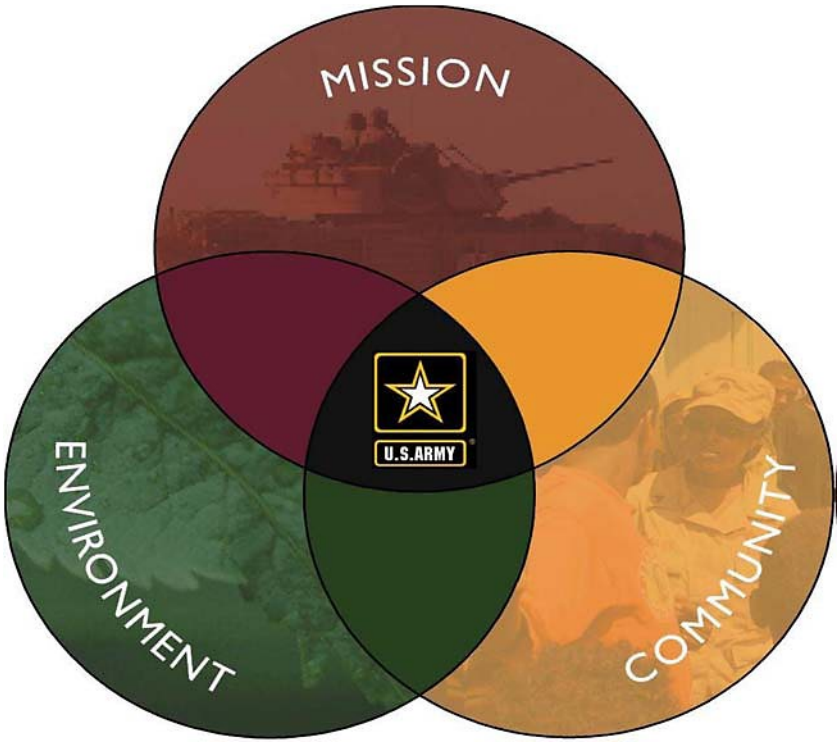
NOTICE TO THE PUBLIC

Fort Carson has prepared an Environmental Assessment (EA) and draft Finding of No Significant Impact (FNSI) for the Low-level Helicopter Flight Training Routes at Fort Carson, CO Low-level Helicopter Flight Training Routes. The purpose of the EA and draft FNSI is to document environmentally related findings and determine whether Fort Carson's Proposed Action to use four newly proposed low-level helicopter training routes between Fort Carson and Pinon Canyon Maneuver Site would have a significant impact on the natural and human environment. Comments on this action are invited and will be accepted for 30 days from the date this notice is published. A copy of the EA and draft FNSI may be reviewed at: https://home.army.mil/carson/index.php/Directorate/directorate-public-works/nepa-and-cultural-resources-documents

Written comments concerning this proposal should be directed to:
Fort Carson NEPA Program Manager
Directorate of Public Works, Environmental Division (AMIM-CRP-E)
1626 Evans St., Bldg. 1219,
Fort Carson, CO 80913.
Or submit by email to: usarmy.carson.imcom-central.list.dpw-ed-nepa@mail.mil
For media queries contact the Fort Carson Public Affairs Office Media Relations Office at (719) 526-7525.

Environmental Assessment for the Low-Level Helicopter Flight Training Routes at Fort Carson, CO
August 2024



Fort Carson

Directorate of Public Works, Environmental Division

Environmental Assessment for the
Low-level Helicopter Flight Training Routes at Fort Carson, CO
August 2024

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Fort Carson, Colorado

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Garrison Commander _____
Fort Carson, CO 809013 Date

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1 National Environmental Policy Act Overview

1.1 Introduction

This Environmental Assessment (EA) has been developed in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality's (CEQ) *Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act* published in 40 Code of Federal Regulations (CFR) Parts 1500-1508, and the Army's NEPA-implementing procedures published in 32 CFR Part 651, *Environmental Analysis of Army Actions (Army Regulation 200-2)*.

This EA facilitates the planning and decision-making by the Garrison Commander. It helps the Army, stakeholders, and the public understand the potential extent of environmental impacts of the Proposed Action and alternatives, and whether the effects are significant.

This EA incorporates by reference the analysis in the following environmental documents:

- Final Environmental Impact Statement for Implementation of Fort Carson Grow the Army Stationing Decisions (February 2009) and Record of Decision (March 2009)
- The Final Programmatic Environmental Impact Statement (PEIS) for the Realignment, Growth, and Stationing of Army Aviation Assets (February 2011) and the Record of Decision (March 2011)
- Fort Carson Combat Aviation Brigade Stationing Implementation Final Environmental Assessment and Finding of No Significant Impact (July 2012)
- Pinon Canyon Maneuver Site Training and Operations Final Environmental Impact Statement (March 2015) and Record of Decision (May 2015)

1.2 Public Involvement

A Notice of Availability (NOA) will be announced in local media, and the documents will be made available online at: https://home.army.mil/carson/index.php/Directorate/directorate-public-works/nepa-and-cultural-resources-documents.

This EA will be made available to the public for 45 days along with a Draft Finding of No Significant Impact (FNSI). Anyone wishing to provide comment on the Proposed Action, EA or Draft FNSI, or to request additional information, can provide comments in writing to the US Army Garrison Fort Carson NEPA Program Manager, Directorate of Public Works, Environmental Division, 1626 Evans Street, Building 1219, Fort Carson, Colorado 80913-4362 or submit comments via email to usarmy.carson.imcom-central.list.dpw-ed-nepa@mail.mil.

1.3 Agency and Tribal Consultation

In accordance with 32 CFR 651.36 regarding the involvement of other agencies and organizations, USAG Fort Carson has provided a copy of these documents to appropriate local, state, and federal government agencies and Native American tribes for their review and

comment. More information concerning other ongoing government agency and tribal consultation is set forth throughout this document.

1.4 Decision to be Made

A decision will be made on whether or not the Proposed Action will have significant impacts. As part of the decision-making process, the Garrison Commander will consider all relevant environmental information and stakeholder and public issues of concern raised as part of the NEPA process. If the process results in a FNSI, the Garrison Commander will document his or her decision on which alternative to implement, which would be signed no earlier than 45 days from the publication of the NOA of the Final EA/Draft FNSI (see Section 1.1 above for information on the NOA publications). Upon a determination that there are no significant impacts, the Army would sign the FNSI and carry out the decision.

2 Proposed Action and Alternatives

2.1 Purpose and Need

To maintain its military readiness posture, the 4th Combat Aviation Brigade (CAB) must conduct day and night vision device, low-level helicopter training operations. The EA and FNSI for the Fort Carson Combat Aviation Brigade Stationing Implementation (Fort Carson, 2012) includes a mitigation measure to continue to fly neighborly to lessen the noise aircraft produce when flying in developed areas. The mitigation is implemented through the use of slant distances over houses, buildings, people, livestock, and moving vehicles.

The current approved route, Route Hawk, is a loop that leaves the eastern portion of Fort Carson and loops to Pinon Canyon Maneuver Site (PCMS) and back to the southern border of Fort Carson (Figure 2). Development along some portions of Route Hawk have made it increasingly difficult to fly neighborly and meet training requirements. There is a need to modify the flight paths along Route Hawk to avoid newly developed areas. There is also a need for a diversity of low-level helicopter training routes to diffuse the impact and provide options for training when, in order to implement fly neighborly and meet training requirements, an area must be avoided for a period of time.

2.2 Proposed Action

The training routes are established for the purpose of low-level helicopter navigation training during day and night time with Night Vision Devices (NVD). Low-level helicopter training occurs between 100 feet (ft) above ground level (AGL) to 300 ft AGL at a speed in excess of 100 knots (115 miles per hour). Low speed flying, hovering or landing are not conducted during low-level helicopter training. The CAB proposes to establish the following low-level helicopter training routes between Fort Carson and PCMS: Gambler, Comanche, Mustang, and Saber (Figure 1).

These low-level helicopter training routes will generally be used by the CAB for helicopter pilot certification, and occasionally used for mission-related training activities. Low-level helicopter

training typically includes two to three helicopters flying in formation. During mission-related training exercises, flight formations may include five to six helicopters. Nap-of-the-earth flying is not authorized on these routes; it is only conducted within the jurisdictional boundaries of Fort Carson and PCMS. No weapons or lasers would be deployed during training flights.

The low-level aviation training would take place in Class G airspace and does not require any use of private lands along the routes. Class G airspace is defined by the Federal Aviation Administration (FAA) as uncontrolled airspace. It is the airspace that is not part of airspace designated as Classes A, B, C, D, or E. The helicopters do take off and land at Butts Army Heliport at Fort Carson. However, the low-level helicopter training does not start until they are off of Fort Carson for various reasons, including populated areas adjacent to Fort Carson and the airspace regulations around Butts Army Heliport.

The eastern leg of Route Hawk is the same as Route Mustang, with a few modifications to improve the training value of the route, while minimizing impacts to residences in the area. Route Mustang has been shifted to the east between where it crosses State Highway 96 and State Highway 10 by 0.25 miles. There is a similar shift to the east as Route Mustang approaches PCMS. Route Gambler is substantially similar to the west leg of Route Hawk. Route Gambler is shifted about 1 mile to the east compared to Route Hawk as it leaves PCMS. The two routes become the same north of State Highway 10 and remain that way until reentering Fort Carson near Gate 16.

These low-level aviation training routes will generally be used by the 4CAB for helicopter pilot certification, and occasionally used for mission-related training activities. Low-level aviation training typically includes two to three helicopters flying in formation. During mission-related training exercises, flight formations may include five to six helicopters. Frequency of training is estimated 1 to 2 times per week, with increased training occurring during exercises held at PCMS. These PCMS exercises occur approximately 5 times a year and last for 1 week. Nap-of-the-earth flying is not authorized on these training routes; it is only conducted within the jurisdictional boundaries of Fort Carson and PCMS.

2.3 No Action Alternative

The no action alternative would continue the use of Route Hawk as the only low-level helicopter training route between Fort Carson and PCMS, as described in *Fort Carson Combat Aviation Brigade Stationing Implementation Final Environmental Assessment and Finding of No Significant Impact (July 2012)* and other related NEPA documents (Summaries in Appendix B). The description is summarized below. (Figure 2)

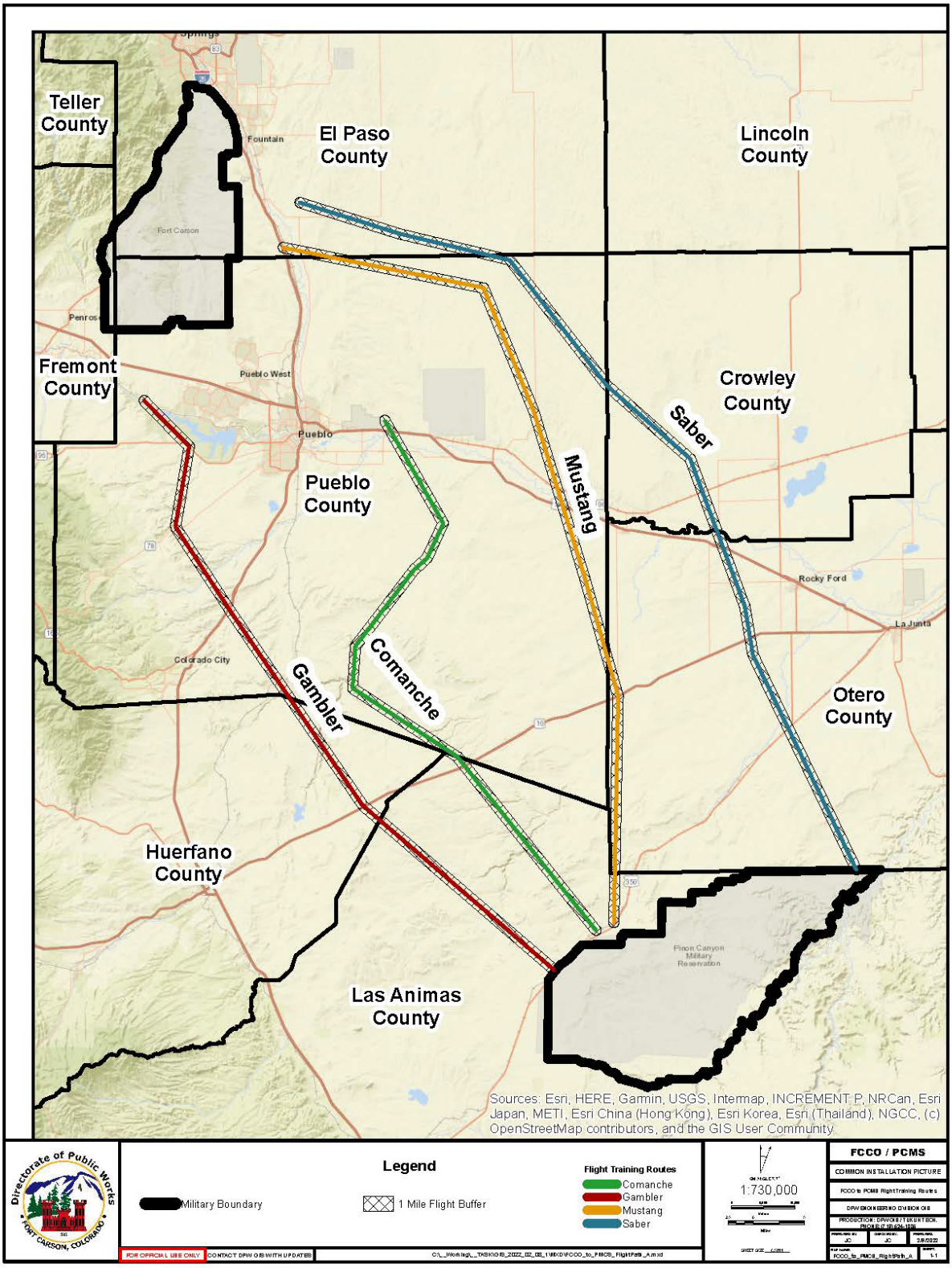


Figure 1: Map of Proposed New Low-Level Helicopter Training Routes between Fort Carson and Pinon Canyon Maneuver Site.

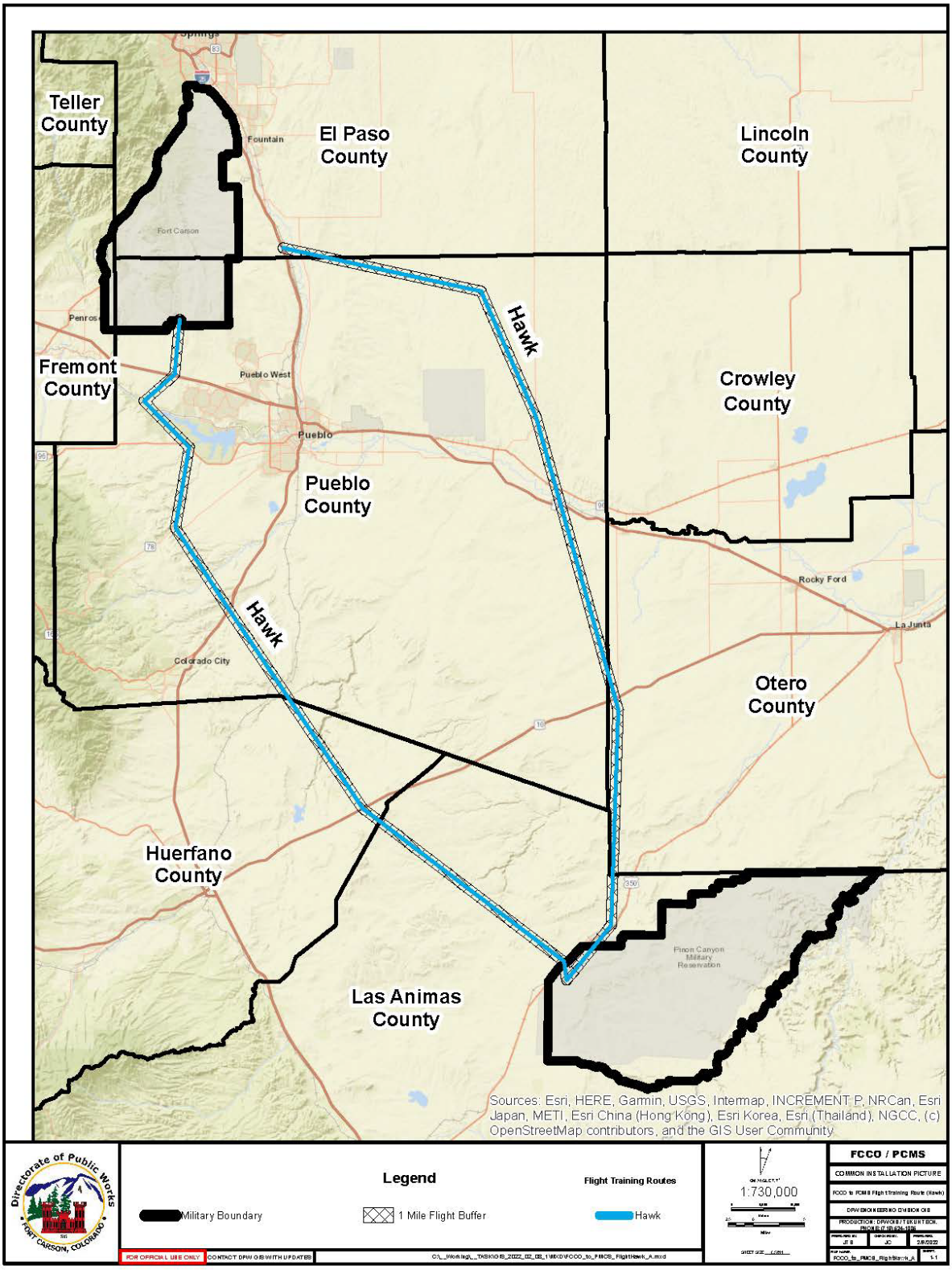


Figure 2: Map of Route Hawk between Fort Carson and Pinon Canyon Maneuver Site.

2.4 Regulations Common to All Alternatives

The CAB must abide by federal, Army, and Fort Carson regulations that govern aviation flight. The Federal Aviation Regulations, 14 CFR 91, establish minimum safe altitudes for aircraft. The minimum safe altitude over cities, towns, settlements, or open-air assemblies of people is 1,000 ft above the highest obstacle within a 2,000-ft radius of the aircraft. Over all other areas, the minimum safe altitude is 500 ft AGL. Aircraft must maintain a 500-ft distance from buildings, structures, vehicles, vessels, and people. However, helicopters are authorized to operate below these minimums, as long as flying is conducted without hazard to persons or property on the surface.

Routes Hawk, Gambler, Comanche, Mustang, and Saber are located within Class G airspace. Within Class G airspace, aircraft are allowed to operate at any altitude, so long as there is no hazard to persons or property on the surface. The routes are primarily flown bi-directionally but become one way once an aircraft is established on the route. The minimum altitude is 100 ft AGL with a ceiling of 300 ft AGL, unless restricted due to hazards, such as towers, wind farms, and wires along the routes.

When entering PCMS, the minimum altitude is 500 ft AGL. On the return flight to Fort Carson, rotary-wing aircraft exit PCMS at an altitude of 500 ft AGL but return to the minimum altitude of 100 ft AGL with a ceiling of 300 ft AGL. Fort Carson has a noise abatement policy for low-level helicopter training routes that requires aircraft to avoid all houses, buildings, people, livestock, and moving vehicles by a minimum slant range of ½ nautical miles (0.58 statute miles). The minimum altitude for aviation training over the Santa Fe Trail on Routes Gambler, Comanche, Mustang and Saber will be 1,000 feet AGL. This requirement will be documented in the Combat Aviation Brigade's Aviation Procedures Guide.

2.5 Connected Actions

Connected actions must be considered in the scope of the Proposed Action. Connected actions are actions that are automatically triggered by the Proposed Action, actions that cannot proceed without the Proposed Action or actions that are interdependent to the Proposed Action (32 CFR 651.51 (a)).

The CAB units are employed in support of ground maneuvers by other Brigade Combat Teams (BCTs) as a part of combined arms team training. The CAB trains regularly with BCTs, at Fort Carson and PCMS, prior to deploying in support of operations. Such training is termed "air-ground integration training." Air-ground integration training with CAB units and ground units allows each type of unit to maneuver more effectively with the other, understanding key limitations and requirements, while promoting increased training readiness and effectiveness. Large-scale battalion and brigade maneuver training events that conduct air-ground integration operations are often the capstone training exercise that tests and certifies units for operational deployments abroad.

The aircraft will take off and land at Butts Army Heliport (BAHP) on Fort Carson and designated landing zones at PCMS. Refueling and maintenance will occur at assigned facilities at Fort Carson. A summary of the effects analysis findings can be found in Appendix A of this EA.

2.6 Screening Criteria for Alternatives

Screening criteria were used to assess whether an alternative was "reasonable" and would be carried forward for evaluation in this EA. The screening criteria are based upon balancing training requirements with sustainment of the land, maximizing troop readiness, and supporting Soldier and Family quality of life at Fort Carson. The Army established the following screening criteria to identify the range of potential alternatives to meet the purpose and need. The low-level helicopter training must be:

- Sized for realistic training
- Focused on training time, not commuting
- Providing a diversity of routes and training scenarios
- Providing available routes for training without airspace conflict
- A reasonable replication of the low-level flight required for combat training
- Performed as low as 100 Feet AGL

2.7 Alternatives Considered but Dismissed from Analysis

The alternative to use simulated flight training only was considered but dismissed from detailed study. This is an alternative that would stop all low-level helicopter training routes between Fort Carson and PCMS. There would be no environmental effects as a result of this alternative. This alternative would not allow for the realism needed to challenge the crew and provide for the team building benefits of real-life training. It does not provide a reasonable replication of the low-level helicopter flight required for combat training.

3 Environmental Consequences of the Proposed Action

3.1 Introduction

For analysis, relevant resources have been categorized to enable a managed and systematic approach; a region of influence (ROI) is identified for each resource.

The ROI for effects from the noise of the helicopters flying between 100 feet AGL and 500 feet AGL is 1 mile from the center of the flight path or a total of 2 miles wide. This distance was determined using the noise information provided in the 2011 noise report (USAPHC, 2011) in Appendix A of the EA and FNSI for the Fort Carson Combat Aviation Brigade Stationing Implementation[1] (Fort Carson, 2012). The helicopters stationed at Fort Carson have a maximum noise level of 92 dBA at 200 feet slant distance. This noise level is 68 dBA at 2500 feet slant distance. At that noise level, less than 1% of the population would be annoyed by the noise level, according to findings by Rylander in 1974 and 1988 (details in Appendix A of EA and FNSI for the Fort Carson Combat Aviation Brigade Stationing Implementation[1] (Fort Carson, 2012)). This is the average noise level between normal speech and a vacuum cleaner. This is a noise level that has negligible effects (Figure 3).

[1] https://home.army.mil/carson/application/files/1016/4934/5665/fort-carson-final-ea-fnsi-cab.pdf

The Affected Environment analysis below includes relevant trends, on-going actions and future projects that could contribute to the incremental or cumulative effects of the Proposed Action (40 CFR 1508.1(g)(3)). The environmental effects analysis includes these elements, along with the direct and indirect effects in the final finding of effects.

The analysis for each resource considers numerous factors when determining impact conclusions. Significance thresholds are defined for each resource to determine whether identified impacts would significantly affect the human environment. The analysis considers the cumulative effect of on-going, reasonably foreseeable actions combine with the Proposed Action or Alternatives. The effects analysis will consider the effects of the trends and projects that may occur at the same time and place as the Proposed Action or Alternatives. Quantitative and qualitative analyses have been used to determine if a threshold would be exceeded. Based on the results of these analyses, this EA identifies if a potential impact would be adverse or beneficial and characterizes the severity as one of the following:

- Negligible – An environmental impact could occur, but the impact might not be perceptible.
- Minor – A perceptible environmental impact that would clearly not be significant.
- Moderate / Less than Significant – An environmental impact could occur, is readily detectable, but is clearly less than significant. Following standard procedures, best management practices (BMPs), or applying precautionary measures to minimize adverse impacts may be required. Moderate / less than significant adverse impacts would not exceed limits of applicable local, state, or federal regulations.
- Significant but Mitigatable – A significant impact is anticipated, but the Army can implement management actions or other mitigation measures to reduce the adverse impacts to less than significant.
- Significant – An environmental impact which, given the context and intensity, violates or exceeds regulatory or policy standards, would substantially alter the function or character of the resource, or otherwise meet the identified threshold.

Mitigation measures are environmental protection measures that would, per 32 C.F.R. § 651.15(a) definitions, avoid, minimize, rectify, reduce, eliminate, or compensate for the adverse impact of the Proposed Action. Mitigation measures considered, if any, are identified within the environmental consequences section for each resource element and summarized in Section 5.1.

BMPs and standing operating procedures (SOPs) are implemented regardless of the level of impacts. They are generic standard practices or actions taken under an existing environmental program that reduce, minimize or avoid impacts to natural and cultural resources.

Table 1: Need for analysis by resource elements.

Resource Elements	Region of Influence	Threshold of Significance	Dismissed from Further Analysis?	Rational for Analyzing Further or Not
Air Quality and Greenhouse Gases (GHG)	Air Quality Control Region	An impact to air quality would be considered significant if the Proposed Action were to generate emissions which: • Did not meet Clean Air Act conformity determination requirements to conform with the State Implementation Plan • Substantially increase GHG emissions; or • Contribute to a violation of any federal, state, or local air regulation.	Yes	There is no change in the number of aircraft assigned to Fort Carson. There will be no change in the amount of training that will take place under either Alternative, therefore there will not be any change in emissions from those described in the environmental documents incorporated by reference in Section 1.1.
Biological Resources	Biological resources within 1 mile on either side of the low-level helicopter flight route	Impacts to biological resources would be considered significant if: • Long-term loss of impairment of a substantial portion of local habitat, • Loss of population of a species, • Unpermitted or unlawful “take” of Endangered Species Act protected species, or species protected under the Bald	No	The noise and visual impacts of the low-level helicopter training may impact wildlife species by inducing flushing or avoidance behaviors that could reduce reproductivity and survival.

Resource Elements	Region of Influence	Threshold of Significance	Dismissed from Further Analysis?	Rational for Analyzing Further or Not
		and Golden Eagle Protection Act or the Migratory Bird Treaty Act • Prevention of attainment of State Wildlife Action Plan goals.		
Water Resources	Watersheds, state-designated stream segments, and groundwater aquifers associated with Fort Carson. U.S. Army Corps of Engineers jurisdictional "waters of the U.S." and wetland resources	Impacts to water quality would be significant if: • Results in an excess sediment load in Fort Carson waters affecting impaired resources, • Results in unpermitted direct effects to waters of the U.S., • Substantially affect surface water drainage or stormwater runoff, • Substantially affect groundwater quantity or quality, or • Does not comply with policies, regulations and permit related to wetland conservation and protection	Yes	No water use would be required and no surface water impacts would occur as a result of either Alternative.
Geology and Soil Resources	Geology and soil resources within the	Impacts on geology, topography, and soil resources would be considered significant if:	Yes	All impacts are related to actions in the air due to aircraft training and no ground disturbance would occur.

Resource Elements	Region of Influence	Threshold of Significance	Dismissed from Further Analysis?	Rational for Analyzing Further or Not
	cantonment, range, and maneuver training areas	• The landscape could not be sustained for military training over a wide area, or • Excessive soil losses were to impair vegetation growth		
Cultural Resources	Cultural resources 1 mile on either side of the center of the low-level helicopter flight route	Impacts to cultural resources would be considered significant if they cause direct or indirect alteration of the characteristics that qualify a property for inclusion in the National Register of Historic Places (NRHP). These may include physical destruction, damage, alteration, removal, changes to or character of the setting, neglect causing deterioration, and transfer, lease or sale. The effects are also considered significant if the Section 106 process is not followed.	No	The noise and visual impacts of the low-level helicopter training may impact cultural resources by noise induced vibrations or perceived changes in the character of setting from the increase in intermittent noise and visual observation of the helicopters during flight.
Quality of Life	Communities within 1 mile on either side of the center of the low-level helicopter flight route	Impacts to Quality of Life would be considered significant if: • A high proportion of the community will be annoyed • Health of the community is affected • Disproportionate adverse economic, social, or health	No	Effects from changes to noise levels could have an effect on the quality of life of individuals that live and work in the ROI.

Resource Elements	Region of Influence	Threshold of Significance	Dismissed from Further Analysis?	Rational for Analyzing Further or Not
		impacts on minority or low-income populations • Substantially disproportionate health or safety risk to children • Risk to health or safety		
Socio-economics	Socio-economic and environmental justice factors within the affected counties	Impacts to socio-economics and environmental justice would be considered significant if: • Substantial changes to the sales volume, income, employment or population • High risk of loss of livestock • Substantial changes to the value of private property	No	Impacts on community socio-economics and communities with environmental justice concerns from the training will be assessed in detail.
Public Land Use and Recreation	Public lands within 1 mile on either side of the center of the low-level helicopter flight route	Impacts to land use would be considered significant if: • The goals in the existing natural resource or land management plans for federal and state lands cannot be attained • A change in the character of the landscape makes a high proportion of recreationists annoyed	No	The noise and visual impacts of the low-level helicopter training may impact designated land use on state and federal lands, such as grazing and recreation.

Resource Elements	Region of Influence	Threshold of Significance	Dismissed from Further Analysis?	Rational for Analyzing Further or Not
		• A change in the character of the Santa Fe Trail that is not compatible with the goals in the National Park Service's Strategic Plan for the trail • Use of the developed recreation areas is terminated due to effects of proposed action		
Traffic and Transportation	Public roadways and key access points within and near Fort Carson and roadways within the Installation boundary	Impacts to traffic and transportation would be considered significant if the activities: • Substantially degrade traffic flow during peak hours, or • Substantially exceed road capacity and design	Yes	All actions would occur in airspace and no interactions with or disturbance to traffic would occur.
Airspace	Class G Airspace within the low-level helicopter flight route	An impact to airspace would be considered significant if: • Proposed Action violates Federal Aviation Administration (FAA) safety regulations or causes a substantial infringement of private or commercial flights	Yes	There is no change to the designated airspace or how it would be used. Safety policies contained in Fort Carson Regulation 95-1 are more stringent than the FAA requirements and will be implemented to avoid any violation of FAA regulations.

Resource Elements	Region of Influence	Threshold of Significance	Dismissed from Further Analysis?	Rational for Analyzing Further or Not
Facilities, Energy Demand and Generation, and Utilities	Utility facilities within Fort Carson and in the immediate surrounding communities and counties	Impacts to facilities, energy demand and generation, and utilities would be considered significant if the Proposed Action were to cause an impairment of the utility service to Fort Carson, local communities, homes or businesses.	Yes	No additional energy requirements are needed and no utilities would be affected by either Alternative.
Hazardous Materials	At Fort Carson and within 1 mile on either side of the center of the low-level helicopter flight route	Impacts to hazardous materials and hazardous waste would be considered significant if substantial additional risk to human health or safety would be attributed to the Proposed Action. This includes direct human exposure.	Yes	There would be no increased risk of release of or generation of hazardous materials compared to those disclosed in the 2012 CAB EA.

3.2 Noise Analysis

The general background noise environment over the open desert and rural communities of southern Colorado is relatively quiet, estimated as 35 dBA (Miller 2002), with sounds generated primarily by wind. Populated areas of cities and towns would have a background noise environment dominated by vehicle highway noise and general human urban activities.

3.2.1 Methods

Noise is generally described as unwanted sound, which can be based either on objective effects (such as, hearing loss or damage to structures) or subjective judgments (such as, community annoyance). Sound is usually represented on a logarithmic scale with a unit called the decibel (dB). Sound on the decibel scale is referred to as sound level. The threshold of human hearing is approximately 0 dB, and the threshold of discomfort or pain is approximately 120 dB.

Noise levels occurring at night generally produce a greater annoyance level than do the same levels occurring during the day. An A-weighted decibel (dBA) is a measure of noise at a given, maximum level or constant state level louder than the same level of intrusive noise during the day, at least in terms of its potential for causing community annoyance. It is generally agreed that people perceive A-weighted intrusive noise at night as being 10 dBA louder than the same level of intrusive noise during the day. This perception is largely because background environmental sound levels at night in most areas are also approximately 10 dBA lower than those during the day. Because noise is measured logarithmically, two identical noise sources at the same point do not double the noise level emitted from that point. For example, a helicopter flying over a point may emit a noise level of 80 dBA, but a second helicopter flying alongside the first would only add about 3 dBA to the overall resulting noise level (Wyle 2017, Baldwin 2015).

Noise levels are computed over a 24-hour period and adjusted for nighttime annoyances to produce the day-night average sound level (DNL). DNL is the community noise metric recommended by the US Environmental Protection Agency (EPA) and has been adopted by most federal agencies (EPA 1974). DNL of 65 dBA is the level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities like construction. Noise tends to be more intrusive at night than during the day. This effect is accounted for by applying a 10 dB penalty to events that occur after 10 pm and before 7 am. Applying this penalty to the noise level calculations results in the day-night average sound level or the DNL.

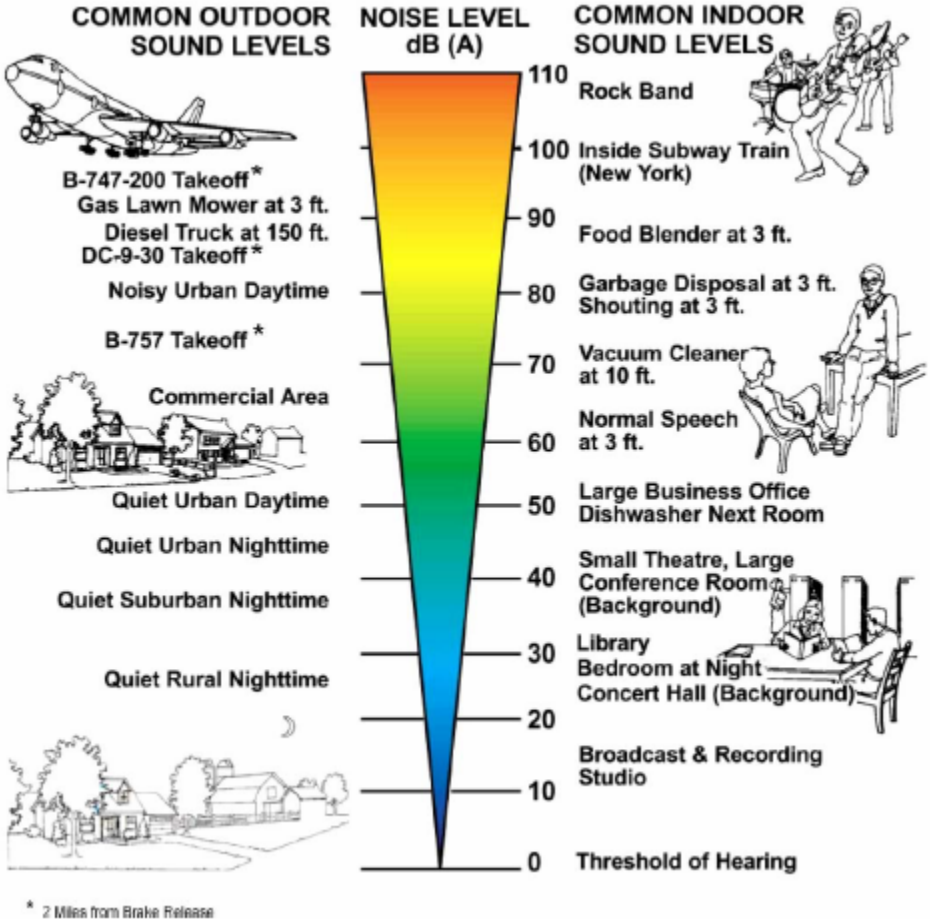
Acceptable DNL noise levels have been established by the Army for aviation noise in noise zones near military airports (AR 200-1). For noise impacts on land use, dB DNL noise levels are as follows:

> **Noise Zone I** – Less than 65 dBA is considered acceptable for normal uses, including residential, schools, and hospitals.
>
> **Noise Zone II** – 65 dB to 75 dBA. This zone is considered unacceptable for most uses; however, annoyance from aircraft noise would be more severe for residential areas, schools, and hospitals, and barriers or special construction would be needed for reasonably acceptable indoor use.

Noise Zone III – Greater than 75 dBA. This zone would be considered unacceptable for most uses, and barriers or special construction costs would be prohibitively expensive and would not totally eliminate the noise annoyance indoors.

For helicopter noise, the effects are highly variable, depending on the speed of the helicopter, the altitude AGL, climatic conditions, and the weight of the helicopter. Impacts on civilians are usually measured by the percentage of the population that is annoyed by a single flyover (U.S. Army Public Health Command [USAPHC] 2011). A flyover consists of the passing of an aircraft overhead or to the side of a point on the ground measured in distance of the aircraft from that point.

To simulate the noise effects from an aircraft flyover, the sound exposure level (SEL) is most often used. This sound metric is the logarithmic measure of A-weighted sound pressure level squared and integrated over a specific time period, usually 1 second, and is measured in dBA. This takes into account the gradually increasing sound level as the aircraft approaches, the maximum sound level when it is overhead, and the gradually decreasing sound level as the aircraft departs to approximate the total sound energy of the event (Harris et al. 2017, Bernard 2017).



Source: US Department of Transportation, FAA.

Figure 3: Common outdoor and indoor sound levels

3.2.2 Results

The USAPHC conducted an assessment of Army operational noise effects on nearby populated areas at and around Fort Carson, Colorado (USAPHC 2011). The noise level for helicopter overflights would be less than 68 dBA at 2500 feet slant distance, which is required over houses, buildings, people, livestock, and moving vehicles per the fly neighborly best management practices described in Section 2.4 (Table 2). This is on the lower end for noise levels in Noise Zone II described in Section 3.2.1. The effects of this transient elevated noise level on wildlife, cultural resources, livestock, quality of life and recreation are described below.

Table 2: Maximum Noise Level of Helicopters Stationed at Fort Carson in dBA.

Slant Distance (feet)	AH-64	CH-47	UH-60
200	92	92	88
500	83	84	80
1,000	77	78	73
1,500	73	74	69
2,000	70	71	66
2,500	67	68	63

DNL is the community noise metric recommended by the EPA (EPA 1974) and has been adopted by most federal agencies (FICON 1992). It has been well established that DNL correlates well with long- term community response to noise (Schultz 1978, Finegold et al. 1994). DNL accounts for the total, or cumulative, noise impact at a given location, and for this reason is often referred to as a “cumulative” metric.

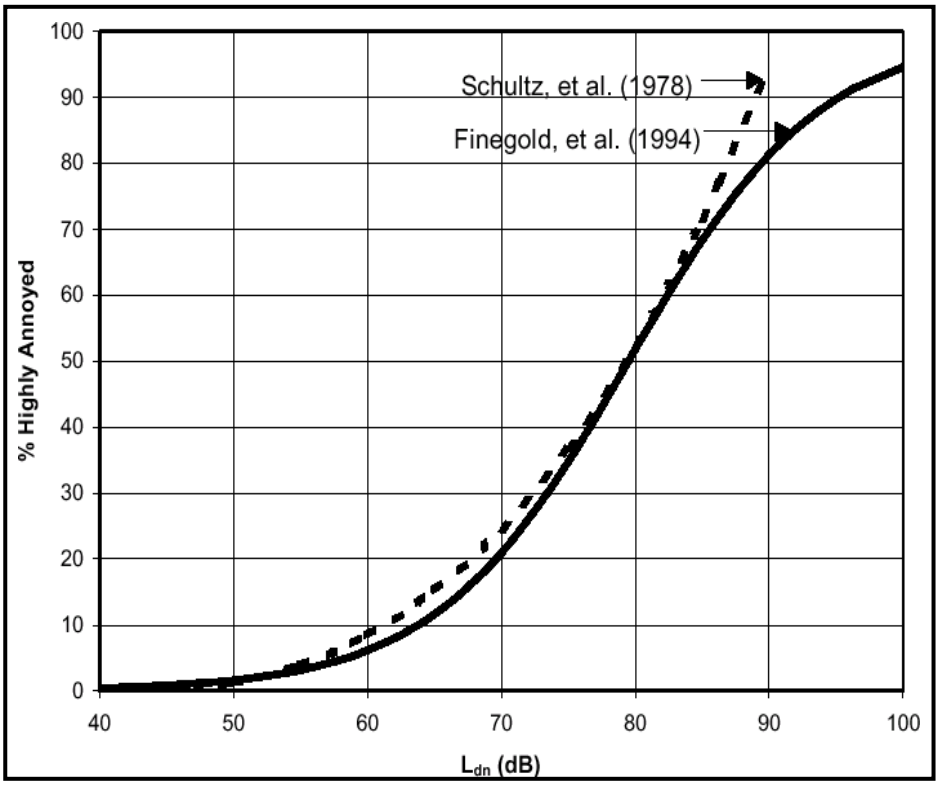


Figure 4. Response of Communities to Noise; Comparison of Original (Schultz 1978) and Current (Finegold et al. 1994) Curve Fits

Table 3: Projected DNL by distance from noise receptor.

NUMBER OF DAILY FLIGHTS	AH-64 100' AGL	AH-64 500' AGL	AH-64 1000' AGL	CH-47 500' AGL	CH-47 1000' AGL	UH-60 100' AGL	UH-60 500' AGL	UH-60 1000' AGL
1	51.1	40.7	35.9	43	38.4	48.3	38.4	33.1
2	54.1	43.7	38.9	46	41.4	51.3	41.4	36.1
4	57.1	46.7	41.9	49	44.4	54.3	44.4	39.1
8	60.1	49.7	44.9	52	47.4	57.3	47.4	42.1

3.3 Biological Resources

3.3.1 Affected Environment

IPaC is an overview tool managed by the US Fish and Wildlife Service (USFWS) and was used to identify the potential threatened or endangered species in the ROI. The database indicated that the Canada lynx, gray wolf, black-footed ferret, New Mexico meadow jumping mouse, Preble's meadow jumping mouse, piping plover, eastern black rail, and the monarch butterfly may occur within the ROI for the low-level helicopter training routes.

The Canada Lynx have been affected by habitat fragmentation from large-scale commercial timber harvest, road construction, and energy development. CPW will continue to cooperate with USFSW to finalize the conservation plan for the Lynx and take action to conserve habitat where possible.

Wolves are extirpated from most of Colorado with the exception of a pack that started spending time in the northwest corner of Colorado (CPW 2015). The authority for managing wolves has recently been removed from the states and back to the USFWS. In a letter to the CPW, the USFWS acknowledged the need to balance the need for conservation of the endangered wolf species while minimizing adverse human-wolf interactions (CPW 2022).

Black-footed ferrets were thought to be extinct in the 1970s. In 1981, a remnant population of ferrets was discovered near Meeteetse, Wyoming. The Colorado State Legislature approved the reintroduction of ferrets into northwest Colorado in 2000. The conservation focus of the black footed ferret Management Plan (CPW 2019) are reintroduction and plague management. In November 2013, 55 ferrets were released on the Walker Ranch, Pueblo County, Colorado. The ranch is comprised of ~63,000 acres on the south border of Fort Carson.

New Mexico meadow jumping mouse populations are threatened by the fragmentation of habitat due to development and changes stream flow during storm events. The State Wildlife Action Plan (CPW 2015) finds that protection of known habitat from both human disturbance and increased natural changes, such as fire, is important to the continued persistence of this species in Colorado. The same challenges are faced by Preble's meadow jumping mouse. Conservation efforts in Colorado include protecting and improving existing habitat through conservation easements and habitat restoration (CPW 2015).

The piping plover population in Colorado is stable. Invasive plants such as tamarisk, dams, agriculture and recreational activities impact the wetland and stream channel habitat essential for the success of the species. Invasive species and dam managers in Colorado will take the species into consideration when taking action that could affect habitat.

The eastern black rail is a marsh and wetland bird that has been in decline over the past century entirely due to habitat loss. CPW recommends that native vegetation and natural streamflows from dammed streams be maintained where possible to improve habitat for the species. Existing habitat should be conserved where possible (CPW 2020).

The monarch butterfly is a Candidate Species under the Endangered Species Act (ESA). CPW highlights loss of habitat due to development, agriculture, and climate change as the main threats to the species in Colorado. The State Wildlife Action Plan (2015) recommends acquiring easements to minimize effects from crop conversion, maintaining habitat corridors, and reduce the use of herbicides as conservation actions to be implemented.

Colorado Parks and Wildlife (CPW) wildlife and habitat mapping[2] shows a bald eagle nesting and roosting area along the western end of the Pueblo Reservoir that intersects Gambler training route. CPW mapping[2] shows that there is pronghorn, elk, big horn sheep, mule deer habitat within the ROI of the training routes including summer range and some concentrated

population areas. The State Trust Lands that allow hunting access on a limited basis as well as Bureau of Land Management and Forest Service Lands that permit hunting within the ROI.

According to CPW, that while the population of big horn sheep is increasing in the ROI there are still challenges with habitat quality, predation, and recreation disturbance. The deer in the southeastern portion of the ROI have been decreasing primarily due to the increase in cougar predation and loss of habitat from development. Near Trinidad, the deer population has been increasing but are still affected by loss of habitat due to development. The elk population within the ROI have stayed relatively stable. The populations are challenged by loss of habitat due to development. Pronghorn numbers are on the rise in the eastern portions and declining on the west side of the ROI. The entire area is losing habitat due to development along the I-25 and Highway 50 corridors. (CPW 2020b)

3.3.2 Environmental Effects

3.3.3 Species Listed under the Endangered Species Act

Canada Lynx

According to CPW habitat mapping[2], there is no potential lynx habitat within the ROI of any of the flight paths. There would be no effect to the Canada lynx.

Gray Wolf

Gray wolves were extirpated in Colorado until 2019 when a pack started living in the northwest corner of the state. There is no evidence or data indicating that there are any wolves within the ROI. There would be no effect to the gray wolf.

Black Footed Ferret

The re-introduced population is on the Walker Ranch, which there is no low-level helicopter flight training proposed. The re-introduction program has been highly successful, so it is assumed for this analysis that there is a potential for the population to grow to areas affected by the training routes proposed. The effects to black-footed ferrets from low-level helicopter training flights would be minor. This is evidenced by the fact that helicopters are used regularly to perform aerial surveys of reintroduction sites to measure colony growth and success (USGS 2004).

Eastern Black Rail

The eastern black rail is a wetland dependent bird according to the USFWS (USFWS 2019). There are no wetlands or marshes identified in the National Wetlands Inventory within the ROIs of any of the routes. There would be no effect to the eastern black rail.

Monarch Butterfly

[2] CPW Interactive Wildlife Map. https://cpw.maps.arcgis.com/apps/instant/interactivelegend/index.html?appid=b3e1f4c17e98481c85f9683b02e91250

The monarch butterfly is a Candidate Species under the ESA and no consultation is needed under Section 7 of the ESA. The USFWS encourages agencies to take advantage of any opportunities to conserve the species. The primary drivers affecting the populations are loss of habitat due to the conversion of grasslands to agriculture, urban development, herbicide use, and logging activities. There would be no effect to the monarch butterfly.

New Mexico Meadow Jumping Mouse

CPW habitat mappings shows no habitat within the ROI of the routes. There would be no effect to the New Mexico meadow jumping mouse.

Preble's Meadow Jumping Mouse

The proposed routes overlap with the CPW mapped habitat within the city of Fountain. Helicopters will not be flying lower than 1000 feet in these areas because of restrictions for flying over populated areas. There would be no effect to the Preble's meadow jumping mouse.

Piping Plover

CPW habitat mapping shows piping plover breeding range and other habitat to be to the east of low-level helicopter routes. There would be no effect to the piping plover.

3.3.4 Big Game

Wild ungulates (such as mule deer, elk, and bighorn sheep) appear to be more sensitive to noise disturbance than domestic livestock (Manci et al. 1988; Weisenberger et al. 1996; Bleich et al. 1990, 1994; White et al. 1993). Behavioral reactions may be related to the history of exposure to such things as humans and aircraft. Behavioral responses can range from mild to severe. Mild responses include head raising, body shifting, or turning to orient toward the aircraft. Moderate responses to disturbance may be nervous behaviors, such as trotting a short distance.

It has been shown that exposure to low-altitude overflights can also result in increased heart rates in mule deer, elk, and bighorn sheep. Weisenberger et al. (1996) measured the heart rate responses of captive bighorn sheep (*Ovis canadensis*) and mule deer (*Odocoileus hemionus*) to simulated aircraft noise ranging from 92 to 112 dB. For both species, heart rates increased following the simulated aircraft noise, but returned to normal levels within 60–180 seconds. Behavioral responses were relatively rare, and the animals returned to normal behavior within four to five minutes. Furthermore, the animals exhibited decreased responses to increased exposure, suggesting habituation.

The noise levels during a low-level helicopter training flight would be less than 92 dBA if the helicopters were directly overhead of big game (Table 2). The effects would be minor and would be negligible with habituation in the long-term.

3.3.5 Raptors

There has been a concern that high-noise events (such as from a low-altitude aircraft overflight) may cause raptors to engage in escape or avoidance behaviors, such as flushing from perches or nests (Ellis et al. 1991). Concerns have been expressed that these activities could impose an

energy cost on the birds that, over the long term, could affect survival or growth. In addition, the birds may spend less time engaged in necessary activities like feeding, preening, or caring for their young because they spend time in noise- avoidance activity. However, the long-term significance of noise-related impacts is less clear. For these concerns to be borne out, disturbance would need to be frequent enough for the energy costs to be cumulatively substantial, and there would need to be a lack of habituation over time. Several studies on nesting raptors have indicated that birds become habituated to aircraft overflights and that long-term reproductive success is not affected by exposure to overflight (Grubb and King 1991; Ellis et al. 1991; Palmer et al. 2003; Andersen et al. 1989; Trimper et al. 1998).

In a literature review of raptor responses to aircraft overflight/noise, Manci et al. (1988) found that most raptors did not show a negative response to overflights. When negative responses were observed, they were predominantly associated with rotary-winged aircraft or jet aircraft that were repeatedly passing within 0.5 miles (0.8 kilometers) or less of a nest. Many raptor-aircraft studies have been conducted since then and several are reviewed below.

In Alaska, Palmer et al. (2003) found small differences in nest attendance and time-activity budgets between undisturbed nesting peregrine falcons (*Falco peregrinus*) and those that were overflown by military aircraft within 500 feet; however, the differences were not correlated with specific overflights, nor did they affect reproductive success. Furthermore, Palmer et al. did not observe a difference in nest provisioning rates between disturbed and undisturbed nests.

The low-level helicopter training flights along the training routes would have a moderate but less than significant effect on raptors on the short-term that would transition to a minor effect in the long-term with habituation.

3.3.6 Eagles

One study of wintering bald eagles observed that 47 percent flushed when approached closer than 984 feet (300 meters) with Army helicopters; however, few eagles flushed in response to helicopter traffic staying over 300 meters in the same areas (Stalmaster and Kaiser 1997). The National Bald Eagle Management Guidelines recommend aircraft avoid overflights within 1,000 feet of nests during the breeding season, and that aircraft corridors be located no closer than 1,000 feet vertical or horizontal distance from communal roost sites (USFWS 2007). This offset is less than is required for flight over buildings, people, livestock and moving vehicles, all of which are present in the vicinity of the known eagle nest at Pueblo State Park. The National Bald Eagle Management Guidelines will be followed for known bald eagle nests along the route, specifically the nesting site on the Arkansas River near Pueblo Reservoir. This mitigation will ensure that the effects to bald eagles are negligible.

In their guidelines for aerial surveys, USFWS (Pagel et al. 2010) summarized past studies by stating that most golden eagles respond to survey aircraft (fixed-wing and helicopters) by remaining on their nests and continuing to incubate or roost. Surveys take place generally as close as 10 to 20 meters from cliffs (including hovering less than 30 seconds if necessary to count eggs) and no farther than 200 meters from cliffs depending on safety (Pagel et al. 2010). Grubb et al. (2007) experimented with multiple exposures to two helicopter types and concluded that flights with a variety of approach distances (800, 400, 200, and 100 meters) had no effect

on golden eagle nesting success or productivity rates within the same year, or on rates of renewed nesting activity the following year, when compared to the corresponding figures for the larger population of non-manipulated nest sites (Grubb et al. 2007). These data suggest golden eagles are not sensitive to the presence or noise of helicopters at the aforementioned distances. The effect would be negligible on golden eagles.

3.3.1 Cumulative Effects

There would be no effect to species listed as endangered or threatened under the ESA. Therefore, there are no cumulative effects on these species.

Big game is actively managed by CPW primarily through hunting programs to meet their management goals. The Herd Management Plans (HMP) for all of the big game species shows that despite small increases or decreases in population from year to year, management goals are being met. The minor effects on individuals would not affect CPW's ability to meet the management goals set out by the HMPs.

The Proposed Action incorporates the USFWS management guidelines for bald eagles and will not cumulatively significantly affect bald eagles within the ROI. Golden eagles and other raptors are not sensitive to noise or other disturbance, so the effects of the Proposed Action would not be cumulatively significant.

3.4 Cultural Resources

3.4.1 Affected Environment

To identify historic properties within the area of potential effects (APEs), the Fort Carson Cultural Resources Manager reviewed data maintained by the Fort Carson Cultural Resources Program, as well as data provided by the Office of Archaeology and Historic Preservation (OAHP) in January 2017 in support of the Archaeological Context Mitigation Project and the OAHP's COMPASS database. In addition, the Santa Fe Trail Multiple Property Documentation Form (MPF), the technical report for the cultural resources survey of the Purgatoire River Region conducted by Colorado Preservation, Inc., specific site data provided by Otero County Commissioners, and spatial data provided by the Comanche National Grasslands were consulted. A total of 584 cultural resources have been recorded within the APEs. Of these, 60 are eligible for the National Register of Historic Places (NRHP); 137 are categorized as "needs data" sites; 1 was rejected from NRHP listing; and 386 are not eligible for inclusion in the NRHP.

3.4.1 Environmental Effects

A helicopter engineering study was conducted during the environmental analysis associated with the 2012 Environmental Assessment for the stationing of the CAB at Fort Carson. It concluded that the effects of the rotor wash will not increase wind speed above typical wind levels experienced within southeastern Colorado or cause ground disturbance during low-level helicopter training operations.

The effects on historical properties and cultural resources from aircraft have been studied. Many of the studies have been completed by the United States Air Force and are focused on jets and

other fixed winged aircraft. The effects are considered comparable with helicopters because they are all subsonic.

Because of the potential for increased fragility of structural components of historical buildings and other historical sites, helicopter noise may affect such sites more severely than newer, modern structures. Most scientific studies of the effects of noise and vibration on historic properties have considered potential impacts on standing architecture. For example, the FAA published a study of potential impacts resulting from vibrations caused by the noise of subsonic Concorde overflights on five historic properties, including a restored plantation house, a stone bridge and tollhouse, and other structures (Hershey, Kevala, and Burns 1975). This study analyzed the breakage probabilities of structural elements that might be considered susceptible to vibration, such as window glass, mortar, and plaster. The results indicated that, with the exception of some already cracked window glass, there was no practical risk of noise-induced vibration damage to any of these structures. The effects are assumed similar with helicopter overflights.

Some studies of the effects of overflights—both subsonic and supersonic—on archaeological structures and other types of sites also have been published. Battis examined the effects of low-altitude overflights of B-52, RF-4C, and A-7 aircraft on standing walls at Long House Ruin in northeastern Arizona (Battis 1988). The motion levels observed during all passes were well below a conservative threshold for vibration in ancient structures, a level of 1.3 millimeters per second, established by two previous studies. Battis concluded that vibration associated with aircraft overflights at speeds and altitudes similar to those measured in his study had/would have no significant damaging effect on Long House and similar sites.

Two Air Force-sponsored studies have included research into potential effects of supersonic overflight on “nonstructural” archaeology and unconventional structures. One study included historic buildings, prehistoric structures, water tanks, archaeological cave/shelter sites and rock art, and seismically sensitive areas such as avalanche and mud/rockslide areas (Sutherland, Brown, and Goerner 1990). That study compared overpressure associated with different types of aircraft in supersonic flight at different altitudes with failure or damage stress values for these types of sites. The authors concluded that overpressures generated by supersonic overflight were well below established damage thresholds. Subsonic aircraft such as helicopters—which were not included in this study—would be even less likely to cause damage.

Battis also completed a study that examined the potential for damage by sonic booms to rock shelter and petroglyph sites located within the Valentine MOA in Texas (Battis 1983). The Texas State Historic Preservation Office helped design and participated in this study, which involved taking measurements at a rock shelter site and at a field of petroglyphs-bearing boulders during supersonic overflights. The peak overpressure for booms generated during supersonic operations over the Valentine MOA was 5.2 psf. The lower limit (the least amount of pressure needed) for damaging rock was measured in the laboratory at 2.1 × 104 psf, 4,000 times the peak overpressure measured during the study. Air Force NEPA documents have examined the potential impacts on historic properties that might result from subsonic and supersonic overflights. In 1995, the Air Force published the Environmental Assessment for Continued Supersonic Operations in the Black Mountain Supersonic Corridor and the

Alpha/Precision Impact Range Area. Eligible and potentially eligible cultural resources in the area of potential effect include petroglyph and pictograph panels located on a variety of rock types, historic adobe and non-adobe structures with standing walls, and historic mines (which contain tunnels) and wells. The report concludes that supersonic low-altitude flights have occurred over these corridors for 25 years or more and have resulted in no significant impacts on cultural resources. The California SHPO agreed, and during National Historic Preservation Act Section 106 review of this undertaking, concurred with the Air Force's finding that continued supersonic overflights would have no effect on historic properties. The effects of the subsonic helicopters would be much less than what is expected from a subsonic boom, so it stands to reason that the effects from helicopters would have no effect on historical properties.

As noted above for the noise effects of noise-induced vibrations on normal structures, assessments of noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites.

All helicopters entering and exiting the PCMS must be at a minimum of 500 ft AGL; maintain a minimum altitude of 1,000 ft AGL over populated areas; and maintain a minimum distance of 500 ft from buildings, structures, vehicles, etc. Therefore, protected resources located within or near populated areas or those that contain buildings or structures will not be subjected to low-level helicopter training effects. Provided procedures and restrictions set forth in the Federal Aviation Regulations (14 CFR 91), Army Regulation 95-1, and Fort Carson noise abatement best management practices are followed, low-level helicopter training along these routes will not cause reasonably foreseen direct, indirect, or cumulative adverse effects to historic properties.

The evaluation and review by the Fort Carson Cultural Resources Manager has made the finding of *no adverse effect* to historic properties in accordance with Section 106 (36 CFR 800.5[b]) of the National Historic Preservation Act for the actions proposed for this undertaking.

3.4.2 Consultation Summary

On February 22, 2022, Fort Carson initiated consultation with the Colorado State Historic Preservation Officer (SHPO) and other consulting parties about the subject undertaking. The initial undertaking review packet included a complete project description, relevant aviation regulations, an identification of the APE, an assessment of effects to historic properties, a finding of effects, detailed maps of each flight route, and a table of protected resources in and around the APE. Fort Carson was unable to resolve disputes over the methods and findings with the Colorado SHPO. In accordance with 36 CFR § 800.4(d)(1)(ii), Fort Cason requested that the Advisory Council for Historic Preservation (ACHP) review the finding pursuant to paragraph (d)(1)iv)(A) through (d)(1)iv)(C) of 36 CFR § 800.4.

The ACHP provided feedback to Fort Carson on June 5, 2024, outlining its concurrence with the finding of *no adverse effect* to historical properties. The ACHP recommended that Fort Carson work to improve communications with the SHPO on complex undertakings and that Fort Carson considers implementing a monitoring plan to validate the assumptions in the effects analysis. A follow up letter from the ACHP on July 15, 2024 recommended additional communication on the undertaking and clarified some misunderstandings from the letter sent on June 5, 2024 (Appendix B).

The Fort Carson Garrison Commander issued a decision letter to ACHP and SHPO on August ##, 2024 (Appendix B). The decision included a monitoring plan to determine if the assumptions used in the analysis are valid (Appendix C).

3.4.1 Cumulative Effects

There is no adverse effect to the cultural resources within the ROI, therefore there is no cumulative effect.

3.5 Socio-economics and Quality of Life

3.5.1 Affected Environment

The proposed training routes include rural areas of El Paso, Pueblo, Crowley, Otero, Las Animas and Huerfano Counties in Colorado. Table 4 based on 2020 Census data (US Census Bureau 2020). This portion of the analysis when added to the previous analysis is intended to provide an overall effect to the working landscape that may be affected by the training along the proposed routes.

All of counties meet the Census Bureau's definition of rural areas (having less than 500 people per square mile). The routes are located in the more sparsely populated areas and do not go directly over cities or towns.

Table 4: 2020 Demographics of El Paso, Pueblo, Crowley, Otero, Las Animas and Huerfano Counties, Colorado.

County	Population	Population outside of Highly Populated Areas	Persons per Square Mile For County	Person per Square Mile outside of Highly Populated Areas	Poverty (percent)	Minority (percent)	Median Value of Home
El Paso	730,395	143,857	243	81	9	32	300,200*
Pueblo	167,412	22,794	59	10	15	49	164,600**
Crowley	5,922	4,280	7	5	48	47	79,400**
Otero	18,284	7,494	16	6	19	48	94,900**
Las Animas	14,555	6,479	3	1	17	47	151,100**
Huerfano	6,820	3,838	5	3	18	38	161,600**

**El Paso County. 2022.Your El Paso County Master Plan, El Paso County Colorado. https://planningdevelopment.elpasoco.com/#1510603950097-f5d985dc-35b2*

***Southern Colorado Economic Development District (SCEDD). 2021. Comprehensive Economic Development Strategy (CEDS). https://www.scedd.com/project/comprehensive-economic-development-strategy/*

Estimates of population outside of highly populated areas for El Paso County excluded the cities of Colorado Springs, Black Forest, Monument, Manitou Springs, Fountain, Fort Carson, and Security-Widefield. Estimates of population outside of highly populated areas for Pueblo County exclude the cities of Pueblo and Pueblo West. The estimates of population outside of highly populated areas for Crowley County exclude the population of Ordway. The estimates of populations outside of highly populated areas for Otero County exclude the cities of La Junta and Rocky Ford. The estimates of populations outside of highly populated areas for Las Animas and Huerfano Counties exclude the city of Trinidad and Walsenburg respectively.

Table 5: Miles of training route that is over each affected county.

County	Gambler (miles)	Comanche (miles)	Mustang (miles)	Saber (miles)	Total (miles)
El Paso	0	0	3	22	25
Pueblo	35	43	54	16	148
Crowley	0	0	0	18	18
Otero	0	0	20	35	55
Las Animas	23	22	7	0	52
Huerfano	13	0	0	0	13
Total	71	65	84	91	311

Table 6: Area (square miles) of airspace within the ROI for each affected county.

County	Gambler (square miles)	Comanche (square miles)	Mustang (square miles)	Saber (square miles)	Total (square miles)
El Paso	0	0	6	44	50
Pueblo	70	86	108	32	296
Crowley	0	0	0	36	36
Otero	0	0	40	70	110
Las Animas	46	44	17	0	104
Huerfano	26	0	0	0	26
Total	142	130	168	182	622

It is assumed that an individual could be directly affected if they live or work within the ROI. The training routes are above rural areas of the counties. The number of individuals that could be directly impacted by the training route use was estimated by multiplying the person per mile (outside of highly populated areas) by the square miles within the ROI for each county. This analysis results in between 0.5 to 3.6 percent of the population being potentially directly affected by the proposed action (Table 7).

Table 7: Average number of people likely living within ROI assuming even distribution of people

County	Estimated Population within ROI	Percent of County Population within ROI

El Paso	4,050	0.5
Pueblo	2960	1.8
Crowley	180	3.0
Otero	660	3.6
Las Animas	104	0.7
Huerfano	78	1.1

The general background noise environment in the ROI is relatively quiet, estimated as 35 dBA (Miller 2002), with sounds generated primarily by wind. Populated areas of cities and towns would have a background noise environment dominated by vehicle highway noise and general human urban activities.

Table 8: Farm demographics for Affected Counties.*

County	Number of Farms	Number of Cattle Farms	Average Size of Farm (acres)	Number of Head of Cattle	Estimated Market Value of Farm** ($1000)
El Paso	1,345	545	468	28,082	729
Pueblo	839	348	1,067	37,418	1,235
Crowley	246	140	1,969	72,158	1,482
Otero	444	217	1,548	75,253	1,584
Las Animas	549	310	3,272	41,560	2,096
Huerfano	437	211	1,331	17,144	1,369

*Data from the 2017 Census of Agriculture, US Department of Agriculture (USDA 2017)

**Estimated value of land, buildings, machinery, and products sold

El Paso County

El Paso County maintains a diverse economy with significant employers in a wide range of sectors and no single industry accounting for a majority of the County's employment base. The majority of El Paso County's job gains since 2010 were in four sectors: health care, accommodation and food services, and construction. The median household income is $71,517 and the median home value is $300,200.

The ROIs for the training routes are defined as rural in the El Paso County Master Plan (El Paso County 2022). Rural areas include agricultural lands which represent a valuable economic resource and allow for a unique lifestyle that should be preserved. The Master Plan highlights the importance of eco-tourism on the region. The focus of this tourism is west of the City of Colorado Springs including county, state and federal lands.

The current version of the Climate and Economic Justice tool, developed by the Council on Environmental Quality (CEQ 2022) identifies communities that are disadvantaged for the purposes of the initiatives created by Executive Order 14008 (Tackling the Climate Crisis at Home and Abroad) using census tracts, which are the smallest geographic unit for which

publicly-available and nationally-consistent datasets. These communities could be considered low-income and/or minority communities under Environmental Justice Executive Order 12898. A community is identified as disadvantaged if the data indicates that the area is at risk from climate or environmental indicators and are above the threshold for those living below poverty or education levels. None of the census tracks in El Paso County are identified as at risk according to the Climate and Economic Justice Screening Tool.

Pueblo County

The Southern Colorado Economic Development District (SCEDD) was formally established on February 16, 1968 under the Public Works and Economic Development Act of 1965. It includes Pueblo, Crowley, Otero, Las Animas, and Huerfano Counties in Colorado. The SCEDD serves as the framework for maintaining a current Comprehensive Economic Development Strategy (CEDS) (SCEDD 2021) for their service areas, and provides staff support and technical assistance to the member counties.

Workforce housing, economic diversification, critical infrastructure, water and wastewater projects, broadband development, and improving raw land to be suitable for industrial and commercial development are the top five Economic Strategies for this region to focus on over the next five years

The SCEDD 2021 Comprehensive Economic Development Strategy (CEDS) concentrates economic development in three areas: access to capital, broadband access and workforce housing. These three elements are described as critical regional economic prosperity drivers. Agriculture and Ranching goals include drought relief assistance, construction of USDA certified meat processing facilities, and development of networks to bring agricultural products to a larger market. There is also a focus on renewable energy, including solar and wind power generation and distribution.

The top industries in Pueblo County are health care, retail and education. The median wage is $48,199, and the median home value is $164,600. Lake Pueblo State Park is in Pueblo County and is one of the top two most visited state parks in Colorado. It includes a State Wildlife Area (SWA), one of several SWAs throughout the County.

The Pueblo County Comprehensive Plan outlines a goal to balance urban and agricultural land use by discouraging the subdivision of prime agricultural lands for residential use. It proposes the use of “right-to-farm” laws and promotes cluster development, instead of sprawling development. The focus area of urban and rural development is adjacent to the City of Pueblo. The Pueblo County Comprehensive Plan projects that the majority of the existing developable land in the Pueblo Region will remain sparsely populated and devoted to traditional ranching and farming. The County wants to promote natural and historic character and develop an aesthetic quality in the region. (Pueblo County 2020)

The Climate and Economic Justice Screening Tool identifies Pueblo County as disadvantaged. The county is above the thresholds for risk of loss of agricultural value due to natural disasters and high energy costs.

Crowley County

The primary industries in Crowley County are health care, agriculture, and education. The median wage is $43,184 and the median home value is $79,400. Projects proposed in the CEDS include broadband expansion, critical infrastructure improvement, affordable housing initiatives, and renewable energy projects. Plans for a large veterinarian clinic and a meat processing facility are also mentioned in the strategy. The Climate and Economic Justice Screening Tool identifies Crowley County as disadvantaged. The county is above thresholds for high energy cost and high unemployment rates.

Otero County

The primary industries in Otero County are health care, education, and public administration. The median wage is $40,494 and the median home value is $94,900. Projects proposed in the CEDS include broadband expansion, critical infrastructure improvement, affordable housing initiatives, and renewable energy projects. Plans for improvements and an addition to the La Junta Airport are included in the CEDS. The strategy also includes the potential for a new meat processing facility in the county. The Climate and Economic Justice Screening Tool identifies Otero County as disadvantaged. The county is at risk because of high energy cost and a high rate of heart disease.

Las Animas County

The primary industries in Las Animas County are health care, retail and food service. The median wage is $40,107 and the median home value is $151,100. Projects proposed in the CEDS include broadband expansion, critical infrastructure improvement, affordable housing initiatives, and renewable energy projects. Las Animas County proposed to improve access to BLM and State Lands for camping, recreations and off-highway vehicle use. Agriculture goals include the construction of a meat packing plant and increased access to rail transportation. The Climate and Economic Justice Screening Tool identifies Las Animas County as disadvantaged. The county is at risk because of high energy cost.

Huerfano County

The primary industries in Huerfano County are health care, retail, and agriculture (primarily cattle and hay/crop production). Agriculture is expected to have a decreased employment rate between 2021 and 2031. The median wage is $36,419 and the median home value is $161,600. Projects proposed in the CEDS include broadband expansion, railway enhancement, critical infrastructure improvements, affordable housing initiatives, and renewable energy projects. Agricultural projects include the construction of meat processing facilities, distribution network expansion, and invasive species control. The Climate and Economic Justice Screening Tool identifies Huerfano County as disadvantaged. The county is at risk because of high energy cost.

Home Value Trends

Colorado Association of Realtors tracks trends in home prices by county in Colorado. The median price of a single family home has increased 15.9 percent, 19.4 percent, 90.5 percent, and 32.0 percent in El Paso, Pueblo, Crowley and Otero Counties Respectively from 2021 prices. It has decreased by 37 percent and 7.3 percent in Las Animas and Huerfano Counties

from 2021 prices. The wide range in the changes between counties are proof of the unpredictability of housing costs and what extrinsic events affect them. (Colorado Association of Realtors 2022)

3.5.1 Environmental Effects

3.5.2 Annoyance

The primary effect of aircraft noise on exposed communities is annoyance. Noise annoyance is defined by the EPA as any negative subjective reaction on the part of an individual or group (EPA 1974). DNL of 65 dBA is a level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities like aviation which do cause noise. Areas exposed to DNL above 65 dB are generally not considered suitable for residential use. The second is DNL of 55 dB, which was identified by EPA as a level requisite to protect the public health and welfare with an adequate margin of safety (EPA 1974) which is essentially a level below which adverse impact is not expected. The third is DNL of 75 dB. This is the lowest level at which adverse health effects could be credible (EPA 1974). The very high annoyance levels correlated with DNL of 75 dB make such areas unsuitable for residential land use. Table 9 shows the relation between annoyance and DNL.

Table 9: Relation between annoyance and DNL (CHABA 1981)

DNL (dB)	% Highly Annoyed
45	0.83
50	1.66
55	3.31
60	6.48
65	12.29
70	22.10

Because the EPA Levels Document (EPA 1974) identified DNL of 55 dB as ". . . requisite to protect public health and welfare with an adequate margin of safety," it is commonly assumed that 55 dB should be adopted as a criterion for community noise analysis. From a noise exposure perspective, that would be an ideal selection. However, financial resources are generally not available to achieve that goal. Most agencies have identified DNL of 65 dB as a criterion which protects those most impacted by noise, and which can often be achieved on a practical basis (FICON 1992). This corresponds to about 12 percent of the exposed population being highly annoyed.

Although DNL of 65 dB is widely used as a benchmark for significant noise impact, and is often an acceptable compromise, it is not a statutory limit, and it is appropriate to consider other thresholds in particular cases. Local ordinances and regulations have been adopted by many municipal governments to prevent civilian development near military installations that would be incompatible with noise generated by military operations.

The helicopter noise is expected to range from 35.9 dB DNL to 47.4 dB DNL depending on the number of flights per day and the aircraft flying over at 1,000 feet (*Table 3*). This is an

overestimation of the noise experience by people in their homes or at their workplace because it is closer than the required slant distance in the Fort Carson aviation regulations. While utilizing training routes, aircraft avoid all houses, buildings, people, livestock, and moving vehicles by a minimum slant range of ½ nautical miles (0.58 statute miles). While using the training routes helicopters are required to maintain a ½ nautical mile slant distance from buildings, people, livestock, and moving vehicles.

This is below the EPA noise level where adverse impacts are not expected (EPA 1974). At these noise levels fewer than 2 percent of the population would be annoyed by the highest noise levels produced by the low-level helicopter training within the ROI and the effects are minor.

3.5.3 Sleep Disturbance

An analysis sponsored by the Air Force summarized 21 published studies concerning the effects of noise on sleep (Pearsons et al. 1989). The analysis concluded that a lack of reliable in-home studies, combined with large differences among the results from the various laboratory studies, did not permit development of an acceptably accurate assessment procedure. The noise events used in the laboratory studies and in contrived in-home studies were presented at much higher rates of occurrence than would normally be experienced. None of the laboratory studies were of sufficiently long duration to determine any effects of habituation, such as that which would occur under normal community conditions. An extensive study of sleep interference in people's own homes (Ollerhead et al. 1992) showed very little disturbance from aircraft noise.

There is some controversy associated with these studies, so a conservative approach should be taken in judging sleep interference. Based on older data, the EPA identified an indoor DNL of 45 dB as necessary to protect against sleep interference (EPA 1974). Assuming an outdoor-to-indoor noise level reduction of 20 dB for typical dwelling units, this corresponds to an outdoor DNL of 65 dB as minimizing sleep interference. This is consistent with Kryter's (1984) finding that indicates that an indoor SEL of 65 dB or lower should awaken less than 5 percent of those exposed.

The helicopter noise is expected to range from 35.9 dB DNL to 47.4 dB DNL depending on the number of flights per day and the aircraft flying over at 1,000 feet (*Table 3*). This is an overestimation of the noise experience by people in their homes or at their workplace, because it is closer than the required slant distance in the Fort Carson aviation regulations. While utilizing training routes, aircraft avoid all houses, buildings, people, livestock, and moving vehicles by a minimum slant range of ½ nautical miles (0.58 statute miles). While using the training routes helicopters are required to maintain a ½ nautical mile slant distance from buildings, people, livestock, and moving vehicles. This is below the noise level expected to disrupt sleep for individuals within the ROI, and the effects are minor.

3.5.4 Heath Risk

There is no scientific basis for a claim that potential health effects exist for aircraft time average sound levels below 75 dB DNL. The potential for noise to affect physiological health, such as the cardiovascular system, has been speculated; however, no unequivocal evidence exists to

support such claims (Harris 1997). Conclusions drawn from a review of health effect studies involving military low- altitude flight noise with its unusually high maximum levels and rapid rise in sound level have shown no increase in cardiovascular disease (Schwarze and Thompson 1993). Additional claims that are unsupported include flyover noise producing increased mortality rates and increases in cardiovascular death, aggravation of post-traumatic stress syndrome, increased stress, increases in admissions to mental hospitals, and adverse effects on pregnant women and the unborn fetus (Harris 1997).

The helicopter noise is expected to range from 35.9 dB DNL to 47.4 dB DNL depending on the number of flights per day and the aircraft flying over at 1,000 feet (*Table 3*). This is an overestimation of the noise experience by people in their homes or at their workplace, because it is closer than the required slant distance in the Fort Carson aviation regulations. While utilizing training routes, aircraft avoid all houses, buildings, people, livestock, and moving vehicles by a minimum slant range of ½ nautical miles (0.58 statute miles). While using the training routes helicopters are required to maintain a ½ nautical mile slant distance from buildings, people, livestock, and moving vehicles. This is below the noise level expected to impact the health of individuals within the ROI and the effects are negligible.

3.5.5 Safety

Aviation accident prevention is an integral part of the Fort Carson Safety Program and applies to all aviation units assigned to or operating on Fort Carson. In accordance with safety policies contained in Fort Carson and FAA regulations, contractors engaged in maintenance, industrial, ground, and flight operations on Fort Carson are part of the team ensuring safety standards are implemented. The Safety Program applies to military personnel, contractors, and military equipment, ensuring the public is kept safe. The Army continuously works to identify hazards, assess the hazards, develop controls and countermeasures, implement the controls, and most importantly, provide supervision on all aviation missions.

Aircraft performing low-level helicopter training will maintain a slant distance of ½ nautical miles, and, therefore, will not be flying directly over houses, buildings, people, livestock and moving vehicles. This, combined with the extensive efforts toward safety standards for aviation training, means the risk to human safety and private property is negligible.

3.5.6 Property Values

While certain frequencies (such as 30 hertz (Hz) for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (CHABA 1977). A study directed specifically at low-altitude, high- speed aircraft showed that there is little probability of structural damage from such operations (Sutherland 1989). One finding in that study is that sound levels at damaging frequencies (e.g., 30 Hz for window breakage or 15 to 25 Hz for whole-house response) are rarely above 130 dB.

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or “rattle,” of objects within the dwelling, such as hanging pictures, dishes, plaques, and bric-a-brac. Windowpanes may also vibrate noticeably when exposed to high levels of airborne noise, causing homeowners to fear breakage. In general,

such noise-induced vibrations occur at sound levels above those considered normally incompatible with residential land use. Therefore, assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

There are a number of factors that affect property values, which makes predicting impacts difficult. Factors directly related to the property, such as size, improvements, and location of the property, as well as current conditions in the real estate market, interest rates, and housing sales in the area are more likely to have a direct adverse impact on property values. Several studies have analyzed property values as they relate to military and civilian aircraft noise. In one study, a regression analysis of property values as they relate to aircraft noise at two military installations was conducted (Fidell et al. 1996). This study found that, while aircraft noise at these installations may have had minor impacts on property values, it was difficult to quantify that impact. Other factors such, as the quality of the housing near the installations and the local real estate market, had a larger impact on property values. Therefore, the regression analysis was not able to predict the impact of aircraft noise on the property values of two comparable properties.

Another study analyzed 33 other studies attempting to quantify the impact of noise on property values (Nelson 2003). The result of the study supports the idea that the potential for an adverse impact on property values as a result of aircraft noise exists and estimates that the value of a specific property could be discounted between 0.5 and 0.6 percent per decibel when compared to a similar property that is not impacted by aircraft noise. Additional data indicates that the discount for property values as a result of noise would be higher for noise levels above 75 dB DNL.

The number of homes within the ROI for each route was estimated through a review of aerial imagery for the routes. It is estimated that there are between 20-25 homes that are within the ROI for Route Saber. There are about 8-10 homes in the ROI for Route Mustang. There are 12-15 and 18-20 homes in the ROIs for Route Comanche and Gambler respectively.

The helicopter noise is expected to range from 35.9 dB DNL to 47.4 dB DNL depending on the number of flights per day and the aircraft flying over at 1,000 feet (*Table 3*). This is an overestimation of the noise experience by people in their homes or at their workplace, because it is closer than the required slant distance in the Fort Carson aviation regulations. While utilizing training routes, aircraft avoid all houses, buildings, people, livestock, and moving vehicles by a minimum slant range of ½ nautical miles (0.58 statute miles). While using the training routes, helicopters are required to maintain a ½ nautical mile slant distance from buildings, people, livestock, and moving vehicles. If the research outlined above is applied without any further assumptions, the low-level helicopter training route use could result in impacts to property values of up to 7 percent.

3.5.7 Environmental Justice

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. This goal will be achieved when everyone enjoys the same degree of protection from environmental and health hazards, as well

as equal access to the decision-making process to have a healthy environment in which to live, learn, and work.

The Climate and Economic Justice Tool (CEQ 2022) highlights Pueblo, Crowley, Otero, Las Animas, and Huerfano Counties as having census tracks that are at or at risk of living in poverty and may be minority or low-income communities (See Section3.6.1 for details). The primary concerns outlined by the tool are loss of agricultural lands due to wildfire or climate change, high unemployment rates, high energy costs, and high risk of heart disease. The CEDs identifies affordable housing, economic diversification, critical infrastructure projects and broadband development as essential to the economic strategy for the region. The Proposed Action has no effect to a minor effect on any of these components identified as challenges to the areas within the ROI. There would be no effect to the affected communities' ability to live, work or learn in a healthy environment. Nor does the Proposed Action expose low-income or majority minority communities to a disproportionate share of any negative environmental consequences.

3.5.8 Livestock

Cattle

Although some studies report that the effects of aircraft noise on domestic animals is inconclusive, a majority of the literature reviewed indicates that domestic animals exhibit some behavioral responses to military overflights, but generally seem to habituate to the disturbances over a period of time.

In response to concerns about overflight effects on pregnant cattle, milk production, and cattle safety, the Air Force prepared a handbook for environmental protection that summarizes the literature on the impacts of low-altitude flights on livestock (and poultry), and which includes specific case studies conducted in numerous airspaces across the country. Adverse effects have been found in a few studies, but have not been reproduced in other similar studies. One such study, conducted in 1983, suggested that two of 10 cows in late pregnancy aborted after showing rising estrogen and falling progesterone levels. These increased hormonal levels were reported as being linked to 59 aircraft overflights. The remaining eight cows showed no changes in their blood concentrations and calved normally (Air Force 1994). A similar study reported that abortions occurred in three out of five pregnant cattle after exposing them to flyovers by six different aircraft (Air Force 1994). Another study suggested that feedlot cattle could stampede and injure themselves when exposed to low-level overflights (Air Force 1994).

A majority of the studies reviewed suggest that there is little or no effect of aircraft noise on cattle. Studies documenting adverse effects on domestic animals have been limited. A number of studies (Parker and Bayley 1960; Kovalcik and Sottnik 1971) investigated the effects of jet aircraft noise and sonic booms on the milk production of dairy cows. Through the compilation and examination of milk production data from areas exposed to jet aircraft noise and sonic booms, it was determined that milk yields were not affected by jet aircraft noise. This was particularly evident in cows that had been previously exposed to jet aircraft noise. Studies are limited on the effects of milk production and helicopter overflight. However, the effects of the subsonic helicopters would be much less than what is expected from jet aircraft, so it stands to reason that the effects from helicopters would have no effect on historical properties.

One study examined the causes of 1,763 abortions in Wisconsin dairy cattle over a one-year time period and found that none of the abortions were associated with aircraft disturbances (Air Force 1993). In 1987, a researcher contacted seven livestock operators for production data, and no effects of low-altitude and supersonic flights were noted. Three out of 43 cattle previously exposed to low-altitude flights showed a startle response to an F/A-18 aircraft flying overhead at 500 feet above ground level (AGL) at 400 knots by running less than 10 meters. They resumed normal activity within one minute (Air Force 1993). In 1983, another researcher found that helicopters caused more reaction than other low-level aircraft overflights (Air Force 1994). A 1964 study also found that helicopters flying 30 to 60 feet overhead did not affect milk production and pregnancies of 44 cows and heifers (Air Force 1994). We are assuming the effects from helicopters would have similar effects to dairy cows and milk production as jets because of the similar nature of the noise and potential for startling the animals.

Additionally, Beyer reported that five pregnant dairy cows in a pasture did not exhibit fright-flight tendencies or have their pregnancies disrupted after being overflown by 79 low-altitude helicopter flights and four low-altitude, subsonic jet aircraft flights (Air Force 1994). A 1956 study found that the reactions of dairy and beef cattle to noise from low-altitude, subsonic aircraft were similar to those caused by paper blowing about, strange persons, or other moving objects (Air Force 1994).

In a report to Congress, the U.S. Forest Service (USFS) concluded that “evidence both from field studies of wild ungulates and laboratory studies of domestic stock indicate that the risks of damage are small (from aircraft approaches of 50 to 100 meters), as animals take care not to damage themselves (USFS 1992). If animals are overflown by aircraft at altitudes of 50 to 100 meters, there is no evidence that mothers and young are separated, that animals collide with obstructions (unless confined) or that they traverse dangerous ground at too high a rate.” These varied study results suggest that, although the confining of cattle could magnify animal response to aircraft overflight, there is no proven cause-and-effect link between startling cattle from aircraft overflights and abortion rates or lower milk production.

The effects to cattle, with the implementation of the required slant distance of ½ nautical mile, are expected to be minor.

Horses

Horses have also been observed to react to overflights of jet aircraft. Several of the studies reviewed reported a varied response of horses to low-altitude aircraft overflights. Observations made in 1966 and 1968 noted that some horses galloped in response to jet flyovers (Air Force 1993). Strong reactions were observed, but no injuries sustained, when pregnant horses were exposed to very low- altitude aircraft overflights (50 meters or lower, most flights with sound levels over 95 dBA) and helicopters hovering 20 meters overhead (Air Force 1994). Although horses were observed noticing the overflights, it did not appear to affect either survivability or reproductive success.

LeBlanc et al. (1991) studied the effects of simulated aircraft noise over 100 dBA and visual stimuli on pregnant mares shortly before parturition. They specifically focused on any changes in pregnancy success, behavior, cardiac function, hormonal production, and rate of habituation.

Their findings reported observations of “flight-fright” reactions, which caused increases in heart rates and serum cortisol concentrations. Levels of anxiety and mass body movements were the highest after initial exposure, but no horses injured themselves or their fetuses. Intensities of responses decreased with continued exposures, indicating habituation. There were no differences in pregnancy success when compared to a control group. Interestingly, the mares in LeBlanc’s study exposed to overflight noise only habituated much more rapidly than mares exposed to the visual stimulus from an overflight as well as the noise.

The effects to horses, with the implementation of the required slant distance of ½ nautical mile, are expected to be minor.

3.5.1 Cumulative Effects

The CEDS includes developments that will increase noise levels locally within the respective counties, such as the La Junta airport expansion, increasing industrial land use, and rail improvements. These could increase the noise level in the nearby communities from 35 dBA to 80 to 90 dBA. Because noise is measured logarithmically, adding noise to an already noisy area is not as noticeable as adding the same noise to a relatively quiet area. The foreseeable growth in ROI will increase as the development plans are implemented in the communities. The effects on community annoyance, sleep disturbance and health risk are minor to negligible. The addition of noise from the training routes to any areas affected by the proposed development would not be significant.

There is an estimated 58-72 homes within the ROI for the proposed routes about 30 of those homes are already within the low-level flight Route Hawk. So values on about 28-32 homes may be affected by the implementation of the proposed action. The impact on home values in the ROI is likely to be much less given the high demand for homes and the current low inventory in the Colorado housing market. The impact to home values within the ROI would be negligible to minor for all training routes.

As summarized above, the primary economic challenges in the counties affected by the low-level helicopter training are limited access to broadband, affordable housing, and high cost of energy for the areas. The counties, except El Paso County, are listed as disadvantaged in CEQ’s Climate and Economic Screening Tool for high energy cost, health risks and unemployment. The primary industries for the counties are health care, retail, food services, and education. Crowley County includes agriculture as a primary industry as well. The low-level helicopter flight training would not affect these components of the economy. The cumulative effects to the economies of the affected counties would be negligible.

Drought and other stochastic natural events could affect the success of livestock farms in the ROI. These types of events would result in changes to the vegetation and water availability for livestock farmers, making it more expensive to raise cattle or horses. The effects of low-elevation flight are mainly startling the animals. The minor impact of occasional low-level helicopter flight training in the area is not likely to lead to cumulative significant effects on livestock farms, because the effects of drought and severe weather are not similar or synergistically related to the effects of overflight by helicopters. Guidance from the Council on

Environmental Quality states that cumulative effects may result from an accumulation of similar effects or the synergistic interaction of different effects. (CEQ 1997)

3.6 Public Land Use

3.6.1 Affected Environment

There are no National Parks, USFWS Wildlife Refuges, wilderness lands, designated Wild and Scenic River or Roadless Areas within the ROI.

Colorado Noise Abatement regulation (C.R.S 25-12-110) sets the limits for off-highway vehicle noise. For vehicles manufactured before 1998 the limit is 99 dBA and for those manufactured during or after 1998 the limit is 96 dBA. According to the Bureau of Transportation Statistics,[3] the average traffic noise along US Highway 350 and the adjacent railroad track in the ROI is between 45 and 55 dBA.

3.6.1.1 US Forest Service

The Comanche Ranger District of the Pikes and San Isabel National Forests; Comanche and Cimarron National Grasslands Land (PSICC) is within the ROI. The land is managed to balance a mix of uses, as most National Forest Lands are. The Land and Resource Management Plan (USFS 1984) designates all of the land as Livestock Grazing Management Area Emphasis (6B). This area is managed for livestock grazing. It also is managed to provide roaded, natural recreation opportunities and semi primitive motorized and non-motorized recreation opportunities. All roads are open to all vehicles, including off-highway vehicles in the area affected by the low-level helicopter flight training routes.

3.6.1.2 Bureau of Land Management

Land managed by the Bureau of Land Management (BLM) within the ROI is managed by the Royal Gorge Field Office and is scattered and isolated. These areas fall under the Other Lands designation of the Royal Gorge Resource Management Plan (BLM 1996). Management focus for this area is mainly grazing with some mining along the western edge. Resources such as wildlife habitat, big game habitat, and raptor nesting/roosting areas area highlighted as management focuses. Off-highway vehicle use is permitted, which has a noise level of up to 92 dBA, in areas within the ROI of the proposed routes. The recreational opportunities on BLM lands within the ROI are primarily primitive, meaning they are not developed recreation sites and lack facilities such as water, flush toilets and fire rings.

3.6.1.3 State Land Use

All Colorado State Trust Lands are managed to provide financial support to important public institutions, primarily K-12 public education. As such, they are (almost always) leased for revenue generating purposes such as livestock grazing, oil/gas development, timber management, tower sites, renewable energy production, or commercial operations. There is

[3] National Transportation Noise Map
https://maps.dot.gov/BTS/NationalTransportationNoiseMap/

limited recreational use, including hunting, on State Trust Lands (Colorado State Land Board 2022).

Route Gambler intersects The Pueblo Reservoir Wildlife Area (SWA). SWAs are managed by CPW for the purpose of conserving wildlife habitat and for wildlife-related recreation. Camping is prohibited within the Pueblo Reservoir SWA.

3.6.1.4 Santa Fe Trail and Scenic Byway

The National Trails System is the network of scenic, historic, and recreation trails created by the National Trails System Act of 1968 and amended over time. This Act authorized three types of trails: the national scenic trails, national recreation trails, and connecting and side trails. National historic trails were authorized under the National Parks and Recreation Act of 1978, amending the National Trails System Act of 1968. These trails provide for outdoor recreation needs; promote the enjoyment, appreciation, and preservation of open-air, outdoor areas and historic resources; and encourage public access and citizen involvement.

In 1987, the Santa Fe Trail was designated a National Historic Trail by the National Park Service (NPS). In the early 1990's, under the authorization of the Trail Systems Act, the Byway was named an Auto Tour Route under the administration of the NPS. NPS provided funds to each state for Auto Tour Route signs which were installed in Colorado by the Colorado Department of Transportation (CDOT). As defined by the National Trails System Act, the Santa Fe National Historic Trail's purpose is: "[t]he identification and protection of the historic route and its historic remnants and artifacts for public use and enjoyment" [NTSA Sec. 3 (3)] and provision for "recreational use or historical interest based on historic interpretation and appreciation." [NTSA Sec. 5 (b) (11) C].

The Santa Fe Historic Trail Foundation Document (NPS 2019) outlines the current threats to the trail, including portions on private land, urbanization, energy development, utility and transportation right-of-way, climate change, invasive species, wildland fire, impacts to wildlife habitat and violations of the Archeological Resources Protection Act.

The Comprehensive Management Plan (NPS 1996) outlines the management objectives of the Santa Fe Trail. The protection of natural and cultural resources along the route and promoting outdoor recreation and enjoyment of the trail by providing consistent and coordinated interpretation were laid out as objectives for the trail management. The plan includes a goal for the visitors to have a safe and enjoyable experience while seeing the actual remnants of the trail, where appropriate. Restoration of the setting of the trail segments is encouraged where economically feasible through fund raising, partnerships and collaboration with local communities. Resource protection goals are focused on maintaining the ruts of the original trail tread and any cultural resources associated with the trail.

Environmental Effects

3.6.1.5 USFS Land Use

The Mustang and Saber training routes intersect the Comanche Ranger District of PSICC National Forest. The primary objective for the land designation of the Comanche Ranger District within the ROI is cattle grazing (USFS 1984). The discussion in Section 3.5.7 summarizes the

science on how cattle are affected by helicopter noise. The analysis shows that the effects would be minor to cattle or horses that are within the ROIs. Therefore, the Proposed Action would not likely prevent the Comanche Ranger District from reaching the Land and Resource Management Plan (USFS 1984) objectives for the Livestock Management Grazing Area.

The required slant distance over moving vehicles and people would minimize the effects to recreationists by keeping the DNL to less than 48 dB DNL. This noise level would annoy about 1 percent of the recreationists present during a training flight during the day. Pickets Wire is a dispersed camping area on the Comanche Ranger District and is within the ROI for the Saber Training Route. The purpose of dispersed camping is to practice low impact camping in an undeveloped area. There are no restrooms, trash disposal or potable water available in these areas.

Generally, motorized dispersed camping is authorized within one vehicle length of National Forest System routes (unless specifically prohibited or, unsafe or if resource damage may occur). Given that the dispersed camping area is within 1 mile of the boundary of PCMS, it would not be subjected to low-level helicopter flight training. The helicopters would be ascending from 100 feet AGL to the required 500 feet AGL to enter PCMS. When the required slant distances are included in the analysis, the maximum noise levels at or below 68 dBA. This is substantially less than an off-highway vehicle, that is able to be used on the National Forest System roads within the ROI, at between 96 to 99 dBA or A passenger vehicle going about 30 miles per hour has a noise level of about 62 dBA. Trucks, which are the typical vehicles seen on National Forest System roads, produced a noise level of about 73 dBA (Noise Pollution Clearing House 2022).

The use of the training routes would not prohibit recreation or camping in the ROI nor is it likely to deter use. The area has low recreation use compared to other parts of the PSICC National Forest and the flights would be relatively infrequent. The probability of a hiker being within the 2 mile ROI during a training flight would be low. There would be less impact from overflights to the dispersed camping area in the ROI than off-highway vehicle use and even passenger vehicles using the National Forest System roads. The effects on recreational use on National Forest Lands is minor.

3.6.1.6 BLM Land Use

The effects to livestock grazing objectives on BLM lands are the same as described above for National Forest System lands. There is limited recreational use of these lands, since they are scattered and isolated. There are no direct or indirect effects of low-level helicopter training flights along the training routes wildlife habitat. Impacts to individual animals of a particular species is described in Section 3.3 of this EA. They range from negligible to minor. The proposed action would not prohibit the attainment of the goals in the Resource Management Plan (BLM 1996)

The effects to BLM land use would be minor.

3.6.1.7 State Land Use

There would be no impact to mining operations on State Trust Lands. The Pueblo Reservoir SWA's primary purpose is to provide wildlife habitat and wildlife-related recreation (such as hunting or bird watching). The analysis is Section 3.3 of this EA illustrates that there would be negligible to minor effects to wildlife and wildlife habitat as a result of low-level helicopter flight training. This finding holds true for effects to wildlife specific to the SWA.

3.6.1.8 Santa Fe Trail and Scenic Byway

Within the ROI, the Santa Fe Trail runs along or adjacent to US Highway 350 and is in close proximity to the railroad tracks that run along US Highway 350. The minimum altitude for aviation training over the Santa Fe Trail on Routes Gambler, Comanche, Mustang and Saber will be 1,000 feet AGL. Since the trail is a linear, continuous feature that is perpendicular to the training routes, it cannot be avoided with a slant distance. This would mean a maximum noise level of between 73 and 78 dBA if the helicopter was 1,000 feet directly overhead. This noise level is somewhere between a vacuum cleaner and garbage disposal for about 10 seconds before fading off as the helicopter flies by. If possible, a slant distance to avoid flying directly over a person would be implemented, making the noise lower (see Table 2). Just as in the discussion on recreation on National Forest Lands, the relatively low recreation use compared to other parts of the Santa Fe Trail and the relatively low frequency of flights would mean that the probability of a hiker being within the 2 mile ROI during a training flight would be low. The effects would be short-term, less than 1 minute.

The proposed action would not prohibit attainment of the goals outlined in the Santa Fe Comprehensive Management Plan (NPS 1996). The trail would continue to be used by recreationists with a probability of a minor, short term impact to a small number of visitors. There would no effect to any cultural resources within the ROI (Section 3.4.1).

3.6.2 Cumulative Effects

Cumulative effects on the National Forest and BLM's ability to meet their objectives for cattle grazing would be similar to the findings in Section 3.5.1. Drought and other stochastic natural events could affect the success of livestock grazing by changing the vegetation and water availability for grazing livestock. The effects of low-level helicopter flight training are mainly startling the animals. The minor impact of occasional low-level helicopter flight training in the area is not likely to lead to cumulative significant effects on livestock grazing, because the effects of drought and severe weather are not similar or synergistically related to the effects of overflight by helicopters. Guidance from the Council on Environmental Quality says that cumulative effects may result from an accumulation of similar effects or the synergistic interaction of different effects. (CEQ 1997)

Recreation on public lands within the ROI includes hiking, camping and off-highway vehicle use. There are no developed campgrounds in the ROI. Dispersed, motorized camping cannot be more than 1 car length off a National Forest System road. The unaffected noise level of the area is likely about 35 dBA, with the primary noise being wind. However, traffic on the roadways would increase the noise level to between 62 and 73 dBA. Off highway vehicle use would

intermittently increase the noise level to as much as 96 to 99 dBA. The maximum training flight noise level would be at or below 68 dBA. This noise would blend in with the occasional car, truck or off-highway vehicle that would pass by a campsite or recreationist, making it relatively unnoticeable. The cumulative effects would be minor.

The noise levels on US Highway 350 likely range from 68 dBA for a passenger car going 45 miles per hour to 88 dBA for a heavy truck going 65 miles per hour. A freight train produces about 80 dBA at 50 miles per hour (California High Speed Rail Authority 2018). When the required slant distances are included in the analysis, the maximum noise levels are at or below 68 dBA. This is substantially less than an off-highway vehicle, that is able to be used on the National Forest System roads with in the ROI, at between 96 to 99 dBA or A passenger vehicle going about 30 miles per hour has a noise level of about 62 dBA. Trucks, which is the typical vehicle seen on National Forest System roads, produced a noise level of about 73 dBA (Noise Pollution Clearing House 2022).

Because of the logarithmic nature of the decibel scale, sound levels do not add and subtract directly and are somewhat cumbersome to handle mathematically. However, rules –of-thumb are useful in dealing with sound levels. First, if a sound's intensity is doubled the sound level increases by 3 dBA, regardless of the initial sound level. This means that the cumulative impacts to the noise level along the Santa Fe Trail within the ROI would be increased by about 3 dBA; which is the smallest change in noise level that can be detected by a human. The cumulative effects on the use and goals of the Santa Fe Trail would be minor.

4 Environmental Consequences for No Action Alternative

The No Action Alternative is the continued use of Route Hawk as a low-level helicopter training route. The alternative that ceases all low-level helicopter training from Fort Carson to PCMS was not analyzed in detail (Section 2.7). Route Hawk has been in use since 2011 when the CAB was first brought to Fort Carson. The use of Route Hawk for low-level helicopter training was analyzed in several environmental reviews (summarized in Appendix A):

- Final Environmental Impact Statement for Implementation of Fort Carson Grow the Army Stationing Decisions (February 2009) and Record of Decision (March 2009)
- The Final Programmatic Environmental Impact Statement (PEIS) for the Realignment, Growth, and Stationing of Army Aviation Assets (February 2011) and the Record of Decision (March 2011)
- Fort Carson Combat Aviation Brigade Stationing Implementation Final Environmental Assessment and Finding of No Significant Impact (July 2012)
- Pinon Canyon Maneuver Site Training and Operations Final Environmental Impact Statement (March 2015) and Record of Decision (May 2015)

Route Hawk, with adjustments described in Section 2.2, follows Route Mustang and Route Gambler. The use of the route must comply with the regulations and best management practices in Section 2.4, Regulations Common to all Alternatives.

4.1 Biological Resources

The direct, indirect and cumulative effects are the same as the Proposed Action for Route Mustang and Route Gambler.

4.2 Cultural Resources

The direct, indirect and cumulative effects are the same as the Proposed Action for Route Mustang and Route Gambler.

4.3 Socio-economics and Quality of Life

The effects on socio-economics and quality of life for the No Action Alternative are approximated using the effects described above for Route Mustang and Route Gambler. There would be about 178 square miles of airspace within the ROI for Pueblo County, 40 square miles in Otero County, 63 in La Animas County, and 26 square miles in Huerfano County. This is about 60 percent of the airspace within the ROI of the Proposed Action in Pueblo County, 36 percent in Otero County, 60 percent in Las Animas County. The airspace within the ROI is the same for Huerfano County. Route Hawk does not enter the airspace above Crowley County.

There would be no noticeable effect to Crowley County from the No Action Alternative. However, moving forward, the communities within the ROI for the No Action Alternatives would experience more frequent flights than if the Proposed Action is implemented because of the lack of diversity in routes under the No Action Alternative.

4.4 Public Land Use

The Comanche Ranger District of the Pikes and San Isabel National Forest and Cimarron and Comanche National Grasslands would not be affected by the continued use of Route Hawk, since the route does not enter the airspace above the Ranger District.

The direct, indirect and cumulative effects to BLM Lands, State Land Trust Lands, State Wildlife Areas and the Santa Fe Trail would be the same as is described in the Proposed Action for Routes Mustang and Gambler.

5 Proposed Mitigations for Proposed Action and No Action Alternatives

To protect the feel and viewshed of the Santa Fe Trail in the project area, the minimum altitude for aviation training over the Santa Fe Trail on Routes Gambler, Comanche, Mustang and Saber will be 1,000 feet AGL. This requirement will be documented in the Combat Aviation Brigade's Aviation Procedures Guide.

6 Summary of Environmental Consequences

The ROI for effects from the noise of the helicopters flying between 100 feet AGL and 500 feet AGL is 1 mile from the center of the flight path or a total of 2 miles wide. See Section 3.1 of this EA for details.

Resource Element	Effects of Proposed Action	Effects of No Action Alternative
Species Listed under ESA	There would be no effect to Threatened or Endangered Species in the ROI	There would be no effect to Threatened or Endangered Species in the ROI
Big Game Species	There would be a short-term, negligible to minor impact to big game species in the ROI	There would be a short-term, negligible to minor impact to big game species in the ROI
Raptors	There would be a short-term negligible to minor impact to raptor species in the ROI	There would be a short-term negligible to minor impact to raptor species in the ROI
Eagles	There would be a short-term negligible to minor impact to bald and golden eagles in the ROI	There would be a short-term negligible to minor impact to bald and golden eagles in the ROI
Cultural Resources	There would be no effect to cultural resources	There would be no effect to cultural resources
Annoyance of Community	The noise levels would annoy between 1-2 percent of the population in the ROI, this is a minor effect	The noise levels would annoy between 1-2 percent of the population in the ROI, this is a minor effect
Sleep Disturbances	The noise levels in homes would awaken less than 5 percent of individuals in the ROI. This is a minor effect on communities	The noise levels in homes would awaken less than 5 percent of individuals in the ROI. This is a minor effect on communities
Health Risk	There would be a negligible effect on the health of those who live and work with the ROI	There would be a negligible effect on the health of those who live and work with the ROI
Safety	There would be a negligible effect on the safety of communities within the ROI	There would be a negligible effect on the safety of communities within the ROI
Property Values	Property values in the ROI would not likely be noticeably impacted by the implementation of the alternative	Property values in the ROI would not likely be noticeably impacted by the implementation of the alternative

Environmental Justice	There would be no environmental justice impacts in the ROI	There would be no environmental justice impacts in the ROI
Livestock	There would be short-term, minor impacts to cattle and horses in the ROI	There would be short-term, minor impacts to cattle and horses in the ROI
Public Land Use of USFS Lands	The alternative would not prevent the attainment of land management goals on USFS lands. There would be a short-term, minor impact to recreationists using the area	The alternative would not prevent the attainment of land management goals on USFS lands. There would be a short-term, minor impact to recreationists using the area
Public Land Use of BLM Lands	The alternative would not prevent the attainment of land management goals on BLM lands. There would be a short-term, minor impact to recreationists using the area	The alternative would not prevent the attainment of land management goals on BLM lands. There would be a short-term, minor impact to recreationists using the area
Public Land Use of State Lands	The alternative would not prevent the attainment of land management goals on State Lands. There would be a short-term, minor impact to recreationists using the area	The alternative would not prevent the attainment of land management goals on State Lands. There would be a short-term, minor impact to recreationists using the area
Use of Santa Fe Trail on Public Lands	The alternative would not prevent the attainment of land management goals for the Santa Fe Trail. There would be a short-term, minor impact to recreationists using the area	The alternative would not prevent the attainment of land management goals for the Santa Fe Trail. There would be a short-term, minor impact to recreationists using the area

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7 Acronyms

AGL	Above Ground Level
BAHP	Butts Army Heliport
BLM	Bureau of Land Management
BMP	Best Management Practices
CAB	4th Combat Aviation Brigade
CEDS	Comprehensive Economic Development Strategy
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CPW	Colorado Parks and Wildlife
dBA	A-Weighted Decibels
DNL	Day-Night Average Sound Level
EA	Environmental Assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FNSI	Finding of No Significant Impact
Ft	Feet
Hz	Hertz
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOA	Notice of Availability
NPS	National Parks Service
NRHP	National Register of Historical Places
OAHP	Office of Archaeology and Historic Preservation
PCMS	Pinon Canyon Maneuver Site
ROI	Region of Influence
SCEDD	Southern Colorado Economic Development District
SOP	Standard Operating Procedure
SWA	State Wildlife Area
USAF	U.S. Air Force
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service

8 List of Preparers

Name	Installation/Affiliation	Role
Bell, Angie	Fort Carson/Environmental	NEPA Program Manager
Craig, Tammy	Fort Carson/Environmental	Pest Control Program Manager
Gallegos, Joseph	Fort Carson/Environmental	Prevention and Restoration Program Manager
Glass, Bridgette	Fort Carson/Environmental	Wetlands and Watershed Specialist
Kolise, Jennifer	Fort Carson/Environmental	Cultural Resource Program Manager
Lehmicke, Anna Joy	Fort Carson/Environmental	Wildlife Biologist
McLemore, Jeffrey	Fort Carson/Environmental	Forestry
Norris, Melinda	Fort Carson/Environmental	Stormwater Program Manager
Rice, James	Fort Carson/DPTMS	DPTMS Director
Rivero-DeAguilar, Carlos	Fort Carson/Environmental	Environmental Division Chief
Trygstad, Paul	Fort Carson/Environmental	Air Program Manager
Wilson, Ted	Fort Carson/DPTMS	Air Traffic and Airspace Chief

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Appendix A: Summary of Effects of CAB training on Fort Carson

The referenced documents below can be found on the Fort Carson NEPA website at https://home.army.mil/carson/index.php/Directorate/directorate-public-works/nepa-and-cultural-resources-documents

Final Environmental Impact Statement for Implementation of Fort Carson Grow the Army Stationing Decisions (February 2009) and Record of Decision (March 2009)

The proposed action assessed in this EIS included the stationing of a Combat Aviation Brigade (CAB) including construction, training at both Fort Carson and PCMS, the addition of personnel at Fort Carson and the use of Route Hawk for low-level helicopter training. The proposed action was not expected to degrade the air quality of the region and be in compliance with the Clean Air Act. Most of the noise associated with the construction was within the noise contours of Butts Army Heliport (BAHP) and would not be noticed by sensitive receptors. Noise from helicopter training at PCMS was not expected to increase outside of the installation boundary. There was some removal of habitat from the construction of facilities to support the stationing of the CAB. The habitat that was removed or downgraded is common on Fort Carson and the loss would be less than significant. The training was expected to have minimal potential for inadvertent impacts to known and unrecorded archaeological resources on Fort Carson and PCMS. Best management practices during construction would keep the effects to soils and water resources to a minimum.

The Final Programmatic Environmental Impact Statement (PEIS) for the Realignment, Growth, and Stationing of Army Aviation Assets (February 2011) and the Record of Decision (March 2011)

The preferred alternative included stationing a CAB at Fort Carson including the construction of runway extension, aviation unit company operations facilities, additional aircraft maintenance hangars, vehicle maintenance shops, and unaccompanied enlisted housing (barracks). The preferred alternative also require the construction of an additional fire station at BAHP. The preferred alternative included training to meet all pre-deployment requirements. Small arms, flight operations, aviation gunnery, air/ground live-fire training and the use of Route Hawk for low-level training were assessed.

Air quality from construction was expected to be temporary and negligible. There was expected to be about 165 tons per year of CO emissions from training. The training would take place outside of the CO maintenance area and was not expected to contribute to the degrade air quality in the region or be uncompliant with the Clean Air Act. The stationing and training of the CAB was not expected to add noticeably to the noise already being generated at BAHP. The frequency of the low-level aerial maneuver training between Fort Carson and PCMS was expected to increase (Route Hawk). The changes to noise was not expected to be noticeable for humans or wildlife with the implementation of Fort Carson and FAA Regulations.

The impact on stormwater, streams and soil resources from the increase in impermeable surfaces from the construction of facilities was expected to be mitigated by properly designed stormwater best management practices and low impact development designs. There was no significant effect expected to ungulates (such as deer and antelope), migratory birds, state or federally listed wildlife, wetlands, floodplains, or native vegetation.

There were no properties eligible for the National Register of Historical Properties within the areas proposed for construction. The assessment found that increased training could result in loss of or damage to cultural resources directly through maneuver training activities or indirectly through loss of cultural resources in a fire caused by military training.

The increased use of airspace on Fort Carson and PCMS, as well as between the two, associated with the CAB will not create obstructions to air navigation, affect flight operations at BAHP, or any other airfield.

Fort Carson Combat Aviation Brigade Stationing Implementation Final Environmental Assessment and Finding of No Significant Impact (July 2012)

The proposed action included the stationing of the CAB at Fort Carson as well as demolition and renovation of existing facilities and the construction of new garrison support facilities for the CAB along Wilderness Road and at Butts Army Heliport. The EA assessed the effects of CAB training on Fort Carson and PCMS.

The impacts of construction at Fort Carson was expected to have effects that were mitigatable to less than significant on air quality and soil resources. Potential impacts of the proposed action could include the generation of fugitive dust and other pollutants during construction, increase in soil erosion and stormwater runoff during construction, loss of or harm to vegetation and a reduction in the acreage of native plant communities, and loss of or harm to wildlife and wildlife habitat as a result of construction. There would be insignificant indirect effects to vegetation and waterways from training due to the small, on-the-ground support units needed to complete training successfully.

Helicopter overflights, including the use of Route Hawk, were found to have a noise level of less than 60 dBA. For comparison, a household refrigerator has a noise level of about 55 dBA, a conversation a noise level of 60 dBA and a vacuum a noise level of about 70 dBA. Effects to deer and antelope have been found to be negligible and herds have been shown to acclimate to the sound of aircraft in an area. Changes were made to Route Hawk so that low-level training avoided the portion of the Santa Fe Trail that is on the National Register of Historic Places (NRHP). There is no effect expected to cultural resources from any of the construction or training activities proposed in the EA.

Pinon Canyon Maneuver Site Training and Operations Environmental Impact Statement (March 2015) and Record of Decision (March 2015)

Aviation activities at PCMS primarily consist of helicopter overflights, including low-level helicopter training associated with the Combat Aviation Brigade, and landings.

The majority of aviation activity at PCMS involves aviation task force support for brigade-level and some battalion-level maneuver rotations. Units also conduct their own aviation collective training apart from ground unit rotations to maintain proficiency of flight skills.

Although aviation activity at PCMS would not generate a noise level that will have a negative impact on sensitive receptors, there is still the potential that individual aircraft overflights to PCMS could annoy people and possibly generate complaints. The Army adopted the use of long-term annoyance as a primary indicator of community response because it attempts to account for all negative aspects of effects from noise (e.g., increased annoyance due to being awakened the previous night by aircraft, and interference with everyday conversation). Fort Carson has a noise abatement policy for the low-level helicopter training routes that aircraft avoid all houses, buildings, people, livestock, and moving vehicles by a minimum slant range of ½ nautical miles (0.58 statute miles). This results in a noise to less than 50 dB DNL, which would annoy one to two percent of the population. The training noise at PCMS including aviation training in the restricted airspace was not expected to have a significant impact on the wildlife or cultural resources in the area.

Appendix B: Advisory Council for Historic Preservation Consultation Correspondence

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT CARSON
1626 ELLIS STREET, SUITE 200
FORT CARSON, CO 80913-4143

April 25, 2024

SUBJECT: ACHP Review of National Historic Preservation Act Section 106 Consultation for Fort Carson the Establishment of Four Low-Level Aviation Training Routes: Gambler, Comanche, Mustang, and Saber

Mr. Christopher Koeppel
Acting Director of the Office of Federal Agency Programs
Advisory Council of Historic Preservation
401 F Street NW, Suite 308
Washington, District of Columbia 20001

Dear Mr. Koeppel,

As commander of US Army Garrison-Fort Carson (USAG-FC), in accordance with 36 CFR § 800.4(d)(1)(ii), I am requesting the Council's review of the USAG FC finding of 'no adverse effect' to historic properties and the Colorado State Preservation Officer's (SHPO) assertion that USAG Fort Carson has not made a 'reasonable and good faith effort" to comply with the standard outlined in 36 CFR § 800.4(b)(1).

On February 22, 2022, USAG FC initiated consultation with the Colorado SHPO and other consulting parties about the subject undertaking. The initial undertaking review packet included a complete project description, relevant aviation regulations, an identification of the area of potential effects (APE), an assessment of effects to historic properties, a finding of effects, detailed maps of each flight route, and a table of protected resources in and around the APE. In the initial undertaking review USAG-FC cited a 2012 Environmental Assessment for the stationing of 4CAB that concluded rotor wash will not increase wind speed above typical wind levels experienced in southeastern Colorado or cause ground disturbance. USAG-FC also detailed regulations that state that all helicopters entering and exiting the Piñon Canyon Maneuver Site (PCMS) must be at a minimum of 500 feet above ground level (AGL); that helicopters must maintain a minimum altitude above populated areas; and maintain a minimum distance of 500 feet from buildings, structures, and vehicles. After considering these factors USAG FC made the determination of 'no adverse effect' to historic properties in accordance with 36 CFR § 800.4(b).

USAG-FC received responses to the undertaking review between February and March of 2022 from the Colorado SHPO, Huerfano County, Otero County, Las Animas County, the Santa Fe Trail Association, and Not 1 More Acre!. There were numerous responses that were not directly related to cultural resources and these were

used to inform the forthcoming Environmental Assessment. There was also questions about the timing of flights and the "intermittent" nature of the training conveyed in the original undertaking. Several concerns were raised about how the APE was developed and whether the APE accounted for visual, auditory and vibrational effects on cultural resources. The Santa Fe Trail Association, the National Park Service Intermountain Region and other consulting parties expressed concerns about the impact low level flights would have on the setting and feeling of the Santa Fe Trail and associated properties. The routes cross National Register Listed segments of the Santa Fe Trail.

On April 19, 2023, USAG-FC responded to concerns regarding the subject undertaking. Training flights will likely occur one to two times a week with increased training during exercises at PCMS. USAG-FC justified the APE using the noise analysis information. That analysis found that at one mile, the noise from the helicopter overflight would be less than a conversation in your living room.

In response to concerns over a "reasonable and good faith" effort to identify historic properties along the routes USAG-FC noted that they had reviewed all data available within the Colorado SHPO Office of Archaeology and Historic Preservation database, which is the repository for the Sate of Colorado's site documentation and technical reports. USAG-FC feels that using a literature review meets the criteria of a "reasonable and good faith" effort since no ground disturbing activities are proposed. In addition, USAG-FC informed stakeholders that they do not have the legal authority nor the resources to conduct survey on private land. USAG-FC added that in the event of post review discovery of archaeological, cultural, or paleontological material that USAG-FC would re-initiate Section 106 consultation in accordance with 36 CFR § 800.13.

The April 19, 2023, USAG-FC response noted that the Santa Fe Trail segments that are eligible or listed on the NRHP were included in the original undertaking review. It was also noted that the forthcoming Environmental Assessment would assess for the effects of the entire trail and associated features, including those that are not eligible for the NRHP, within the APE. The analysis found that there were no adverse effects to historic properties, including the listed/eligible Santa Fe Trail Segments within the APE because of the intermittent and temporary nature of the low-level aviation training operations.

On May 17, 2023, the Colorado SHPO responded to the April 19, 2023, review. In the response the Colorado SHPO detailed two major concerns. One revolved around a clerical error in the definition of the route Saber APE, where the buffer was not reported accurately. The other concern involved the lack of inventory within the APE. In their response the Colorado SHPO stated that "the current identification efforts are limited to

a desktop search of existing files maintained by Fort Carson and this office". The response also states that while this is a good start, they would like to ascertain how the Army has sought and gathered information from Tribes and other parties likely to have knowledge of, or concern with historic properties.

USAG-FC amended the undertaking review on August 17, 2023. The updated review included corrections and clarification on the original APE and sites that may have not been accounted for due to the route Saber clerical error. USAG-FC also informed the Colorado SHPO that they consulted the Santa Fe Trail Multiple Property Document Form (MPDF), the technical report for the Cultural Resource survey of the Purgatoire River completed by Colorado Preservation, Inc., spatial data maintained by Comanche National Grasslands along U.S. Highway 350, contacted Tribes, and contacted all other consulting parties, to ascertain the locations of any sites of religious, cultural, or historic significance. USAG-FC received responses from the Comanche Nation, Huerfano County, and Otero County. The Comanche Nation and Huerfano County informed USAG-FC that they did not have any sites that were not already in the review. Otero County informed Fort Carson that they had three sites, within the APE, that were currently being considered for the national register and may not be in the Colorado SHPO database. These sites included the Valley View-Hillcrest Cemetery, Manzanola Methodist Church, and the Manzanola Cemetery-Mountain View. All sites within the APE were considered and added to the record by USAG-FC.

On September 13, 2023, the Colorado SHPO responded to the amended undertaking review. In the response the Colorado SHPO states that they agree that the defined APE is appropriate for the undertaking. They also state that they do not concur with the determination of no adverse effects pursuant to 36 CFR § 800.5(b). In that letter, the Colorado SHPO states that USAG-FC has not met the "reasonable and good faith effort" outlined in 36 CFR § 800.4(b)(1). They state that additional survey, research, and documentation efforts need to be completed to appropriately identify yet unrecorded historic properties located throughout the APE.

USAG-FC followed up with additional information to the Colorado SHPO, consulting parties and Tribes on October 5, 2023. Colorado SHPO responded on October 31, 2023, and Otero County on November 5, 2023. The Colorado SHPO, Tribes and consulting parties were informed by USAG-FC on March 22, 2024, that it was my intention to engage the ACHP to comment directly on the analysis of the project. The Colorado SHPO responded on March 29, 2024, confirming that they did not concur with our efforts to identify historic properties on private lands and remained concerned about the effects of rotor wash on historic properties along the route.

USAG-FC has considered the nature and magnitude of this undertaking and believes that since the undertaking does not involve any ground disturbing activities, a comprehensive literature review meets the definition of a reasonable and good faith

effort and is thus compliant with 36 CFR § 800.4(b)(1). When considering the nature and magnitude of this undertaking additional survey of private land is out of scope, will add no value to planning and protection of cultural resources, and will not contribute to the identification of sites that may be adversely affected by this undertaking. USAG-FC has also reached out to all known applicable professional, tribal, state, and local representatives to identify additional resource that may be within the APE. It is the view of USAG-FC that the resource identified during the undertaking review are representative of all resources within the APE and that the undertaking will have no adverse effect to any resource within the APE.

My cultural resource staff and I are unable to resolve this dispute with the Colorado SHPO. In accordance with 36 CFR § 800.4(d)(1)(ii), I am requesting that the council review the finding pursuant to paragraph (d)(1)iv)(A) through (d)(1)iv)(C) of 36 CFR § 800.4. Enclosed with this request is all supporting documentation including all information required per 36 CFR § 800.11(d) and all correspondence and discussions surrounding this Section 106 consultation for this undertaking with the Colorado SHPO and Otero County. I appreciate you and your staff's time and effort providing a response.

If you have any questions, or require clarification, please contact Ben Zandarski, USAG-FC, Cultural Resources Manager, at 719-722-9321, or via email at benjamin.a.zandarski.civ@army.mil. All consulting parties will be notified of this request and the request documentation will be made available.

Sean M. Brown
Colonel, U.S. Army
Garrison Commander

Enclosures

June 5, 2024

Sean M. Brown
Garrison Commander
United States Army Garrison, Fort Carson
1626 Ellis Street
Suite 200, Building 111
Fort Carson, CO 80913-4145

Ref*:* *Establishment of Four Low-Level Aviation Training Routes by United States Army Garrison Fort Carson, Colorado*
ACHP Project Number: 018530

Dear COL Brown,

On May 7, 2024, the Advisory Council on Historic Preservation (ACHP) received a request from the Department of the Army (Army) for our review of its finding of effect for the referenced undertaking. This request was made by the Army in accordance with 36 CFR § 800.5(c)(2)(i) of the regulations implementing Section 106 of the National Historic Preservation Act due to an inability to resolve a dispute with the Colorado State Historic Preservation Officer (SHPO) and Otero County, Colorado. The Colorado SHPO believes that the Army has not made a reasonable and good faith effort to identify historic properties in the area of potential effects (APE), and therefore, cannot concur with the finding of no adverse effect. Otero County does not agree with the finding of no adverse effect. On May 21, 2024, the ACHP notified the Army that it was extending its review period for an additional 15 days pursuant to 36 CFR § 800.5(c)(3)(i).

It is the ACHP's advisory opinion that the Army conducted a reasonable and good faith identification effort and correctly applied the criteria of adverse effect to the historic properties that will be affected by the undertaking. However, based on our review of the documentation the Army provided and a meeting between ACHP and United States Army Garrison-Fort Carson (USAG-FC) staff on May 23, 2024, the dispute may have been avoided had the Army more effectively consulted with the Colorado SHPO and others. We offer additional guidance to the Army to consider regarding effective consultation for future Section 106 undertakings.

Background

USAG-FC proposes to establish four low-level aviation training routes across southeastern Colorado, from Fort Carson to the Pinon Canyon Maneuver Site (PCMS). Training entails one to two helicopters flying 100-300' above ground level for the length of the route, with the following exceptions: aircraft must be a minimum of 500' above ground level (AGL) as they enter PCMS, a minimum of 1,000' AGL over populated areas and cities, and a minimum distance of 500' directly above or at a 2,500' slant near individual buildings, structures, etc. A single flight consists of one to two helicopters flying out-and-back along the same or a different route. Flights will occur one to three times per week on one of the four routes, increasing in frequency and number of helicopters (up to six) during three to five week-long training periods per year.

USAG-FC initiated consultation on the undertaking via correspondence dated February 2, 2022. They sent additional letters on April 19, 2023, August 17, 2023, and October 5, 2023, to respond to the concerns of the Colorado SHPO, Otero County, and other consulting parties. USAG-FC sent a final letter on March 11, 2024, notifying parties of the Army's intent to request the advisory comments of the ACHP.

ACHP Review of Findings

Reasonable and Good Faith Identification

The Colorado SHPO expressed concern that the Army did not properly identify historic resources within the APE. USAG-FC determined that a pedestrian survey was not possible and a literature review was a sufficient identification effort due to the lack of ground disturbance in the undertaking. After Colorado SHPO raised concerns about the identification effort, the Army expanded its identification by contacting consulting parties and Tribes with ancestral ties to the area to ask if any properties in the APE had not been identified. The Army's final list of historic properties was amended based on the responses.

The ACHP's regulations do not require that a federal agency survey the entirety of the APE for a proposed undertaking. Rather, the agency's identification effort can be considered reasonable and in good faith when it has appropriately taken into account, in consultation with the SHPO, or the Tribal Historic Preservation Officer (THPO), if on Tribal lands, the factors specified in 36 C.F.R. § 800.4(b)(1) - past planning, research and studies, the magnitude and nature of the undertaking and the degree of federal involvement, the nature and extent of potential effects on historic properties, and the likely nature and location of historic properties within the APE. According to the Section 106 regulations, the federal agency is ultimately responsible for defining the level of effort for identification of historic properties in a Section 106 review.

The ACHP's opinion is that the Army has made a reasonable and good faith effort to identify historic properties in the APE, based on the scope of the undertaking and the absence of any ground disturbance associated with the project. The identification effort by USAG-FC revealed a variety of historic resources, including subsurface archaeological sites, surface historic archaeological sites, and buildings and structures. The area(s) of significance for each of these resources is also varied. Thus, it can be reasonably presumed that additional identification efforts would not reveal new types of historic resources.

While technically sufficient, the Army could have considered other identification efforts to be more responsive to the concerns raised by the Colorado SHPO. A range of survey options are possible between a literature review and intensive survey, including review of historic aerial photos, historic maps, and/ or county assessor records. The ACHP urges USAG-FC to use all available methods when identifying historic properties in future undertakings.

Finding of No Adverse Effect

The dispute as to whether the Army correctly applied the criteria of adverse effect in this case includes a disagreement over the adequacy of the Army's effort to identify historic properties within the APE. As stated above, the ACHP believes that the identification effort is adequate for an appropriate assessment of effects. In reviewing how the criteria of adverse effect have been applied, the ACHP was guided by the regulations in 36 CFR § 800.5(a)(l) and finds that the Army's finding of no adverse effect is appropriate.

The Army evaluated effects to the historic properties based on four factors: rotor wash, vibration, auditory impacts, and visual impacts. Additionally, the Army considered the temporary and intermittent effects of the undertaking which would occur, on average, only one to three times per week on any given route. Based on the studies presented by the Army, it does not appear that rotor wash or vibration are reasonable or foreseeable effects of this undertaking. The visual intrusion of the helicopters is minor, temporary, and

intermittent; thus, it does not rise to the level of an adverse effect. The ACHP notes that the determination for auditory effects is not as apparent, and the ACHP recognizes that the undertaking will alter the setting and feeling of historic resources during times when the flights are occurring. However, because the effect is temporary and intermittent, it will not diminish overall integrity of a resource to the point that it can no longer convey its significance. Thus, it is the ACHP's advisory opinion that the Army correctly applied the criteria of adverse effect in making a finding of no adverse effect.

However, the Army stated in several letters that "should potential impacts to any historic properties be identified in the future *due to a change in the submitted scope of work, proposed location, or due to activities proposed beyond the scope of this undertaking*, additional Section 106 consultation will be initiated as required" (emphasis added). ACHP notes that *unforeseen effects from a proposed undertaking* can also occur, with or without a change in scope. The Army should consider the possibility of unforeseen effects for this specific undertaking and all future undertakings. For this project, the Army could consider establishing a monitoring plan to assess the effects of the undertaking as they occur. This could also ease the concerns of consulting parties who believe the project will adversely affect historic resources.

Communication

In reviewing the administrative record for this undertaking, as well as participating in a meeting with USAG-FC Cultural Resources staff held on May 23, 2024, the ACHP notes that the Army's communication with the SHPO and consulting parties was lacking. Most notably, the administrative record does not show that the Army hosted any meetings with consulting parties to discuss their concerns; all consultation occurred through written correspondence. While written communication is useful for the administrative record, for complex undertakings such as this and where disagreements are present, verbal communication and meetings are often more efficient and effective. A meeting between consulting parties, virtually or in-person, would have allowed for the active discussion about the undertaking and its effects in a way that is consistent with the definition of consultation (36 CFR § 800.16(f)).

Additionally, the Army did not properly convey how it reached its findings and the details of the undertaking were provided piecemeal throughout the consultation. As an example, in the May 23, 2024, meeting, USAG-FC cultural resources staff stated that helicopters will be at least 1,000' above the Santa Fe Trail. This is not mentioned anywhere in the consultation materials, despite repeated concerns from consulting parties about impacts to the trail. The Army also described the project in very general terms, rather than providing specific details in response to questions, such as the total number of flights that could occur in a year or the specific locations of known cities and population centers in the flight paths. In future consultations, the Army should ensure that consulting parties receive complete information about the undertaking, and clearly state the rationale it used in making its findings and determinations.

To improve the outcome of this specific consultation and to improve consultation on future undertakings, the ACHP recommends that the Army host a meeting with the Colorado SHPO and the consulting parties to discuss the outstanding issues associated with this undertaking. During this meeting, the Army should present to the consulting parties all information that was presented to the ACHP to describe the project in detail, to support the rationale for its no adverse effect finding, and to answer any remaining questions. The ACHP is available to participate in such a meeting if the Army and consulting parties are amenable.

Based on the above information, it is ACHP's advisory opinion that the Army has adequately taken reasonable steps to identify historic properties made a reasonable determination in its finding of no adverse effect. In accordance with 36 CFR §§ 800.5(c)(3)(ii) (B), the Army is now required to take into account this advisory opinion in reaching a final decision on its finding of effect, and provide to the ACHP, SHPO, and other consulting parties a summary of how these advisory comments were considered by the Army. Once the summary of decision has been sent to the ACHP and other parties, the agency

official's responsibilities are fulfilled for this step in the Section 106 process.

Should you have any questions or require additional assistance, please contact Lauren Cooper at (202) 517-0213 or by e-mail at lcooper@achp.gov and reference the ACHP Project Number above.

Sincerely,

Jaime Loichinger
Director
Office of Federal Agency Programs

July 15, 2024

Sean M. Brown
Garrison Commander
United States Army Garrison, Fort Carson
1626 Ellis Street
Suite 200, Building 111
Fort Carson, CO 80913-4145

Ref*:* *Establishment of Four Low-Level Aviation Training Routes by United States Army Garrison Fort Carson, Colorado*
ACHP Project Number: 018530

Dear COL Brown,

On May 7, 2024, the Advisory Council on Historic Preservation (ACHP) received a request from the Department of the Army (Army) for our review of its finding of effect for the referenced undertaking. On June 5, 2024 the ACHP sent an advisory opinion that the Army conducted a reasonable and good faith identification effort and correctly applied the criteria of adverse effect to the historic properties that will be affected by the undertaking. We also noted that the Army had not thoroughly engaged consulting parties in the consultation process and recommended that United States Army Garrison-Fort Carson (USAG-FC) staff host a meeting with consulting parties to describe the project in detail, to support the rationale for its no adverse effect finding, and to answer any remaining questions. This meeting occurred on June 26, 2024.

The ACHP appreciates that the Army followed our recommendation regarding the meeting; however, we observed inconsistencies and incomplete information being presented to the consulting parties during the meeting. Specifically, USAG-FC did not give a detailed description of the undertaking or explain how it determined its finding of no adverse effect. Most concerning, some material presented at the meeting appeared to be in direct conflict with information that USAG-FC had given to the ACHP, specifically regarding effects to the Santa Fe Trail and the eligibility of the Santa Fe Trail. This has called into question the good faith effort of the Army in following the Section 106 process and can erode the trust among consulting parties that is necessary for effective consultation.

The ACHP has thoroughly reviewed the information presented at the June 26, 2024, meeting. While the new information does not substantively change ACHP's previous advisory opinion regarding the identification effort and effect finding for the undertaking, it is also the ACHP's opinion that the Army has failed to adequately describe the undertaking and document how it reached its findings so that consulting parties can understand its basis, as required by 36 CFR § 800.11(a). To address this, we advise USAG-FC to resubmit your findings with a complete and accurate documentation package that includes, among other things:

- a thorough and accurate description of the undertaking, including total number of times aircraft may pass over a historic resource in a week; and the height or distance of the aircraft above the ground;

- eligibility determinations, including for all segments of the Santa Fe Trail in the APE;
- the effect of the undertaking on historic resources, including the distance aircraft may be from the Santa Fe Trail; and
- the rationale for how the Army came to its finding of effect.

As a final point, we note that during the June 26 meeting, USAG-FC also incorrectly referred to the ACHP's June 5 letter as "findings." We remind USAG-FC that the ACHP does not make a finding on disputes. Consistent with the regulations, we provide advisory comments on disputes that are intended to assist federal agencies and consulting parties in conducting Section 106 reviews. The Army is ultimately responsible for findings and determinations related to the undertaking.

In accordance with 36 CFR §§ 800.5(c)(3)(ii) (B), the Army is now required to take into account this advisory opinion in reaching a final decision on its finding of effect, and provide to the ACHP, SHPO, and other consulting parties a summary of how these advisory comments were considered by the Army. Once the summary of decision has been sent to the ACHP and other parties, the agency official's responsibilities are fulfilled for this step in the Section 106 process.

Should you have any questions or require additional assistance, please contact Lauren Cooper at (202) 517-0213 or by e-mail at lcooper@achp.gov and reference the ACHP Project Number above.

Sincerely,

Jaime Loichinger

Jaime Loichinger
Director
Office of Federal Agency Programs

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT CARSON
1626 ELLIS STREET, SUITE 200
FORT CARSON, CO 80913-4143

August 1, 2024

SUBJECT: Response to ACHP Review of National Historic Preservation Act Section 106 Consultation for Fort Carson the Establishment of Four Low-Level Aviation Training Routes: Gambler, Comanche, Mustang, and Saber

Ms. Jaime Loichinger
Director of the Office of Federal Agency Programs
Advisory Council of Historic Preservation
401 F Street NW, Suite 308
Washington, District of Columbia 20001

Dear Ms. Loichinger:

The US Army Garrison-Fort Carson (USAG-FC) received the Advisory Council on Historic Preservation's (ACHP) response to the USAG-FC's request for review of the finding of effect on the establishment of four low-level aviation training routes, in accordance with 36 CFR § 800.5(c)(2)(i), on June 5, 2024. An additional letter from ACHP was also received on July 15, 2024 in response to the June 26, 2024 meeting that USAG-FC hosted with the consulting parties. USAG-FC appreciates and considered the Council's advisory opinion, recommendations, and guidance to affirm the initial finding of *no adverse effect* to historic properties and conduct the undertaking as proposed in the finding.

On June 26, 2024, USAG-FC hosted a meeting to discuss ACHP's advisory opinion, recommendations, and guidance; and USAG FC's plans moving forward regarding improving communication and monitoring plan for the undertaking. The consensus was that for complex undertakings the process would be improved by the Cultural Resources Manager (CRM) initiating consultation prior to completing the analysis and Section 106 undertaking review packet. The early consultation and scoping will assist the CRM in preparing a more comprehensive undertaking review. USAG-FC will continue to use all available methods to identify historic properties in the Area of Potential Effect (APE). Moving forward, the identification methods will be more clearly discussed in the undertaking review for greater transparency.

USAG-FC developed a monitoring plan for twelve sites identified within the APEs to serve as a representative sample and assess the effects of the undertaking. The monitoring of the seven sites outside of the installation is contingent upon coordination with federal and state agencies who manage the properties. The CRM will coordinate with appropriate staff to get permission, gain access, and share findings of the monitoring. The monitoring plan will be shared in the forthcoming Environmental Assessment (EA) for comment from the consulting parties. All monitoring will be conducted in accordance with USAG-FC's established monitoring program.

The training community at Fort Carson has acknowledged that the Santa Fe Trail is an important historic resource and has modified training routes to minimize the effects to the trail from training. An example of this is in the review of the effects of low-level aviation training in 2012. Public concern led to the modification of Route Hawk to diminish potential effects to the eligible segments of the Santa Fe Trail. The route was shifted to the south to keep the route within the Pinon Canyon Maneuver Site (PCMS) instead of flying parallel to the Santa Fe Trail, railroad, and the U.S. Highway 350. The consultation on the modification of Route Hawk was concluded with the State Historic Preservation Officer (SHPO) providing no comments during the final 30-day comment period, effectively concurring with the finding of *no adverse effect.* This modification was maintained in the new proposed Route Mustang.

In the same vein, the consultation on the establishment of four low-level aviation training routes has resulted in additional modification in training scenarios. The Combat Aviation Brigade (CAB) has agreed to increase the minimum above ground level (AGL) to 1,000 AGL when conducting aviation training over the Santa Fe Trail on Routes Gambler, Comanche, Mustang, and Saber. The minimum AGL for these portions of the routes will be documented in the CAB's Aviation Procedures Guide.

In response to ACHP's second letter dated July 15, 2024, USAG-FC is resubmitting the findings with thorough and accurate description of the undertaking including the effect of the undertaking on historic properties and the minimum AGL over Santa Fe Trail; the number of times and AGL the helicopters may pass over a historic resource in a week; the eligibility determination, including all segments of the Santa Fe Trail in the APE; and the rationale for how USAG-FC came to its finding of effect. An additional map of the segments of the Santa Fe Trail in the APE with the new minimum AGL is included in a new enclosure.

If you have any questions or require clarification, please contact Ben Zandarski, USAG-FC, Cultural Resources Manager, at 719-722-9321, or via email at benjamin.a.zandarski.civ@army.mil. In accordance with 36 CFR § 800.5(c)(3)(ii)(B), all consulting parties will receive the summary of the final decision.

Sincerely,

Erik C. Oksenvaag
Colonel, U.S. Army
Garrison Commander

Enclosures

Appendix C: Monitoring Plan for Low-Level Helicopter Flights from Fort Carson to the Pinon Canyon Maneuver Site

Monitoring Plan for Low-Level Helicopter Flights from Fort Carson to the Pinon Canyon Maneuver Site

Prepared by:
Benjamin A Zandarski II and Marisa Miller Acosta
Cultural Resource Manager and PCMS Archaeologist
Fort Carson Directorate of Public Work

Prepared for:
Fort Carson Directorate of Public Works

Date:
July 21, 2024

Contents

List of Abbreviations

4CAB: 4th Infantry Division Combat Aviation Brigade

ACHP: Advisory Council on Historic Places

AGL: Above Ground Level

APE: Area of Potential Effect

BLM: Bureau of Land Management

CDOH: Colorado Department of Highways

CDOT: Colorado Department of Transportation

CRM: Cultural Resource Manager

EA: Environmental Assessment

FCR: Fire Cracked Rock

GNSS: Global Navigation Satellite System

IDW: Inverse Distance Weighted

NDVI: Normalized Difference Vegetation Index

NHPA: National Historic Preservation Act

NMSU: New Mexico State University

NRHP: National Register of Historic Places

OAHP: Office of Archaeology and Historic Preservation

PCMS: Pinon Canyon Maneuver Site

SHPO: State Historic Preservation Office

USGS: United States Geological Survey

Executive Summary

This Monitoring Plan outlines procedures for assessing the impact of low-level helicopter training operations conducted by the 4th Infantry Division Combat Aviation Brigade (4CAB) between Fort Carson and the Pinon Canyon Maneuver Site (PCMS). The plan is designed to evaluate potential effects on selected archaeological sites, focusing on both environmental and anthropogenic factors, particularly those arising from low-level flights.

1. Overview of Low-Level Flight Operations

The 4CAB at Fort Carson is proposing to conduct low-level helicopter training operations to maintain military readiness. The training will be carried out along designated routes between Fort Carson and the PCMS. The primary route used for these operations are Gambler, Comanche, Mustang, and Saber, with the existing Route Hawk also being utilized with slight modifications to avoid residential areas.

1.1 Flight Details

The low-level training flights are conducted at altitudes ranging from 100 to 300 feet above ground level (AGL) and at speeds exceeding 100 knots (115 miles per hour). The helicopters used in these operations include the Boeing AH-64 (Apache), Boeing CH-47 (Chinook), Sikorsky UH-60 (Black Hawk), and Eurocopter UH-72 (Lakota). Typically, flight occur approximately one to three times a week, including two to three helicopters in formation. During mission-related training exercises, which are scheduled approximately once per quarter, lasting about one week, can see flight formations expand to include up to six helicopters.

1.2 Operational Policies

The training operations adhere to strict protocols, and hovering, taking off, or landing along the flight paths is not permitted. Furthermore “nap-of-the-earth” flying, which involves flying close to the ground and utilizing terrain for cover, is not conducted in these exercises. This restriction is part of the operational protocols to ensure safety and compliance with training guidelines.

In implementing these operations, Fort Carson follows the “Fly Neighborly” policy, which was first articulated in the 2012 Environmental Assessment (EA) for the Fort Carson Combat Aviation Stationing. This policy, further supported by the guidelines in the Fort Carson Noise Management Plan (2018), aims to reduce the noise and other environmental impacts associated with aviation operations. By spreading flight operations across a broader area, the policy seeks to mitigate potential nuisances to the public and minimize the acoustic footprint of military exercises.

The introduction of new routes such as Gambler and Mustang, along with modifications to Route Hawk, is part of a strategic effort to provide a more diverse suite of training options while adhering to the “Fly Neighborly” policy. These adjustments are designed to diffuse the effects of low-level aviation training, ensuring that noise and other impacts are minimized, thus enhancing the overall effectiveness of the training while respecting community concerns.

2. Monitoring Plan and Purpose

The primary purpose of this monitoring plan is to systematically assess and document any unforeseen effects from low-level helicopter training operations on selected archaeological sites between Fort Carson and the PCMS. The plan aims to identify any changes in the physical integrity of these sites and to determine if any unforeseen adverse effects are caused by vibrations, noise, and other disturbances resulting from training exercises. The findings from the monitoring effort will help to determine if additional consultation is required.

2.1 Objectives

The key objectives of the monitoring plan are as follows:

- **Establish Baseline Conditions:** Conduct comprehensive surveys of the sites to establish the current condition. This includes mapping, photographing, and assessing the condition of the significant features.
- **Monitor Changes:** Regularly monitor the sites to identify any physical changes, such as structural damage, erosion, or newly exposed features and artifacts, that may result from low-level flights.
- **Evaluate Potential Impacts:** Assess the extent of any disturbances to the sites, distinguishing between those caused by natural processes and those attributable to military training activities.
- **Develop Adaptive Management Strategies:** Based on monitoring data, recommend management actions to protect the site’s integrity. In cases where adverse effects from low-level flights are identified, consult with SHPO and other consulting parties to determine necessary actions, which may include suspending training activities.

2.2 Focus Areas

The monitoring will focus on the following aspects:

- **Structural Integrity:** Evaluation of the stability and condition of built structures and features at the site.
- **Artifact/Feature Exposure and Displacement:** Monitoring for the exposure or movement of artifacts/features due to vibrations or other disturbances

- **Erosion and Soil Movement:** Use of soil erosion pins to measure soil displacement and assess any unforeseen impact of helicopter induced ground vibrations.
- **Vibration Monitoring:** Deployment of accelerometers at selected sites to measure ground vibrations and assess their potential impact on site stability.
- **Vegetation Changes:** Application of Normalized Difference Vegetation Index (NDVI) analysis and Soil Adjusted Vegetation Index (SAVI) to detect changes in vegetation health and cover, which may indicate broader environmental disturbances. This analysis will help identify indirect effects on sites, such as soil erosion or changes in microhabitats that could impact preservation conditions.

2.3 Methodologies

The methodologies employed in the monitoring plan include:

- **Baseline Data Collection:** Detailed initial surveys using sub-meter GNSS receivers for mapping, along with extensive photographic documentation.
- **Recurring Monitoring:** Scheduled follow-up visits to each site to track changes over time, including the use of soil erosion pins, accelerometers, and NDVI and SAVI analysis.
- **Data Analysis and Reporting:** Systematic analysis of collected data to identify trends and inform management strategies. Regular reports will be produced to document findings and recommendations, ensuring compliance with cultural resource laws and engagement with stakeholders.

2.4 Significance

Monitoring these archaeological sites is essential for compliance with federal and state historic preservation regulations, including the National Historic Preservation Act (NHPA) and its implementing regulations at 36 CFR 800. The data collected will inform necessary actions to protect these cultural resources, including consultation with the SHPO and other stakeholders in the event of an adverse effect. This comprehensive approach ensures responsible stewardship of cultural heritage and helps balance operational readiness with preservation obligations.

3. Site Selection Process

3.1 Rationale

The primary rationale behind the selection of sites includes:

- **Historic and Cultural Significance:** Sites were chosen based in their historic value and potential to provide insights into the past human activities. This

includes sites listed on or eligible for the National Register of Historic Places (NRHP), as well as those designated as “needs data”. The inclusion of “needs data” sites ensure a comprehensive monitoring plan and provides these sites with a proper updated recording. This selection was necessary due to the limited availability of other suitable sites that meet our established criteria.

- **Diversity of Site Types:** The selection encompasses a range of site types, ensuring that the monitoring plan addresses the unique characteristics and unforeseen vulnerabilities of different site categories.
- **Monitor for Changes:** Sites were selected that would allow for the monitoring of any unforeseen changes that might occur due to low-level flights. This includes that ability to observe natural processes and document sites conditions to ensure continued protection of cultural resources.
- **Land Ownership Considerations:** Priority was given to sites located on public lands, including federal and state-owned properties. This approach minimizes the burden on private landowners and facilitates compliance with legal and regulatory frameworks, as public land is more directly managed by relevant agencies.

3.2 Coordination with Agencies

The selection process for the monitoring plan includes ongoing coordination with various agencies that manage the lands where the selected archaeological sites are located. These agencies include, but are not limited to, the Comanche National Grasslands, Colorado Department of Transportation (CDOT), Bureau of Reclamation, Bureau of Land Management (BLM), and Colorado Parks and Wildlife. The plan’s implementation is contingent upon successful coordination with these entities to ensure comprehensive oversight and compliance with their management policies.

3.3 Selected Site Types

The monitoring plan includes a diverse range of sites, each representing different aspects of the region’s cultural heritage”

1. **Open Lithic Sites:** The sites consist primarily of lithic scatters, where stone tools and debitage are found, indicating areas of tool production and use.
2. **Open Architectural Sites:** Prehistoric sites featuring structural elements such as foundations, walls, or other architectural remains. These sites are typically associated with prehistoric habitation or ceremonial activities.
3. **Sheltered Architectural Sites:** Sites with architectural features located within rockshelters or other natural enclosures, providing protection from environmental factors.

4. **Homesteads:** Historical habitation sites that include small-scale farming or residential structures, often indicative of individual family units or small communities.
5. **Ranches:** Larger historical habitation sites typically associated with livestock operations, including barns, stables, and other agricultural infrastructure.
6. **Open Camp Sites:** Sites that served as temporary or seasonal habitation, which may contain hearths, lithic scatters, and other artifacts.
7. **Sheltered Camps:** Sites that served as temporary or seasonal habitation areas, often located within sheltered environments such as rockshelters. These sites typically include hearths, lithic scatters, and other cultural materials.
8. **Rock Art Sites:** Sites featuring petroglyphs or pictographs, often located in rockshelters or on exposed rock surfaces. These sites are typically sensitive to environmental change and require careful monitoring to detect any signs of deterioration or vandalism.

4. General Monitoring Procedures

The General Monitoring Procedures section outlines the standardized methods and processes to be used across all selected archaeological sites. These procedures are designed to provide consistent reliable data collection, ensuring a comprehensive understanding of the site's conditions and any changes that may occur over time.

4.1 Baseline Data Collection

Baseline data collection is the foundational step in the monitoring process, establishing a reference point for future comparisons. This phase involves detailed surveys and documentation to capture the current state of each site, including:

- **Mapping:** Use of sub-meter Global Navigation Satellite System (GNSS) receivers to accurately map the spatial boundaries and significant features of each site.
- **Photographic Documentation:** Comprehensive photographic records of site, including all significant features. Standardized photo points will be established for consistent documentation in subsequent monitoring visits.
- **Condition Assessment:** Detailed evaluations of the physical condition of the site and features. Assessment will focus on identifying existing disturbances and documenting baseline conditions, considering factors such as:
    - **Effects of Animals:** Disturbances caused by wildlife, such as bioturbation, burrowing trampling, or scavenging.
    - **Effects of Erosion and Other Geologic Processes:** Natural processes that may lead to soil movement, sediment deposition, or landform change.

- **Effects of Natural Disasters:** Impact of events such as floods, fires, and storms.
- **Effects of Development:** Changes due to construction, land use changes, or other development activities in the vicinity.
- **Other Human Impacts:** Vandalism, unauthorized excavation, or other anthropogenic activities.
- **Effects of Vegetation:** Changes in plant growth that may affect site stability or visibility, including root damage or increased cover.
- **Speed of Deterioration:** Rates of degradation observed in materials or features, such as weathering of rock art or decay of wooden structures.

4.2 Recurring Monitoring

Following the baseline data collection, recurring monitoring visits will be conducted according to a predetermined schedule. The frequency of these visits may be adjusted based on the initial findings and any observed changes:

- **First Year Visit:** An initial follow up visit one year after the baseline data collection to assess any immediate changes.
- **Subsequent Visits:** If a no significant changes are detected, the next visit will be scheduled for three years after the baseline visit. If after three years no significant changes are detected, the next visit will occur 5 years from the baseline visit. If no changes are detected after 5 years, the next visit will occur 10 years from the baseline visit. If no changes are detected after 10 years, a reassessment will be conducted in consultation with the Colorado SHPO and other stakeholders to determine the necessity of continued monitoring.

4.3 Analytic Techniques

Several analytic techniques will be employed to monitor and assess changes at sites, including:

- **Accelerometers:** These will be used to measure ground vibrations, particularly in areas sensitive to structural integrity concerns. Accelerometers will be strategically placed at selected sites, with data collection focused on periods of intense military activity.
- **Soil Erosion Pins:** Installed at various locations within each site to measure soil movement and erosion over time. This method provides quantitative data on changes in soil stability, which can impact the preservation of site features.
- **Laser Level Analysis:** Used to monitor the structural integrity of standing features, particularly at historic ranch sites. This non-invasive technique helps detect any shifts or tilts in structures, indicating potential stability issues.

- **NDVI and SAVI Analysis:** Normalized Digital Vegetation Index (NDVI) analysis and Soil Adjusted Vegetation Index will be applied using satellite imagery to detect changes in vegetation health and cover. This analysis can help identify broader environmental disturbances that may affect site integrity, such as increased erosion or changes in soil composition.

4.4 Data Management and Reporting

All collected data, including maps and analytical measurements will be stored in the Fort Carson Cultural Resource Geodatabase. Photographs, monitoring forms, and other documentation will be securely archived with digital backups maintained on the Fort Carson Network. A hard copy of all forms will also be stored in Fort Carson's curation facility. Regular reports will be generated after each visit to summarize findings, assess any observed changes, and provide recommendations for management actions. The Colorado SHPO, relevant agencies, and relevant consulting parties will be provided with these monitoring reports. Fort Carson will coordinate stakeholder participation where possible during subsequent monitoring visits, ensuring transparency and collaborative management of cultural resources.

4.5 Stakeholder Engagement and On-Site Observations

To facilitate a thorough understanding of the low-level flights, an on-site observation meeting will be organized. This event will include the SHPO and other consulting parties, providing an opportunity to observe low-level helicopter flights in real-time. The meeting aims to offer stakeholders firsthand experience of the training operations, fostering an informed dialogue about the monitoring process and any observed effects. This engagement will enhance collaboration and ensure that all parties have a comprehensive understanding of the environmental and cultural resource considerations involved.

5. Site Specific Monitoring

This section outlines the specific monitoring strategies and considerations for each selected archaeological site. Given the diversity of site types and conditions, tailored approaches are necessary to accurately assess and document any unforeseen impacts from low-level flights. The methodologies and focus areas will be adapted to the unique characteristics of each site, ensuring a comprehensive understanding of any changes over time.

5.1 5PE148 (Open Camp on Lake Pueblo)

5.1.1 Overview

Site 5PE148 is an open camp located near Lake Pueblo. The site features a concentration of fire-cracked rocks, indicating potential prehistoric use as a habitation or activity area. The site's known artifacts include lithic debris, with no substantial structural remains.

5.1.2 Previous Investigations

The site was originally recorded in 1965 by John Kennedy from Denver University, identifying two scrapers and several flakes. In 2006, Cultural Resource Analyst Inc. revisited the site, documenting a single fire-cracked rock concentration (Feature 1) composed of 15 small, reddened quartz cobbles. No additional artifacts were noted during this recording, and the site was recommended not eligible for inclusion in the NRHP, though it was noted that recent deposition might cover subsurface materials. The site is listed as "needs data".

5.1.3 Monitoring Focus

The primary focus will be to relocate Feature 1 and conduct a thorough surface survey to identify any newly exposed artifacts or features. Monitoring will include assessing the site for signs of landscape deflation and emergence of new artifacts or features due to low-level flight activities. The use of erosion pins will measure soil movement and assess the stability of the site's surface conditions over time. Additionally, NDVI and SAVI analysis will be conducted for the general area, providing data on vegetation health and potential environmental changes that could impact the site.

5.1.4 Special Considerations

There will be no subsurface testing conducted at this site as it is beyond the scope of this project. No vegetation management practices will be implemented. Consulting parties, agency officials, and the Colorado SHPO will be invited to accompany Fort Carson Archaeologists during subsequent monitoring visits, ensuring transparency and comprehensive documentation. The monitoring efforts will be carefully designed to avoid any direct or indirect impacts to the site.

5.2 5OT234.10 (Mountain Branch of the Santa Fe Trail)

5.2.1 Overview

Site 5OT234.10 represents a segment of the historic Mountain Branch of the Santa Fe Trail, historically used by various tribal communities and later by European settlers as a 19th century trade route. The specific segment 5OT234.10, located within Comanche National Grasslands, features shallow ruts marking the path of the trail.

5.2.2 Previous Investigations

The site was first documented by Buckles in 1986, highlighting the eligibility for the NRHP under Criterion A for its historic significance. The 1994 survey by Christian Zier, associated with the “Cultural Resource Inventory and Excavation for the Diamond Shamrock Colorado Springs Pipeline,” provided further insights into the site’s condition. The most recent recording by Alpine Archaeology in 2018, as part of the “Preservation Plan for the Santa Fe National Historic Trail on Comanche National Grasslands,” confirmed the presence of shallow ruts and reinforced the site’s historical value.

5.2.3 Monitoring Focus

Monitoring will include detailed documentation of the site’s condition, with photo points established at regular intervals along the trail, to capture changes in the visibility and condition of the ruts. Monitoring will also focus on assessing erosion and other environmental impacts along the trail and surrounding areas. NDVI and SAVI analysis will be used to track changes in vegetation, which may indicate the stability and health of local soils. Erosion pins will be placed along the periphery of the trail but not directly in the ruts to avoid any adverse effects on the trail. These pins will help monitor soil movement and assess erosion patterns adjacent to the trail.

5.2.4 Special Considerations

Collaboration with Comanche National Grasslands management is essential to ensure that monitoring aligns with preservation guidelines. Additionally, it is crucial to acknowledge the broader historical context of the trail, respecting its significance to tribal communities. Consulting parties, including the Colorado SHPO, tribal representative, and other stakeholders, will be invited to observe flights over the trail. When conducting low-level aviation training all flights will return to 1000 ft AGL prior to crossing the trail.

5.3 5PE799 (Brantzell Site – Open Camp and Historic Habitation on CDOT Property)

5.3.1 Overview

The Brantzell Site (5PE799) is a multi-component archaeological site located on Colorado Department of Transportation (CDOT) property. The site includes both historic and prehistoric elements, featuring two structural remnants and three distinct lithic concentrations. The historic component comprises two structures, while the prehistoric component includes artifacts indicative of habitation activity.

5.3.2 Previous Investigations

The site was originally recorded in 1987 by D. Angulski and J. Gooding for the Colorado Department of Highways (CDOH), after being identified by Buckles. The recording described Structure 1 as a 5.5 by 7-meter stone building with six or more courses of

limestone and a significant amount of exterior rubble. Structure 2 was identified as a 2.5 by 2.5-meter dugout lined with limestone and adobe masonry. Prehistoric elements included three lithic concentrations, containing artifacts such as oxidized sandstone, chipped stone debitage, groundstone, a projectile point, and a lap anvil. The site was revisited in 1999 by S. Sherman and J. Brooke of Centennial Archaeology Inc., who noted the collapse of the structures and did not identify any prehistoric artifacts. The 1999 report recommended further investigation for potential subsurface integrity.

5.3.3 Monitoring Focus

Monitoring efforts at the Brantzell Site will focus on documenting all visible features, particularly the collapsed structures, and conducting a detailed survey to identify any new artifacts or features. Special attention will be paid to assessing the structural remnants of Structure 1 and 2. The use of erosion pins will measure soil movement and assess the stability of the site's surface conditions over time. NDVI and SAVI analysis will also be conducted to monitor vegetation changes, which could indicate site disturbances or exposures.

5.3.4 Special Considerations

No subsurface testing in planned, as this falls outside the scope of this project. The monitoring will be conducted using non-invasive methods to preserve the site's integrity. Given the site's location on CDOT property, coordination with CDOT will be essential to ensure access and compliance with any relevant regulations. Consulting parties, including the Colorado SHPO, will be engaged in reviewing the monitoring results and discussing any necessary preservation actions.

5.4 5OT313 (Historic Habitation on Comanche National Grasslands)

5.4.1 Overview

Site 5OT313 consists of two unmodified sandstone block structures located in Minnie Canyon within the Comanche National Grassland, Otero County, Colorado. These structures are examples of vernacular architecture, characterized by the use of locally available sandstone and traditional building techniques. They likely represent early homesteading in the area.

5.4.2 Previous Investigations

This site was originally recorded in 1984 by Jerry Saunders. The documentation provided limited details, describing the site as containing an abandoned corner junction of 1 standing house" and a "second house with a large amount of walls standing." The site was noted to be situated on a flat area overlooking Minnie Canyon, with associated photographs showing two unmodified sandstone structures typical of the region's early homesteads.

5.4.3 Monitoring Focus

The primary focus of baseline monitoring at the site will be to ensure all features and artifacts are accurately documented. This includes creating plan and profile drawings of the remnant structures and updating all site records to modern standards. New photo points will be established to capture each elevation of the structures, and original photographs will be replicated where possible. Additionally, historic archival research and documentation will be conducted during the baseline assessment. Structural stability assessments will be carried out, using visual inspection and laser level analysis, to detect any shifts or deteriorations in the sandstone walls. The use of erosion pins will help measure soil movement around the site, while accelerometers will be deployed to detect and monitor vibrations, particularly during low-level flight activities to assess any potential impacts on the structural integrity of the buildings.

5.4.4 Special Considerations

Given the age and exposed nature of the structures, it is critical to avoid any actions that might further destabilize them. As the site is located on public land managed by the Comanche National Grassland, all monitoring activities will be coordinated with the appropriate federal agencies. This coordination ensures compliance with regulations and facilitates the sharing of monitoring results. No subsurface testing is planned, and all data collection will be non-invasive to preserve the site's current state. Consulting parties and the Colorado SHPO will be consulted to provide context and recommendations for ongoing preservation efforts.

5.5 5PE152 (Open Camp on Lake Pueblo)

5.5.1 Overview

Site 5PE152 is identified as an open camp situated on a terrace above the Arkansas River, near Lake Pueblo. The site is of interest due to its potential prehistoric occupation, as indicated by the presence of various artifacts and features.

5.5.2 Previous Investigations

The site was originally recorded in 1965 by Tom Huffman from University of Denver. Documentation noted the presence of prehistoric artifacts such as mano and metate fragments, debitage, and an obsidian patterned biface. A concentration of fire cracked rock (FCR) was also identified, suggesting the presence of at least a deflated thermal feature. The site was broadly described as a camp, though detailed recording of specific features was limited.

5.5.3 Monitoring Focus

The monitoring at this site will focus on accurately locating and documenting all identifiable features and artifacts. If the site cannot be located at the reported coordinates, a 200-meter square pedestrian survey will be conducted, employing 20

meter transects. Documentation will include mapping with a sub-meter GNSS receiver and establishing photo points for consistent future monitoring. The FCR concentration will be carefully examined and documented, with emphasis on assessing the potential for additional deflated or intact thermal features. NDVI and SAVI analysis will be conducted for the surrounding area to monitor changes in vegetation, which could indicate broader site disturbances. Additionally, erosion pins will be installed to monitor soil movement and assess any impacts on the site's features and artifacts.

5.5.4 Special Considerations

No subsurface testing is planned, as it is beyond the scope of this project. Monitoring will prioritize non-invasive methods to preserve the site's integrity. Comprehensive efforts will be made to update the site's documentation, addressing gaps in previous records. Coordination with consulting parties, including the Colorado SHPO and relevant federal and state agencies, will ensure that all findings are thoroughly reviewed and that appropriate preservation measures are considered.

5.6 5HF737 (Cucharas Ranch- Historic Ranch on BLM Land)

5.6.1 Overview

Site 5HF737, also known as Cucharas Ranch, is a historic ranch located on Bureau of Land Management (BLM) land. The site features a complex of historic ranch structures, representing a significant period of early ranching activities in the region. It includes 16 documented features, such as residential buildings, livestock facilities, and utility structures.

5.6.2 Previous Investigations

The site was recorded by Monica Weimer in 2001. The documentation includes detailed descriptions of the features and their conditions. Key structures include the main house, a cabin, chicken sheds, a privy, and various outbuildings like a hay barn and a garage. The site also contains a small lithic scatter, indicative of prehistoric use in the area. The ranch is noted for its architectural and historical significance, leading to its eligibility for the NRHP under Criterion C.

5.6.3 Monitoring Focus

Monitoring will focus on replicating existing photographs of the structures and ensuring all features are comprehensively documented. Any missing elevation photos will be added, and new photo points will be established. The structural stability of each building will be assessed, particularly those showing signs of deterioration. This will include using a laser level to measure any shifts or settling of the structures. Erosion pins will be installed around key structures to monitor soil movement, and accelerometers will be deployed to detect vibrations, especially during low-level flight activities. NDVI and SAVI analysis will be conducted to assess vegetation changes around the structures, helping to identify environmental issues such as erosion, soil instability, or changes in water

drainage patterns. These analyses will aid in understanding how environmental factors may be impacting the site and will help isolate unforeseen impacts specifically from low-level flight activities. This comprehensive approach ensures that all contributing factors are considered in the preservation and monitoring efforts.

5.6.4 Special Considerations

As the site is on BLM land, all monitoring activities will require coordination with the BLM to ensure compliance with federal regulations and preservation guidelines. Special care will be taken to document the prehistoric component. All findings and proposed actions will be shared with the BLM and other stakeholders to inform future preservation strategies.

5.7 5LA0470 (Open Architectural Site on the PCMS)

5.7.1 Overview

Site 5LA04750 is located on the PCMS. It was originally recorded as containing four prehistoric stone circles and an associated lithic scatter. The stone circles designated Features 1through 4, indicate the site's use for activities that might include habitation or ceremonial purposes.

5.7.2 Previous Investigations

The site was originally recorded in 1987 by R. Hilman and others from Larson-Tibesar Associates, documenting the presence of four stone circles and a surrounding lithic scatter. In 2003, the site was revisited by K. Barnes and W. Blunk from New Mexico State University (NMSU). During this investigation, two shovel probes were conducted, one yielded cultural material, while the other did not. The artifacts recovered included lithic debitage, suggesting tool making activities at the site. The site has been recommended as eligible for the NRHP under Criterion D, due to its potential to provide significant archaeological information.

5.7.3 Monitoring Focus

The monitoring plan will focus on thoroughly documenting the stone circle and lithic scatter. This includes detailed mapping with sub-meter GNSS receiver and establishing photo points for comprehensive visual records. A survey will be conducted to identify any new artifacts or features that have exposed since the last investigation. Erosion pins will be installed to monitor soil movement around the stone circles, helping assess the impact of natural processes or military activities. Additionally, NDVI and SAVI analysis will be employed to observe changes in vegetation, which may reveal broader environmental shifts affecting the site.

5.7.4 Special Considerations

The site monitoring will be conducted by USAG Fort Carson cultural resource staff. All past monitoring efforts will be incorporated into the current monitoring and vice versa.

The emphasis will be on non-invasive monitoring methods to preserve the site's integrity. Consulting parties, including the Colorado SHPO and tribal entities, will be engaged in reviewing findings and advising on preservation strategies.

5.8 5LA4776 (Sheltered Architectural Site on PCMS)

5.8.1 Overview

Site 5LA4776 is located on the PCMS. The site features a large lithic scatter and several rockshelter, indicating it was likely used for various prehistoric activities, including tool production and habitation.

5.8.2 Previous Investigations

The site was originally recorded in 1987 by R. Himan and others of Larson-Tibesar Associates. At that time a significant lithic scatter and rockshelter were documented. During a subsequent revisit in 2003 by M. Owens and others from NMSU, additional features were identified, including multiple rockshelters and a roasting pit. The site includes the following features:

- Feature 1: Rockshelter
- Feature 2: Rockshelter
- Feature 3: Rockshelter
- Feature 4: Roasting Pit
- Feature 5: Stone Circle
- Feature 6: Contiguous Wall
- Feature 7: Contiguous Wall

During the 2003 evaluation, 12 shovel test probes were conducted. While most were sterile, one test probe revealed a thermal feature consisting of ash, charcoal, and fire-cracked rock. The presence of these features suggests the site was used for a variety of purposes, including habitation and food processing. The site has been recommended eligible for the NRHP under Criterion D for its potential to provide significant archaeological information.

5.8.3 Monitoring Focus

Monitoring at site 5LA4776 will include detailed documentation of the existing features, particularly the rockshelters and the thermal feature identified in previous evaluations. This will involve creating detailed maps using sub-meter GNSS receivers, taking photographs at established photo points, and conducting survey to detect any new exposures of artifacts or features. Erosion pins will be installed to monitor soil movement around the identified features, and NDVI and SAVI analysis will be employed to track changes in vegetation, which may affect the site's condition. Additionally, accelerometers will be used to monitor vibrations and assess any potential impacts on the site's features, particularly during low-level flight activities.

5.8.4 Special Considerations

The site monitoring will be conducted by USAG Fort Carson cultural resource staff. All past monitoring efforts will be incorporated into the current monitoring and vice versa. The emphasis will be on non-invasive monitoring methods to preserve the site's integrity. Consulting parties, including the Colorado SHPO and tribal entities, will be engaged in reviewing findings and advising on preservation strategies.

5.9 5LA9649 (Sheltered Lithic on PCMS)

5.9.1 Overview

Site 5LA9649 is located on the PCMS. The site features two rockshelters and an associated lithic scatter, suggesting prehistoric usage for various activities, including habitation and tool production.

5.9.2 Previous Investigations

The site was initially documented by M. Chidley and colleagues from NMSU. Feature 1, one of the rockshelters, contained minimal deposition and a fine-grained quartzite flake. Feature 2, another rockshelter, has been deflated by erosion and contained a slab metate. The site also yielded several types of lithic artifacts, including small and large thin patterned bifaces, retouched/utilized flakes, and cores. Additionally, groundstone artifacts were identified, alongside a significant amount of debitage, with 151 flakes made of various materials such as argillite, chert, quartzite, and basalt. Despite the initial field recommendation of not eligible for the NRHP the site is currently listed as "needs data" for further evaluation.

5.9.3 Monitoring Focus

The monitoring plan for site 5LA9649 will focus on thoroughly documenting the existing features, particularly the rockshelters and lithic scatter. Efforts will include precise mapping using sub-meter GNSS receivers, photographic documentation at established photo points, and a comprehensive survey to detect any newly exposed artifacts or changes in site condition. The rockshelters will be closely monitored for signs of erosion or structural changes, while erosion pins will used to measure soil movement. NDVI and SAVI analysis will be conducted to monitor changes in vegetation, which may provide insight into environmental impacts affecting the site.

5.9.4 Special Considerations

The site monitoring will be conducted by USAG Fort Carson cultural resource staff. After the baseline monitoring is complete USAG Fort Carson staff will develop a research design to evaluate the site. This research design will be submitted to the Colorado SHPO and tribal entities for review. Once an adequate research design has been developed USAG Fort Carson archaeologists will evaluate the site. Should USAG Fort

Carson, the Colorado SHPO, and affiliated tribes determine the site is not eligible for the NRHP a new site of the same type will be selected for monitoring.

5.10 5LA11500 (Prehistoric Quarry, Rock Art, and Sheltered Architectural)

5.10.1 Overview

Site 5LA11500 is located on the PCMS. This site encompasses a prehistoric quarry, rock art, and rockshelters. The presence of these diverse features suggests the site was used for a range of activities, including resource extraction, habitation, and potentially ceremonial or artistic expressions.

5.10.2 Previous Investigations

The site was documented in 2018 by N. Albin and colleagues from Fort Carson Cultural Resource Management staff. Key features identified include a stone enclosure or abutment structure (Feature 1), rockshelters (Features 2 and 4), a prehistoric quarry (Feature 3), and a rock art panel (Feature 5). Collectively these features underscore the site's importance, leading to is recommendation for eligibility under Criterion D of the NRHP, due to its potential to provide significant archaeological information.

5.10.3 Monitoring Focus

Monitoring at site 5LA1150 will involve comprehensive documentation of all identified features, including detailed mapping with a sub-meter GNSS receiver and systematic photographic documentation. The rock art panel, in particular, will be monitored for any signs of deterioration, such as weathering or vandalism. Erosion pins will be placed around key features like the quarry and stone enclosure to track soil movement and assess any unforeseen environmental impacts. NDVI and SAVI analysis will also be conducted to monitor vegetation changes, which could indicate broader environmental influences on the site.

5.10.4 Special Considerations

The site monitoring will be conducted by USAG Fort Carson cultural resource staff. All past monitoring efforts will be incorporated into the current monitoring and vice versa. The emphasis will be on non-invasive monitoring methods to preserve the site's integrity. Consulting parties, including the Colorado SHPO and tribal entities, will be engaged in reviewing findings and advising on preservation strategies. No subsurface testing is included in the scope of monitoring.

5LA13450 (Rock Art and Sheltered Lithic on PCMS)

5.11.1 Overview

Site 5LA13450 is located on the PCMS. The site encompasses three rockshelters, an open-air rock art panel, and a large lithic scatter, indicating a diverse range of prehistoric activities, from habitation to artistic expression.

5.11.2 Previous Investigations

The site was recorded by S. Cowell of Stell Environmental. The primary features documented include three rockshelters (Features 1, 2, and 5) and multiple rock art panels (Panels 1, 2, and 3).

- **Panel 1,** within Feature 1 rockshelter, contains 23 distinct elements including quadrupeds, a possible turtle, anthropomorphs, and abstract figures.
- **Panel 2,** located in Feature 2, consists of 7 elements, featuring abstract circles, quadrupeds, and other unidentified symbols.
- **Panel 3,** positioned approximately 2 meters south of Feature 3, includes 4 elements, depicting quadrupeds, lines, and other unknown figures.

The rock art is characterized by solid pecked petroglyphs. The site also contains a large lithic scatter which suggests extensive tool making activities. Based on the variety and significance of the features, the site was recommended eligible under Criteria C, and D of the NRHP.

5.11.3 Monitoring Focus

The monitoring plan will prioritize detailed documentation and preservation of all site features, especially the rock art panels. This includes mapping with sub-meter GNSS receivers establishing consistent photo points, and closely monitoring the rock art for signs of weathering, erosion, or other forms of deterioration. The rockshelters and lithic scatter will be examined to identify new artifacts or changes in the site's condition. Erosion pins will be used to measure soil movement, and NDVI and SAVI analysis will track changes in vegetation that may impact the site. Accelerometers will also be utilized to monitor vibrations, particularly during low-level flight activities, to assess potential impacts to the site's integrity.

5.11.4 Special Considerations

The site monitoring will be conducted by USAG Fort Carson cultural resource staff. All past monitoring efforts will be incorporated into the current monitoring and vice versa. The emphasis will be on non-invasive monitoring methods to preserve the site's integrity. Consulting parties, including the Colorado SHPO and tribal entities, will be engaged in reviewing findings and advising on preservation strategies. No subsurface testing is included in the scope of monitoring.

5.1 5LA6121 (Historic Homestead on PCMS)

5.1.1 Overview

Site 5LA6121 is a historic homestead located in an unnamed drainage of Minnie canyon on the PCMS. The site was originally recorded in 1993 by R.F Carrillo and M. Church of WCRM Inc. The site was recommended eligible for the National Register of Historic Places (NRHP) under criteria A, C, and D, indicating it's historical significance in association with events that have made a significant contribution to the broad patterns of our history (early ranching/homesteading and Hispanic settlement in Colorado), architectural significance (Vernacular architecture), and the potential to yield information important to history

The site includes three features:

- Feature 1: dugout – This dugout is built into the base of a drainage, with two walls made from local sandstone blocks. The interior walls are constructed with mud mortar, and there is evidence of mud plaster inside the structure. The floor of the dugout has been filled with slope wash. There is a window on the east wall and a door on the south wall.
- Feature 2: Juniper Post Corral – The corral consists of local juniper branches and twine, held together by bailing wire. The corral features a single row of posts driven into the ground with a crosstie beam, and a small shed within the north wall.
- Feature 3: Platform – This small platform, surrounded by a fence corral, measures 5 meters by 4 meters and may have been used to support a tent.

Numerous artifacts were identified on site, including a machine-made barrel hoop, a spoon handle, glass fragments (both amethyst and clear), white improved earthenware fragments, a metal pants button, a cast iron bed frame, a chain purse frame, a harness buckle and strap, an aluminum drinking cup, a horseshoe, a wagon axle, and brakes, a hand pump, a 1922 license plate, and a zinc mason jar

5.1.2 Previous Investigations

The site was recorded in 1993 by WCRM Inc., during which the three primary features were identified and described. Numerous artifacts, both domestic and industrial, were cataloged. The site's eligibility under criteria A, C, and D was established due to its historical and architectural significance, as well as its potential to contribute valuable information to the understanding of the region's history.

The historical context suggests the site was part of the broader settlement and ranching activities that characterized the early 20th century in the region. The site's association with these activities, as well as it's unique construction contribute to it's significance.

5.1.3 Monitoring Focus

Monitoring at 5LA6121 will focus on assessing the structural integrity of the dugout, the condition of the juniper post corral, and any changes to the platform. The site will also be monitored for any newly exposed artifacts, especially in areas where slope wash may have affected the site since the last recording. During the baseline monitoring additional historic archival research will be conducted.

5.1.4 Special Considerations

For site 5LA6121, special considerations will focus on ensuring that erosion and environmental factors do not further impact the site. Erosion pins will be strategically installed around the dugout and platform to measure soil movement and any unforeseen effects to the feature. Should any significant findings be identified, they will be promptly communicated to all relevant stakeholders for further evaluation and action.

6. Monitoring Methods and Equipment

6.1 Overview of Monitoring Techniques

The primary goal of this monitoring plan is to assess whether there are unforeseen impacts to the selected archaeological sites resulting from low-level flight activities. This goal is achieved by establishing a comprehensive baseline assessment before the commencement of low-level flights and conducting subsequent condition assessments to identify any changes or impacts that cannot be explained by natural or other human processes.

6.1.1 Approach

The monitoring approach is multifaceted, combining non-invasive, visual, and data driven methods. Visual inspections and photographic documentation are critical components, providing immediate and tangible insights into the site's condition. Additionally, the use of accelerometers, erosion pins, NDVI/SAVI, and laser level analysis allows for the detection of subtle environmental changes that may not be immediately apparent through visual means. These complimentary methodologies ensure a robust and comprehensive understanding of the site's condition.

6.1.2 Non-Invasive Methods

All monitoring activities prioritize the preservation of site integrity. Tools such as erosion pins and accelerometers will not be placed in locations that could disturb significant features. Visual inspections will be conducted by qualified archaeologists, ensuring that observations and interventions are made with the utmost care. The integrity of each site will be maintained, with strict protocols in place to prevent and disturbance during monitoring activities.

6.1.3 Frequency and Scope

Monitoring visits are scheduled at specific intervals: an initial baseline assessment, followed by visits at 1 year, 3 years, 5 years and 10 years post-baseline. This schedule is designed to track changes over time and identify any unforeseen impacts potentially linked to low-level flight activities. The monitoring scope is comprehensive, assessing various factors including the effects of animals, erosion, development, natural disasters, and other environmental and human induced processes.

6.1.4 Collaboration and Consultation

Regular consultation will occur when monitoring reports are submitted, and if significant findings are identified. These consultations will involve key stakeholders, including the Colorado SHPO, consulting parties, and affiliated tribal entities. Feedback from these consultations will be instrumental in updating and refining the monitoring plan as necessary, ensuring it remains responsive to new information and conditions.

6.1.5 Flexibility and Adaptability

The monitoring plan is designed to be flexible and adaptive. In the event of new discoveries at the sites, appropriate documentation will be submitted to the SHPO, including Revisitation Forms, Data Management Forms, and relevant component forms (historic, prehistoric, linear, and architectural). Significant findings will prompt a review with consulting parties to determine whether low-level flights should be suspended until the issues are addressed. This adaptive approach ensures that the monitoring plan can evolve in response to emerging challenges and new data.

6.2 Photographic Documentation

6.2.1 Photo Points

Photo points will be carefully selected at each site to either replicate existing photographs or establish new points that accurately capture the full extent of significant features. This includes wide-angle site overviews, close-ups of specific features, and comprehensive images showing each elevation of any structures present. At least two overview photographs will be taken per site to provide a comprehensive visual representation. Photographs will avoid capturing foreign objects such as people, equipment, or vehicles in the background, except when necessary for scale.

6.2.2 Equipment and Quality

An iPhone 14 Pro camera will be used for the baseline documentation, ensuring high-quality images. For subsequent monitoring visits, at least the same quality camera will be used, with upgrades as technology evolves. Photographs will predominately be taken in landscape format to maintain consistency and provide a broad prospective of the site.

6.2.3 Replication and Comparison

Subsequent photographs will be taken from the same distance, angle, and bearing as the baseline photographs to ensure accurate comparison over time. Photo points will be precisely recorded using a sub-meter GNSS receiver. The naming convention will follow a format: CF202#_5LL####_#, representing the project number, the Smithsonian trinomial, and the image number, respectively. Each photo will be accompanied by a composition sheet detailing the angle, aspect, distance, coordinates, and a description of the photo.

6.2.4 Documentation and Record Keeping

Each photo and associated meta data such as the angle, aspect distance, coordinates, date, time, and description will be catalogued and integrated into the overall monitoring data system. The photographs and accompanying documentation will be stored in a secure and accessible format, ensuring they are available for future reference and analysis. All photograph compositions will also be printed on archival paper and stored in the Fort Carson Curation Facility.

6.2.5 Use of Photographs in Reporting

Photographs will play a crucial role in monitoring reports, providing visual evidence of the site conditions and changes over time. They will be carefully selected to illustrate significant findings and support the narrative of the reports. The guidelines for including photographs in reports will ensure that only the most relevant and informative images are used, highlighting key aspects of the monitoring efforts.

6.3 Mapping and GPS

6.3.1 Mapping Techniques

Site features will be meticulously recorded using sub-meter GNSS receivers, ensuring high accuracy in capturing the spatial data. Features will be documented as points, lines, and polygons, depending on the detail required. For instance, a small hearth may be recorded as a point, whereas a large roasting pit would be mapped as a polygon to provide a more detailed representation. This approach ensures that the complexity and scale of each feature are accurately conveyed.

6.3.2 GPS Equipment

The baseline monitoring will employ a Bad-Elf Flex ® GNSS receiver. Subsequent monitoring efforts may use other receivers of equal or greater quality and accuracy as the technology evolves. All Positional Dilution of Precision (PDOP) and Horizontal Dilution of Precision (HDOP) data will be retained. This retention helps in assessing quality and reliability of the spatial data collected. The GPS equipment will be configured to ensure consistent data collection across all sites and visits, maintaining a standardized approach to mapping.

6.3.3 Data Collection and Integration

GPS data collected on site will include all features, field specimens, and any relevant reference areas. Additionally, the site datum (if present), site boundary, photo points, erosion pin locations, and accelerometers placements will be recorded. These comprehensive datasets will be integrated into the Fort Carson geodatabase, which serves as the primary repository for all spatial data. The database will be updated regularly to reflect any new features or changes observed during monitoring visits.

6.3.4 Coordinate Systems and Datum

All mapping data will be standardized to the WGS 84 UTM Zone 13 North coordinate system. This consistency ensures compatibility and accuracy in spatial analysis and mapping across sites. Topographic basemaps or contours will be included in all site maps, providing a clear understanding of the site's layout and physical context. These maps will serve as essential tools for monitoring site changes, planning protective measures, and supporting archaeological research.

6.4 Erosion Monitoring

6.4.1 Erosion Pin Installation

Erosion pins will be installed using linear transects that provide comprehensive coverage of the site area while avoiding disturbance to the site's integrity. Pin may also be placed near areas of potential instability. The erosion pins will be constructed of ½ inch by 1-foot rebar, with a washer welded on 1 inch from the top for accurate measurement. Lines will be etched into the rebar in centimeter increments, with a zero-line etched at approximately 12 cm to indicate the modern ground surface. The tops of the rebar will be painted a blaze orange to avoid any safety hazards. No rebar will be placed within features.

6.4.2 Measurement Protocols

Measurements will be taken during each monitoring effort, up to 5 years, at which point the pins will be removed. The measurements will be stored in the GIS. If deposition exceeds the erosion pin washer or if erosion causes displacement of the rebar, it will be reported as such. An appropriate interpolation method, such as Inverse Distance Weighting (IDW) or Spline Interpolation, will be used for surface analysis to visualize trends and impacts.

6.4.3 Data Analysis

Collected data will be analyzed to assess erosion impacts over time. This analysis will involve comparing measurements from different time points to identify trends in soil movement. Criteria for determining significant erosion changes will include the rate of soil loss or gain, the extent of erosion across the site, and any visible impacts on site features or artifacts.

6.4.4 Reporting

Erosion data will be integrated into the overall site condition assessment and included in the monitoring reports. Visual aids, such as maps and graphs, will be used to illustrate trends and highlight areas of concern. These reports will provide clear and actionable insights into erosion impacts. The primary purpose of reporting erosion data is to determine of erosion may be related to low-level flight activities. If erosion is attributed to other factors recommendations to mitigate erosion will be provided to relevant agencies.

6.5 Vegetation and Environmental Monitoring

6.5.1 NDVI Analysis

Normalized Difference Vegetation Index (NDVI) analysis will be conducted to monitor vegetation changes over time. The NDVI will be calculated using Sentinel-2 imagery, which provides high-resolution, multispectral data suitable for detailed vegetation monitoring. The formula for NDVI is:

$$NDVI = \frac{(NIR - RED)}{NIR + RED}$$

Where the NIR (near-infrared) band is Band 8, and the RED band is Band 4. NDVI calculations will be performed using the raster calculator in ArcGIS Pro, ensuring consistency and accuracy across all time points.

6.5.2 SAVI Analysis

Soil-Adjusted Vegetation Index (SAVI) will be utilized to account for soil brightness in areas with sparse vegetation. The formula for SAVI is:

$$SAVI = \frac{(NIR - RED}{NIR + RED\_L}\ x\ (1 + L)$$

Where the soil adjustment factor L is typically set to 0.5. The same Sentinel-2 bands used for NDVI will be applied here. SAVI calculations will also be conducted using the raster calculator tool in ArcGIS Pro.

6.5.3 Area of Potential Effect (APE)

Both NDVI and SAVI analysis will cover each site and the 3-mile APE where it intersects the site. This comprehensive analysis will help identify any vegetation changes or disturbances potentially caused by low-level flight activities.

6.5.4 Environmental Factors

Additional environmental factors, such as weather patterns and water sources, will be monitored to provide context for the NDVI and SAVI analysis. These factors will be recorded using meteorological data and remote sensing tools and integrated into the overall analysis.

6.5.5 Data Collection and Frequency

NDVI and SAVI data will be collected at the baseline and then 1 years, 3 years, 5 years, and 10 years post-baseline. These time points will align with the overall monitoring schedule, allowing for consistent data collection and analysis. Data will be stored in the Fort Carson GIS for integration with other datasets. NDVI and SAVI data will be collected more frequently when the accelerometer is running at a particular site, to allow for cross correlation analysis between significant vibrations and vegetation health.

6.5.6 Integration with Other Data

NDVI and SAVI data will be integrated with erosion and photographic data to provide a comprehensive understanding of the site conditions. This integration will help assess the overall impact of environmental changes, including potential disturbances from low-level flights.

6.5.7 Reporting and Visualizations

The results of NDVI and SAVI analyses will be reported in the monitoring reports. Visual aids, such as maps and charts, will be included to illustrate vegetation and environmental trends. These visualizations will help stakeholders understand the extent and impact of vegetation changes over time.

6.6 Accelerometer Monitoring

6.6.1 Accelerometer Installation and Data Collection

Accelerometers will be strategically installed at selected sites to monitor vibrations. Installation will focus on areas where structural integrity may be compromised, such as near historic structures or near archaeological features. The placement will ensure that accelerometers can capture vibrations from low-level flights without being obstructed or compromised by other environmental factors. GeoSIG AC-2x accelerometers will be used due to their high sensitivity and ability to detect a wide range of vibrations, including those caused by low-level flights. These accelerometers are sensitive enough to detect vibrations in the range if 0.1 Hz to 100 Hz, making them suitable for this monitoring purpose.

Accelerometer data will be continuously collected and stored on-site using data loggers. The data will be periodically downloaded and transferred to a secure database for analysis. Data collection will occur for a one-month period annually, or during significant training events, to capture a representative sample of vibrations.

6.6.2 Data Analysis

The collected accelerometer data will be analyzed to identify vibration patterns and disturbances. Fourier Transform analysis will be used to convert the time domain signal into the frequency domain, allowing for the identification of specific vibration frequencies associated with low-level flights. Significant vibrations will be identified based on their frequency range (matching the expected range of helicopter vibrations), amplitude

(indicating the strength of vibrations) and temporal correlation with known flight times. Any vibrations that meet these criteria will be flagged for further analysis.

6.6.3 Integration with Other Data

Accelerometer data will be integrated with other monitoring data (e.g. photographic, erosion, NDVI, SAVI) in the Fort Carson geodatabase. Correlation analysis will be conducted to determine if significant vibrations are associated with changes in vegetation, soil erosion, or structural integrity. Cross correlation analysis will be used to compare accelerometer data with other datasets. For example, periods of high vibration detected by accelerometers will be compared to determine if there is a relationship between vibrations and vegetation health.

6.6.4 Reporting

The results of the accelerometer monitoring will be included in the annual monitoring reports. The reports will summarize the detected vibrations, their potential sources, and any correlations with other data types. Visual aids such as graphs showing vibration frequency and amplitude over time, heat maps indicating areas of significant vibration, and charts correlating vibration data with other data sets will be included in the reports to illustrate the findings.

6.7 Laser Level Monitoring

6.7.1 Laser Level Installation and Data Collection

Laser levels will be periodically placed to monitor the structural integrity of historic buildings and features. During each monitoring session, the laser levels will be set up on a stable surface or mounted using the lasers built-in stabilizer and magnetic base. The focus will be on key structural points, such as walls, corners, and rooflines. A high-precision Huepar B03CG laser level will be used for this purpose. This model is equipped with self-leveling capabilities and a 360° magnetic pivoting base, allowing for versatile placement and stable measurement. Measurements will be taken during each visit, establishing a baseline and subsequent data point for comparison.

6.7.2 Data Analysis

The collected data from the laser levels will be analyzed to identify any structural movements or shifts. The analysis will focus on detecting deviations from the baseline measurements. Statistical methods will be used to determine the significance of any detected changes, and correlation analysis will be conducted to link these changes to the timing of low-level flight activities. Any structural movements that exceed predetermined thresholds will be flagged for further investigation.

6.7.2 Integration with Other Data

Laser level data will be integrated with other monitoring data, such as accelerometer readings, erosion measurements, and NDVI/SAVI analysis. This integration will be facilitated through the Fort Carson geodatabase, enabling comprehensive correlation

analysis. For example, if significant vibrations are detected by accelerometers, the corresponding laser-level data will be examined to determine if these vibrations have caused any structural movements. Similarly, erosion data will be cross-referenced with laser level measurements to assess any potential impacts on structural stability.

6.7.3 Reporting

The results of the laser level monitoring will be included in the reports. These reports will detail any detected structural movements, their potential sources, and any correlations with other data types. Visual aids, such as diagrams showing structural changes over time, graphs depicting the extent of detected movements, and charts correlating laser level data with other datasets, will be included in the reports to provide a clear and comprehensive overview of the findings.

6.8 Integration and Analysis

6.8.1 Integration with other Data Sources

To ensure a comprehensive understanding of the impacts from low-level flights, data from various sources will be integrated and analyzed collectively. This includes data from accelerometers, laser levels, erosion pins, NDVI, and SAVI analyses. All the data will be stored in the Fort Carson geodatabase, enabling efficient analysis and multi-layered analysis.

6.8.2 Data Correlation and Analysis

Collected data will be systematically analyzed to identify correlations between different types of disturbances and the unforeseen impacts of low-level flights. The analysis will involve:

1. Cross-Correlation Analysis:
    a. This will be used to compare data from different sources (e.g. accelerometer vibrations with laser level structural changes) to identify patterns and potential casual relationships.
2. Statistical Analysis
    a. Tool such as regression analysis will be employed to determine the significance of observed changes and their potential linkage to low-level flight activities.
    b. For example, a regression model might examine the relationship between flight times, vibration amplitude, and erosion depth to determine if flight significantly impact erosion rates.
3. Temporal Analysis
    a. Comparing data collected over different time periods to identify trends and changes over time.
    b. This includes evaluating changes in NDVI or SAVI indices to assess vegetation health over the course of the monitoring period.

6.8.3 Reporting and documentation

The results of the integrated analysis will be documented in monitoring reports. These reports will include a comprehensive overview of the detected disturbances, potential sources, and their correlations. Visual aids such as graphs, charts, and maps illustrating the data and analysis results will be included to provide a clear understanding of the findings.

6.8.4 Future Monitoring Adjustments

Future monitoring adjustments will be made based on the analysis and feedback from stakeholders. This may include changes to the monitoring frequency, the introduction of new monitoring technologies, or modifications in data analysis techniques to better capture and understand any unforeseen impacts of low-level flights.

7. Outreach and Engagement

7.1.1 Annual Society for American Archaeology (SAA) Meeting

Fort Carson personnel will present the methodology and preliminary results of the monitoring program at the Annual SAA meeting in Denver, Colorado, scheduled for April 23-27, 2025. This presentation will capture, and present data collected over a six-month period, showcasing the initial findings and the applied methodologies. The presentation will include visual aids, such as graphs, charts, and maps, to illustrate the data and finding effectively.

7.1.2 Local Chapter Presentations

In addition to the SAA meeting, annual results and methodologies will be presented at the monthly meetings of the Pike Peak chapter and Pueblo chapter of the Colorado Archaeological Society. These presentations will provide an opportunity to share insights and engage with the local community. As part of these presentations, a tour of the sites within the monitoring program that were identified on the PCMS will be organized. This tour will offer a firsthand look at the monitoring efforts and the sites being studied, fostering a deeper understanding and appreciation of the projects scope and objectives.

7.1.3 Methodology and Preliminary Results

The outreach efforts will focus on presenting the comprehensive methodology employed in the monitoring program, including the use of accelerometers laser levels, erosion pins, NDVI, and SAVI analysis. Preliminary results will highlight key findings from the initial six months of data collection, demonstrating the program’s effectiveness in detecting and analyzing any unforeseen impacts of low-level flights on archaeological and historic sites. The presentation will also emphasize the importance of a

multidisciplinary approach and the integration of various data sources to achieve a holistic understanding of the potential disturbances.

7.1.4 Engagement and Feedback

Engagement with the archaeological community and stakeholders through these outreach efforts is crucial. Feedback gathered from these presentations will be invaluable in refining the monitoring methodologies and enhancing the overall program. The interactions will also help in building partnerships and collaborations, ensuring the program's long-term success and sustainability.

8. Conclusion

The monitoring plan outlined in this document provides a comprehensive approach to assessing any unforeseen impacts of low-level helicopter flights across archaeological and historic sites in southeast Colorado. By integrating various data sources such as accelerometers, laser levels, erosion pins, NDVI, and SAVI analyses, we can systematically identify any unforeseen disturbances. These findings will also assist land managers, by identifying any potential disturbances outside of low-level flights, so they may ensure the preservation of these important sites. Continuous coordination with stakeholders and the implementation of feedback will enhance the effectiveness and sustainability of the monitoring program. Through outreach efforts, including presentations at prominent conferences and local chapter meetings, we aim to foster a greater understanding of the monitoring program and its significance, while also gathering valuable feedback to inform future efforts.

Appendix A: Glossary of Terms

Glossary of Terms

Accelerometer: A device used to measure vibrations or changes in motion. In this project, accelerometers are used to detect vibrations caused by low-level helicopter flights to assess any unforeseen impacts to archaeological sites.

Archaeological Site: A location where evidence of past human activity is preserved and studied, including artifacts, structures, and other cultural material.

Artifact: Any object made, modified, or used by humans, typically found at an archaeological site.

Area of Potential Effect (APE): The geographic area within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties.

Cultural Resource Management (CRM): The practice of managing and preserving cultural resources, such as historic sites, artifacts, and structures, particularly in compliance with legal and regulatory frameworks.

Erosion Pin: A metal rod inserted into the ground to measure changes in soil levels over time, used to monitor erosion at an archaeological site.

Historic Properties: Any prehistoric or historic district, site, building, structure, or objects included in, or eligible for inclusion in, the National Register of Historic Places (NRHP).

Hillshade: A technique used in mapping to represent the illumination of terrain from a given light source, typically the sun, to highlight variations in terrain.

Integrity: The ability of a historic property to convey its historic significance, through aspects such as location, design, setting, materials, workmanship, feeling, and association.

LiDAR: A remote sensing method that uses light in the form of a pulsed laser to measure distances, commonly used to create high-resolution maps of the Earth's surface.

Mitigation: Actions taken to avoid, minimize, or compensate for the effects of an undertaking on historic properties, typically as the result of Section 106 consultations.

NDVI (Normalized Vegetation Index): A remote sensing measure used to assess vegetation health and cover by analyzing the difference between near-infrared (which vegetation strongly reflects) and red light (which vegetation absorbs).

Remote Sensing: The use of satellite or airborne sensor technologies to detect and classify objects on Earth, including vegetation, buildings, and landscapes.

SAVI (Soil Adjusted Vegetation Index): A remote sensing measure similar the NDVI but adjusted to minimize the influence of soil brightness when analyzing vegetation cover, particularly in areas with sparse vegetation.

Section 106 Review: A process required by the National Historic Preservation Act (NHPA) to evaluate the effects of federally funded projects on historic properties.

SHPO (State Historic Preservation Office): A state-level agency that manages and protects historic resources in compliance with federal and state preservation laws.

Sub-Meter GNSS Receiver: A Globla Navigation Satellite System (GNSS) device capable of providing location data with accuracy to within one meter of less, used for precise mapping and documentation of archaeological sites.

Vernacular Architecture: Traditional or local architecture that uses available materials and reflects the cultural practices of the area.

Visual Inspection: The process of examining a site or object by sight to assess its condition, typically conducted by a qualified archaeologist.

Finding of No Significant Impact:
Low-level Helicopter Flight Training Routes at Fort Carson, CO

September 2022

Introduction

To maintain its military readiness posture, the 4th Combat Aviation Brigade (4CAB) must conduct day and night vision device, low-level helicopter training operations. Route Hawk, the current low-level helicopter training route (training route), is being proposed for decommissioned because of encroachment of communities on the route. Four new training routes have been proposed to replace Route Hawk.

Description of the Proposed Action

Low-level aviation training occurs between 100 feet (ft) above ground level (AGL) to 300 ft AGL at a speed in excess of 100 knots (115 miles per hour). Low speed flying, hovering or landing are not conducted during low-level aviation training. The Combat Aviation Brigade at Fort Carson proposes to establish the following low-level aviation training routes between Fort Carson and PCMS: Gambler, Comanche, Mustang, and Saber (Figure 1 of the Environmental Assessment). No weapons or lasers would be deployed during training flights.

No Action Alternative

The no action alternative would continue the use of Route Hawk as the only low level elevation training route between Fort Carson and PCMS as described in *Fort Carson Combat Aviation Brigade Stationing Implementation Final Environmental Assessment and Finding of No Significant Impact (July 2012)* and other related NEPA documents (Figure 2 of the Environmental Assessment). No weapons or lasers would be deployed during training flights.

Public Review

Pursuant to 651.14(b), Title 32 Code of Federal Regulations (Environmental Analysis of Army Actions), the Army made the Environmental Assessment (EA) and Draft Finding of No Significant Impact (FNSI) available to the public for review for 30 days prior to a final decision. A Notice of Availability (NOA) of the documents was announced in local media. The documents are available online at: https://home.army.mil/carson/index.php/Directorate/directorate-public-works/nepa-and-cultural-resources-documents .

Summary of the Environmental Consequences and Mitigation Measures

The Army Public Health Command analysis of noise generated from helicopters stationed at Fort Carson would be a maximum of 92 decibels (dB) at 200 feet. Applying the required slant distances for houses, buildings, people, livestock, and moving vehicles by a minimum slant range of ½ nautical miles reduces the noise levels to between 66 dB and 70 dB. Noise levels averaged over a 24-hour period and adjusted for nighttime annoyance differentiation or day-night average sound level (DNL) is a good measure of effects to communities. The noise levels for this metric is between 35.9-to 47.4 dB for low level helicopter training routes with slant distances implemented.

The US Fish and Wildlife Service database indicated that the Canada lynx, gray wolf, black footed ferret, New Mexico meadow jumping mouse, Preble's meadow jumping mouse, piping plover, eastern black rail, and the monarch butterfly may be found in the areas below the training routes. The analysis in the EA found that there would be no effect to Threatened or Endangered Species.

Big game species are only temporarily impacted by low-level helicopter flight. The primary effects are raised heads, trotting or running from the area. These effects last from 3-5 minutes on average. There would be a short-term, negligible to minor impact to big game species.

Raptors and eagles may flush when exposed to helicopter overflights less than 500 feet from their nests. There has been no evidence that this temporary flushing has reduced nest success. The National Bald Eagle Management Guidelines recommend aircraft avoid overflights within 1,000 feet of nests during the breeding season, and that aircraft corridors are located no closer than 1,000 feet vertical or horizontal distance from communal roost sites. There is a known bald eagle nesting site at the Arkansas River along Route Gambler (which is identical to the west-leg of Route Hawk). There would be a short-term negligible to minor impact to raptor species. There would be no adverse effect to cultural resources.

The DNL noise levels of 35.9-to 47.4 dB would annoy between 1-2 percent of the population that live or work within the training routes or between 80 and 160 people. The noise levels in homes would awaken less than 5 percent of individuals. Property Values Property values in the ROI would not likely be noticeably impacted. This is a minor effect on the quality of life in the affected communities.

Studies analyzing low-level flight and livestock found that there is only a short-term minor effect. The risk of damage is small, even with overflights as close as 125 feet, as animals take care not to damage themselves. There is no evidence of impacts to pregnant livestock, calving success or milk production. Studies also indicated that the effects are reduced with habitation to the helicopter overflights. There would be short-term, minor impacts to cattle and horses.

The primary use of US Forest Service, Bureau of Land Management and State lands is grazing and undeveloped recreation. The low-level helicopter training would not affect the agency's ability to accomplish objectives and meet goals in the respective management plans.

The training routes all cross the Santa Fe Trail and Scenic By-way near U.S. Highway 350. The trail in this area is exposed to elevated noise levels because of the proximity to the highway and railroad tracks. The minimum altitude for aviation training over the Santa Fe Trail on Routes Gambler, Comanche, Mustang and Saber will be 1,000 feet AGL. This requirement will be documented in the Combat Aviation Brigade's Aviation Procedures Guide. The effects would be short-term and negligible. The goals set forth in the Santa Fe Comprehensive Management Plan would not be affected by the proposed action.

Conclusion and Findings

Based on careful review of the EA, I have determined that no significant effects to the human or natural environment are anticipated because of the implementation of the Proposed Action. The Proposed Action is not a major federal action that would significantly affect the quality of the

environment within the meaning of Section 102(2)(c) of NEPA; and an environmental impact statement is not required and will not be prepared. My decision is based on the potential environmental and socio-economic impacts associated with the Proposed Action as analyzed in the EA. This decision complies with legal requirements and will take into account all submitted information regarding reasonable alternatives and environmental impacts.

_____ Date: _____

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Garrison Commander
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