requires all federal agencies to the greatest extent practicable and permitted by law, to make achieving environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

The DOT Order 5610.2(a) defines minority as "individuals who are Black; Hispanic or Latino; Asian American; American Indian and Alaskan Native; Native Hawaiian and other Pacific Islander". A minority population is any readily identifiable group of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who will be similarly affected by a proposed DOT program, policy, or activity.

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

FAA Order 1050.1F provides guidance for the preparation of environmental justice analysis in support of an EA. Section 4-3.3, Exhibit 4-1 of the Order indicates that FAA should consider whether the action would have the potential to lead to a disproportionately high and adverse impact, i.e., a low-income or minority population, due to: significant impacts in other environmental impact categories; or impacts on the physical or natural environment that affect an environmental justice population in a way that the FAA determines are unique to the environmental justice population and significant to that population. If a significant impact would affect low income or minority populations at a disproportionately higher level than it would other population segments, an environmental justice issue is likely.

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

1. Is predominately borne by a minority population and/or a low-income population; or

2. Will be suffered by the minority population and/or low-income population and is appreciable more severe or greater in magnitude than adverse effects that will be suffered by the non-minority population and/or low-income population.

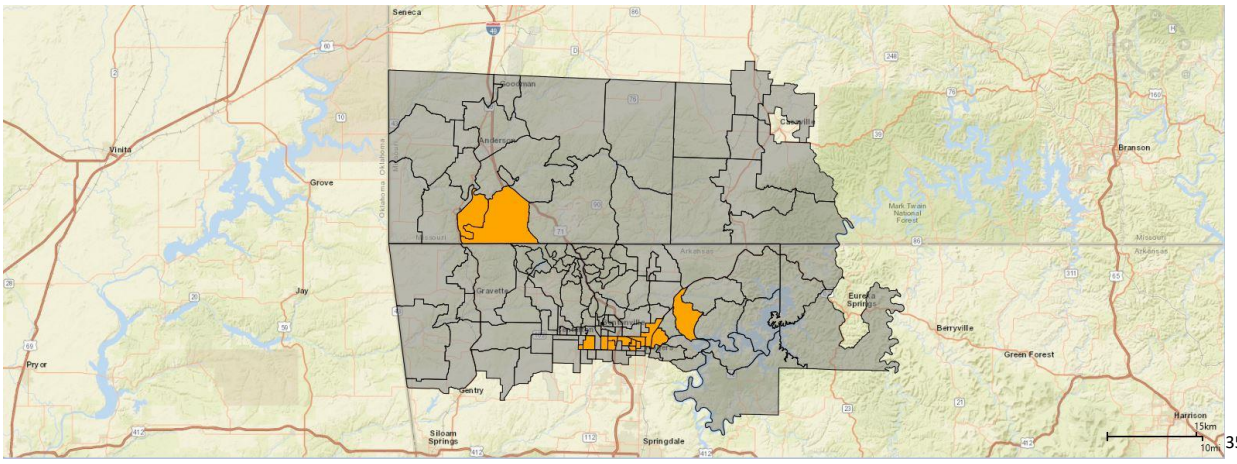
The FAA has not established a significance threshold for environmental justice. In assessing significance, FAA considers the following factors: (1) significant impacts in other environmental impact categories; or (2) impacts on the physical or natural environment that affect an environmental justice population in a way that the FAA determines are unique to the environmental justice population and significant to that population.

3.6.2 Affected Environment

Minority and low-income populations were mapped at the Census Block Group level using 2020 American Community Survey (ACS) 5-year estimates from the U.S. Census Bureau. The analysis was performed using the Aviation Environmental Design Tool (AEDT). The FAA utilized a combination of the *fifty-percent analysis* and *meaningfully greater analysis* to complete the analysis for the study area. Low-income populations in the study area were identified by using *the Low-Income Threshold Criteria* analysis.

Minority Population Fifty-Percent Analysis

As depicted in Figure 5, there are 15 census block groups out of 127 that have minority populations at or above 50 percent. However, the percentage of minority individuals residing within the study area at the census block level is below 50 percent at approximately 23.3 percent.



[35]

Figure 5 Census Block Groups in the Study Area with Minority Populations ≥ 50 Percent

Minority Population Meaningfully Greater Analysis

The minority population in the study area at the census block group level was compared to the reference community, which is the percentage of minority individuals residing within four counties: Barry, Benton, Carroll, and McDonald. Because the study area is within all or parts of the four counties listed, the FAA determined that it would be an appropriate geographical region for comparison.

The reference community percentages are shown in Table 3-3. The percentage of minorities residing within the study area at the census block group level, approximately 23.3 percent, is slightly higher than

[35] Image: AEDT, as modified by the FAA.

that of the reference community, which is approximately 22.54 percent. Based on the analysis, the FAA determined that the percentage of minorities residing within study area was not meaningfully greater than the percentage of minorities residing within the reference community.

Low-Income Threshold Criteria Analysis

The low-income population in the study area at the census block group level was compared to the reference community, which is the percentage of low-income individuals residing within four counties: Barry, Benton, Carroll, and McDonald. Because the study area is within all or parts of the four counties listed, the FAA determined that it would be an appropriate geographical region for comparison.

The percentage of low-income individuals residing within the study area at the census block group level is approximately 10.8 percent as compared to 15.25 percent in the reference community. The reference community percentages are shown in Table 3-3. The FAA's AEDT analysis data is included in Appendix F.

Table 3-3 Low-income and Minority Populations in the Four Counties Encompassing the Study Area

State	County	Low-Income	Percent Minority
Missouri	Barry	18	16.30
Arkansas	Benton	8.86	28.29
Arkansas	Carroll	15.35	18.46
Missouri	McDonald	18.79	27.13
Column Averages (Reference Community)		15.25	22.54

3.6.3 Environmental Consequences

The proposed action would not result in adverse or significant impacts in any environmental resource category. As noted in Section 3.5, *Noise and Noise-Compatible Land Use*, and the Noise Analysis Report in Appendix C, the drone's noise emissions could be perceptible in areas within the study area, but will stay well below the level determined to constitute a significant impact. Since the percentage of low-income individuals was lower in the study area than the reference community, the FAA determined there was not a significant low-income Environmental Justice (EJ) community present. Additionally, Zipline's operations will be happening throughout the study area and, due to the large size of the area, as well as the low number daily operations, it is unlikely that minority EJ populations would be disparately impacted by the proposed action. Since the proposed action would not result in effects that would be predominately or uniquely born by an EJ population, the FAA determined it would not result in an adverse effect on a low-income or a minority population.

3.7 Visual Effects (Visual Resources and Visual Character)

3.7.1 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 suburban or natural landscapes.

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

3.7.2 Affected Environment

The proposed action would take place over mostly suburban and commercially-developed properties. As noted in Section 3.3, *DOT Act Section 4(f) Resources*, there are some public parks that could be valued for aesthetic attributes within the study area. Zipline's proposal is to avoid overflights of large open-air gatherings of people during the scope of the proposed action, which includes public parks and other public properties that may be covered under Section 4(f).

3.7.3 Environmental Consequences

The proposed action makes no changes to any landforms, or land uses, thus there would be no effect to the visual character of the area. The operations will be happening in airspace only. The FAA estimates that at typical operating altitude and speeds the UA en route would be observable for approximately six seconds by an observer on the ground. The proposed action involves airspace operations that are unlikely to result in visual impacts on anywhere in the study area, including sensitive areas such as Section 4(f) properties where the visual setting is an important resource of the property. This is due in part to Zipline's flight planning system discussed above. Additionally, the short duration that each drone flight could be seen from any resource in the operating area, approximately six seconds in total, and the low number of proposed flights per day spread throughout the 1,200 square mile operating area, would minimize any potential for significant visual impacts at any location in the study area. Any visual effects are expected to be similar to existing air traffic in the vicinity of the operating area.

3.8 Water Resources (Surface Waters)

3.8.1 Regulatory Setting

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

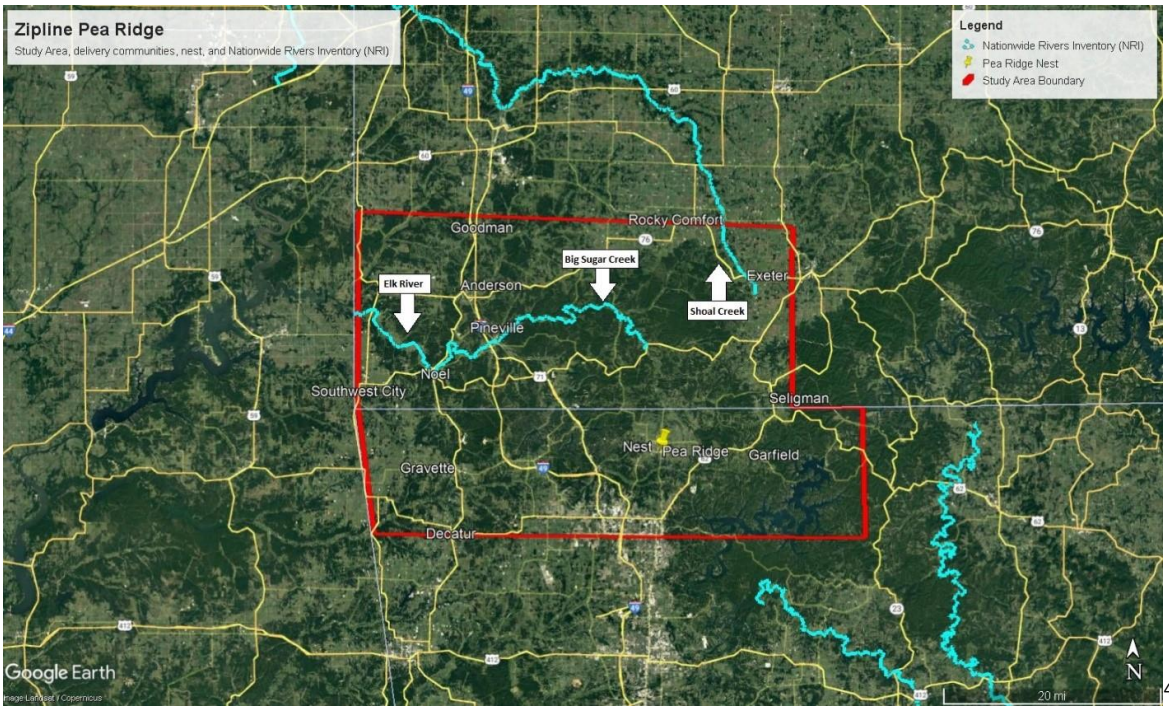
The *Wild and Scenic Rivers Act* (Public Law 90-542; 16 U.S.C. 1271-1287) preserves certain river areas eligible to be included in a national system that possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values in free-flowing condition for the

benefit and enjoyment of present and future generations.[36] Rivers or river segments selected for inclusion on the National Wild and Scenic Rivers System (WSRS) are river systems, designated by Congress or the Secretary of the Interior, with outstandingly remarkable values (ORVs). Classifications are based on the degree of development present along the river, and whether the river is wild, scenic, or recreational.[37] The Nationwide Rivers Inventory (NRI) are river segments identified by the National Park Service (NPS) as potential candidates for listing on the WSRS.[38] Federal agencies must seek to avoid or mitigate actions that would adversely affect designated Wild and Scenic Rivers and NRI river segments.

3.8.2 Affected Environment

Approximately 24 square miles of surface waters occur within the operating area, or approximately two percent of the area, based on the EPA's Environmental Justice Screening and Mapping Tool (EJSCREEN) report for this proposed action (Appendix E). Notable surface waters include Beaver Lake, Lake Windsor, Lake Ann, Lake Avalon, Lake Norwood, Lake Loch Lomond, and Lake Brittany, in addition to rivers such as the Elk River and tributary streams that are also protected by the CWA. Zipline's operations will not require a NPDES permit or any other authorization under the CWA.

There are three NRI river segments that occur within the operating area, located in the southwest Missouri section of the study area: Shoal Creek, Big Sugar Creek, and Elk River.[39] The NRI river segments are depicted in Figure 6 below. There are no Wild and Scenic River segments within the study area.



[40]

Figure 6 Study Area with NRI River Segments

[36] Wild and Scenic Rivers Act. Available: https://www.rivers.gov/documents/wsr-act.pdf. Accessed May 4, 2022.
[37] National Wild and Scenic Rivers System. Available: https://www.rivers.gov/wsr-act.php. Accessed: May 4, 2022.
[38] National Park Service (NPS) Nationwide Rivers Inventory. Available: https://www.nps.gov/subjects/rivers/nationwide-rivers-inventory.htm. Accessed: May 4, 2022.
[39] National Park Service (NPS) Nationwide Rivers Inventory (NRI) Interactive Map. Available: https://www.nps.gov/maps/full.html?mapId=8adbe798-0d7e-40fb-bd48-225513d64977. Accessed: March 25, 2022.
[40] Image: Google Earth, as modified by the FAA

3.8.3 Environmental Consequences

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

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

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

There will be no construction activities associated with the proposed action. The proposed action would not have the potential to adversely affect natural and beneficial water resource values to a degree that substantially diminishes or destroys such values, or to adversely affect surface waters such that the beneficial uses and values of such waters are appreciably diminished or can no longer be maintained and such impairment cannot be avoided or satisfactorily mitigated. The proposed action would not cause an exceedance of water quality standards established by federal, state, local, and tribal regulatory agencies, and the proposed action would not contaminate public drinking water supply such that public health may be adversely affected.

Zipline delivery flights will not overfly NRI river segments at an intensity that could cause any detrimental impacts to the values of these resources. Currently, UA operations can occur over these river segments under existing regulatory authorities. Consultation with the NPS is only necessary for water resources projects that could impact a NRI river segment. However, the FAA contacted the NPS Regional Rivers Coordinator in April 2022 for assistance in determining whether Zipline's overflights could potentially affect the recreational values of these three NRI segments. The NPS Regional Rivers Coordinator responded in May 2022 and confirmed that the proposed action will not preclude the listed NRI segments from being considered for inclusion in the WSRS. The FAA's outreach letter and NPS response letter are included in Appendix G. Zipline's limited overflights will not introduce any visual, audible, or other sensory intrusions that are out of character with the river segments or alter their settings. Therefore, the potential for impacts to surface waters, including NRI river segments, are not significant.

4.0 LIST OF PREPARERS and CONTRIBUTORS

Table 4-1 lists the principal preparers, reviewers, and contributors to this EA.

Table 4-1. List of Preparers and Contributors

Name and Affiliation	Years of Industry Experience	EA Responsibility
Mike Millard, Flight Standards, FAA Aviation Safety	40	Flight Standards Environmental Specialist and Document Review
Christopher Couture, FAA Aviation Safety	16	Program Management, Environmental Science, and Document Review
Shawna Barry, FAA Office of Environment and Energy	15	NEPA subject matter expert, Biological Resources, and Document Review
Sean Doyle, FAA Office of Environment and Energy	16	Noise Analysis and Document Review
Adam Scholten, FAA Office of Environment and Energy	11	Noise Analysis and Document Review
Contractor Contributors		
Jodi Jones, FAA Aviation Safety, PrimCorp, LLC	12	NEPA subject matter expert, Research, and Document Review
Brad Thompson, FAA Aviation Safety, Science Applications International Corporation (SAIC)	7	NEPA subject matter expert, Research, and Document Review

5.0 LIST of AGENCIES CONSULTED

Federal Agencies

U.S. Fish and Wildlife Service, Arkansas Ecological Services Field Office

U.S. Fish and Wildlife Service, Missouri Ecological Services Field Office

National Park Service, Midwest Regional Office, Omaha, Nebraska

State Agencies

Arkansas Department of Parks, Heritage, and Tourism – Arkansas Historic Preservation Program

Missouri Department of Natural Resources, State Preservation Office

Tribes

Apache Tribe

Caddo Nation

Delaware Nation

Delaware Tribe of Indians

Osage Nation

Seneca-Cayuga

Appendix A

IPaC Report

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Missouri Ecological Services Field Office
101 Park Deville Drive
Suite A
Columbia, MO 65203-0057
Phone: (573) 234-2132 Fax: (573) 234-2181

In Reply Refer To:
Project Code: 2022-0027468
Project Name: Pea Ridge

April 04, 2022

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

To Whom It May Concern:

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

Threatened and Endangered Species

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and may be affected by your proposed project. The species list fulfills the requirement for obtaining a Technical Assistance Letter from the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).
New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. **Note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days.** The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Consultation Technical Assistance

Refer to the Midwest Region S7 Technical Assistance website for step-by-step instructions for making species determinations and for specific guidance on the following types of projects:

projects in developed areas, HUD, pipelines, buried utilities, telecommunications, and requests for a Conditional Letter of Map Revision (CLOMR) from FEMA.

Federally Listed Bat Species

Indiana bats, gray bats, and northern long-eared bats occur throughout Missouri and the information below may help in determining if your project may affect these species.

Gray bats - Gray bats roost in caves or mines year-round and use water features and forested riparian corridors for foraging and travel. If your project will impact caves, mines, associated riparian areas, or will involve tree removal around these features – particularly within stream corridors, riparian areas, or associated upland woodlots –gray bats could be affected.
Indiana and northern long-eared bats - These species hibernate in caves or mines only during the winter. In Missouri the hibernation season is considered to be November 1 to March 31. During the active season in Missouri (April 1 to October 31) they roost in forest and woodland habitats. Suitable summer habitat for Indiana bats and northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥5 inches diameter at breast height (dbh) for Indiana bat, and ≥3 inches dbh for northern long-eared bat, that have exfoliating bark, cracks, crevices, and/or hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Tree species often include, but are not limited to, shellbark or shagbark hickory, white oak, cottonwood, and maple. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of other forested/wooded habitat. Northern long-eared bats have also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore, these structures should also be considered potential summer habitat and evaluated for use by bats. If your project will impact caves or mines or will involve clearing forest or woodland habitat containing suitable roosting habitat, Indiana bats or northern long-eared bats could be affected.
Examples of unsuitable habitat include:

- Individual trees that are greater than 1,000 feet from forested or wooded areas;
- Trees found in highly-developed urban areas (e.g., street trees, downtown areas);
- A pure stand of less than 3-inch dbh trees that are not mixed with larger trees; and
- A stand of eastern red cedar shrubby vegetation with no potential roost trees.

Using the IPaC Official Species List to Make No Effect and May Affect Determinations for Listed Species

1. If IPaC returns a result of “There are no listed species found within the vicinity of the project,” then project proponents can conclude the proposed activities will have **no effect** on any federally listed species under Service jurisdiction. Concurrence from the Service is not required for **No Effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records. An example "No Effect" document also can be found on the S7 Technical Assistance website.

2. If IPaC returns one or more federally listed, proposed, or candidate species as potentially present in the action area of the proposed project – other than bats (see #3 below) – then project proponents can conclude the proposed activities **may affect** those species. For assistance in determining if suitable habitat for listed, candidate, or proposed species occurs within your project area or if species may be affected by project activities, you can obtain Life History Information for Listed and Candidate Species through the S7 Technical Assistance website.
3. If IPac returns a result that one or more federally listed bat species (Indiana bat, northern long-eared bat, or gray bat) are potentially present in the action area of the proposed project, project proponents can conclude the proposed activities **may affect** these bat species **IF** one or more of the following activities are proposed:
    a. Clearing or disturbing suitable roosting habitat, as defined above, at any time of year;
    b. Any activity in or near the entrance to a cave or mine;
    c. Mining, deep excavation, or underground work within 0.25 miles of a cave or mine;
    d. Construction of one or more wind turbines; or
    e. Demolition or reconstruction of human-made structures that are known to be used by bats based on observations of roosting bats, bats emerging at dusk, or guano deposits or stains.

If none of the above activities are proposed, project proponents can conclude the proposed activities will have **no effect** on listed bat species. Concurrence from the Service is not required for **No Effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records. An example "No Effect" document also can be found on the S7 Technical Assistance website.
If any of the above activities are proposed in areas where one or more bat species may be present, project proponents can conclude the proposed activities **may affect** one or more bat species. We recommend coordinating with the Service as early as possible during project planning. If your project will involve removal of over 5 acres of suitable forest or woodland habitat, we recommend you complete a Summer Habitat Assessment prior to contacting our office to expedite the consultation process. The Summer Habitat Assessment Form is available in Appendix A of the most recent version of the Range-wide Indiana Bat Summer Survey Guidelines.

Other Trust Resources and Activities

Bald and Golden Eagles - Although the bald eagle has been removed from the endangered species list, this species and the golden eagle are protected by the Bald and Golden Eagle Act and the Migratory Bird Treaty Act. Should bald or golden eagles occur within or near the project area please contact our office for further coordination. For communication and wind energy projects, please refer to additional guidelines below.

Migratory Birds - The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Service. The Service has the responsibility under the MBTA

to proactively prevent the mortality of migratory birds whenever possible and we encourage implementation of recommendations that minimize potential impacts to migratory birds. Such measures include clearing forested habitat outside the nesting season (generally March 1 to August 31) or conducting nest surveys prior to clearing to avoid injury to eggs or nestlings.

Communication Towers - Construction of new communications towers (including radio, television, cellular, and microwave) creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. However, the Service has developed voluntary guidelines for minimizing impacts.

Transmission Lines - Migratory birds, especially large species with long wingspans, heavy bodies, and poor maneuverability can also collide with power lines. In addition, mortality can occur when birds, particularly hawks, eagles, kites, falcons, and owls, attempt to perch on uninsulated or unguarded power poles. To minimize these risks, please refer to guidelines developed by the Avian Power Line Interaction Committee and the Service. Implementation of these measures is especially important along sections of lines adjacent to wetlands or other areas that support large numbers of raptors and migratory birds.

Wind Energy - To minimize impacts to migratory birds and bats, wind energy projects should follow the Service's Wind Energy Guidelines. In addition, please refer to the Service's Eagle Conservation Plan Guidance, which provides guidance for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities.

Next Steps

Should you determine that project activities **may affect** any federally listed species or trust resources described herein, please contact our office for further coordination. Letters with requests for consultation or correspondence about your project should include the Consultation Tracking Number in the header. Electronic submission is preferred.

If you have not already done so, please contact the Missouri Department of Conservation (Policy Coordination, P. O. Box 180, Jefferson City, MO 65102) for information concerning Missouri Natural Communities and Species of Conservation Concern.
We appreciate your concern for threatened and endangered species. Please feel free to contact our office with questions or for additional information.

Karen Herrington

Note: IPaC has provided all available attachments because this project is in multiple field office jurisdictions.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds

- Wetlands

Official Species List

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

This species list is provided by:

Missouri Ecological Services Field Office
101 Park Deville Drive
Suite A
Columbia, MO 65203-0057
(573) 234-2132

This project's location is within the jurisdiction of multiple offices. However, only one species list document will be provided for all offices. The species and critical habitats in this document reflect the aggregation of those that fall in each of the affiliated office's jurisdiction. Other offices affiliated with the project:

Arkansas Ecological Services Field Office
110 South Amity Suite 300
Conway, AR 72032-8975
(501) 513-4470

Project Summary

Project Code: 2022-0027468
Event Code: None
Project Name: Pea Ridge
Project Type: Drones - Use/Operation of Unmanned Aerial Systems
Project Description: Commercial drone operation
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@36.61902955,-94.25584898047083,14z

Counties: Arkansas and Missouri

Endangered Species Act Species

There is a total of 13 threatened, endangered, or candidate species on this species list.

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

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

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

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

Mammals

NAME	STATUS
Gray Bat *Myotis grisescens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6329	Endangered
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5949 General project design guidelines: https://ipac.ecosphere.fws.gov/project/EEMSBP27IFDR5ACHOC76KNTKEQ/documents/generated/6868.pdf	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045 General project design guidelines: https://ipac.ecosphere.fws.gov/project/EEMSBP27IFDR5ACHOC76KNTKEQ/documents/generated/6868.pdf	Threatened
Ozark Big-eared Bat *Corynorhinus (=Plecotus) townsendii ingens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7245	Endangered

Birds

NAME	STATUS
Eastern Black Rail *Laterallus jamaicensis ssp. jamaicensis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10477	Threatened
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: U.S.A. (AL, AR, CO, FL, GA, ID, IL, IN, IA, KY, LA, MI, MN, MS, MO, NC, NM, OH, SC, TN, UT, VA, WI, WV, western half of WY) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/758	Experimental Population, Non-Essential

Fishes

NAME	STATUS
Ozark Cavefish *Amblyopsis rosae* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6490	Threatened

Clams

NAME	STATUS
Neosho Mucket *Lampsilis rafinesqueana* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3788	Endangered

Insects

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

Crustaceans

NAME	STATUS
Benton County Cave Crayfish *Cambarus aculabrum*	Endangered

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/5011

Flowering Plants

NAME	STATUS
Missouri Bladderpod *Physaria filiformis*	Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/5361

Critical habitats

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

NAME	STATUS
Neosho Mucket *Lampsilis rafinesqueana*	Final

https://ecos.fws.gov/ecp/species/3788#crithab

USFWS National Wildlife Refuge Lands And Fish Hatcheries

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

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

Migratory Birds

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

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

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

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10

NAME	BREEDING SEASON
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Cerulean Warbler *Dendroica cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 23 to Jul 20
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Henslow's Sparrow *Ammodramus henslowii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3941	Breeds May 1 to Aug 31
Kentucky Warbler *Oporornis formosus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
Le Conte's Sparrow *Ammodramus leconteii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

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

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

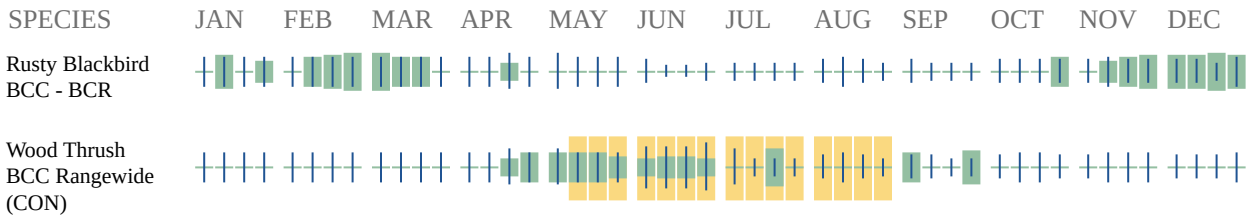
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

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

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

BCC Rangewide (CON)



Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides

birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

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

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

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

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE VISIT HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

IPaC User Contact Information

Agency: Federal Aviation Administration
Name: Jodi Jones
Address: 800 Independence Ave SW
City: Washington
State: DC
Zip: 20591
Email jodi.a-ctr.jones@faa.gov
Phone: 2022670509

Appendix B

Tribal and Historic Outreach Letters

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Arkansas Historic Preservation Program
Section 106 Review
1100 North Street
Little Rock, AR 72201

Via electronic submission to section106@arkansas.gov

To whom it may concern:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption for an Unmanned Aircraft System (UAS) delivery operations in and around Bentonville, AR in Benton and Carrol Counties. The FAA has determined that this proposed action is a Federal undertaking as defined in 36 CFR § 800.16 (y). Therefore, the FAA is initializing consultation with the State Historic Preservation Officer (SHPO) pursuant to § 800.11 (d).

Proposed Activity Description
The Federal Aviation Administration (FAA) has been asked to approve waivers and/or exemptions to aeronautical regulations, thereby approving the UAS operation in the area depicted below. FAA approval of the UAS operation in the area is an undertaking subject to regulations pursuant to the National Historic Preservation Act.

The UAS operation will be flown by an unmanned aircraft weighing 49.6 lbs., including a 3.9 lb. payload, at approximately 200 feet, but no more than 400 feet above ground level (AGL) in the vicinity of Bentonville, AR (see attached operations area map). The purpose is for package delivery, consisting of approximately eight to ten flights each day, five days per week, with each flight lasting approximately fifteen minutes. Flights will occur primarily Tue-Sat, no holidays, with operating hours from 8 am until 6 pm, daylight hours. The dimension of the UAS area defines the Area of Potential Effect (APE). According to the National Park Service online database of the National Register of Historic Places, there are approximately 155 historic properties within the UAS operations area. The FAA determined that the undertaking does not have the potential to affect historic properties; however, since this UAS technology is new to most people, consultation with the SHPO is initiated. The UAS operation will have no affects to the ground. All flights will takeoff from, and return to the launch and recovery site adjacent to the Walmart Neighborhood Market located at 240 Slack St., Pea Ridge, AR 72751 (36.443805, -94.119836).

Consultation
The FAA seeks concurrence from the SHPO of its no historic properties affected [§ 800.11 (d)] determination for the proposed UAS operation area. Your response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation.

If you have any comments or questions or need additional information regarding the proposed operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David M. Menzimer

Digitally signed by David M. Menzimer
Date: 2021.06.15 08:10:53 -07'00'

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

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Missouri Department of Natural Resources
State Historic Preservation Office
Attn: Section 106 Review
P.O. Box 176
Jefferson City, MO 65102-0176

To whom it may concern:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) for the approval of a Certificate of Waiver and/or Exemption for an Unmanned Aircraft System (UAS) delivery operations in and around Bentonville, AR in Benton and Carrol Counties. The FAA has determined that this proposed action is a Federal undertaking as defined in 36 CFR § 800.16 (y). Therefore, the FAA is initializing consultation with the State Historic Preservation Officer (SHPO) pursuant to § 800.11 (d).

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Sincerely,

David M. Menzimer

Digitally signed by David M. Menzimer
Date: 2021.06.15 08:10:11 -07'00'

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

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Chairman Bobby Komardley
Apache Tribe of Oklahoma
P.O. Box 1330
Anadarko, OK 73005

Dear Chairman Komardley:

The purpose of this letter is to initiate formal government-to-government consultation regarding issuance by the Federal Aviation Administration (FAA) for an Unmanned Aircraft System (UAS) delivery operations in and around Bentonville, AR in Benton and Carrol Counties and McDonald and Barry Counties in MO. The FAA has determined that this proposed action is a Federal undertaking as defined in 36 CFR § 800.16 (y). Therefore, the FAA is initializing consultation with the State Historic Preservation Officer (SHPO) pursuant to § 800.11 (d).

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Consultation
The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Your

response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation.

If you have any comments or questions or need additional information regarding the UAS operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David M. Menzimer

Digitally signed by David M. Menzimer
Date: 2021.06.15 06:21:55 -07'00'

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

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Chairman Bobby Gonzalez
Caddo Nation
P.O. Box 487
Binger, OK 73009

Dear Chairman Gonzalez:

The purpose of this letter is to initiate formal government-to-government consultation regarding issuance by the Federal Aviation Administration (FAA) for an Unmanned Aircraft System (UAS) delivery operations in and around Bentonville, AR in Benton and Carrol Counties and McDonald and Barry Counties in MO. The FAA has determined that this proposed action is a Federal undertaking as defined in 36 CFR § 800.16 (y). Therefore, the FAA is initializing consultation with the State Historic Preservation Officer (SHPO) pursuant to § 800.11 (d).

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Sincerely,

David M. Menzimer

Digitally signed by David M. Menzimer
Date: 2021.06.15 06:23:02 -07'00'

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

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

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

Dear President Dotson:

The purpose of this letter is to initiate formal government-to-government consultation regarding issuance by the Federal Aviation Administration (FAA) for an Unmanned Aircraft System (UAS) delivery operations in and around Bentonville, AR in Benton and Carrol Counties and McDonald and Barry Counties in MO. The FAA has determined that this proposed action is a Federal undertaking as defined in 36 CFR § 800.16 (y). Therefore, the FAA is initializing consultation with the State Historic Preservation Officer (SHPO) pursuant to § 800.11 (d).

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Sincerely,

David M. Menzimer

Digitally signed by David M. Menzimer
Date: 2021.06.15 06:23:46 -07'00'

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

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Chief Chester Brooks
Delaware Tribe of Indians
5100 Tuxedo Blvd.
Bartlesville, OK 74006

Dear Chief Brooks:

The purpose of this letter is to initiate formal government-to-government consultation regarding issuance by the Federal Aviation Administration (FAA) for an Unmanned Aircraft System (UAS) delivery operations in and around Bentonville, AR in Benton and Carrol Counties and McDonald and Barry Counties in MO. The FAA has determined that this proposed action is a Federal undertaking as defined in 36 CFR § 800.16 (y). Therefore, the FAA is initializing consultation with the State Historic Preservation Officer (SHPO) pursuant to § 800.11 (d).

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Sincerely,

David M. Menzimer

Digitally signed by David M. Menzimer
Date: 2021.06.15 08:07:33 -07'00'

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

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Principal Chief Geoffrey Standing Bear
Osage Nation
P.O. Box 779
Pawhuska, OK 74056

Dear Chief Standing Bear:

The purpose of this letter is to initiate formal government-to-government consultation regarding issuance by the Federal Aviation Administration (FAA) for an Unmanned Aircraft System (UAS) delivery operations in and around Bentonville, AR in Benton and Carrol Counties and McDonald and Barry Counties in MO. The FAA has determined that this proposed action is a Federal undertaking as defined in 36 CFR § 800.16 (y). Therefore, the FAA is initializing consultation with the State Historic Preservation Officer (SHPO) pursuant to § 800.11 (d).

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Sincerely,

David M. Menzimer

Digitally signed by David M. Menzimer
Date: 2021.06.15 08:08:26 -07'00'

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

Enclosure

U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., S.W.
Washington, DC 20591

Chief Charles Diebold
Seneca-Cayuga Nation
P.O. Box 453220
Grove, OK 74344

Dear Chief Diebold:

The purpose of this letter is to initiate formal government-to-government consultation regarding issuance by the Federal Aviation Administration (FAA) for an Unmanned Aircraft System (UAS) delivery operations in and around Bentonville, AR in Benton and Carrol Counties and McDonald and Barry Counties in MO. The FAA has determined that this proposed action is a Federal undertaking as defined in 36 CFR § 800.16 (y). Therefore, the FAA is initializing consultation with the State Historic Preservation Officer (SHPO) pursuant to § 800.11 (d).

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The FAA is soliciting the opinion of the tribe(s) concerning any tribal lands, or sites of religious or cultural significance that may be affected by the proposed operation area. Your

response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation.

If you have any comments or questions or need additional information regarding the UAS operation, please do not hesitate to contact Mr. Mike Millard, in writing at: FAA, AFS-800, 800 Independence Ave., S.W., Washington, D.C. 20591; by telephone: (202) 267-7906; or by email: 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

David M. Menzimer

Digitally signed by David M. Menzimer
Date: 2021.06.16 09:30:31 -07'00'

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

Enclosure

CULTURAL RESOURCE COMMENTS
Section 106 Review

CONTACT PERSON/ADDRESS:

Federal Aviation Administration
Attn: Mike Millard
AFS-800
800 Independence Ave, S.W.
Washington DC, 20591

Copied:

Mr. Scott Tenner, FAA
Mr. Brian Boehmer, Aviation, MoDOT

PROJECT:

Unmanned Aircraft System Delivery Operations in and Around Bentonville, AR including McDonald and Barry Counties

FEDERAL AGENCY:

FAA

COUNTY:

McDonald and Barry

The Missouri State Historic Preservation Office (SHPO) has reviewed the information submitted on the above referenced project. Based on this review, we have made the following determination:

[X] Adequate documentation has been provided as outlined in 36 CFR Section 800.11. After review of the initial submission, the project area has no known historic properties present and a low potential for the occurrence of cultural resources. SHPO concurs with your determination of **No Historic Properties Affected**.

[ ] An adequate cultural resource survey of the project area has been previously conducted; therefore, SHPO concurs with your determination of **No Historic Properties Affected**.

[ ] An adequate cultural resource survey has been conducted for this project titled, by . Based on this survey and its negative findings, SHPO concurs with your determination of **No Historic Properties Affected.**

PLEASE BE ADVISED THAT, IF THE CURRENT PROJECT AREA OR SCOPE OF WORK CHANGES, SUCH AS A BORROW AREA BEING ADDED, OR CULTURAL MATERIALS ARE ENCOUNTERED DURING CONSTRUCTION, APPROPRIATE INFORMATION MUST BE PROVIDED TO THIS OFFICE FOR FURTHER REVIEW AND COMMENT. Please retain this documentation as evidence of consultation with SHPO under Section 106 of the National Historic Preservation Act, as amended. SHPO concurrence does not complete the Section 106 process as federal agencies will need to conduct consultation with all interested parties.

By: Toni M. Prawl **June 28, 2021**
Toni M. Prawl, Ph.D., Deputy State Historic Preservation Officer **Date**

MISSOURI DEPARTMENT OF NATURAL RESOURCES
STATE HISTORIC PRESERVATION OFFICE
P.O. Box 176, Jefferson City, Missouri 65102
For additional information, please contact Amy Rubingh, (573) 751-4589.

Please be sure to refer to the project number: 030-MLT-21

Asa Hutchinson
Governor
Stacy Hurst
Secretary

July 07, 2021

Mr. David M. Menzimer
Aviation Safety
Manager, General Aviation Operations Branch,
Flight Standards Service
U.S. Department of Transportation
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, DC 20591

Re: Benton and Carroll Counties – General
Section 106 – FAA
Proposed Undertaking – Unmanned Aircraft Systems (UAS) Delivery Operations
AHPP Tracking Number – 108161

Dear Mr. Menzimer:

The staff of the Arkansas Historic Preservation Program (AHPP) reviewed the submission for the above-referenced undertaking Benton and Carroll Counties in and around Bentonville, Arkansas. The proposed undertaking entails the operation of an Unmanned Aircraft System (UAS) for the purpose of delivering packages. The UAS will operate at a limited height of 200 to 400 feet, during daylight hours. No ground disturbance will take place and any visual and other disturbance in and around historic properties identified by the Federal Aviation Administration (FAA) will not meet the criteria defined in 36 CFR § 800.16(i).

Based on the provided information, the AHPP concurs with the finding of **no adverse effect to historic properties affected pursuant to 36 CFR § 800.5(a)(1)** for the proposed undertaking. However, we do point out that UAS have the potential to affect historic properties in the future as it becomes more common. Pursuant to **36 CFR § 800.5(a)(1)**, "Adverse effects may include reasonable foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative." It is the opinion of the AHPP that UAS undertakings do have the potential to cause effects and we recommend consultation on subsequent UAS projects in Arkansas.

Tribes that have expressed an interest in the area include the Cherokee Nation, the Delaware Nation, the Osage Nation, the Shawnee Tribe, and the United Keetoowah Band of Cherokee Indians. We recommend consultation in accordance with 36 CFR § 800.2(c)(2).

We appreciate the opportunity to review this undertaking. If you have any questions, please contact Jessica Cogburn of my staff at (501) 324-9357 or jessica.cogburn@arkansas.gov. Please refer to the AHPP Tracking Number above in any correspondence.

Sincerely,

Jessica H. Cogburn

Digitally signed by Jessica H. Cogburn
Date: 2021.07.07 16:32:21 -05'00'

for
Scott Kaufman
Director, AHPP

cc: Dr. Melissa Zabecki, Arkansas Archeological Survey

Appendix C

Noise Analysis Report

Noise Assessment for Zipline Proposed Package Delivery Operations with Sparrow Unmanned Aircraft

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

Final

HMMH Report No. 309990.003-4

January 5, 2022

Prepared for:

JD RoVolus, LLC
121 Pearl Street
Ypsilanti, MI 48197

Federal Aviation Administration
Aviation Safety, Flight Standards Service
Office of Environment and Energy
Policy, Engineering, Analysis, and Research (PEARS II)
693KA9-18-D-00005

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Noise Assessment for Zipline Proposed Package Delivery Operations with Sparrow Unmanned Aircraft

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693KA9-18-D-00005

Prepared by:
David Crandall

HMMH
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Contents

Figures

Tables

1 Introduction and Background

This document presents the methodology and estimation of noise exposure related to proposed Unmanned Aircraft (UA) package delivery operations conducted by Zipline as a commercial operator under the provisions of 14 CFR Part 135. Zipline is proposing to perform package delivery operations at multiple potential locations in the continental United States utilizing an operational model that involves a central distribution center (a "nest") and supporting route network to transport packages to delivery locations ("delivery sites") in the surrounding communities such as medical centers, health facilities, and private homes.

Nest and delivery sites are driven by partnerships Zipline has established with health organizations, retailers, and other businesses to deliver medical supplies and retail goods to surrounding communities. Flight paths to and from the nest and delivery sites use a network or route plans, with a structure of common flight path segments near the nest and various branches to deliver to individual locations.[1] Delivery sites are selected by Zipline after potential customers are identified and their specific locations have been surveyed and satisfy various criteria.

The Zipline Sparrow Unmanned Aircraft is unique to Zipline, and often referred to as a "Zip."[2] The UA is a fixed-wing design powered by two electric motors, mounted on a single pylon above the fuselage, turning three-bladed propellers. The wingspan is 10 feet, 10 inches, with a fuselage length of 6 feet, 2 inches. The maximum takeoff weight is listed as 49.3 pounds. Figure 1 depicts the UA considered in this report.

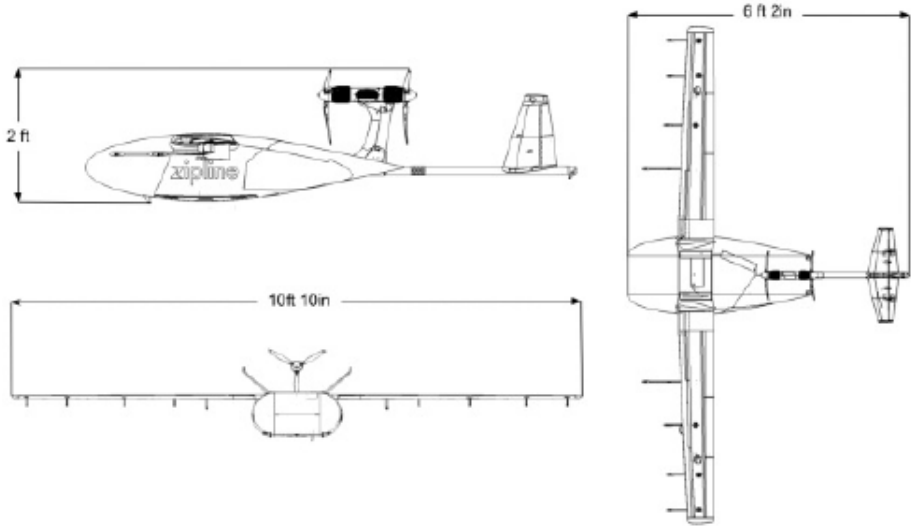

Figure 1. Sparrow Unmanned Aircraft

[1] Zipline materials defined "route plan" as "Standardized and static end to end path of a [UA] to and from a delivery location (originating from a nest) that includes considerations for altitude, keep-out areas, etc."
[2] According to the definitions in Zipline's CONOPS dated June 7, 2021, regulatory technical documents regarding the UA are titled "Sparrow Unmanned Aircraft Flight Manual" and "Sparrow Unmanned Aircraft Maintenance Manual." Therefore Sparrow is used in this document for consistency.

As a fixed-wing design, the UA needs forward airspeed to remain in controlled flight, and general operating airspeeds are expected to be in the range of 45 to 60 knots. The UA is launched via catapult at the nest and then climbs to en route altitude, at which point it navigates along a defined path from the nest to the intended delivery site. The en route portion of the flight would generally be operated at an altitude of 250 feet Above Ground Level (AGL) and is always below an altitude of 400 feet AGL. Approaching the delivery site, the UA flies a pattern near the delivery point, descends to 60 feet AGL, drops the package via parachute at a pre-defined drop zone, climbs to en route altitude, and then flies along a defined path for recovery at the nest via a recovery system.

The methodology proposed in this document provides quantitative guidance to FAA Environmental Specialists to inform environmental decision making on UA noise exposure from proposed Zipline package delivery operations. The methods presented here are suitable for review of Federal actions under the requirements of the National Environmental Policy Act (NEPA) and other applicable environmental special purpose laws or other federal environmental review requirements at the discretion and approval of the FAA. In particular, the anticipated use of this report is to function as a non-standard equivalent methodology under FAA Order 1050.1F, and as such, would require prior written approval from FAA's Office of Environment and Energy (AEE) for each individual project for which a NEPA determination is sought.[3]

The methodology has been developed with data provided by Zipline and FAA to date and therefore is limited to Zipline operations with the Sparrow UA and the flight phases and maneuvers described herein. The noise analysis methodology and estimated noise levels of the proposed activity levels are based upon noise measurement data provided by Zipline and reviewed by FAA. Results of the noise analysis are presented in terms of the Day-Night Average Sound Level (DNL) based on varying levels of operations for areas at ground level below each phase of the flight.[4]

Section 2 of this document describes the relevant noise and operations data made available by Zipline and FAA. Section 3 describes the approach to developing noise exposure estimates for the various UA flight phases associated with typical operations from the available data. Section 4 presents the estimated DNL levels for various flight phases based on varying levels of typical operations as described by Zipline to date.

[3] 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

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

2 Unmanned Aircraft Delivery Operations and Noise Measurement Data Set Descriptions

Six data sets formed the basis of the noise assessment for the proposed Zipline delivery operations. The data sets include the CONOPS dated June 7, 2021, Noise Test Data report dated September 24, 2021, sample flight track data received on October 29, 2021, and correspondence to FAA's Office of Environment and Energy (AEE) dated April 27, 2021, September 30, 2021, and October 20, 2021.[5] These data sets form the basis for conducting the noise analysis for proposed UA delivery operations. The following subsections provide additional detail on each data source.

2.1 Operations, Flight Paths, and Flight Profile Data

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

2.1.1 Operations

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

Note that DNL noise levels presented in this report are all shown consistent with effective daytime (7 AM to 10 PM) operations levels. For consideration of nighttime (10 PM to 7 AM) noise levels, a ten times operational weighting (equivalent to DNL 10 dB increase) should be applied. Section 3.5 and Section 4 provide techniques to apply the operational weighting and to calculate effective operations for analysis with the DNL metric.

2.1.2 Flight Paths and Profiles

The UA will fly a network of defined flight paths between a central distribution center (known as a "nest") and delivery sites that are developed on an "as-needed basis." Each delivery site is based on customer demand and a suitability survey specific to each candidate location. The nest includes a launcher and recovery apparatus for the UA, along with a building to recharge, pack, and prepare the UAs for deliveries. After launch from the nest, the UA will use the defined flight paths to navigate on

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

both the outbound (nest to delivery) and inbound (post-delivery to recovery) legs. The UA uses the United States Global Positioning System (GPS) for navigation.

Analysis of flight profile data provided by Zipline revealed that a typical profile for operations of the UA can be broken into four discrete phases as described below, in the following sub-sections, and depicted in Figure 2 and Figure 3:

- Launch and climb: Includes launch from the nest and climb to en route altitude.
- En route: Includes flight of the UA to and from the nest at en route altitude. The UA will use the same flight path to and from the nest to a delivery site and may include circular or oval patterns along the route, as needed, for weather and operational conditions.
- Delivery: This includes a unique delivery flight pattern, with orientation dependent upon wind direction and the delivery site.
- Descent and recovery: This includes inbound descent from en route flight and recovery at the nest.

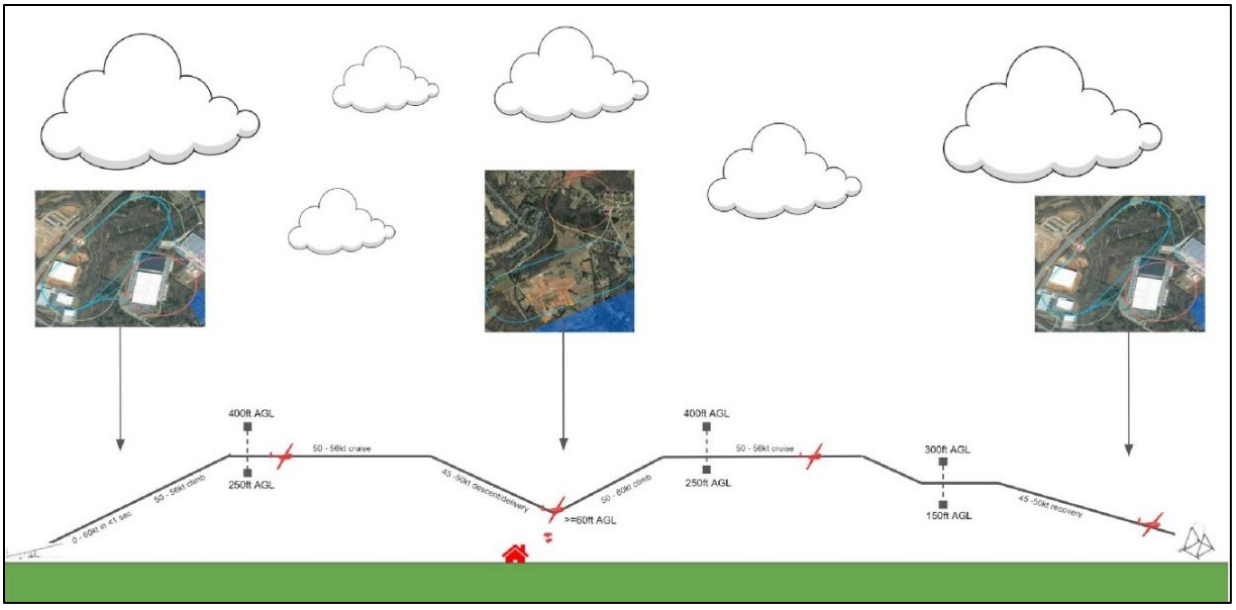

Figure 2. Flight Profile Example

Source: Zipline, September 30, 2021

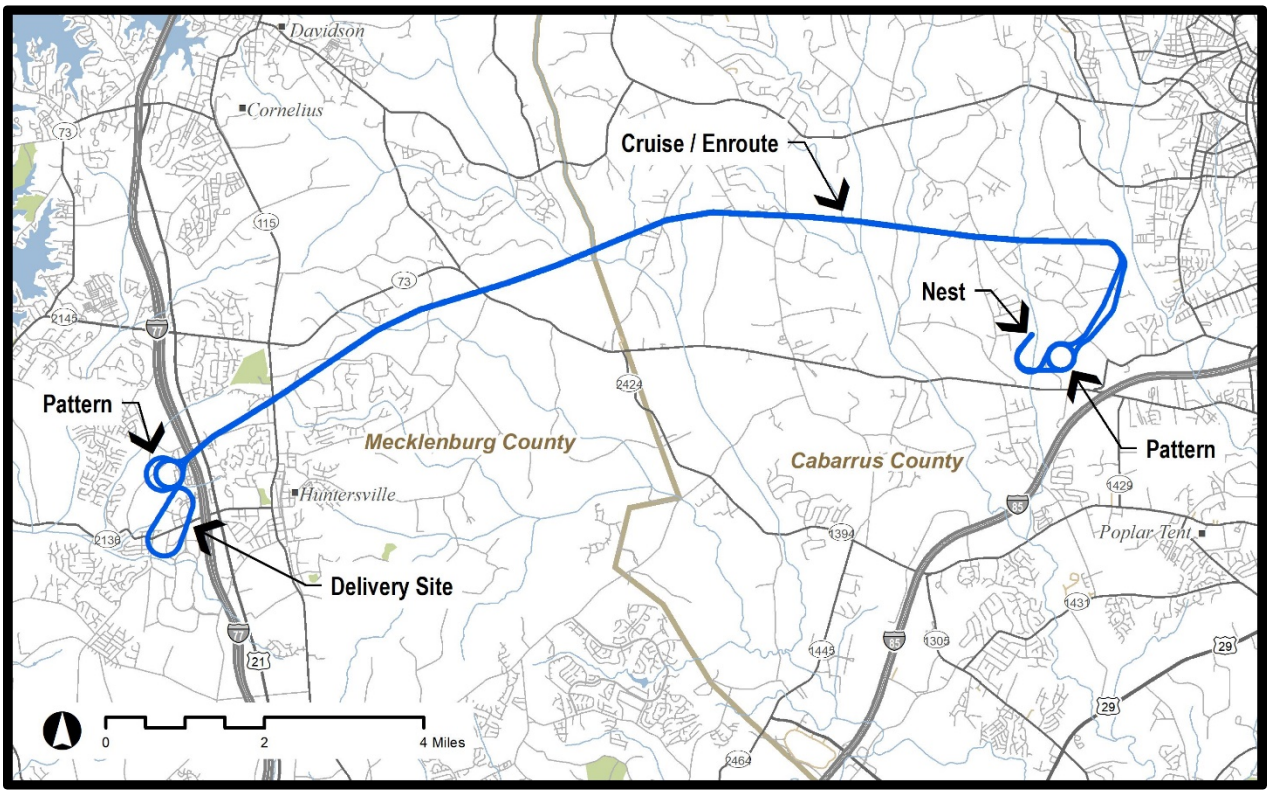

Figure 3. Annotated Example Delivery Flight Path

Sources: Zipline, October 29, 2021; Annotations by HMMH

2.1.2.1 Launch and Climb

During the launch and climb phase, the UA is launched from the nest using a catapult mechanism (a "launcher") as depicted in Figure 4. The launcher is expected to launch the aircraft to 60 knots ground speed, at which point the UA will separate from the launcher and then maintain a nominal climb trajectory at an airspeed of 50 to 56 knots and a climb angle of approximately 8 to 11 degrees until reaching en route altitude.

Figure 4. UA on the Launcher

Source: Zipline, CONOPS, June 7, 2021

2.1.2.2 En route

En route is defined as the phase of flight where the UA transits to and from the nest to delivery sites on a defined network of flight paths. During this flight phase, the UA will typically operate at an altitude of 250 ft Above Ground Level (AGL) and a nominal airspeed of 56 knots. However, the UA may operate at altitudes as low as 130 ft AGL or as high as 400 ft AGL, and with possible ground speeds as low as 40 knots.

Once defined, a particular en route path is expected to be flown consistently, as the UA uses GPS for navigation. As shown in Figure 3, the en route paths are the same for the inbound and outbound legs. A single en route path may support a handful of delivery sites at the edges of the operational area or may, very close to the nest, support the majority of the delivery sites.

In some instances, the UA may enter a circular holding pattern en route to or from a delivery. Holding may occur at a series of defined static holding points or at ad-hoc holding dictated as necessary along the route. Duration spent in holding, the size of the holding pattern, and orientation of the holding pattern is dictated based on operational necessity, weather, and terrain. However, the radius of the

holding pattern flown by the UA is not expected to exceed approximately 820 feet for static holds and approximately 1,640 feet for ad-hoc holds, respectively. When holding is conducted within the en route path, the UA is anticipated to maintain altitudes and speeds consistent with typical en route operations.

2.1.2.3 Delivery

The delivery phase of flight is defined by descent from the en route phase to a delivery site to deliver a package. The delivery occurs within a 40 foot by 40-foot square drop zone in a designated area pre-surveyed by Zipline for suitability before use. The flight path flown by the UA during the delivery phase is chosen at the time of the flight such that the UA is flying into the wind to minimize ground speed at the time of the package release.

During the delivery phase, both prior to and after delivery, there are several associated "pattern" turns flown by the UA that could occur within approximately 1 to 1.5 statute miles of the drop zone. Figure 5 and Figure 6 show the top-down view of a typical delivery pattern and the altitude profile information, respectively.

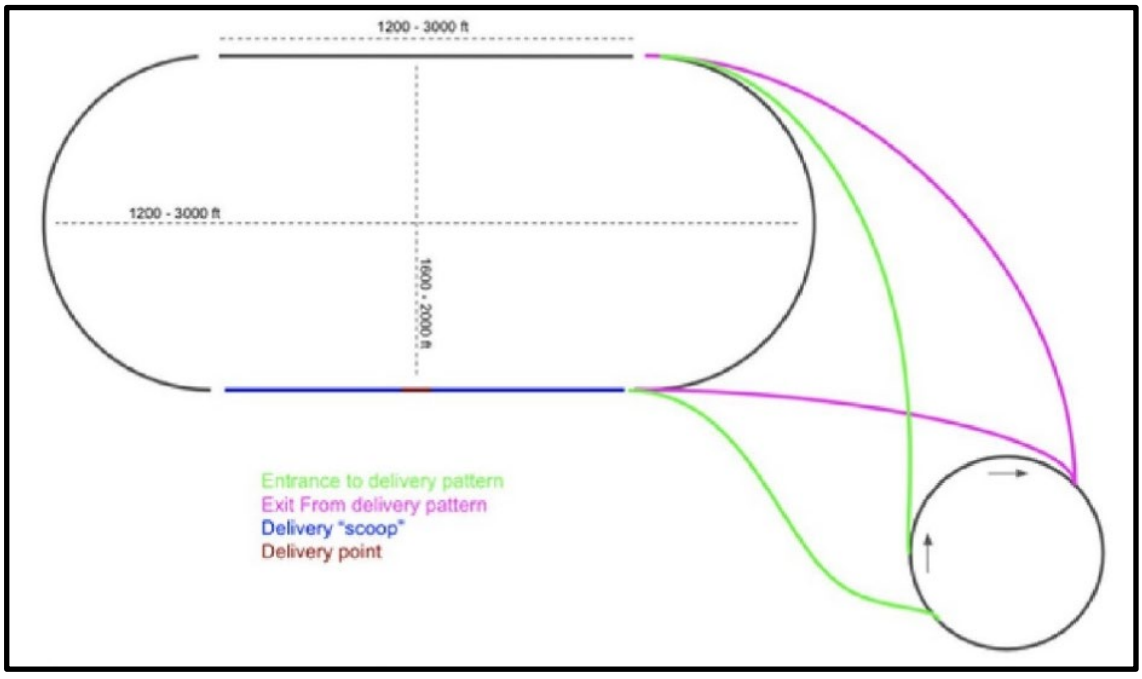

Figure 5. Top Down Diagram of Nominal Delivery Pattern Dimensions
Source: Zipline, April 27, 2021

Figure 6 depicts typical altitude profiles of the UA while in the delivery pattern. The package release during delivery is preceded by a straight segment descending from approximately 130 ft AGL or higher at a descent angle of approximately eight degrees to the package release altitude. The actual package release occurs at or above 60 ft AGL at a ground speed of 40 knots. After package release, the UA climbs to an altitude of at least 130 ft AGL at a climb angle of approximately eight degrees. The UA will then

commence one or more turns to rejoin the en route flight path, as described in Section 2.1.2.2, for return to the nest and recovery.

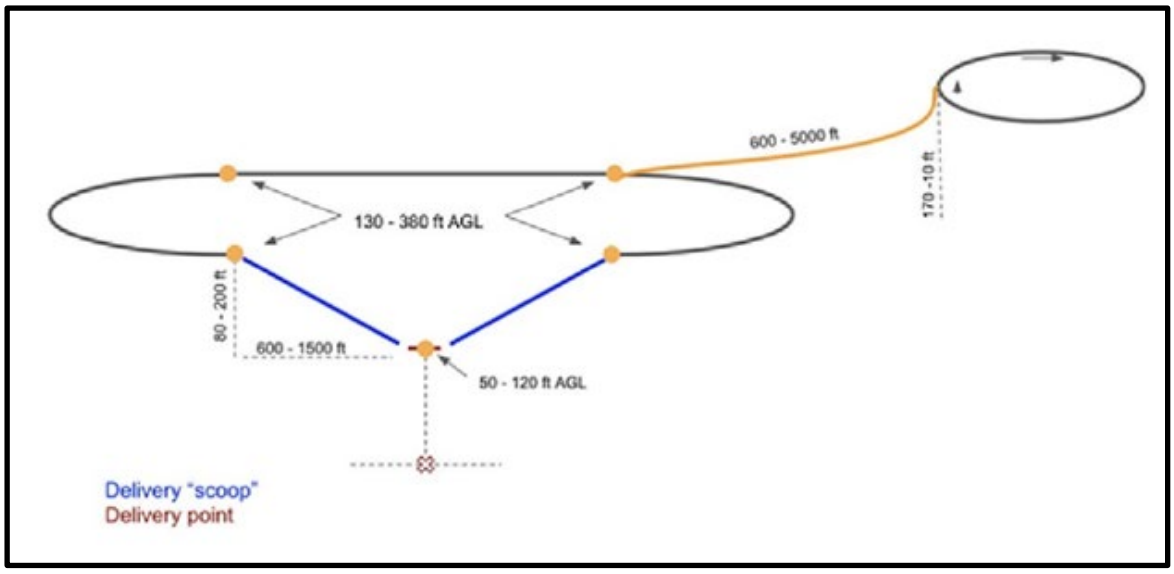

Figure 6. Profile View of Delivery Patterns
Source: Zipline, April 27, 2021

2.1.2.4 Descent and Recovery

The recovery phase of flight is defined as descent from the en route flight phase and recovery of the UA at the nest. The UA is recovered at the nest using a cable recovery mechanism as depicted in Figure 7. Approaching the nest, the UA will descend from en route altitude to 36 feet AGL, at a descent angle of approximately six degrees and an airspeed of 50 to 56 knots. The UA will then be arrested and quickly decelerate via a hook engaging a cable as part of the recovery infrastructure and then lowered to the ground for reuse.

Figure 7. The Recovery System Raising to Recover a Returning UA
Source: Zipline, CONOPS, 6/7/2021

2.2 Acoustical Data

Noise measurement data were provided by Zipline, representative of each phase of the flight (launch, en route, delivery, and recovery). The noise measurements were performed at a Zipline facility near Esparto, California, between August 10, 2021, and September 14, 2021 and provided in a September 24, 2021 document.

In some cases, the data set provided multiple samples of the same operating conditions; the more conservative sample is used for this analysis. The provided documentation does not fully describe the test setup for all measurements. In instances where the distances between the microphone and the noise source are not stated, they are estimated based on the geometry described in the measurement narrative.

Table 1 presents the various measurements of SEL and L_{Amax} that are used in this analysis.

Table 1. SEL and L_{Amax} Relationship Relative to Distance

Source: Zipline, September 24, 2021

Measurement	Distance between Source and Microphone (ft)	SEL (dB)	L_{Amax} (dB)	Note
Launch Under Track	15.0*	81.9	86.4	Nest launch/departure measurement with the microphone positioned under flightpath. Assume this includes launch and launcher noise; distance estimated because altitude over microphone was not provided.
Launch Sideline	50.0	75.5	78.3	Nest launch/departure measurement with microphone positioned sideline/lateral/perpendicular to launcher orientation and flightpath; assume this includes launch and launcher noise.
Recovery	59.4*	72.8	76.4	Nest Recovery Noise. Distance estimated based on 50 ft from recovery location and oriented sideline/perpendicular of aircraft approach path; assume a recover altitude of 32 ft relative to the microphone.
Delivery	56.0*	68.1	66.5	Delivery Noise Distance estimated based on indicated flight altitude of 60 ft AGL and estimated microphone height of 4 feet AGL; assume delivery speed is 45 knots based on the middle of the ranges presented.
Notes: *Distance between sound source microphone not provided explicitly. These values are estimated distances as discussed in the Note field.				

3 Methodology for Data Analysis

The previously described data sets were used to develop a method to estimate community noise exposure that could result from Zipline delivery operations originating at a single nest within a proposed single area of operations, with each nest operating up to seven days a week with varying levels of daily and equivalent annual delivery operations. There are currently no standardized tools or processes in place to conduct a noise assessment for the proposed operational scenario and UA. HMMH, with detailed technical guidance from the FAA Office of Environment and Energy, developed a customized noise exposure prediction process based on the available data to conduct this analysis. The following subsections describe that noise analysis methodology.

3.1 Application of Operations

The DNL metric applies a 10 dB weighting for operations between 10 PM and 7 AM. The 10 dB weighing is mathematically equivalent to 10 times the number of operations. Therefore, the operations near point *i* can be weighted to develop a daytime equivalent number of operations ($N_{equiv,i}$). The generalized form is expressed in Equation (1).[6]

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

Where:

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

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

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

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

[6] Equation (1) has includes the three time periods of day, evening, night for consistency with other FAA documents that discuss the development of time averaging metrics such as DNL from individual SELs. Presentation of Equation (1) also allows the practitioner to modify this process for the CNEL metric for use in California.

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

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

3.2 Nest Infrastructure

As noted in Section 1 and Section 2.1.2, Zipline's central operation facility is called a nest. The nest includes the launcher (Section 2.1.2.1), the recovery mechanism (Section 2.1.2.4), along with a building/facility to recharge, pack, and prepare the UAs. For the purpose of this noise analysis methodology, the Nest Extents depicted in Figure 8 refer to the portion of the property in which the launcher and recovery gear could be positioned. The Nest Extents, for the noise analysis shall be a rectangle, circle, or other polygon that includes all the possible locations for the launcher and the recovery gear.[7]

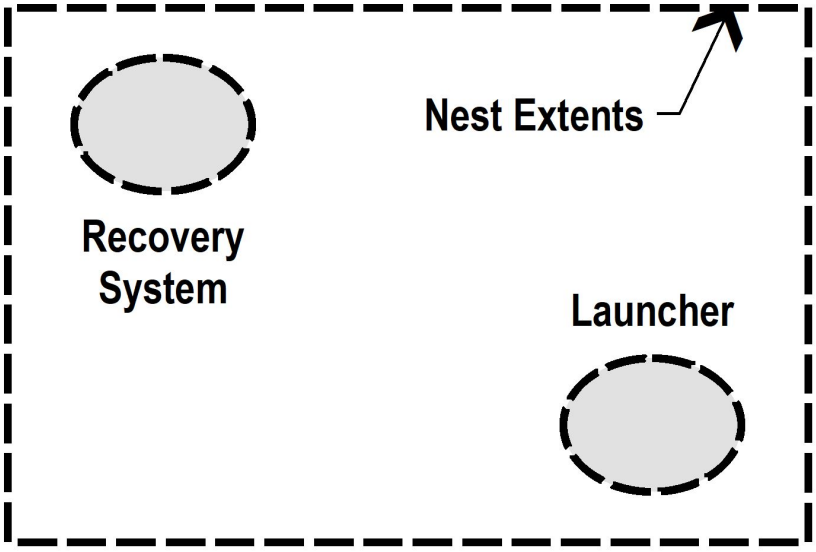

Figure 8. Conceptual Nest Extents
Source: HMMH

3.3 Launch and Climb

As noted in Section 2.1.2.1, the launcher is expected to launch the aircraft to 60 knots ground speed. Nominal climb trajectory after launch is stated to have an angle of approximately 8 to 11 degrees at an airspeed of 50 to 56 knots. For noise estimation, the eight-degree value is used as it places aircraft close to the ground, yielding a conservative/louder noise estimate. Since the en route portion is described as being level flight at 250 ft AGL, the climb phase associated with a launch extends about 1,800 feet ground track distance from the launcher.[8] The aircraft ground speed will be assumed to be initially 40

[7] Materials indicate that the launcher and recovery gear are made to be moved as needed.
[8] To reach an altitude of 250 ft with a 8 degree climb 250 ft/tan(8 deg) = 1,778 ft.

knots based on the 56-knot nominal airspeed and an assumed 16-knot headwind. This lower ground speed will increase event duration and provide a slightly more conservative noise level estimate compared to a faster ground speed.

3.4 Application of Acoustical Data

The Day-Night Average Sound Levels (DNLs) can be estimated with a summation of the Sound Exposure Levels (SELs). For the purpose of calculating SEL, three specific activities are considered:

- Launch related activities at the nest
- Flight of the aircraft including climb, en route, delivery, and descent at various altitudes and speeds
- Recovery related activities at the nest

3.4.1 General Assumptions

The following assumptions have been made in the application of acoustical data unless noted otherwise.

Sound transmission between the noise source and the receiver is solely a function of distance with no additional atmospheric attenuation effects.

In this analysis, the knowns include reference sound levels at known distances. Those reference levels will be adjusted for spherical spreading to develop the sound levels at various points. For a stationary point source, the relationship of the level at point *i* (L_i) to a reference level is provided in Equation (4):

$$L_i = L_R + 20 \times \log_{10}\left(\frac{Dist_R}{Dist_i}\right), dB \quad (4)$$

where L_R is the measured reference level, $Dist_R$ is the distance between the reference level measurement location and the sound source, and $Dist_i$ is the distance between the sound source and Point *i*. $Dist_R$ and $Dist_i$ must be in the same units of distance. Moving sources will be addressed Section 3.4.3.

Sound transmits equally in all directions.

Sound transmits equally in all directions relative to the noise source (e.g., the L_{Amax} 10 meters off the nose of the aircraft is the same as 10 meters below the aircraft, 10 meters to the side of the aircraft and 10 meters to the rear of the aircraft).

3.4.2 Launch

Two sets of measurements are provided for launch. One measurement location was positioned on sideline (lateral) of the aircraft's flightpath, and one was positioned under the flight path (flyover). Of the two, the sideline values appear more appropriate than the flyover because a) the distance associated with the former is more clearly defined, and b) the former will propagate a more conservative estimate throughout the rest of the analysis. The launch noise sources are assumed to be a

stationary point source, occurring once for each aircraft departure. Sound exposure level for a given point i (SEL_i) located a specific distance ($Dist_i$) in feet from this particular launcher will be based on spherical spreading of a point source and calculated with Equation (5), where 75.5 dB was the measured SEL of a launch 50 feet from the launcher as indicated in Table 1. It is assumed that the launcher apparatus dominates the sideline noise with minimal contribution from the UA and therefore the equation is set up for a stationary source.

$$SEL_i = 75.5 + 20 \times \log_{10}\left(\frac{50}{Dist_i}\right), dB \quad (5)$$

3.4.3 Aircraft Flight

The applicant's aircraft is fixed wing and therefore must continue to move to be airborne. Flight of the aircraft in still air is anticipated to be in the range of 40 to 60 knots.[9] Sound exposure level for a given point i (SEL_i) with the aircraft flying directly overhead at altitude (Alt_i) in feet and a speed (Vi) in knots, will be calculated based on the guidance in *14 CFR Part 36 Appendix J, Section J36.205 Detailed Data Correction Procedures*.[10] It should be noted that the equations presented in this Section 3.4.3 are only applicable for an aircraft that is moving relative to a stationary receptor.

In particular, the sound exposure level adjustment for the altitude defined in 14 CFR Part 36 for a moving aircraft, is presented here as Equation (6).

$$\Delta J_1 = 12.5 \times log_{10}\left(\frac{H_A}{H_T}\right), dB \quad (6)$$

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

The sound exposure level adjustment for speed, as defined in 14 CFR Part 36, is presented here as Equation (7).

$$\Delta J_3 = 10 \times log_{10}\left(\frac{V_{RA}}{V_R}\right), dB \quad (7)$$

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

To estimate the sound exposure level of the UA flying en route the measured sound exposure level made during delivery will be used. As shown in Table 1, the SEL is 68.1 dB measured when the vehicle was 56 feet high traveling at approximately 45 knots; therefore, adapting that measurement to the en

[9] Various documents provide various speed ranges. This range represents the lower and upper bounds mentioned.
[10] 14 CFR Part 36 Noise Standards: Aircraft Type And Airworthiness Certification

route condition when the UA is flying at an Altitude of Alt_i feet AGL and V_i knots can be made using Equation (8) to arrive at an estimate SEL_i dB for that phase of the flight.

$$SEL_i = 68.1 + 12.5 \times \log_{10}\left(\frac{56}{Alt_i}\right) + 10 \times \log_{10}\left(\frac{45}{V_i}\right), dB \quad (8)$$

3.4.4 Recovery

The applicant's aircraft is recovered by catching a wire positioned approximately 36 feet AGL, and then the aircraft rapidly decelerates and decreases in altitude until it comes to rest on a designated surface. The recovery sources are assumed to be a stationary point source, occurring once for each aircraft arrival. Similar to the en route noise, to estimate the sound exposure level at a given point i (SEL_i) located at a specific distance ($Dist_i$) in feet from the recovery device will be based on spherical spreading of a point source. Equation (9) calculates the recovery SEL_i as a function of distance from the recovery device where 72.8 dB was measured 59.9 feet from the recovery mechanism.

$$SEL_i = 72.8 + 20 \times \log_{10}\left(\frac{59.9}{Dist_i}\right), dB \quad (9)$$

3.5 Proposed DNL Estimation Methodology

The number of operations overflying a particular receiver's location on the ground will vary based on the proposed operating area and demand. For a given receiver location *i*, and a single instance of sound source *A*, the SEL for that sound source SEL_{iA} is (energy) summed for the average annual daily number of DNL daytime equivalent operations ($N_{DNL,iA}$) to compute the DNL, or equivalently, by Equation (10).

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

The above equation applies to an SEL value representing one noise source such as an UA launch or an UA recovery. For cases where a particular receiver would be exposed to multiple sound sources (A through Z), the complete DNL at that point would be calculated with Equation (11).

$$DNL_i = 10 \times log_{10}\left(10^{\left(\frac{DNL_{iA}}{10}\right)} + 10^{\left(\frac{DNL_{iB}}{10}\right)} + \cdots + 10^{\left(\frac{DNL_{iZ}}{10}\right)}\right), (dB) \quad (11)$$

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

3.5.1 DNL for Launch Operations

The launch and climb process includes accelerating the UA to initial airspeed via a launcher and then having the UA climb at an angle of eight or more degrees. Additional details regarding the nominal launch profile are discussed in Section 2.1.2.1.

Launch operations will be represented by two sound levels provided by Zipline materials. First, the launch will be treated as a stationary source, creating a single noise event for each aircraft departure using the relationships in Section 3.4.2. Second, the aircraft itself will be treated as it moves along its flight path until the en route portion, assumed to be when it reaches an altitude of 250 ft AGL, using the relationships in Section 3.4.3.

The materials provided by Zipline indicate that for any single departure, the UA will be launched on one of two flight paths, depending on the winds. Since the launcher will be aligned in one of two directions, the initial flight paths, including the turns to the initial heading, are expected to be consistent from flight to flight.

3.5.2 DNL for En Route

En route includes the UA flying to and from the nest to delivery sites as discussed in Section 2.1.2.2. A representative receiver will be positioned directly under the flight path, and the DNL will be calculated based on the altitude and speed-adjusted delivery SEL calculated in Section 3.4.3 and Equation (8). Operations will be based on representative numbers defined in relevant materials and generally assume that a receiver under the flight path will be overflown by the UA while it is traveling both outbound and inbound for a single delivery.

In instances where the UA may enter a holding pattern, DNL may be calculated consistent with the methodology used for en route flight. However, during holding, the UA may overfly a single location multiple times outbound or inbound while making a delivery, and the number of operations experienced during holding may exceed the number of delivery operations. In these instances, operations under the flight path over a receiver may vary based on information regarding the frequency of holding operations defined in relevant materials and may include additional overflights of the UA beyond typical inbound and outbound delivery operations.

3.5.3 DNL for Delivery Sites

Delivery includes delivery of a package by the UA to a delivery site as discussed in Section 2.1.2.3. As the specific delivery sites and flight path to and from a specific delivery site is likely not known at the time of the noise analysis, the sound exposure will be represented by the noise level associated with the vehicle during delivery and applied throughout a radius surrounding the delivery site where the UA could be at the lowest altitude and slowest speed. The information shown in Figure 3 and Section 2.1.2.3 indicates this area could be on the order of 1 to 1.5 statute miles.

A representative receiver will be placed under the flight path at the delivery site, and the SELs and DNL will be calculated as a function of altitude and speed as detailed in Section 3.4.3. Results will be presented in a tabular format for varying numbers of deliveries.

3.5.4 DNL for Recovery Operations

Recovery operations will be represented by two sound levels provided by Zipline. First, aircraft will fly a flight path from en route conditions (Section 2.1.2.2) and descend to the recovery apparatus at an assumed 36 ft AGL (Section 2.1.2.4). Second, the actual recovery event will be treated as a stationary source, creating a single noise event for each aircraft recovered using the relationships in Section 3.4.4.

3.5.5 DNL for Nest Activities

The launch and recovery operations discussed in Sections 3.5.1 and 3.5.4 are anticipated to occur at the same location. Therefore, the results for both will be calculated for a single set of receptors. Operations will be assumed to be “head-to-head” in which case the launch and the recovery flight paths will be the same.

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4 Noise Exposure Estimate Results

This section presents the estimated noise exposure for Zipline's proposed operations for a given set of average annual day (AAD) deliveries. The values presented are in tabular format and use of the table requires estimating the number of DNL Equivalent deliveries associated with the nest. One delivery includes the outbound launch and inbound recovery and is representative of two operations. The DNL Equivalent deliveries, $N_{DNL,i}$ as described in Section 3.1, is presented below as Equation (12)

$$Deliveries_{DNL,i} = Deliveries_{Day} + 10 \times Deliveries_{Night} \quad (12)$$

$Deliveries_{Day}$ are between 7 AM and 10 PM and $Deliveries_{Night}$ are 10 PM and 7 AM. [11] If a portion of a delivery occurs in the nighttime hours (either launch or recovery) then it should be counted within $Deliveries_{Night}$.

For estimating noise exposure, the noise levels for each flight phase should be considered separate based on the level of proposed operations for a given location. If a particular location is at the transition of two flight phases (for example, completing climb and starting en route), then the louder of the two results should be used.

4.1 Noise Exposure for Operations at the Nest

For operations at the nest, the UA-related noises include the launch and recovery. To provide a conservative view, all operations are assumed to be on the same flight path operating in opposite directions.

Table 2 presents for a given number of daily average DNL Equivalent deliveries (including the launch, climb, descent, and recovery as detailed in Section 2.1.2), the estimated extent of DNL 45 dB, 50 dB, 55 dB, 60 dB, and 65 dB under the flight paths for a given orientation of the launcher relative to the nest extents as described in Section 3.2. Table 3 presents for a given number of deliveries (including the launch, climb, descent, and recovery), the estimated extent of DNL 45 dB, DNL 45 dB, 50 dB, 55 dB, 60 dB, and 65 dB to the sideline of the nest for a given orientation of the launcher and nest extents. The analyses presented in Table 2 and Table 3 were rounded up conservatively to the nearest 25 ft intervals. The actual noise levels, should they be calculated with greater precision or measured, are anticipated to be within the estimated extents depicted.[12]

The subsections that follow discuss how to interpret the data contained in Table 2 and Table 3 for application to estimating nest noise exposure for two circumstances.

[11] Discussion of modification of this process for use in California with the CNEL metric is discussed in Section 3.1.
[12] The calculation of the equations presented in Section 3 require that distance is provided. The DNL levels were calculated at 25 foot intervals from 25 to 1,925 ft. The interval of 25 feet was selected based on professional judgement considering the anticipated use of these tables for estimating noise at locations outside of the nest.

Table 2. Estimated Extent of Noise Exposure from the Nest per Number of Deliveries - Under Flight Paths

Number of DNL Equivalent Deliveries Served by Nest		Estimated Extents, feet, for				
Average Daily	Annual	DNL 45 dB	DNL 50 dB	DNL 55 dB	DNL 60 dB	DNL 65 dB
<= 1	<= 365	25	25	25	25	25
<= 5	<= 1,825	25	25	25	25	25
<= 10	<= 3,650	50	25	25	25	25
<= 15	<= 5,475	50	25	25	25	25
<= 20	<= 7,300	75	25	25	25	25
<= 40	<= 14,600	100	50	25	25	25
<= 60	<= 21,900	150	50	25	25	25
<= 80	<= 29,200	200	75	50	25	25
<= 100	<= 36,500	225	75	50	25	25
<= 120	<= 43,800	275	100	50	25	25
<= 140	<= 51,100	325	100	50	25	25
<= 160	<= 58,400	375	125	50	25	25
<= 180	<= 65,700	400	150	50	25	25
<= 200	<= 73,000	450	150	75	25	25
<= 220	<= 80,300	500	175	75	25	25
<= 240	<= 87,600	525	175	75	50	25
<= 260	<= 94,900	575	200	75	50	25
<= 280	<= 102,200	725	200	75	50	25
<= 300	<= 109,500	750	225	75	50	25
<= 340	<= 124,100	800	250	100	50	25
<= 360	<= 131,400	825	275	100	50	25
<= 380	<= 138,700	850	275	100	50	25
<= 400	<= 146,000	925	300	100	50	25
<= 420	<= 153,300	975	325	100	50	25
<= 440	<= 160,600	1000	325	100	50	25
<= 460	<= 167,900	1075	350	125	50	25
<= 480	<= 175,200	1150	350	125	50	25
<= 500	<= 182,500	1200	350	125	50	25

Notes:
a) One delivery includes the outbound launch and inbound recovery and is representative of two operations.
b) If a value for deliveries is not specifically defined in in this table, use the next highest value. For example, if there are 50 average daily DNL Equivalent deliveries, use the entry for 60 average daily DNL Equivalent deliveries.

Table 3. Estimated Extent of Noise Exposure from the Nest per Number of Deliveries - Sideline

Number of DNL Equivalent Deliveries Served by Nest		Estimated Extents, feet, for				
Average Daily	Annual	DNL 45 dB	DNL 50 dB	DNL 55 dB	DNL 60 dB	DNL 65 dB
<= 1	<= 365	25	25	25	25	25
<= 5	<= 1,825	25	25	25	25	25
<= 10	<= 3,650	50	25	25	25	25
<= 15	<= 5,475	50	25	25	25	25
<= 20	<= 7,300	50	25	25	25	25
<= 40	<= 14,600	75	50	25	25	25
<= 60	<= 21,900	75	50	25	25	25
<= 80	<= 29,200	100	50	25	25	25
<= 100	<= 36,500	100	50	50	25	25
<= 120	<= 43,800	100	75	50	25	25
<= 140	<= 51,100	125	75	50	25	25
<= 160	<= 58,400	125	75	50	25	25
<= 180	<= 65,700	150	75	50	25	25
<= 200	<= 73,000	150	75	50	25	25
<= 220	<= 80,300	150	75	50	25	25
<= 240	<= 87,600	150	100	50	25	25
<= 260	<= 94,900	175	100	50	25	25
<= 280	<= 102,200	175	100	50	25	25
<= 300	<= 109,500	175	100	50	50	25
<= 340	<= 124,100	200	100	50	50	25
<= 360	<= 131,400	200	100	75	50	25
<= 380	<= 138,700	200	125	75	50	25
<= 400	<= 146,000	225	125	75	50	25
<= 420	<= 153,300	225	125	75	50	25
<= 440	<= 160,600	225	125	75	50	25
<= 460	<= 167,900	225	125	75	50	25
<= 480	<= 175,200	225	125	75	50	25
<= 500	<= 182,500	250	125	75	50	25

Notes:
a) One delivery includes the outbound launch and inbound recovery and is representative of two operations.
b) If a value for deliveries is not specifically defined in in this table, use the next highest value. For example, if there are 50 average daily DNL Equivalent deliveries, use the entry for 60 average daily DNL Equivalent deliveries.

4.1.1 Nest Flight Paths Are Known to Be on a Single Axis

If the initial launch/climb flight paths and recovery paths are known and are parallel (i.e., on a single axis, with one heading and its 180-degree counterpart), analogous to an airport with a single runway, then the noise extents from nest operations can be represented as a rectangular area.

The length of the rectangle is represented by the distance/noise levels presented in Table 2 added to the nest extent sides that the flight paths cross. The "under flight path" levels and distances from Table 2 would be added to both sides of the nest extents and create the long sides of the rectangle along the flight path. The width of the rectangle is represented by the distance/noise levels presented in Table 3 added to the lateral sides of the nest extents, which represent those sides parallel to the flight path.

Figure 9 presents guidance on constructing a rectangle representing the extent of various noise exposure levels and orient the nest extents relative to the flight paths based on the data presented in Table 2 and Table 3.

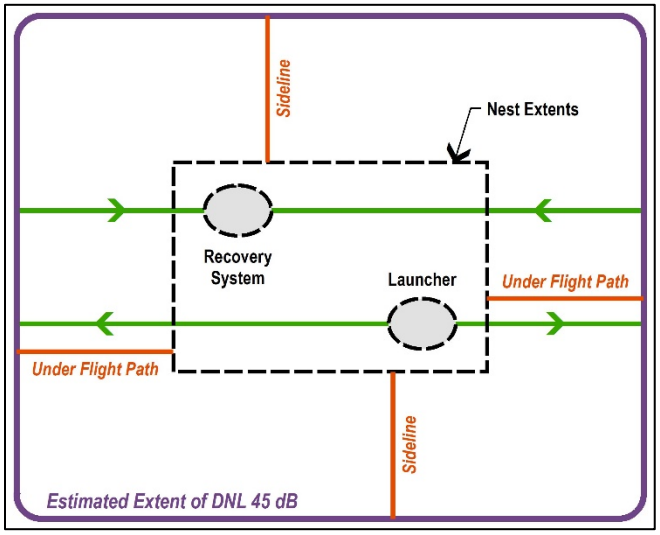


Figure 9. Demonstration of Determining Extent of DNL 45 dB at Nest with Flight Paths at 180 Degrees
Source: HMMH

4.1.2 Nest Flight Paths are Not Known or Varied

For situations in which the flight paths are not known or are expected to be more complicated than presented in Section 4.1.1, a conservative rectangular area can be constructed to represent the anticipated extent of noise exposure. Such situations may be include a) the orientation of the launch and recovery infrastructure are not known, b) launch and recovery will not occur in opposite directions/single axis, or c) flight paths from the nest have not been determined. The polygon is developed by applying the distance "Under Flight Path" provided in Table 2 to all sides of the nest extents. Figure 10 presents guidance on how to apply the "Under Flight Path" provided in Table 2 relative to a rectangular nest extent.

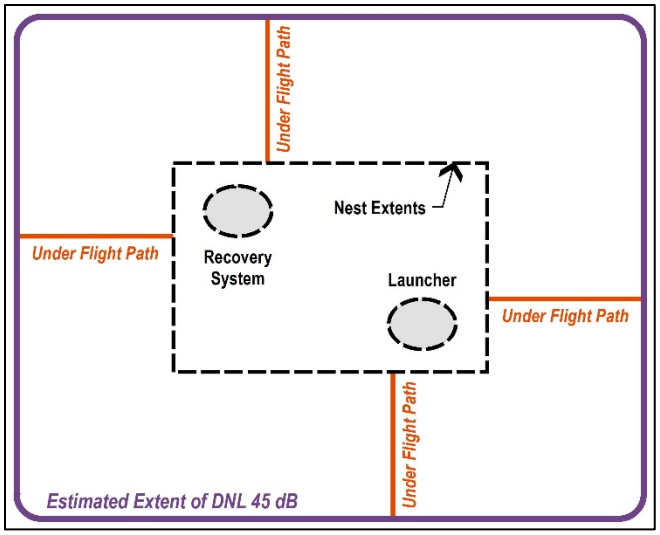


Figure 10. Demonstration of Determining Extent of DNL 45 dB at a Nest for Flight Paths are Not Known or Varied
Source: HMMH

4.2 Noise Exposure under En Route Paths

For en route conditions, the UA is expected to fly the same outbound flight path between the nest and the delivery site and inbound flight path back to the nest (See Section 2.1.2 and Figure 3). Therefore, each location under the en route path would be overflown twice for each delivery served by the respective overhead en route path.

In addition, there is expected to be at least one location near a nest in which all flight paths will intersect. For Zipline's operations, all departures and arrivals would always be funneled through the same point prior to continuing to the delivery site or to the recovery. This is where the maximum expected concentration of operations should occur at en route altitudes between 250ft - 400ft AGL. [13]

Table 4 presents the estimated DNL for a location on the ground directly under an en route path for various counts of daily average DNL Equivalent deliveries. The en route noise calculated for each delivery includes both the inbound and outbound traversal of the en route path.

[13] Zipline October 20, 2021

Table 4. Estimated DNL Directly Under En Route Flight Paths at Various Altitudes and Ground Speeds

Number of DNL Equivalent Deliveries Served by Route		Day Night Average Sound Level (DNL), dB					
		Altitude 130 ft AGL		Altitude 250 ft AGL		Altitude 400 ft AGL	
Average Daily	Annual	40 kts	60 kts	40 kts	60 kts	40 kts	60 kts
<= 1	<= 365	17.7	15.9	14.1	12.4	11.6	9.8
<= 5	<= 1,825	24.7	22.9	21.1	19.4	18.6	16.8
<= 10	<= 3,650	27.7	25.9	24.1	22.4	21.6	19.8
<= 15	<= 5,475	29.4	27.7	25.9	24.1	23.3	21.6
<= 20	<= 7,300	30.7	28.9	27.1	25.4	24.6	22.8
<= 40	<= 14,600	33.7	31.9	30.2	28.4	27.6	25.8
<= 60	<= 21,900	35.5	33.7	31.9	30.2	29.4	27.6
<= 80	<= 29,200	36.7	35.0	33.2	31.4	30.6	28.9
<= 100	<= 36,500	37.7	35.9	34.1	32.4	31.6	29.8
<= 120	<= 43,800	38.5	36.7	34.9	33.2	32.4	30.6
<= 140	<= 51,100	39.1	37.4	35.6	33.8	33.0	31.3
<= 160	<= 58,400	39.7	38.0	36.2	34.4	33.6	31.9
<= 180	<= 65,700	40.2	38.5	36.7	34.9	34.1	32.4
<= 200	<= 73,000	40.7	38.9	37.1	35.4	34.6	32.8
<= 220	<= 80,300	41.1	39.3	37.6	35.8	35.0	33.2
<= 240	<= 87,600	41.5	39.7	37.9	36.2	35.4	33.6
<= 260	<= 94,900	41.8	40.1	38.3	36.5	35.7	34.0
<= 280	<= 102,200	42.2	40.4	38.6	36.8	36.1	34.3
<= 300	<= 109,500	42.5	40.7	38.9	37.1	36.4	34.6
<= 340	<= 124,100	43.0	41.2	39.4	37.7	36.9	35.1
<= 360	<= 131,400	43.2	41.5	39.7	37.9	37.1	35.4
<= 380	<= 138,700	43.5	41.7	39.9	38.2	37.4	35.6
<= 400	<= 146,000	43.7	41.9	40.2	38.4	37.6	35.8
<= 420	<= 153,300	43.9	42.2	40.4	38.6	37.8	36.1
<= 440	<= 160,600	44.1	42.4	40.6	38.8	38.0	36.3
<= 460	<= 167,900	44.3	42.6	40.8	39.0	38.2	36.4
<= 480	<= 175,200	44.5	42.7	40.9	39.2	38.4	36.6
<= 500	<= 182,500	44.7	42.9	41.1	39.4	38.6	36.8

Notes:

a) One delivery includes an outbound operation and inbound operation along the same flight path, thus two overflights.
b) If a value for deliveries is not specifically defined in in this table, use the next highest value. For example, if there are 50 average daily deliveries, use the entry for 60 average daily deliveries.
c) If a value for altitude or speed is not specifically defined in in this table, use the next lowest value. For example, if the UA is anticipated to operate at an altitude of 190 ft AGL at 45 kts, use the entry for 130 ft AGL and 40 kts.

In some instances, the UA may overfly locations not consistent with the en route circumstances and associated results presented in Table 4. This may include maneuvers such as en route static or ad-hoc holding patterns. For these circumstances, Table 5 presents the equations for calculating the estimated DNL for a receiver directly under a specified given number of DNL Equivalent average daily individual overflights, defined as N_o.

Table 5. Estimated DNL Directly Under Overflights

Altitude and Speed of Overflight		DNL for 1 Overflight Between 7 AM and 10 PM (dB)	DNL equation for the number of DNL Equivalent Overflights
Altitude 60 ft AGL	40 kts	18.9	$10 \times \log_{10}(N_o) + 18.9$
	60 kts	17.1	$10 \times \log_{10}(N_o) + 17.1$
Altitude 130 ft AGL	40 kts	14.7	$10 \times \log_{10}(N_o) + 14.7$
	60 kts	12.9	$10 \times \log_{10}(N_o) + 12.9$
Altitude 250 ft AGL	40 kts	11.1	$10 \times \log_{10}(N_o) + 11.1$
	60 kts	9.4	$10 \times \log_{10}(N_o) + 9.4$
Altitude 400 ft AGL	40 kts	8.6	$10 \times \log_{10}(N_o) + 8.6$
	60 kts	6.8	$10 \times \log_{10}(N_o) + 6.8$

Notes:
a) The DNL value for a given number of average DNL Equivalent Operations, N_o, can be found by using the equations associated with operation of the UA at a specified altitude and speed interval. In this case, one operation represents a single overflight.
b) If a value for altitude or speed is not specifically defined in in this table, use the next lowest value. For example, if the UA is anticipated to operate at an altitude of 190 ft AGL at 45 kts, use the entry for 130 ft AGL and 40 kts.

4.3 Noise Exposure for Operations under Delivery

Table 6 presents DNL values over a range of potential daily average DNL Equivalent delivery counts at a delivery site. The DNL values present what is anticipated to be the loudest noise exposure level that could be associated with a UA during its delivery attempts during the course of an average 24-hour period. Also included in Table 6 is the equation for calculating the estimated DNL for a specific number of daily average DNL Equivalent delivery counts at a delivery site, defined as N_d, for instances where the number of deliveries may fall between the range of presented delivery count intervals.

It should be noted that the UA may fly in a circular and then an oval pattern near the delivery site as it approaches the drop zone, and may make multiple turns as it leaves the drop zone. Therefore, a multiple of the number of Deliveries/Flybys could be considered if the levels in Table 6 are applied beyond the immediate designed 40 foot by 40-foot drop zone. As discussed in 2.1.2 and presented in Figure 11, such patterns are generally within 1 and 1.5 statute miles of the designator delivery site.[14]

[14] A single delivery drop at 60 feet is anticipated to be of greater SEL and DNL than two pattern passes at 130 feet AGL ground speed and equivalent to six pattern passes at 250 feet AGL. This general comparison assumes delivery and pattern passes are at the same speed.

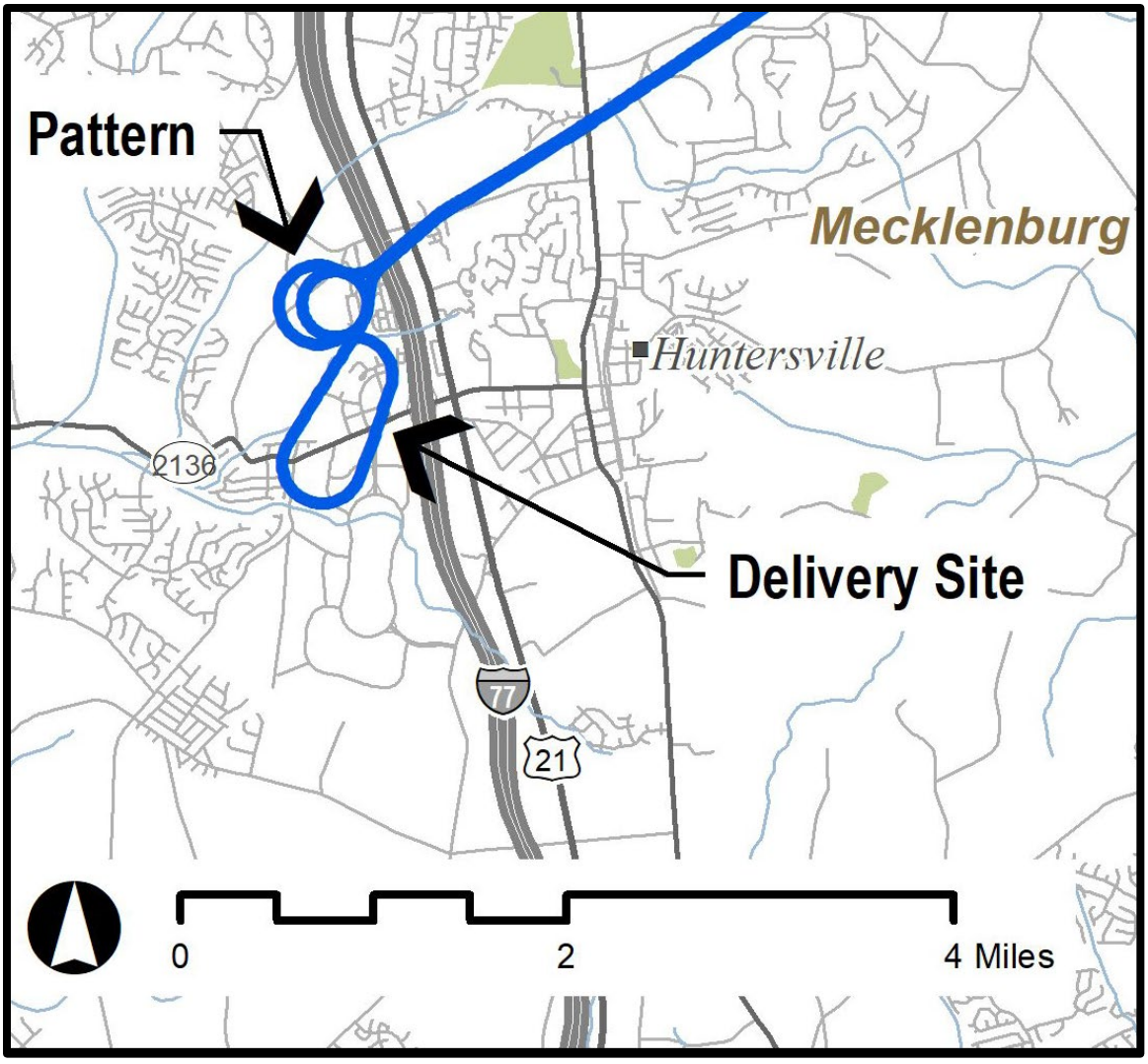


Figure 11. Annotated Example Delivery Flight Path around Delivery Site

Sources: Zipline, October 29, 2021; Annotations by HMMH

Table 6. Estimated Maximum DNL at Delivery Site

Number of DNL Equivalent Deliveries, Delivery Attempts, and Flybys		60 ft AGL 40 knot Ground Speed Estimated DNL (dB)
Average Daily	Annual	
<= 1	<= 365	18.9
<= 5	<= 1,825	25.9
<= 10	<= 3,650	28.9
<= 15	<= 5,475	30.6
<= 20	<= 7,300	31.9
<= 40	<= 14,600	34.9
<= 60	<= 21,900	36.7
<= 80	<= 29,200	37.9
<= 100	<= 36,500	38.9
<= 120	<= 43,800	39.7
<= 140	<= 51,100	40.3
<= 160	<= 58,400	40.9
<= 180	<= 65,700	41.4
<= 200	<= 73,000	41.9
<= 220	<= 80,300	42.3
<= 240	<= 87,600	42.7
<= 260	<= 94,900	43.0
<= 280	<= 102,200	43.3
<= 300	<= 109,500	43.6
<= 340	<= 124,100	44.2
<= 360	<= 131,400	44.4
<= 380	<= 138,700	44.7
<= 400	<= 146,000	44.9
<= 420	<= 153,300	45.1
<= 440	<= 160,600	45.3
<= 460	<= 167,900	45.5
<= 480	<= 175,200	45.7
<= 500	<= 182,500	45.9
N_d	$N_d \times 365$	$10 \times \log_{10}(N_d) + 18.9$

Notes:
a) One delivery includes the outbound launch and inbound recovery.
b) If a value is not specifically in in this table, use the next highest. For example, if there we are 50 daily operations, use the entry for 60 daily operations.

Appendix D

Non-Standard Noise Methodology Memos

Federal Aviation Administration

Memorandum

Date: May 9, 2022

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

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

MICHAEL JAY MILLARD Digitally signed by MICHAEL JAY MILLARD Date: 2022.05.09 13:47:37 -04'00'

Subject: Environmental Assessment (EA) Noise Methodology Approval Request for Zipline International Inc. Commercial Package Delivery Operations with the Sparrow UA from Pea Ridge/Bentonville, AR

FAA Office of Flight Standards (AFS) requests FAA Office of Environmental and Energy, Noise Division (AEE-100) approval of the noise methodology to be used for the Environmental Assessment (EA) for Zipline International, Inc. (Zipline) operations using the Sparrow unmanned aircraft (UA) in Pea Ridge/Bentonville, AR to provide package delivery services as a 14 CFR Part 135 operator as described below.

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

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

Description of Aircraft and Proposed Operations

AFS is evaluating Zipline's proposed commercial package delivery operations using the Sparrow UA from a single central distribution center (a "nest") located in Pea Ridge/Bentonville, AR operating area. Approval of a Federal Action providing Zipline's air carrier Operations Specifications (OpSpecs) is required before these operations can occur.

Zipline is proposing to perform package delivery operations from the nest connecting to a supporting route network within the proposed operating area to transport packages to delivery locations ("delivery sites"); such as medical centers, health facilities, and private homes, in twelve surrounding communities.

The Sparrow UA is a fixed-wing design with a maximum takeoff weight listed as 49.3 pounds. General operating airspeeds of the UA are expected to be in the range of 45 to 60 knots. The UA is launched via catapult at the nest and then climbs to en route altitude, at which point it navigates along a defined path from the nest to the intended delivery site. The en route portion of the flight would generally be operated at an altitude of 250 feet Above Ground Level (AGL) and is always below an altitude of 400 feet AGL. Approaching the delivery site, the UA flies a pattern near the delivery point, descends to 60 feet AGL, drops a package via parachute at a pre-defined drop zone, climbs back to en route altitude, and then flies along a defined path for recovery at the nest via a cable driven recovery system.

Zipline projects operating a maximum of 20 delivery flight operations per day during daytime hours (7 AM to 10 PM) from the Pea Ridge/Bentonville, AR nest as detailed in Table 1 under the scope of this proposed action.

Table 1. Maximum Anticipated Daily UA Delivery Operations per Community

Community	**Maximum Daily Deliveries**
Goodman	1.6
Rocky Comfort	1.6
Anderson	1.6
Exeter	1.6
Pineville	1.6
Noel	1.6
Southwest City	1.6
Gravette	1.6
Decatur	1.6
Pea Ridge	1.6
Garfield	1.6
Seligman	1.6
Total*	20.0
**Note: Totals may not match due to rounding*	

Noise Analysis Methodology

AFS requests use of the noise analysis methodology described in HMMH Report No. 309990.003-4 for the “Noise Assessment for Zipline Proposed Package Delivery Operations with Sparrow Unmanned Aircraft” dated January 5, 2022.

Federal Aviation Administration

Memorandum

Date: May 12, 2022

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
Date: 2022.05.12 11:38:48 -04'00'

Subject: Environmental Assessment (EA) Noise Methodology Approval Request for Zipline International, Inc. Commercial Package Delivery Operations with the Sparrow UA from Pea Ridge/Bentonville, AR

The Office of Environment and Energy, Noise Division (AEE-100), has reviewed the proposed non-standard noise modeling methodology to be used for Zipline International, Inc. (Zipline) operations using the Sparrow unmanned aircraft (UA) in Pea Ridge/Bentonville, Arkansas (AR). This request is in support of an Environmental Assessment (EA) for Zipline to provide package delivery services as a 14 CFR Part 135 operator in Pea Ridge/Bentonville, AR and communities in a surrounding operating area.

The Proposed Action is to use the Sparrow UA from a single central distribution center, referred to as a "nest", connecting to a supporting route network to deliver packages to potential delivery locations ("delivery sites") such as medical centers, health facilities, and private homes within the proposed operating area to sixteen surrounding communities. Typical operations of the UA will consist of departure from the nest via launch by catapult and a quick climb to an approximate en route altitude between 250-400 feet above ground level (AGL). The UA will then navigate along a defined path from the nest to the intended delivery site. Approaching the delivery site, the UA will fly a pattern near the delivery point, descend to 60 feet AGL, and drop a package via parachute within a pre-defined drop zone. Following delivery, the UA will climb back to en route altitude, fly along a defined path back to the nest, and then be recovered at the nest via a cable driven arrestor system.

Zipline projects operating a maximum of 20 delivery flight operations per day during daytime hours (7 AM to 10 PM) from the Pea Ridge/Bentonville nest under the scope of this proposed action. Zipline anticipates daily delivery operations will be distributed among the twelve communities as presented in Table 1 of the proposed non-standard noise modeling methodology request, "Environmental Assessment (EA) Noise Methodology Approval Request for Zipline International Inc. Commercial Package Delivery Operations with the Sparrow UA from Pea Ridge/Bentonville, AR" dated May 9, 2022.

As the FAA does not currently have a standard approved noise model for assessing UA, and in accordance with FAA Order 1050.1F, all non-standard noise analysis in support of the noise impact analysis for the National Environmental Policy Act (NEPA) must be approved by AEE. This letter serves as AEE's response to the method developed in in HMMH Report No. 309990.003-4 for the "Noise Assessment for Zipline Proposed Package Delivery Operations with Sparrow Unmanned Aircraft" dated January 5, 2022.

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

Appendix E

EJSCREEN Report

EJScreen Report (Version 2.0)

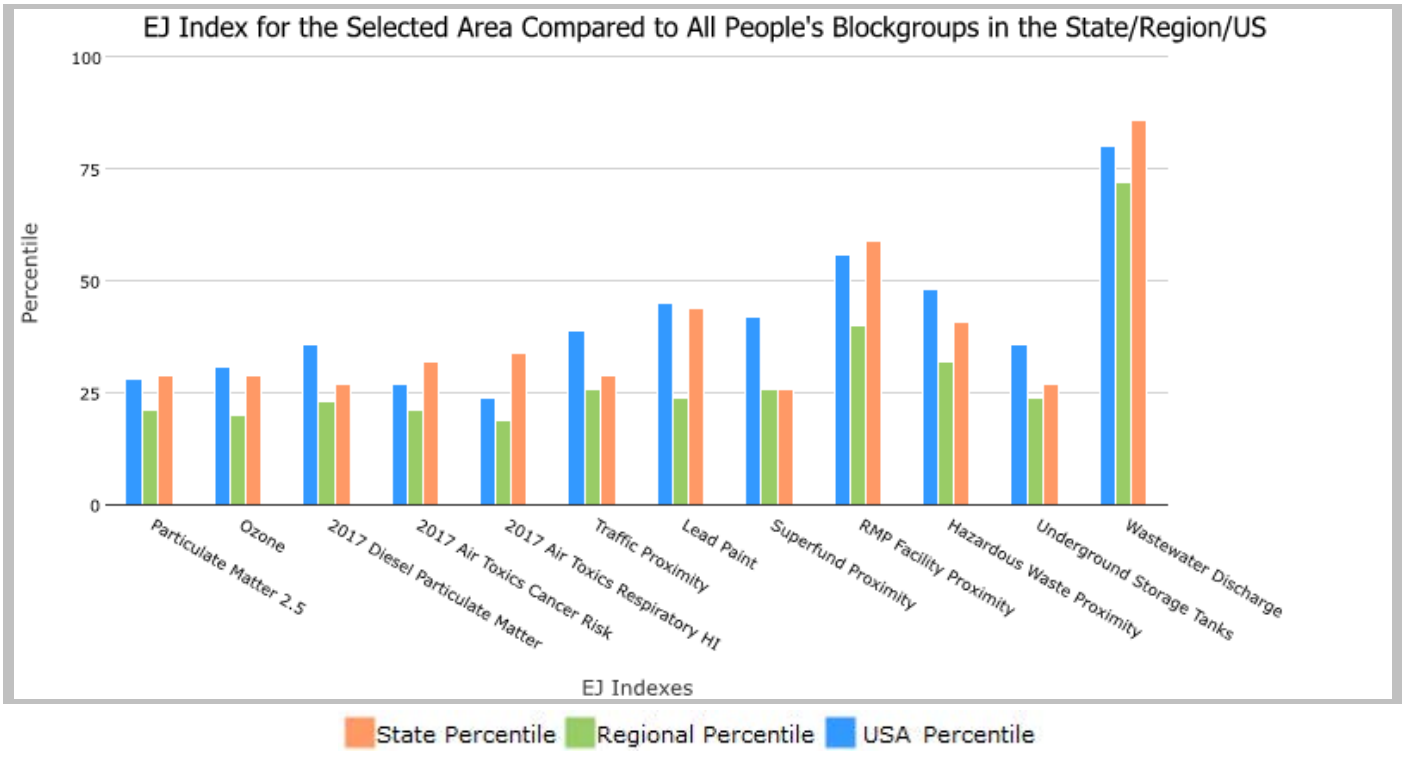
the User Specified Area, ARKANSAS, EPA Region 6

Approximate Population: 176,673

Input Area (sq. miles): 1199.48

Bentonville Region

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
Environmental Justice Indexes			
EJ Index for Particulate Matter 2.5	29	21	28
EJ Index for Ozone	29	20	31
EJ Index for 2017 Diesel Particulate Matter*	27	23	36
EJ Index for 2017 Air Toxics Cancer Risk*	32	21	27
EJ Index for 2017 Air Toxics Respiratory HI*	34	19	24
EJ Index for Traffic Proximity	29	26	39
EJ Index for Lead Paint	44	24	45
EJ Index for Superfund Proximity	26	26	42
EJ Index for RMP Facility Proximity	59	40	56
EJ Index for Hazardous Waste Proximity	41	32	48
EJ Index for Underground Storage Tanks	27	24	36
EJ Index for Wastewater Discharge	86	72	80



This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

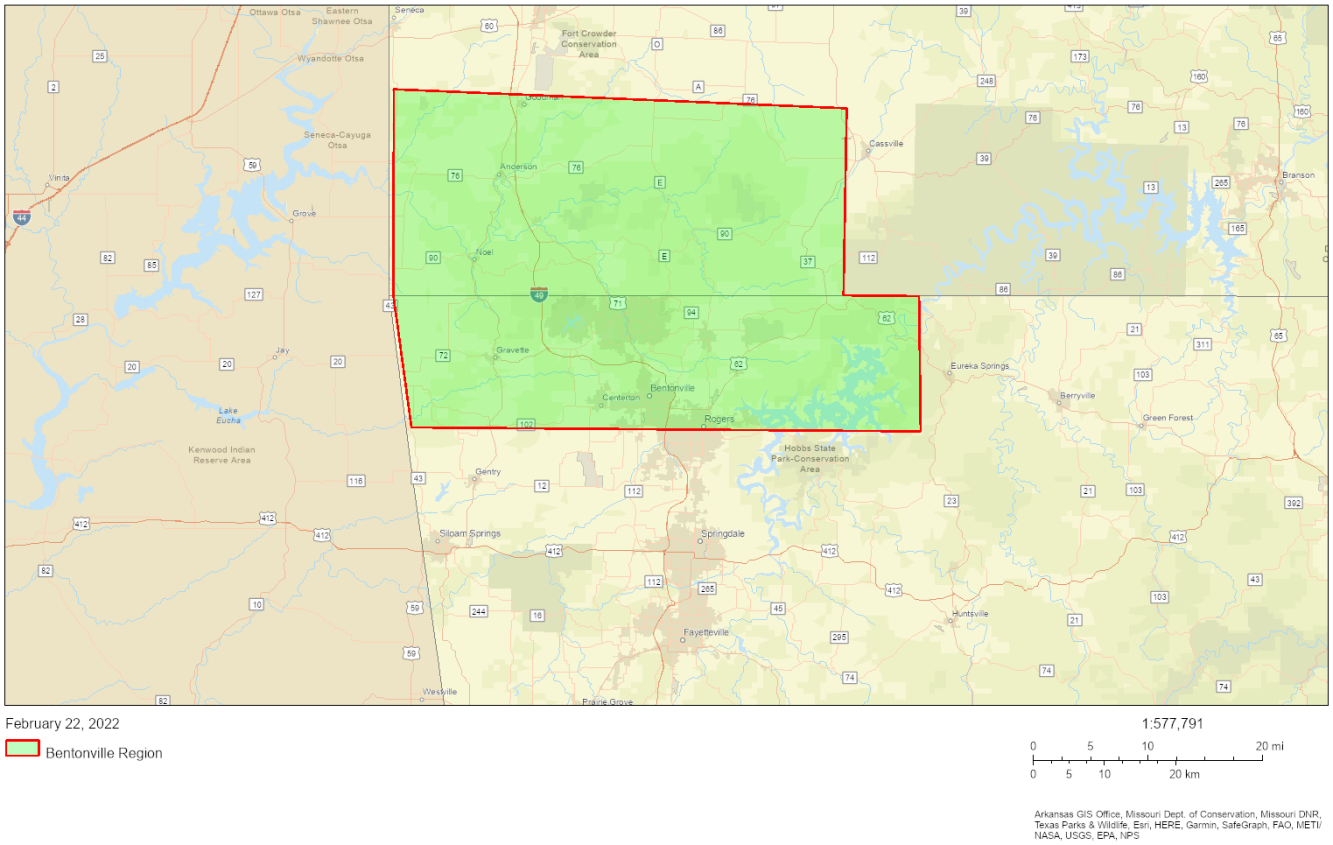
EJScreen Report (Version 2.0)

the User Specified Area, ARKANSAS, EPA Region 6

Approximate Population: 176,673

Input Area (sq. miles): 1199.48

Bentonville Region



Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	4

EJScreen Report (Version 2.0)

the User Specified Area, ARKANSAS, EPA Region 6

Approximate Population: 176,673

Input Area (sq. miles): 1199.48

Bentonville Region

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Pollution and Sources							
Particulate Matter 2.5 (µg/m^3)	9.36	9.27	52	9.32	35	8.74	71
Ozone (ppb)	42.9	41.3	81	41.1	64	42.6	56
2017 Diesel Particulate Matter* (µg/m^3)	0.177	0.179	58	0.219	<50th	0.295	<50th
2017 Air Toxics Cancer Risk* (lifetime risk per million)	30	35	55	32	70-80th	29	80-90th
2017 Air Toxics Respiratory HI*	0.43	0.48	51	0.37	80-90th	0.36	80-90th
Traffic Proximity (daily traffic count/distance to road)	140	180	63	470	42	710	39
Lead Paint (% Pre-1960 Housing)	0.086	0.15	46	0.16	55	0.28	37
Superfund Proximity (site count/km distance)	0.025	0.037	66	0.08	34	0.13	22
RMP Facility Proximity (facility count/km distance)	0.6	0.64	69	0.83	60	0.75	64
Hazardous Waste Proximity (facility count/km distance)	0.42	0.55	64	0.8	56	2.2	41
Underground Storage Tanks (count/km^2)	0.62	1	61	2	39	3.9	39
Wastewater Discharge (toxicity-weighted concentration/m distance)	0.0024	0.47	69	0.5	58	12	57
Socioeconomic Indicators							
Demographic Index	25%	34%	40	44%	24	36%	42
People of Color	21%	28%	52	52%	18	40%	37
Low Income	30%	40%	31	36%	43	31%	53
Unemployment Rate	3%	5%	39	5%	35	5%	35
Linguistically Isolated	2%	2%	81	6%	51	5%	59
Less Than High School Education	11%	13%	46	15%	47	12%	58
Under Age 5	7%	6%	57	7%	50	6%	60
Over Age 64	15%	17%	50	13%	66	16%	55

*Diesel particular matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's 2017 Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

For additional information, see: www.epa.gov/environmentaljustice

EJSCREEN ACS Summary Report

Location: User-specified polygonal location
Ring (buffer): 0-miles radius
Description: Bentonville Region

Summary of ACS Estimates	2015 - 2019
Population	172,951
Population Density (per sq. mile)	140
People of Color Population	36,846
% People of Color Population	21%
Households	65,772
Housing Units	73,459
Housing Units Built Before 1950	3,802
Per Capita Income	32,441
Land Area (sq. miles) (Source: SF1)	1,234.97
% Land Area	98%
Water Area (sq. miles) (Source: SF1)	23.91
% Water Area	2%

	2015 - 2019 ACS Estimates	Percent	MOE (±)
Population by Race			
Total	172,951	100%	782
Population Reporting One Race	168,245	97%	2,215
White	153,203	89%	756
Black	3,345	2%	338
American Indian	1,978	1%	188
Asian	6,618	4%	454
Pacific Islander	1,010	1%	229
Some Other Race	2,091	1%	250
Population Reporting Two or More Races	4,706	3%	192
Total Hispanic Population	19,932	12%	608
Total Non-Hispanic Population	153,020		
White Alone	136,105	79%	750
Black Alone	3,318	2%	338
American Indian Alone	1,741	1%	188
Non-Hispanic Asian Alone	6,580	4%	454
Pacific Islander Alone	1,007	1%	229
Other Race Alone	227	0%	194
Two or More Races Alone	4,042	2%	192
Population by Sex			
Male	86,547	50%	677
Female	86,404	50%	515
Population by Age			
Age 0-4	11,239	6%	325
Age 0-17	43,406	25%	491
Age 18+	129,545	75%	674
Age 65+	27,144	16%	303

Data Note: Detail may not sum to totals due to rounding. Hispanic population can be of any race.
N/A means not available. **Source:** U.S. Census Bureau, American Community Survey (ACS) 2015 - 2019 .

EJSCREEN ACS Summary Report

Location: User-specified polygonal location
Ring (buffer): 0-miles radius
Description: Bentonville Region

	2015 - 2019 ACS Estimates	Percent	MOE (±)
Population 25+ by Educational Attainment			
Total	116,959	100%	498
Less than 9th Grade	5,394	5%	216
9th - 12th Grade, No Diploma	7,997	7%	190
High School Graduate	36,488	31%	331
Some College, No Degree	24,516	21%	357
Associate Degree	7,820	7%	164
Bachelor's Degree or more	34,744	30%	522
Population Age 5+ Years by Ability to Speak English			
Total	161,712	100%	754
Speak only English	145,042	90%	700
Non-English at Home[1+2+3+4]	16,669	10%	411
[1]Speak English "very well"	9,310	6%	300
[2]Speak English "well"	3,487	2%	230
[3]Speak English "not well"	1,945	1%	153
[4]Speak English "not at all"	1,927	1%	215
[3+4]Speak English "less than well"	3,872	2%	263
[2+3+4]Speak English "less than very well"	7,360	5%	291
Linguistically Isolated Households*			
Total	1,579	100%	127
Speak Spanish	1,067	68%	125
Speak Other Indo-European Languages	29	2%	19
Speak Asian-Pacific Island Languages	441	28%	82
Speak Other Languages	43	3%	36
Households by Household Income			
Household Income Base	65,772	100%	288
< $15,000	5,455	8%	152
$15,000 - $25,000	6,225	9%	163
$25,000 - $50,000	14,886	23%	234
$50,000 - $75,000	12,991	20%	242
$75,000 +	26,215	40%	373
Occupied Housing Units by Tenure			
Total	65,772	100%	288
Owner Occupied	44,339	67%	266
Renter Occupied	21,433	33%	264
Employed Population Age 16+ Years			
Total	134,310	100%	596
In Labor Force	83,525	62%	531
Civilian Unemployed in Labor Force	2,447	2%	94
Not In Labor Force	50,785	38%	432

Data Note: Datail may not sum to totals due to rounding. Hispanic population can be of anyrace.
N/A means not available. **Source:** U.S. Census Bureau, American Community Survey (ACS)
*Households in which no one 14 and over speaks English "very well" or speaks English only.

EJSCREEN ACS Summary Report

Location: User-specified polygonal location
Ring (buffer): 0-miles radius
Description: Bentonville Region

	2015 - 2019 ACS Estimates	Percent	MOE (±)
Population by Language Spoken at Home*			
Total (persons age 5 and above)	161,712	100%	754
English	145,042	90%	783
Spanish	10,919	7%	497
French	96	0%	149
French Creole	N/A	N/A	N/A
Italian	N/A	N/A	N/A
Portuguese	N/A	N/A	N/A
German	609	0%	189
Yiddish	N/A	N/A	N/A
Other West Germanic	N/A	N/A	N/A
Scandinavian	N/A	N/A	N/A
Greek	N/A	N/A	N/A
Russian	N/A	N/A	N/A
Polish	N/A	N/A	N/A
Serbo-Croatian	N/A	N/A	N/A
Other Slavic	N/A	N/A	N/A
Armenian	N/A	N/A	N/A
Persian	N/A	N/A	N/A
Gujarathi	N/A	N/A	N/A
Hindi	N/A	N/A	N/A
Urdu	N/A	N/A	N/A
Other Indic	N/A	N/A	N/A
Other Indo-European	868	1%	175
Chinese	227	0%	116
Japanese	N/A	N/A	N/A
Korean	202	0%	216
Mon-Khmer, Cambodian	N/A	N/A	N/A
Hmong	N/A	N/A	N/A
Thai	N/A	N/A	N/A
Laotian	N/A	N/A	N/A
Vietnamese	364	0%	142
Other Asian	2,751	2%	371
Tagalog	142	0%	47
Other Pacific Island	N/A	N/A	N/A
Navajo	N/A	N/A	N/A
Other Native American	N/A	N/A	N/A
Hungarian	N/A	N/A	N/A
Arabic	72	0%	68
Hebrew	N/A	N/A	N/A
African	N/A	N/A	N/A
Other and non-specified	376	0%	104
Total Non-English	16,669	10%	1,087

Data Note: Detail may not sum to totals due to rounding. Hispanic popultion can be of any race.
N/A meansnot available. **Source:** U.S. Census Bureau, American Community Survey (ACS) 2015 - 2019.
*Population by Language Spoken at Home is available at the census tract summary level and up.

Appendix F

AEDT EJ Analysis Data

Pea Ridge Study Area Block Group ACS 2020 5-Year Estimate Data

STATE	COUNTY	NAME	Population Total	Population Minority	Percent Minority	Population Low-Income	Percent Low-income
AR	Benton County	Block Group 1, Census Tract 210.01, Benton County, Arkansas	779	30	3.9	118	15.3
AR	Benton County	Block Group 2, Census Tract 206.06, Benton County, Arkansas	1841	103	5.6	31	1.7
AR	Benton County	Block Group 2, Census Tract 209.04, Benton County, Arkansas	3572	744	20.8	0	0
AR	Carroll County	Block Group 1, Census Tract 9502.01, Carroll County, Arkansas	942	10	1.1	15	1.6
AR	Benton County	Block Group 2, Census Tract 206.05, Benton County, Arkansas	1257	480	38.2	215	17.1
AR	Benton County	Block Group 1, Census Tract 204.01, Benton County, Arkansas	1751	302	17.2	252	15.6
AR	Benton County	Block Group 2, Census Tract 208.03, Benton County, Arkansas	1621	333	20.5	90	5.6
AR	Benton County	Block Group 1, Census Tract 210.03, Benton County, Arkansas	2409	838	34.8	316	13.5
AR	Benton County	Block Group 1, Census Tract 209.05, Benton County, Arkansas	1112	18	1.6	9	0.8
AR	Benton County	Block Group 3, Census Tract 208.01, Benton County, Arkansas	938	17	1.8	18	1.9
AR	Benton County	Block Group 2, Census Tract 203.01, Benton County, Arkansas	1126	382	33.9	211	18.9
AR	Benton County	Block Group 2, Census Tract 205.03, Benton County, Arkansas	1392	940	67.5	272	19.5
AR	Benton County	Block Group 1, Census Tract 207.04, Benton County, Arkansas	2211	67	3	147	6.6
AR	Benton County	Block Group 1, Census Tract 214.05, Benton County, Arkansas	883	130	14.7	69	7.8
AR	Benton County	Block Group 3, Census Tract 206.07, Benton County, Arkansas	3905	2792	71.5	169	4.3
AR	Benton County	Block Group 2, Census Tract 204.01, Benton County, Arkansas	2250	198	8.8	135	6.2
AR	Benton County	Block Group 1, Census Tract 202.01, Benton County, Arkansas	1095	604	55.2	57	5.2
AR	Benton County	Block Group 2, Census Tract 205.04, Benton County, Arkansas	1497	253	16.9	246	16.4
AR	Benton County	Block Group 3, Census Tract 205.01, Benton County, Arkansas	2315	369	15.9	13	0.6
AR	Benton County	Block Group 2, Census Tract 209.03, Benton County, Arkansas	2001	667	33.3	165	8.3
AR	Benton County	Block Group 2, Census Tract 203.02, Benton County, Arkansas	1840	1178	64	569	30.9
AR	Benton County	Block Group 2, Census Tract 201.03, Benton County, Arkansas	1009	180	17.8	184	18.2
AR	Benton County	Block Group 1, Census Tract 203.05, Benton County, Arkansas	2482	1267	51	331	13.3
AR	Benton County	Block Group 3, Census Tract 206.04, Benton County, Arkansas	1278	278	21.8	59	4.6
AR	Benton County	Block Group 2, Census Tract 208.06, Benton County, Arkansas	1698	95	5.6	115	7.1
AR	Benton County	Block Group 1, Census Tract 202.03, Benton County, Arkansas	1596	131	8.2	27	1.7
AR	Benton County	Block Group 4, Census Tract 205.01, Benton County, Arkansas	1633	563	34.5	127	8.2
AR	Benton County	Block Group 3, Census Tract 203.02, Benton County, Arkansas	2091	943	45.1	316	15.1
AR	Benton County	Block Group 1, Census Tract 214.04, Benton County, Arkansas	1214	280	23.1	150	12.4
AR	Carroll County	Block Group 2, Census Tract 9502.01, Carroll County, Arkansas	1238	120	9.7	62	5
AR	Benton County	Block Group 3, Census Tract 201.03, Benton County, Arkansas	1001	135	13.5	76	7.6
AR	Benton County	Block Group 1, Census Tract 207.03, Benton County, Arkansas	1138	77	6.8	43	3.8
AR	Benton County	Block Group 1, Census Tract 206.07, Benton County, Arkansas	2527	689	27.3	31	1.2
AR	Benton County	Block Group 2, Census Tract 203.05, Benton County, Arkansas	1564	386	24.7	33	2.1
AR	Benton County	Block Group 1, Census Tract 206.05, Benton County, Arkansas	918	95	10.3	217	23.6
AR	Benton County	Block Group 3, Census Tract 208.06, Benton County, Arkansas	3813	560	14.7	18	0.5
AR	Benton County	Block Group 3, Census Tract 201.02, Benton County, Arkansas	1703	182	10.7	302	17.7
AR	Benton County	Block Group 3, Census Tract 205.03, Benton County, Arkansas	1691	900	53.2	231	13.7
AR	Benton County	Block Group 4, Census Tract 208.01, Benton County, Arkansas	954	104	10.9	0	0
AR	Benton County	Block Group 3, Census Tract 203.01, Benton County, Arkansas	1555	832	53.5	443	28.5
AR	Benton County	Block Group 1, Census Tract 206.08, Benton County, Arkansas	2290	965	42.1	22	1
AR	Benton County	Block Group 3, Census Tract 213.04, Benton County, Arkansas	3867	1196	30.9	201	5.2
AR	Benton County	Block Group 3, Census Tract 210.01, Benton County, Arkansas	1164	403	34.6	179	15.4
AR	Benton County	Block Group 1, Census Tract 206.04, Benton County, Arkansas	2614	675	25.8	61	2.8
AR	Benton County	Block Group 2, Census Tract 209.06, Benton County, Arkansas	1086	100	9.2	106	9.8
AR	Benton County	Block Group 3, Census Tract 208.05, Benton County, Arkansas	1229	190	15.5	8	0.7
AR	Benton County	Block Group 1, Census Tract 205.01, Benton County, Arkansas	756	302	39.9	234	31.8
AR	Benton County	Block Group 3, Census Tract 213.05, Benton County, Arkansas	1520	335	22	219	14.4
AR	Benton County	Block Group 3, Census Tract 208.03, Benton County, Arkansas	1221	44	3.6	150	12.3
AR	Benton County	Block Group 3, Census Tract 214.07, Benton County, Arkansas	1267	46	3.6	41	3.2
AR	Benton County	Block Group 4, Census Tract 207.01, Benton County, Arkansas	951	319	33.5	0	0
AR	Benton County	Block Group 2, Census Tract 201.02, Benton County, Arkansas	2419	1207	49.9	28	1.2
AR	Benton County	Block Group 2, Census Tract 207.01, Benton County, Arkansas	1149	64	5.6	46	4
AR	Benton County	Block Group 3, Census Tract 207.01, Benton County, Arkansas	1314	110	8.4	24	1.8
AR	Benton County	Block Group 2, Census Tract 214.09, Benton County, Arkansas	798	60	7.5	49	6.1
AR	Benton County	Block Group 2, Census Tract 208.01, Benton County, Arkansas	1395	18	1.3	30	2.2
AR	Benton County	Block Group 2, Census Tract 210.01, Benton County, Arkansas	2140	205	9.6	90	4.2
AR	Benton County	Block Group 3, Census Tract 206.05, Benton County, Arkansas	1859	220	11.8	154	8.3
AR	Benton County	Block Group 4, Census Tract 201.02, Benton County, Arkansas	1246	21	1.7	20	1.6
AR	Benton County	Block Group 2, Census Tract 214.07, Benton County, Arkansas	1687	200	11.9	131	7.8
AR	Benton County	Block Group 2, Census Tract 207.03, Benton County, Arkansas	2526	480	19	74	2.9
AR	Benton County	Block Group 1, Census Tract 201.04, Benton County, Arkansas	1755	312	17.8	128	7.4
AR	Benton County	Block Group 2, Census Tract 214.04, Benton County, Arkansas	787	194	24.7	12	1.5
AR	Benton County	Block Group 3, Census Tract 207.03, Benton County, Arkansas	1532	381	24.9	49	3.2
AR	Benton County	Block Group 1, Census Tract 201.02, Benton County, Arkansas	2428	568	23.4	28	1.2
AR	Benton County	Block Group 4, Census Tract 210.01, Benton County, Arkansas	1804	205	11.4	199	11.3
AR	Benton County	Block Group 3, Census Tract 202.01, Benton County, Arkansas	1237	427	34.5	318	25.7
AR	Benton County	Block Group 1, Census Tract 209.06, Benton County, Arkansas	2378	377	15.9	0	0
AR	Benton County	Block Group 2, Census Tract 208.05, Benton County, Arkansas	2045	499	24.4	148	7.5

AR	Benton County	Block Group 2, Census Tract 213.04, Benton County, Arkansas	2753	654	23.8	296	10.8
AR	Benton County	Block Group 2, Census Tract 206.04, Benton County, Arkansas	1322	575	43.5	84	6.4
AR	Benton County	Block Group 1, Census Tract 203.04, Benton County, Arkansas	4099	1145	27.9	665	16.6
AR	Benton County	Block Group 1, Census Tract 204.02, Benton County, Arkansas	1027	338	32.9	63	6.1
AR	Benton County	Block Group 1, Census Tract 207.01, Benton County, Arkansas	2620	24	0.9	127	4.8
AR	Benton County	Block Group 1, Census Tract 208.01, Benton County, Arkansas	1065	161	15.1	0	0
AR	Benton County	Block Group 3, Census Tract 214.05, Benton County, Arkansas	486	39	8	49	10.1
AR	Benton County	Block Group 1, Census Tract 209.03, Benton County, Arkansas	2853	746	26.1	192	6.8
AR	Benton County	Block Group 1, Census Tract 206.06, Benton County, Arkansas	2553	492	19.3	164	6.6
AR	Benton County	Block Group 1, Census Tract 213.04, Benton County, Arkansas	2698	862	31.9	288	10.7
AR	Benton County	Block Group 2, Census Tract 209.05, Benton County, Arkansas	1824	141	7.7	97	5.3
AR	Benton County	Block Group 2, Census Tract 202.01, Benton County, Arkansas	3098	1757	56.7	579	18.7
AR	Benton County	Block Group 1, Census Tract 205.04, Benton County, Arkansas	1663	387	23.3	297	17.9
AR	Benton County	Block Group 4, Census Tract 213.05, Benton County, Arkansas	1309	93	7.1	131	10.4
AR	Benton County	Block Group 1, Census Tract 208.05, Benton County, Arkansas	1256	6	0.5	0	0
AR	Benton County	Block Group 2, Census Tract 206.07, Benton County, Arkansas	2545	1144	45	110	4.3
AR	Benton County	Block Group 2, Census Tract 207.04, Benton County, Arkansas	2436	574	23.6	85	3.5
AR	Benton County	Block Group 1, Census Tract 203.01, Benton County, Arkansas	1769	1304	73.7	252	14.2
AR	Benton County	Block Group 3, Census Tract 214.04, Benton County, Arkansas	2847	1712	60.1	64	2.2
AR	Benton County	Block Group 1, Census Tract 205.03, Benton County, Arkansas	1112	669	60.2	53	5.2
AR	Benton County	Block Group 2, Census Tract 202.03, Benton County, Arkansas	1164	552	47.4	48	4.1
AR	Benton County	Block Group 2, Census Tract 214.05, Benton County, Arkansas	627	8	1.3	17	2.7
AR	Benton County	Block Group 3, Census Tract 209.06, Benton County, Arkansas	1212	313	25.8	0	0
AR	Benton County	Block Group 1, Census Tract 208.06, Benton County, Arkansas	1136	33	2.9	18	1.6
AR	Benton County	Block Group 1, Census Tract 208.03, Benton County, Arkansas	1624	39	2.4	106	6.6
AR	Carroll County	Block Group 3, Census Tract 9502.01, Carroll County, Arkansas	1277	40	3.1	124	9.8
AR	Benton County	Block Group 1, Census Tract 213.05, Benton County, Arkansas	829	190	22.9	127	15.3
AR	Benton County	Block Group 1, Census Tract 201.03, Benton County, Arkansas	1659	186	11.2	59	3.6
AR	Benton County	Block Group 1, Census Tract 203.02, Benton County, Arkansas	496	308	62.1	0	0
AR	Benton County	Block Group 2, Census Tract 206.08, Benton County, Arkansas	1488	896	60.2	173	11.6
AR	Benton County	Block Group 1, Census Tract 209.04, Benton County, Arkansas	2964	289	9.8	325	11.1
AR	Benton County	Block Group 2, Census Tract 205.01, Benton County, Arkansas	639	150	23.5	13	2.2
AR	Benton County	Block Group 1, Census Tract 214.09, Benton County, Arkansas	1236	91	7.4	84	6.8
MO	McDonald County	Block Group 1, Census Tract 704.02, McDonald County, Missouri	1570	201	12.8	136	8.7
MO	McDonald County	Block Group 1, Census Tract 701.01, McDonald County, Missouri	1061	73	6.9	113	10.7
MO	McDonald County	Block Group 2, Census Tract 701.01, McDonald County, Missouri	2039	160	7.8	140	7.1
MO	Barry County	Block Group 2, Census Tract 9605, Barry County, Missouri	794	0	0	72	9.1
MO	McDonald County	Block Group 1, Census Tract 703, McDonald County, Missouri	1094	548	50.1	101	9.2
MO	McDonald County	Block Group 1, Census Tract 704.01, McDonald County, Missouri	2680	692	25.8	728	28.3
MO	McDonald County	Block Group 2, Census Tract 702, McDonald County, Missouri	1482	412	27.8	402	27.9
MO	McDonald County	Block Group 4, Census Tract 703, McDonald County, Missouri	1514	768	50.7	470	32.3
MO	McDonald County	Block Group 2, Census Tract 704.02, McDonald County, Missouri	737	91	12.3	59	8.4
MO	Barry County	Block Group 3, Census Tract 9604.02, Barry County, Missouri	1359	154	11.3	212	15.7
MO	McDonald County	Block Group 3, Census Tract 702, McDonald County, Missouri	1487	299	20.1	157	10.6
MO	Barry County	Block Group 3, Census Tract 9604.01, Barry County, Missouri	1045	82	7.8	251	24
MO	McDonald County	Block Group 1, Census Tract 701.02, McDonald County, Missouri	1407	208	14.8	163	11.7
MO	McDonald County	Block Group 2, Census Tract 703, McDonald County, Missouri	1421	694	48.8	316	22.2
MO	Barry County	Block Group 2, Census Tract 9604.02, Barry County, Missouri	1551	279	18	189	12.2
MO	Barry County	Block Group 2, Census Tract 9604.01, Barry County, Missouri	1261	222	17.6	224	17.8
MO	Barry County	Block Group 1, Census Tract 9605, Barry County, Missouri	1918	57	3	545	28.4
MO	McDonald County	Block Group 3, Census Tract 703, McDonald County, Missouri	1748	841	48.1	507	29
MO	McDonald County	Block Group 2, Census Tract 701.02, McDonald County, Missouri	894	155	17.3	161	18
MO	McDonald County	Block Group 2, Census Tract 704.01, McDonald County, Missouri	929	367	39.5	104	11.5
MO	McDonald County	Block Group 4, Census Tract 702, McDonald County, Missouri	590	89	15.1	193	32.7
MO	Barry County	Block Group 1, Census Tract 9604.01, Barry County, Missouri	1680	221	13.2	452	27
MO	McDonald County	Block Group 3, Census Tract 704.02, McDonald County, Missouri	958	299	31.2	127	13.3
MO	McDonald County	Block Group 1, Census Tract 702, McDonald County, Missouri	1271	408	32.1	477	37.8
MO	Barry County	Block Group 1, Census Tract 9604.02, Barry County, Missouri	1492	410	27.5	212	14.3
			207972	52043	23.3377953	19620	10.08267717

Barry County Block Group ACS 2020 5-Year Estimate Data

STATE	COUNTY	NAME	Population Total	Population Minority	Percent Minority	Population Low-Income	Percent Low-Income
MO	Barry County	Block Group 1, Census Tract 9604.01, Barry County, Missouri	1680	221	13.2	452	27
MO	Barry County	Block Group 1, Census Tract 9601.01, Barry County, Missouri	955	0	0	55	6
MO	Barry County	Block Group 1, Census Tract 9606, Barry County, Missouri	841	72	8.6	92	11
MO	Barry County	Block Group 4, Census Tract 9603.01, Barry County, Missouri	651	186	28.6	45	7
MO	Barry County	Block Group 2, Census Tract 9606, Barry County, Missouri	1795	123	6.9	169	9
MO	Barry County	Block Group 2, Census Tract 9601.01, Barry County, Missouri	1901	0	0	420	22
MO	Barry County	Block Group 1, Census Tract 9602.02, Barry County, Missouri	1357	134	9.9	127	10
MO	Barry County	Block Group 3, Census Tract 9601.02, Barry County, Missouri	944	0	0	250	26
MO	Barry County	Block Group 2, Census Tract 9603.01, Barry County, Missouri	1095	841	76.8	446	43
MO	Barry County	Block Group 2, Census Tract 9604.01, Barry County, Missouri	1261	222	17.6	224	18
MO	Barry County	Block Group 2, Census Tract 9605, Barry County, Missouri	794	0	0	72	9
MO	Barry County	Block Group 5, Census Tract 9605, Barry County, Missouri	1442	16	1.1	87	8
MO	Barry County	Block Group 1, Census Tract 9601.02, Barry County, Missouri	904	205	22.7	49	5
MO	Barry County	Block Group 3, Census Tract 9604.02, Barry County, Missouri	1359	154	11.3	212	16
MO	Barry County	Block Group 1, Census Tract 9602.01, Barry County, Missouri	606	27	4.5	172	28
MO	Barry County	Block Group 3, Census Tract 9603.01, Barry County, Missouri	1333	279	20.9	214	16
MO	Barry County	Block Group 3, Census Tract 9604.01, Barry County, Missouri	1045	82	7.8	251	24
MO	Barry County	Block Group 2, Census Tract 9602.02, Barry County, Missouri	2044	563	27.5	604	32
MO	Barry County	Block Group 2, Census Tract 9603.02, Barry County, Missouri	1370	384	28	121	9
MO	Barry County	Block Group 3, Census Tract 9605, Barry County, Missouri	1164	30	2.6	366	33
MO	Barry County	Block Group 2, Census Tract 9604.02, Barry County, Missouri	1551	279	18	189	12
MO	Barry County	Block Group 1, Census Tract 9603.02, Barry County, Missouri	1125	359	31.9	261	23
MO	Barry County	Block Group 1, Census Tract 9605, Barry County, Missouri	1918	57	3	545	28
MO	Barry County	Block Group 4, Census Tract 9605, Barry County, Missouri	1472	294	20	463	33
MO	Barry County	Block Group 2, Census Tract 9602.01, Barry County, Missouri	1879	127	6.8	104	6
MO	Barry County	Block Group 1, Census Tract 9603.01, Barry County, Missouri	750	227	30.3	83	11
MO	Barry County	Block Group 2, Census Tract 9601.02, Barry County, Missouri	887	273	30.8	83	9
MO	Barry County	Block Group 1, Census Tract 9604.02, Barry County, Missouri	1492	410	27.5	212	14
			35615	5565	16.29642857	6368	17.67857143

Carroll County Block Group ACS 2020 5-Year Estimate Data

STATE	COUNTY	NAME	Population Total	Population Minority	Percent Minority	Population Low-Income	Percent Low-Income
AR	Carroll County	Block Group 3, Census Tract 9502.01, Carroll County, Arkansas	1277	40	3.1	124	9.8
AR	Carroll County	Block Group 2, Census Tract 9501, Carroll County, Arkansas	1675	111	6.6	136	8.4
AR	Carroll County	Block Group 1, Census Tract 9502.01, Carroll County, Arkansas	942	10	1.1	15	1.6
AR	Carroll County	Block Group 1, Census Tract 9503.01, Carroll County, Arkansas	2420	1147	47.4	113	4.7
AR	Carroll County	Block Group 1, Census Tract 9504, Carroll County, Arkansas	1344	113	8.4	0	0
AR	Carroll County	Block Group 2, Census Tract 9503.02, Carroll County, Arkansas	1674	867	51.8	753	45
AR	Carroll County	Block Group 1, Census Tract 9502.02, Carroll County, Arkansas	632	108	17.1	249	39.4
AR	Carroll County	Block Group 1, Census Tract 9505.01, Carroll County, Arkansas	1481	0	0	335	22.6
AR	Carroll County	Block Group 2, Census Tract 9502.01, Carroll County, Arkansas	1238	120	9.7	62	5
AR	Carroll County	Block Group 2, Census Tract 9502.02, Carroll County, Arkansas	1020	178	17.5	169	16.7
AR	Carroll County	Block Group 2, Census Tract 9503.01, Carroll County, Arkansas	1328	408	30.7	95	7.2
AR	Carroll County	Block Group 2, Census Tract 9504, Carroll County, Arkansas	1684	240	14.3	162	9.7
AR	Carroll County	Block Group 1, Census Tract 9501, Carroll County, Arkansas	1329	252	19	201	15.4
AR	Carroll County	Block Group 1, Census Tract 9505.02, Carroll County, Arkansas	1315	407	31	291	22.1
AR	Carroll County	Block Group 2, Census Tract 9505.01, Carroll County, Arkansas	886	0	0	166	18.7
AR	Carroll County	Block Group 1, Census Tract 9503.02, Carroll County, Arkansas	2211	498	22.5	450	22
AR	Carroll County	Block Group 3, Census Tract 9505.02, Carroll County, Arkansas	1387	25	1.8	283	20.6
AR	Carroll County	Block Group 3, Census Tract 9502.02, Carroll County, Arkansas	927	0	0	12	1.3
AR	Carroll County	Block Group 2, Census Tract 9505.02, Carroll County, Arkansas	1868	1314	70.3	321	17.2
AR	Carroll County	Block Group 3, Census Tract 9504, Carroll County, Arkansas	1424	240	16.9	279	19.6
			28062	6078	18.46	4216	15.35

Benton County Block Group ACS 2020 5-Year Estimate Data

STATE	COUNTY	NAME	Population Total	Population Minority	Percent Minority	Population Low-Income	Percent Low-Income
AR	Benton County	Block Group 1, Census Tract 210.01, Benton County, Arkansas	779	30	3.9	118	15.3
AR	Benton County	Block Group 1, Census Tract 214.06, Benton County, Arkansas	1639	905	55.2	154	9.5
AR	Benton County	Block Group 1, Census Tract 202.05, Benton County, Arkansas	2400	1564	65.2	718	29.9
AR	Benton County	Block Group 1, Census Tract 204.02, Benton County, Arkansas	1027	338	32.9	63	6.1
AR	Benton County	Block Group 2, Census Tract 213.04, Benton County, Arkansas	2753	654	23.8	296	10.8
AR	Benton County	Block Group 2, Census Tract 213.14, Benton County, Arkansas	2183	489	22.4	71	3.3
AR	Benton County	Block Group 2, Census Tract 211.02, Benton County, Arkansas	2389	1281	53.6	935	39.1
AR	Benton County	Block Group 2, Census Tract 206.06, Benton County, Arkansas	1841	103	5.6	31	1.7
AR	Benton County	Block Group 2, Census Tract 209.04, Benton County, Arkansas	3572	744	20.8	0	0
AR	Benton County	Block Group 2, Census Tract 202.06, Benton County, Arkansas	2033	1725	84.8	45	2.2
AR	Benton County	Block Group 1, Census Tract 204.04, Benton County, Arkansas	2081	1078	51.8	351	16.9
AR	Benton County	Block Group 2, Census Tract 206.05, Benton County, Arkansas	1257	480	38.2	215	17.1
AR	Benton County	Block Group 1, Census Tract 204.01, Benton County, Arkansas	1751	302	17.2	252	15.6
AR	Benton County	Block Group 2, Census Tract 208.03, Benton County, Arkansas	1621	333	20.5	90	5.6
AR	Benton County	Block Group 1, Census Tract 212.02, Benton County, Arkansas	1696	375	22.1	344	20.3
AR	Benton County	Block Group 1, Census Tract 210.03, Benton County, Arkansas	2409	838	34.8	316	13.5
AR	Benton County	Block Group 1, Census Tract 213.15, Benton County, Arkansas	1660	544	32.8	119	7.3
AR	Benton County	Block Group 1, Census Tract 209.05, Benton County, Arkansas	1112	18	1.6	9	0.8
AR	Benton County	Block Group 3, Census Tract 208.01, Benton County, Arkansas	938	17	1.8	18	1.9
AR	Benton County	Block Group 2, Census Tract 203.01, Benton County, Arkansas	1126	382	33.9	211	18.9
AR	Benton County	Block Group 2, Census Tract 205.03, Benton County, Arkansas	1392	940	67.5	272	19.5
AR	Benton County	Block Group 1, Census Tract 207.04, Benton County, Arkansas	2211	67	3	147	6.6
AR	Benton County	Block Group 1, Census Tract 214.05, Benton County, Arkansas	883	130	14.7	69	7.8
AR	Benton County	Block Group 3, Census Tract 206.07, Benton County, Arkansas	3905	2792	71.5	169	4.3
AR	Benton County	Block Group 2, Census Tract 204.01, Benton County, Arkansas	2250	198	8.8	135	6.2
AR	Benton County	Block Group 2, Census Tract 210.04, Benton County, Arkansas	1897	532	28	233	12.3
AR	Benton County	Block Group 1, Census Tract 213.06, Benton County, Arkansas	1761	319	18.1	75	4.3
AR	Benton County	Block Group 2, Census Tract 213.13, Benton County, Arkansas	1538	349	22.7	14	0.9
AR	Benton County	Block Group 1, Census Tract 202.01, Benton County, Arkansas	1095	604	55.2	57	5.2
AR	Benton County	Block Group 2, Census Tract 205.04, Benton County, Arkansas	1497	253	16.9	246	16.4
AR	Benton County	Block Group 4, Census Tract 211.01, Benton County, Arkansas	1555	748	48.1	151	9.7
AR	Benton County	Block Group 2, Census Tract 214.06, Benton County, Arkansas	1138	477	41.9	34	3
AR	Benton County	Block Group 3, Census Tract 205.01, Benton County, Arkansas	2315	369	15.9	13	0.6
AR	Benton County	Block Group 2, Census Tract 209.03, Benton County, Arkansas	2001	667	33.3	165	8.3
AR	Benton County	Block Group 2, Census Tract 213.08, Benton County, Arkansas	2420	338	14	9	0.4
AR	Benton County	Block Group 2, Census Tract 203.02, Benton County, Arkansas	1840	1178	64	569	30.9
AR	Benton County	Block Group 2, Census Tract 204.02, Benton County, Arkansas	2078	1006	48.4	94	4.7
AR	Benton County	Block Group 2, Census Tract 213.05, Benton County, Arkansas	2463	234	9.5	172	7.1
AR	Benton County	Block Group 1, Census Tract 203.05, Benton County, Arkansas	2482	1267	51	331	13.3
AR	Benton County	Block Group 3, Census Tract 206.04, Benton County, Arkansas	1278	278	21.8	59	4.6
AR	Benton County	Block Group 2, Census Tract 208.06, Benton County, Arkansas	1698	95	5.6	115	7.1
AR	Benton County	Block Group 1, Census Tract 202.03, Benton County, Arkansas	1596	131	8.2	27	1.7
AR	Benton County	Block Group 1, Census Tract 213.12, Benton County, Arkansas	1698	413	24.3	148	8.7
AR	Benton County	Block Group 1, Census Tract 211.01, Benton County, Arkansas	1449	631	43.5	533	37.1
AR	Benton County	Block Group 1, Census Tract 212.01, Benton County, Arkansas	2121	851	40.1	11	1
AR	Benton County	Block Group 2, Census Tract 213.17, Benton County, Arkansas	1832	227	12.4	376	20.5
AR	Benton County	Block Group 4, Census Tract 205.01, Benton County, Arkansas	1633	563	34.5	127	8.2
AR	Benton County	Block Group 3, Census Tract 202.06, Benton County, Arkansas	3547	2748	77.5	701	19.8
AR	Benton County	Block Group 2, Census Tract 204.04, Benton County, Arkansas	1731	910	52.6	159	9.3
AR	Benton County	Block Group 1, Census Tract 214.04, Benton County, Arkansas	1214	280	23.1	150	12.4
AR	Benton County	Block Group 3, Census Tract 203.02, Benton County, Arkansas	2091	943	45.1	316	15.1
AR	Benton County	Block Group 3, Census Tract 214.07, Benton County, Arkansas	1267	46	3.6	41	3.2
AR	Benton County	Block Group 3, Census Tract 201.03, Benton County, Arkansas	1001	135	13.5	76	7.6
AR	Benton County	Block Group 1, Census Tract 207.03, Benton County, Arkansas	1138	77	6.8	43	3.8
AR	Benton County	Block Group 1, Census Tract 206.07, Benton County, Arkansas	2527	689	27.3	31	1.2
AR	Benton County	Block Group 2, Census Tract 203.05, Benton County, Arkansas	1564	386	24.7	33	2.1
AR	Benton County	Block Group 1, Census Tract 206.05, Benton County, Arkansas	918	95	10.3	217	23.6
AR	Benton County	Block Group 3, Census Tract 208.06, Benton County, Arkansas	3813	560	14.7	18	0.5
AR	Benton County	Block Group 2, Census Tract 212.02, Benton County, Arkansas	1407	559	39.7	258	18.3

AR	Benton County	Block Group 3, Census Tract 201.02, Benton County, Arkansas	1703	182	10.7	302	17.7
AR	Benton County	Block Group 2, Census Tract 210.03, Benton County, Arkansas	1023	197	19.3	196	19.2
AR	Benton County	Block Group 2, Census Tract 211.01, Benton County, Arkansas	652	262	40.2	165	25.3
AR	Benton County	Block Group 1, Census Tract 205.01, Benton County, Arkansas	756	302	39.9	234	31.8
AR	Benton County	Block Group 4, Census Tract 208.01, Benton County, Arkansas	954	104	10.9	0	0
AR	Benton County	Block Group 3, Census Tract 205.03, Benton County, Arkansas	1691	900	53.2	231	13.7
AR	Benton County	Block Group 3, Census Tract 214.06, Benton County, Arkansas	2376	1120	47.1	173	7.3
AR	Benton County	Block Group 3, Census Tract 203.01, Benton County, Arkansas	1555	832	53.5	443	28.5
AR	Benton County	Block Group 1, Census Tract 206.08, Benton County, Arkansas	2290	965	42.1	22	1
AR	Benton County	Block Group 3, Census Tract 204.04, Benton County, Arkansas	1473	491	33.3	104	7.1
AR	Benton County	Block Group 3, Census Tract 213.04, Benton County, Arkansas	3867	1196	30.9	201	5.2
AR	Benton County	Block Group 2, Census Tract 213.06, Benton County, Arkansas	2982	501	16.8	54	1.8
AR	Benton County	Block Group 1, Census Tract 206.04, Benton County, Arkansas	2614	675	25.8	61	2.8
AR	Benton County	Block Group 3, Census Tract 210.01, Benton County, Arkansas	1164	403	34.6	179	15.4
AR	Benton County	Block Group 2, Census Tract 209.06, Benton County, Arkansas	1086	100	9.2	106	9.8
AR	Benton County	Block Group 1, Census Tract 213.14, Benton County, Arkansas	969	405	41.8	70	7.2
AR	Benton County	Block Group 3, Census Tract 210.04, Benton County, Arkansas	1422	258	18.1	123	8.6
AR	Benton County	Block Group 3, Census Tract 208.05, Benton County, Arkansas	1229	190	15.5	8	0.7
AR	Benton County	Block Group 3, Census Tract 214.08, Benton County, Arkansas	1747	1182	67.7	166	9.5
AR	Benton County	Block Group 2, Census Tract 202.05, Benton County, Arkansas	1152	512	44.4	91	7.9
AR	Benton County	Block Group 2, Census Tract 213.12, Benton County, Arkansas	2631	314	11.9	612	23.3
AR	Benton County	Block Group 3, Census Tract 213.05, Benton County, Arkansas	1520	335	22	219	14.4
AR	Benton County	Block Group 3, Census Tract 208.03, Benton County, Arkansas	1221	44	3.6	150	12.3
AR	Benton County	Block Group 4, Census Tract 207.01, Benton County, Arkansas	951	319	33.5	0	0
AR	Benton County	Block Group 2, Census Tract 201.02, Benton County, Arkansas	2419	1207	49.9	28	1.2
AR	Benton County	Block Group 2, Census Tract 207.01, Benton County, Arkansas	1149	64	5.6	46	4
AR	Benton County	Block Group 3, Census Tract 207.01, Benton County, Arkansas	1314	110	8.4	24	1.8
AR	Benton County	Block Group 2, Census Tract 214.09, Benton County, Arkansas	798	60	7.5	49	6.1
AR	Benton County	Block Group 2, Census Tract 208.01, Benton County, Arkansas	1395	18	1.3	30	2.2
AR	Benton County	Block Group 2, Census Tract 201.03, Benton County, Arkansas	1009	180	17.8	184	18.2
AR	Benton County	Block Group 1, Census Tract 213.16, Benton County, Arkansas	3780	696	18.4	121	3.2
AR	Benton County	Block Group 2, Census Tract 210.01, Benton County, Arkansas	2140	205	9.6	90	4.2
AR	Benton County	Block Group 3, Census Tract 206.05, Benton County, Arkansas	1859	220	11.8	154	8.3
AR	Benton County	Block Group 3, Census Tract 202.05, Benton County, Arkansas	2530	1518	60	128	5.1
AR	Benton County	Block Group 4, Census Tract 201.02, Benton County, Arkansas	1246	21	1.7	20	1.6
AR	Benton County	Block Group 1, Census Tract 213.13, Benton County, Arkansas	1587	666	42	250	15.8
AR	Benton County	Block Group 2, Census Tract 214.07, Benton County, Arkansas	1687	200	11.9	131	7.8
AR	Benton County	Block Group 2, Census Tract 207.03, Benton County, Arkansas	2526	480	19	74	2.9
AR	Benton County	Block Group 1, Census Tract 201.04, Benton County, Arkansas	1755	312	17.8	128	7.4
AR	Benton County	Block Group 2, Census Tract 214.04, Benton County, Arkansas	787	194	24.7	12	1.5
AR	Benton County	Block Group 1, Census Tract 213.17, Benton County, Arkansas	737	137	18.6	111	18
AR	Benton County	Block Group 3, Census Tract 207.03, Benton County, Arkansas	1532	381	24.9	49	3.2
AR	Benton County	Block Group 1, Census Tract 201.02, Benton County, Arkansas	2428	568	23.4	28	1.2
AR	Benton County	Block Group 4, Census Tract 210.01, Benton County, Arkansas	1804	205	11.4	199	11.3
AR	Benton County	Block Group 3, Census Tract 202.01, Benton County, Arkansas	1237	427	34.5	318	25.7
AR	Benton County	Block Group 1, Census Tract 209.06, Benton County, Arkansas	2378	377	15.9	0	0
AR	Benton County	Block Group 2, Census Tract 208.05, Benton County, Arkansas	2045	499	24.4	148	7.5
AR	Benton County	Block Group 2, Census Tract 206.04, Benton County, Arkansas	1322	575	43.5	84	6.4
AR	Benton County	Block Group 1, Census Tract 203.04, Benton County, Arkansas	4099	1145	27.9	665	16.6
AR	Benton County	Block Group 1, Census Tract 207.01, Benton County, Arkansas	2620	24	0.9	127	4.8
AR	Benton County	Block Group 1, Census Tract 208.01, Benton County, Arkansas	1065	161	15.1	0	0
AR	Benton County	Block Group 3, Census Tract 214.05, Benton County, Arkansas	486	39	8	49	10.1
AR	Benton County	Block Group 1, Census Tract 213.08, Benton County, Arkansas	3454	469	13.6	11	0.3
AR	Benton County	Block Group 2, Census Tract 214.08, Benton County, Arkansas	1573	161	10.2	234	15
AR	Benton County	Block Group 2, Census Tract 204.05, Benton County, Arkansas	2368	566	23.9	119	5
AR	Benton County	Block Group 3, Census Tract 213.15, Benton County, Arkansas	1602	38	2.4	55	3.4
AR	Benton County	Block Group 1, Census Tract 209.03, Benton County, Arkansas	2853	746	26.1	192	6.8
AR	Benton County	Block Group 3, Census Tract 211.01, Benton County, Arkansas	1235	529	42.8	70	5.7
AR	Benton County	Block Group 1, Census Tract 211.02, Benton County, Arkansas	1347	370	27.5	104	7.7
AR	Benton County	Block Group 1, Census Tract 206.06, Benton County, Arkansas	2553	492	19.3	164	6.6
AR	Benton County	Block Group 1, Census Tract 213.04, Benton County, Arkansas	2698	862	31.9	288	10.7
AR	Benton County	Block Group 2, Census Tract 209.05, Benton County, Arkansas	1824	141	7.7	97	5.3
AR	Benton County	Block Group 2, Census Tract 202.01, Benton County, Arkansas	3098	1757	56.7	579	18.7
AR	Benton County	Block Group 1, Census Tract 205.04, Benton County, Arkansas	1663	387	23.3	297	17.9
AR	Benton County	Block Group 4, Census Tract 213.05, Benton County, Arkansas	1309	93	7.1	131	10.4

AR	Benton County	Block Group 1, Census Tract 210.04, Benton County, Arkansas	982	194	19.8	81	8.2
AR	Benton County	Block Group 1, Census Tract 208.05, Benton County, Arkansas	1256	6	0.5	0	0
AR	Benton County	Block Group 1, Census Tract 214.08, Benton County, Arkansas	2040	1456	71.4	418	20.9
AR	Benton County	Block Group 2, Census Tract 206.07, Benton County, Arkansas	2545	1144	45	110	4.3
AR	Benton County	Block Group 1, Census Tract 204.05, Benton County, Arkansas	1926	493	25.6	92	4.8
AR	Benton County	Block Group 3, Census Tract 204.01, Benton County, Arkansas	2324	1145	49.3	221	9.5
AR	Benton County	Block Group 2, Census Tract 207.04, Benton County, Arkansas	2436	574	23.6	85	3.5
AR	Benton County	Block Group 1, Census Tract 203.01, Benton County, Arkansas	1769	1304	73.7	252	14.2
AR	Benton County	Block Group 3, Census Tract 214.04, Benton County, Arkansas	2847	1712	60.1	64	2.2
AR	Benton County	Block Group 1, Census Tract 205.03, Benton County, Arkansas	1112	669	60.2	53	5.2
AR	Benton County	Block Group 2, Census Tract 202.03, Benton County, Arkansas	1164	552	47.4	48	4.1
AR	Benton County	Block Group 2, Census Tract 213.15, Benton County, Arkansas	3192	971	30.4	0	0
AR	Benton County	Block Group 2, Census Tract 214.05, Benton County, Arkansas	627	8	1.3	17	2.7
AR	Benton County	Block Group 3, Census Tract 212.01, Benton County, Arkansas	2158	681	31.6	280	13.6
AR	Benton County	Block Group 3, Census Tract 209.06, Benton County, Arkansas	1212	313	25.8	0	0
AR	Benton County	Block Group 2, Census Tract 212.01, Benton County, Arkansas	977	514	52.6	51	5.2
AR	Benton County	Block Group 1, Census Tract 208.03, Benton County, Arkansas	1624	39	2.4	106	6.6
AR	Benton County	Block Group 1, Census Tract 208.06, Benton County, Arkansas	1136	33	2.9	18	1.6
AR	Benton County	Block Group 1, Census Tract 213.05, Benton County, Arkansas	829	190	22.9	127	15.3
AR	Benton County	Block Group 1, Census Tract 214.07, Benton County, Arkansas	1200	317	26.4	95	7.9
AR	Benton County	Block Group 1, Census Tract 201.03, Benton County, Arkansas	1659	186	11.2	59	3.6
AR	Benton County	Block Group 1, Census Tract 214.09, Benton County, Arkansas	1236	91	7.4	84	6.8
AR	Benton County	Block Group 1, Census Tract 203.02, Benton County, Arkansas	496	308	62.1	0	0
AR	Benton County	Block Group 2, Census Tract 206.08, Benton County, Arkansas	1488	896	60.2	173	11.6
AR	Benton County	Block Group 3, Census Tract 204.02, Benton County, Arkansas	2551	1615	63.3	9	0.4
AR	Benton County	Block Group 1, Census Tract 209.04, Benton County, Arkansas	2964	289	9.8	325	11.1
AR	Benton County	Block Group 1, Census Tract 202.06, Benton County, Arkansas	1841	841	45.7	74	4
AR	Benton County	Block Group 2, Census Tract 205.01, Benton County, Arkansas	639	150	23.5	13	2.2
AR	Benton County	Block Group 2, Census Tract 213.16, Benton County, Arkansas	2430	314	12.9	52	2.2
			273510	81379	28.2882353	23155	8.855555556

McDonald County Block Group ACS 2020 5-Year Estimate Data

STATE	COUNTY	NAME	Population Total	Population Minority	Percent Minority	Population Low-Income	Percent Low-Income
MO	McDonald County	Block Group 3, Census Tract 702, McDonald County, Missouri	1487	299	20.1	157	10.6
MO	McDonald County	Block Group 1, Census Tract 701.02, McDonald County, Missouri	1407	208	14.8	163	11.7
MO	McDonald County	Block Group 2, Census Tract 703, McDonald County, Missouri	1421	694	48.8	316	22.2
MO	McDonald County	Block Group 2, Census Tract 704.02, McDonald County, Missouri	737	91	12.3	59	8.4
MO	McDonald County	Block Group 4, Census Tract 703, McDonald County, Missouri	1514	768	50.7	470	32.3
MO	McDonald County	Block Group 2, Census Tract 702, McDonald County, Missouri	1482	412	27.8	402	27.9
MO	McDonald County	Block Group 1, Census Tract 704.01, McDonald County, Missouri	2680	692	25.8	728	28.3
MO	McDonald County	Block Group 1, Census Tract 703, McDonald County, Missouri	1094	548	50.1	101	9.2
MO	McDonald County	Block Group 2, Census Tract 701.01, McDonald County, Missouri	2039	160	7.8	140	7.1
MO	McDonald County	Block Group 1, Census Tract 701.01, McDonald County, Missouri	1061	73	6.9	113	10.7
MO	McDonald County	Block Group 3, Census Tract 703, McDonald County, Missouri	1748	841	48.1	507	29
MO	McDonald County	Block Group 2, Census Tract 701.02, McDonald County, Missouri	894	155	17.3	161	18
MO	McDonald County	Block Group 4, Census Tract 702, McDonald County, Missouri	590	89	15.1	193	32.7
MO	McDonald County	Block Group 3, Census Tract 704.02, McDonald County, Missouri	958	299	31.2	127	13.3
MO	McDonald County	Block Group 1, Census Tract 704.02, McDonald County, Missouri	1570	201	12.8	136	8.7
MO	McDonald County	Block Group 2, Census Tract 704.01, McDonald County, Missouri	929	367	39.5	104	11.5
MO	McDonald County	Block Group 1, Census Tract 702, McDonald County, Missouri	1271	408	32.1	477	37.8
			22882	6305	27.12941176	4354	18.78823529

Appendix G

NRI Outreach Letters

From: Santiago, Hector R <Hector_Santiago@nps.gov>
Sent: Thursday, May 19, 2022 4:47 PM
To: Millard, Mike (FAA) <mike.millard@faa.gov>
Subject: Re: [EXTERNAL] RE: NRI River UAS Overflight Assistance

Dear Mr. Millard,

The National Park Service (NPS) has reviewed your information regarding UAS Overflight Project in fulfillment of Section 5(d) of the Wild and Scenic Rivers Act (WSRA). As you have identified, several segments listed on the Nationwide Rivers Inventory (NRI), including the Elk River, Big Sugar Creek, and Shoal Creek are within the project's study area boundary. The project as proposed does not entail instream work or reside within the one-forth mile river corridor or area of concern. The project as proposed will not preclude the listed Rivers from being considered for inclusion into the National Wild and Scenic River System (System)

The NRI is a register of rivers that may be eligible for inclusion in the System. The intent of the NRI is to provide information to assist Agencies in making balanced decisions regarding the use of the nation's river resources and to prevent potential impacts to the values for which a river has been listed. The NPS, as part of normal planning and environmental review processes, should take care to avoid or mitigate adverse effects on rivers identified in the NRI. The NRI can be found at the following link: https://www.nps.gov/subjects/rivers/nationwide-rivers-inventory.htm

No further coordination under section 5(d) of the WSRA is required, specific to the project as proposed.

Sincerely,

Hector Santiago
Regional Rivers Coordinator
National Park Service,
Omaha, NE

From: Millard, Mike (FAA)
Sent: Friday, April 8, 2022 9:02 AM
To: hector_santiago@nps.gov
Subject: NRI River UAS Overflight Assistance

Mr. Santiago,

I am reaching out to you based on your information being listed for Wild and Scenic Rivers for Missouri on the NPS website.

I am the FAA (Federal Aviation Administration) Flight Standards Environmental Specialist, and we are working a UAS (Unmanned Aircraft System) operation request for Bentonville, AR that includes a portion of Missouri. We have already completed the Section 7 consultation with USFWS, but our research also identified three NRI river segments within the area that we would like your input on.

Attached please find an image of the Zipline operating area showing the three NRI river segments within the area, and a yellow pin titled "Nest" where the UAS will launch and recover from. While this is not a water resources project that necessitates consultation, we feel it is good to consult with NPS and hear if you have any concerns about Zipline overflights potentially affecting the recreational values of these three segments.

Here are the details about the UAS operation in the AR and MO area.

The UAS operation will be flown by an unmanned aircraft weighing 49.6 lbs., including a 3.9 lb. payload, at approximately 200 feet, but no more than 400 feet above ground level (AGL) in the vicinity of Bentonville, AR (see attached operations area map). The purpose is for package delivery, consisting of a maximum 20 flights each day, five days per week, with each flight lasting approximately fifteen minutes. All flights will takeoff from, and return to the launch and recovery site adjacent to the Walmart Neighborhood Market located at 240 Slack St., Pea Ridge, AR 72751 (36.443805, -94.119836). Flights will occur primarily Tue-Sat, no holidays, during daylight operating hours (~30 minutes before sunrise to ~30 minutes after sunset).

Of those 20 flights per day for the entire area, we would only anticipate a very few would cross the NRI river segments, with the visibility of the UAS only lasting a few seconds as it passes overhead.

The UAS is a small fixed-wing unmanned aircraft launched from the launch site using an electric catapult launcher. The UAS propulsion system consists of twin electric motors with three bladed propellers arranged in a co-axial tractor-pusher configuration. The UAS is constructed of foam fuselage parts attached to a central carbon fiber frame and plastic/composite wings and tail section. The UAS dimensions are: Length: 6 ft 2 in; Wingspan: 10 ft 10 in; Height: 2 ft.

Once airborne the UAS follows a preplanned route at or below 400 feet AGL. The pre-planned route is optimized to avoid terrain and object obstructions, areas of high aircraft traffic, areas where people may gather in large numbers such as highways, parks and schools.

At the delivery site, the UAS descends in an orbit to an altitude of no lower than 60 feet AGL to release the package within a predesignated drop zone. A package is carried internally in the aircraft's fuselage, and is dropped by opening a set of payload doors on the belly of the aircraft. The package is only dropped at predesignated drop zones that have been specially selected to ensure sufficient clearance to accommodate a descent approach by the aircraft to no lower than 60 feet AGL, and adequate isolation to safely accommodate package delivery by parachute. The package falls under a small parachute, which limits terminal velocity.

After the delivery, the UAS ascends to its cruise altitude and follows a preplanned route back to the launch and recovery site.

On returning to the recovery site, the aircraft is recovered via an automated capture line.

Once the tail hook on the UAS is engaged, the UAS is decelerated in midair via a controlled line payout system and then lowered down to a height at which a team member can remove the UAS from the capture line.

The UAS operator proposes to conduct deliveries from its launch and recovery location to vetted Delivery Sites such as medical centers, health facilities, private homes, and consumer product facilities. The proposed operation would be capable of delivering during daylight hours when no adverse weather conditions are present.

Your assistance in helping us to determine if you foresee any affect to the NRI river segments in the operating area for this new form of package delivery is greatly appreciated.

Thank you!

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

Appendix H

Public Comments and FAA Responses

Appendix H. Public Comments and FAA Responses

Arkansas Historic Preservation Program, 1100 North St., Little Rock, AR 72201

The staff of the Arkansas Historic Preservation Program (AHPP) reviewed the draft environmental assessment for the above referenced undertaking in Benton and Carroll Counties, Arkansas. The proposed undertaking entails the operation of an Unmanned Aircraft System (UAS) for the purpose of delivering packages. No ground disturbance will take place and any visual and other disturbance in and around historic properties identified by the Federal Aviation Administration (FAA) will not meet the criteria defined in 36 CFR § 800.16(i).

The AHPP responded to the original submission for Section 106 Review on July 7, 2021 (AHPP Tracking Number 108161). The AHPP still concurs with the finding of no adverse effect to historic properties pursuant to 36 CFR § 800.5(b)(1) as a result of this undertaking. In addition, pursuant to 36 CFR § 800.5(a).1), "adverse effects may include reasonable foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative." The AHPP looks forward to consulting on subsequent UAS projects in Arkansas.

Tribes that have expressed an interest in the area include the Cherokee Nation, the Delaware Nation, the Osage Nation, the Shawnee Tribe, and the United Keetoowah Band of Cherokee Indians. We recommend consultation in accordance with 36 CFR § 800.2(c)(2).

FAA Response

Of the five tribes that have expressed interest, the FAA had previously contacted the Delaware Nation and the Osage Nation. The Tribal Directory Assessment Tool (TDAT) did not identify the Cherokee Nation, the Shawnee Tribe, and the United Keetoowah Band of Cherokee Indians during our review. The FAA will share a copy of the Final EA and FONSI/ROD with these tribes.

From David Lide, Arkansas Aviation

I am against Zipline as they have failed to answer my questions on how they will avoid hitting my drone when they are taking off or landing. My LZ is located beside a large Walmart store that will likely have their service. I shouldn't be required to stay on the ground just because they are located beside my LZ. This will cause an airspace conflict as it's already hard enough to look for real aircraft let alone a small drone in the same airspace. I am also against it as I am unsure how the drone will avoid flying over my real aircraft airport that I am working with the FAA on getting certified once completed and possibly having a tower that I private pay a controller to man. I personally have over 60 hours and have flown the combined distance of Arkansas to Mexico using my drone in different parts of Arkansas all within visual line of sight.

FAA Response

These comments raise concerns that are related to the safe operation of UAS and not specifically to the environmental categories examined in this EA. The FAA offers the following responses based on the safety concerns:

(1) How they will avoid hitting my drone when they are taking off or landing?

Response: Other individuals may currently fly drones in most locations in accordance with the FAA's drone operating rules under 14 CFR (Code of Federal Regulations) Part 107. In order for a drone operator to conduct package deliveries for compensation, they must meet the requirements and certification standards under 14 CFR Part 135. Certification under Part 135 means that an operator has proven to the FAA that they have implemented a wide range of safety measures such that the likelihood of a collision with other aircraft or structures is not expected to occur.

(2) How the drone will avoid flying over my real aircraft airport?

Response: The concerns are safety related and not environmental but the following explanation is provided. As contained in Zipline's GOM, routes will not operate within 3 NM of any public use, military runway or other landing area. For private, uncontrolled airport mitigations, routes will remain .50 NM or greater from remote control airfields. For private uncontrolled (Class G airspace) airports, Zips remain >= 1.7 NM and 40 degrees from either side of the runway centerline and >= 1.1 NM when parallel to the runway.

Ashley Wardlow, Interim President and CEO Greater Bentonville Area Chamber of Commerce

I write in support of the FAA's efforts to authorize Zipline's medical delivery operations from Pea Ridge, Arkansas. I am the Interim President and CEO of the Greater Bentonville Area Chamber of Commerce.

I have seen first-hand the excitement and value Zipline has brought to our community since visiting the Pea Ridge site last June.

Having Zipline in the Northwest Arkansas community is helping to attract innovation, advance the larger aviation community, and generate interest from students about pursuing STEM opportunities. I look forward to the start of commercial operations to bring greater access to medical products for patients throughout the region.

FAA Response

Comment noted.

John and Barbie Humphrey, 910 Todd Cr, Pea Ridge, AR

I write in support of the FAA's efforts to authorize Zipline's medical delivery operations from Pea Ridge, Arkansas. I am John Humphrey and have been a Zipline customer for about 6 months in the city of Pea Ridge.

Zipline has been an asset to our town and has brought both a great service and much pride to town. They have developed personal relationships with their customers throughout the community and have been extremely customer focused on creating a great service. I know much of what is holding them back from their growing operations is the FAA regulations.

I have seen first-hand the excitement and value Zipline has brought to our community. I've received dozens of deliveries so far and I'm looking forward to them being able to expand their service. Adding Rx service would be an important service not only just for my family but for the community as a whole. I could receive my wife's prescriptions without having to go to the store. Others in town....especially persons with disabilities or limitations in transportation could potentially use the service to get needed prescriptions without having to leave their homes.

Having Zipline in the Northwest Arkansas community is helping to attract innovation, advance the larger aviation community, and generate interest from students about pursuing STEM opportunities. I look forward to the start of commercial operations to bring greater access to medical products for patients throughout the region.

FAA Response

Comment noted.

Cameron Alexander, 760 Ray St., Pea Ridge, AR

I write in support of the FAA's efforts to authorize Zipline's medical delivery operations from Pea Ridge, Arkansas. I am Cameron Alexander, and I have lived in Pea Ridge for 4 years. Being a local from the NWA area, I have been astounded by the technological growth within the industry and was definitely excited when I began to see construction of the Zipline Tour begin last year. There have been many times that Zipline has helped our family when we forget grocery items for family get together and as they continue to expand their assortment of items my family would greatly benefit from the access to medical products.

I have seen first-hand the excitement and value Zipline has brought to our community. I was fortunate enough to become one of their customers early this year and to see the innovation Zipline has successfully implemented into our region brings me much joy. It is a joy to see Zipline's involvement within our little community and I love being able to tell others about them and the opportunities they have to grow their business.

Having Zipline in the Northwest Arkansas community is helping to attract innovation, advance the larger aviation community, and generate interest from students about pursuing STEM opportunities. I look forward to the start of commercial operations to bring greater access to medical products for patients throughout the region.

FAA Response

Comment noted.

Mayor Jackie Crabtree, City of Pea Ridge, P.O. Box 10, 975 Weston St., Pea Ridge, AR 72751

The city of Pea Ridge has worked closely with Zipline during the process of planning, permitting and building the structure, "The Nest".

There have been no issues with any aspect of the project with the city. To date we have not received any citizen complaints to the city about the drone activity.

I personally would highly recommend the approval of the Zipline Pea Ridge Draft EA.

FAA Response

Comment noted.

Appendix I

Acronyms and Abbreviations

Appendix I: Acronyms and Abbreviations

ACS - American Community Survey

AEDT - Aviation Environmental Design Tool

AGL - Above Ground Level

APE - Area of Potential Effects

BCC - Birds of Conservation Concern

BVLOS - Beyond Visual Line of Sight

CEQ - Council on Environmental Quality

CFR - Code of Federal Regulations

COA - Certificate of Waiver or Authorization

CWA - Clean Water Act

CZMP - Coastal Zone Management Plan

dB - Decibel

DNL - Day-Night Average Sound Level

DOT - Department of Transportation

EA - Environmental Assessment

EJ - Environmental Justice

EJSCREEN - Environmental Justice Screening and Mapping Tool

EO - Executive Order

EPA - Environmental Protection Agency

ESA - Endangered Species Act

EXPN - Experimental Population, Non-Essential Species

FAA - Federal Aviation Administration

FEMA - Federal Emergency Management Agency

FHWA - Federal Highway Administration

FONSI - Finding of No Significant Impact

IPaC - Information for Planning and Consultation

IPP - UAS Integration Pilot Program

MDC - Missouri Department of Conservation

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

NPDES - National Pollutant Discharge Elimination System

NPS - National Park Service

NRHP - National Register of Historic Places

NRI - Nationwide Rivers Inventory

NTSB - National Transportation Safety Board

OpSpecs - Operations Specifications

ORVs - Outstandingly Remarkable Values

PSP - Partnership for Safety Program

ROD - Record of Decision

RPIC - Remote Pilot in Command

SHPO - State Historic Preservation Office(r)

The Plan - Arkansas Wildlife Action Plan

THPO - Tribal Historic Preservation Office(r)

U.S.C - United States Code

UA - Unmanned Aircraft

UAS - Unmanned Aircraft Systems

USFWS - United States Fish and Wildlife Service

WSRS - National Wild and Scenic Rivers System

Zipline - Zipline International Inc.