DRAFT
ENVIRONMENTAL ASSESSMENT

ENHANCEMENT OF AIR AND GROUND TRAINING AND READINESS BY ESTABLISHING RESTRICTED AIRSPACE IN EASTERN NORTH CAROLINA

APRIL
2025

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DRAFT

ENVIRONMENTAL ASSESSMENT

For
Enhancement of Air and Ground Training and Readiness by Establishing Restricted Airspace in Eastern North Carolina

Marine Corps Installations East – Marine Corps Base Camp Lejeune

April 2025

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Abstract

Designation:	Environmental Assessment
Title of Proposed Action:	Enhancement of Air and Ground Training and Readiness by Establishing Restricted Airspace in Eastern North Carolina
Lead Agency for the EA:	Department of the Navy/Marine Corps
Cooperating Agency:	Federal Aviation Administration
Affected Region:	Eastern North Carolina
Action Proponent:	Marine Corps Installations East – Marine Corps Base Camp Lejeune
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Date:	April 2025

The Marine Corps Installations East – Marine Corps Base Camp Lejeune, along with the Federal Aviation Administration as a cooperating agency, has prepared this Environmental Assessment in accordance with the National Environmental Policy Act, as implemented by the Marine Corps and Federal Aviation Administration regulations for implementing the National Environmental Policy Act. The Proposed Action would enhance air and ground training in eastern North Carolina improving force readiness.

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Draft
Environmental Assessment for Enhancement of Air and Ground Training and Readiness by Establishing Restricted Airspace in Eastern North Carolina

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Abbreviations and Acronyms

Acronym	Definition
<	Greater Than
II MEF	II Marine Expeditionary Force
A-	Alert Areas
AGL	Above Ground Level
ATCAA	Air Traffic Control Assigned Airspace
BASEOPS	Base Operations
BASH	Bird/Wildlife Aircraft Strike Hazard
BT	Bombing Target
C2	Command and Control
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulation
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
dB	decibel
dBA	A-weighted decibel
DNL	Day-Night Average Sound Level
DoD	Department of Defense
EA	Environmental Assessment
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FICUN	Federal Interagency Committee on Urban Noise
FL	Flight Level
FONSI	Finding of No Significant Impact
FY	Fiscal Year
GHG	Greenhouse Gases
Hz	hertz
IFR	Instrument Flight Rules
JO	Joint Order
L_{max}	Maximum Sound Level
LOA	Letter of Agreement
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCIEAST	Marine Corps Installations East
MCO	Marine Corps Order
MCRP	Marine Corps Reference Publication
MOA	Military Operation Area
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NCDEQ	North Carolina Department of Environmental Quality
NEPA	National Environmental Policy Act
NO_2	nitrogen dioxide
NOTAM	Notice to Airmen
NO_x	oxides of nitrogen
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
PM_{10}	particulate matter less than or equal to 10 microns in diameter
R-	restricted areas
ROI	Region of Influence
RTA	Range and Training Area
SEL	Sound Exposure Level
SO_2	sulfur dioxide
SUA	Special Use Airspace
U.S.	United States
U.S.C	U.S. Code
UAS	Unmanned Aircraft System
USFWS	U.S. Fish and Wildlife Service
VFR	Visual Flight Rules
VOC	Volatile Organic Compound

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1. Purpose of and Need for the Proposed Action

1.1 Introduction

Marine Corps Installations East – Marine Corps Base Camp Lejeune (MCIEAST) proposes to enhance air and ground training in eastern North Carolina. The existing Special Use Airspace (SUA) complex in eastern North Carolina along with the ground-based range and training areas (RTAs) support training requirements for Marines stationed at Marine Corps Base (MCB) Camp Lejeune, Marine Corps Air Station (MCAS) New River, and MCAS Cherry Point. As currently configured, the SUA complex in eastern North Carolina does not have the capability to fully support aircrew training requirements for the II Marine Expeditionary Force (II MEF), especially with the introduction of the F-35. These modern aircraft are equipped with longer range sensors and improved sophisticated weapons systems, and they employ different tactics than the legacy aircraft they are replacing. The Marine Corps must maintain force readiness to continue to meet its statutory mission and functions as required by 10 United States Code (U.S.C.) section 5063.

MCIEAST has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA), as implemented by Department of the Navy regulations (32 Code of Federal Regulations [CFR] part 775); and Marine Corps Order (MCO) 5090.2, Volume 12. The Federal Aviation Administration (FAA) has participated in the preparation of this EA as a cooperating agency based on the FAA/Department of Defense (DoD) Memorandum of Understanding found in Appendix 7 of FAA Order Joint Order (JO) 7400.2R. As a cooperating agency, the FAA would adopt this EA, in whole or in part, to comply with their NEPA procedures defined in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* (FAA 2015) and the FAA Order 1050.1F Desk Reference (FAA 2020). If warranted based on the findings in this EA and completion of any required regulatory consultation, MCIEAST and FAA would each issue a Finding of No Significant Impact (FONSI) for this proposed action.

1.2 Procedures to Establish SUA

The FAA is responsible for all navigable airspace in the United States (U.S.) as defined in 14 CFR Chapter 1, Subchapter E, parts 71–77. The FAA processes requests for the establishment of SUA in accordance with FAA Order JO 7400.2R, *Procedures for Handling Airspace Matters*. SUA consists of defined dimensions of airspace where activities must be confined because of their nature, or where limitations are imposed on non-participating aircraft operations, or both. FAA Headquarters has the authority to approve new SUA or changes to SUA.

The FAA process for establishing SUA is comprised of aeronautical and environmental analyses. These processes occur concurrently to the extent possible. The aeronautical analysis involves the proponent (in this case, MCIEAST) submitting a formal airspace proposal to the FAA, which defines the proposed SUA (dimensions and altitudes), times of use, and activities that would occur in the SUA. The FAA ensures the proposed SUA is compliant with airspace regulations and the safe and efficient use of the navigable airspace, and then circulates the airspace proposal for public review.

In addition to its aeronautical analysis, the FAA has participated in this EA as a cooperating agency to ensure compliance with its NEPA requirements defined in FAA Order 1050.1F, *Environmental Impacts:*

Policies and Procedures and FAA 1050.1 Desk Reference. The aeronautical and environmental processes must be complete prior to FAA approval of any SUA. Once approved, new SUA is published in FAA Order JO 7400.10, *Special Use Airspace* (published annually; current effective publication is FAA Order JO 7400.10G dated February 6, 2025) and illustrated on section aeronautical charts, which are updated every 56 days. Once published, the SUA would be available for military use.

1.3 Background

1.3.1 Existing Training Airspace in Eastern North Carolina

The existing training airspace in eastern North Carolina is a large complex that overlies ground-based RTAs and includes restricted areas, Military Operations Areas (MOAs), an Alert Area, and Air Traffic Control Assigned Airspace (ATCAAs) (**Figure 1.3-1**). **Table 1.3-1** provides the altitudes for the existing airspace[1]. These airspace areas connect to larger Warning Areas over the Atlantic Ocean (not shown on Figure 1.3-1). Definitions of the types of training airspace in eastern North Carolina are described below.

A restricted area is a type of SUA established under 14 CFR part 73 within which the flight of non-participating aircraft is subject to restriction (but is not wholly prohibited). Restricted areas (designated with an 'R-' on aeronautical charts) are established to segregate military activities considered hazardous from non-participating aircraft.

MOAs, another type of SUA, are established outside of class A airspace for the purpose of separating certain military training activities from Instrument Flight Rules (IFR) traffic. MOAs are used for non-hazardous activities to include air combat tactics, aerobatics, formation training, and low-altitude tactics. When a MOA is in use, air traffic control will normally reroute or restrict non-participating IFR traffic. Non-participating civil and military aircraft flying under Visual Flight Rules (VFR), which is permitted up to 18,000 feet, may transit an active MOA by employing see-and-avoid procedures.

An Alert Area is another type of SUA which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft. These areas (designated with an 'A-' on aeronautical charts) are designated to inform non-participating pilots of areas that contain a high volume of military aircraft operations they might not otherwise expect to encounter.

[1] Altitude references for airspace and aircraft operations are presented in several units of measure: above ground level (AGL), above mean sea level (MSL), and Flight Level (FL):

- AGL references are usually used at lower altitudes (almost always below 10,000 feet), when clearance from terrain is more of a concern for aircraft operation.
- MSL altitudes are used most across aviation when operating at or below 18,000 feet when clearance from terrain is less of a concern for aircraft operation.
- FL is used to describe the cruising altitudes for aircraft traveling long distances above 18,000 feet. Flight Levels are given in hundreds of feet, e.g., FL300 is 30,000 feet.

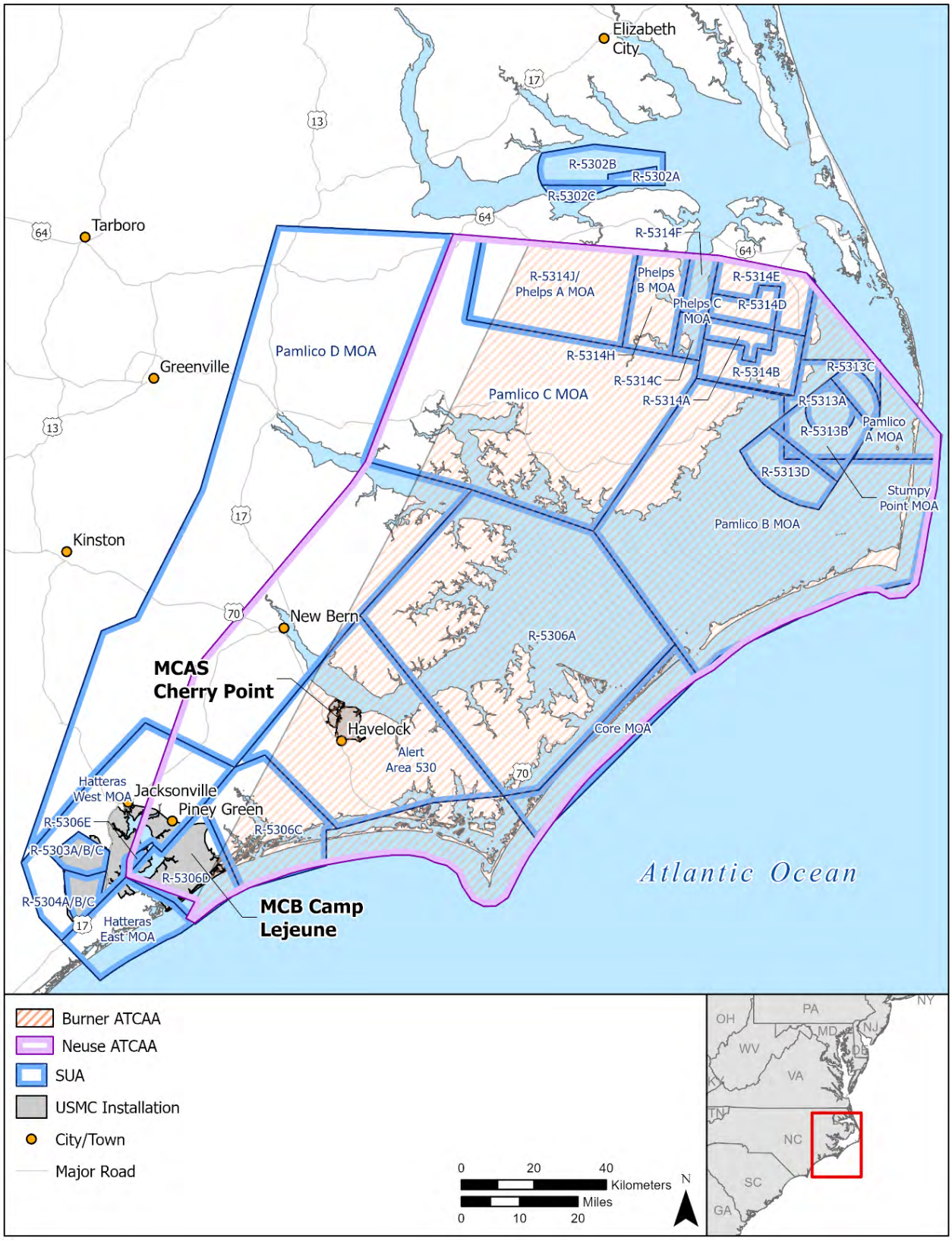

Figure 1.3-1 Existing SUA in Eastern North Carolina

Table 1.3-1 Existing Training Airspace in Eastern North Carolina

Airspace	Designated Altitudes
Restricted Areas:	
R-5302A	Surface up to 14,000 feet MSL
R-5302B	100 feet AGL up to 14,000 feet MSL
R-5302C	100 feet AGL up to 3,000 feet MSL
R-5303 A/B/C	A: Surface up to but not including 7,000 feet MSL B: 7,000 feet MSL up to but not including 10,000 feet MSL C: 10,000 feet MSL up to but not including FL180
R-5304 A/B/C	A: Surface to but not including 7,000 feet MSL B: 7,000 feet MSL to but not including 10,000 feet MSL C: 10,000 feet MSL to but not including FL180
R-5306A	Surface up to but not including FL180
R-5306C	1,200 feet MSL up to but not including FL180
R-5306D	Surface up to but not including FL180
R-5306E	Surface up to but not including FL180
R-5306F	FL180 to FL290
R-5313A	Surface to 18,000 feet MSL
R-5313B	100 feet AGL to 13,000 feet MSL
R-5313C	100 feet AGL to 13,000 feet MSL
R-5313D	500 feet AGL to 13,000 feet MSL
R-5314A	Surface to FL205
R-5314B	500 feet above the surface to FL205
R-5314C	200 feet above the surface to 15,000 feet MSL
R-5314D	Surface to FL205
R-5314E	500 feet above the surface to FL205
R-5314F	200 feet above the surface to 15,000 feet MSL
R-5314H	500 feet above the surface to 10,000 feet MSL
R-5314J	1,000 feet above the surface to 6,000 feet MSL
MOAs:	
Core MOA	3,000 feet MSL up to but not including FL180
Hatteras F East/West MOA	3,000 feet MSL up to but not including FL180
Pamlico A MOA	8,000 feet MSL up to but not including FL180
Pamlico B MOA	8,000 feet MSL up to but not including FL180
Pamlico C MOA	8,000 feet MSL up to but not including FL180
Pamlico D MOA	10,000 feet MSL up to but not including FL180
Phelps A MOA	6,000 feet MSL up to but not including FL180
Phelps B MOA	10,000 feet MSL up to but not including FL180
Phelps C MOA	15,000 feet MSL up to but not including FL180
Stumpy Point MOA	Surface up to but not including 8,000 feet MSL
Alert Area:	
A-530	Surface up to but not including FL180
ATCAAs:	
Burner A/B/C ATCAAs	FL180 to FL500
Neuse A/B/C ATCAAs	FL180 to FL230

Legend: AGL = above ground level; ATCAA = Air Traffic Control Assigned Airspace; FL = Flight Level; MSL = mean sea level; MOA = Military Operations Area

Source: Restricted Areas, MOAs, and Alert Areas are published in FAA Order JO 7400.10G (2025). ATCAAs are not published.

ATCAA is airspace of defined vertical and lateral limits, assigned by air traffic control, for the purpose of providing air traffic segregation between the specified activities being conducted, within the assigned airspace and other IFR traffic. ATCAAs are not classified as SUA and are not published on aeronautical charts, but rather designated in a Letter of Agreement (LOA) with the FAA. An ATCAA can be used to support non-hazardous training like that occurring in MOAs and usually overlays a MOA in higher altitudes (18,000 feet to 60,000 feet). When requested, an ATCAA is released by the FAA for military use when not required for other air traffic control purposes, such as for commercial air traffic. Non-military aircraft may fly in an ATCAA during military training so long as air traffic control can maintain IFR separation from military aircraft; only non-hazardous military activities may be undertaken in an ATCAA. VFR traffic is not permitted at or above 18,000 feet. There are two ATCAAs that exist in the airspace above most of the SUA in eastern North Carolina.

1.3.2 Training Requirements and SUA Shortfalls

Marine Corps Reference Publication (MCRP) 7-20B.1, *Operational Training Ranges Required Capabilities*, provides guidance to ensure range assets and capabilities are properly established to support training operations and requirements. When significant transitions in weapons, technology, and doctrine are introduced, training ranges must be assessed and, where necessary, modified to ensure the Marine Corps can continue to meet its mission and functions under 10 U.S.C. section 5063 to train and equip Marines to support combatant commanders around the world. Training must evolve as required by changes in equipment and doctrine to produce Marines who can survive in diverse and challenging operational environments. Accordingly, the supporting infrastructure necessary to accomplish this training, including airspace, must also evolve.

Training requirements for pilots, aircrew, and the "command and control" (C2) system that supports them, cover a wide range of capabilities, from developing individual skills to complex multi-aircraft combat maneuvers. At the individual skills level, pilots start with takeoff and landing and progress to operation of every sensor and system on an aircraft, weapons employment, maneuvering, etc. Pilots then progress to tactical training involving two aircraft, then four aircraft, etc. Finally, pilots and the C2 system supporting them, train in large force exercises simulating real-world wartime operations, involving multiple flights of varying types of aircraft in various combat scenarios to include, in conjunction with C2, coordination with and support of ground force maneuver and fires.

Historically, the mission requirements for legacy aircraft (those no longer being produced) were more specific and SUA could be tailored to meet the requirements of aircraft stationed nearby. This practice has resulted in small, fragmented SUA that does not fully support modern aircraft with advanced weapon systems and sensors. While the situation has been manageable for legacy aircraft, it has generated a critical training area shortfall for the F-35 which has much more advanced and longer-range capabilities.

The F-35 was developed to address the shortfalls of legacy aircraft, emerging threats, and future operating environments. It will ultimately replace the following three legacy aircraft: AV-8B Harrier, F/A-18 Hornet, and EA-6B Prowler. The F-35 also assumes new missions that legacy aircraft are not capable of performing. It has a range increase of 60 percent over legacy aircraft with significantly better speed, stealth, radars, electro-optical systems, defensive systems, and communication capabilities.

MCAS Cherry Point was selected to base six F-35 squadrons by Fiscal Year (FY) 2029 (U.S. Marine Corps 2010). These aircraft have already started arriving at MCAS Cherry Point and require significant SUA to train pilots.

To continue to support pilot training with the introduction of the F-35, new ordnance systems, and evolving tactics, the SUA in eastern North Carolina needs to be improved consistent with MCRP 7-20B.1 to provide the necessary training resource and support readiness for Marine Corps forces.

1.4 Purpose and Need for the Proposed Action

The purpose of the Proposed Action is to enhance air and ground training within eastern North Carolina SUA.

The Proposed Action is needed to better meet force readiness requirements of existing and new aircraft platforms, ordnance systems, and tactics to ensure the Marine Corps continues to meet its mission and functions required under 10 U.S.C. section 5063.

10 U.S.C. section 5063: The Marine Corps shall be organized, trained, and equipped to provide fleet marine forces of combined arms, together with supporting air components, for service with the fleet in the seizure or defense of advanced naval bases and for the conduct of such land operations as may be essential to the prosecution of a naval campaign.

1.5 Scope of Environmental Analysis

This EA includes a description of the affected environment and an analysis of potential environmental impacts associated with the action alternatives and the No Action Alternative. All potentially relevant environmental resource areas were considered for analysis in this EA. In compliance with NEPA, and Department of the Navy and FAA guidelines, the level of detail used in describing a resource is commensurate with the anticipated level of potential environmental impact. The affected environment and environmental consequences are provided in Chapter 3.

This EA also includes a cumulative impacts analysis that (1) defines cumulative impacts, (2) describes past, present, and reasonably foreseeable future actions relevant to cumulative impacts, (3) analyzes the incremental interaction the Proposed Action may have with other actions, and (4) evaluates cumulative impacts potentially resulting from these interactions. The scope of the cumulative impacts analysis involves both the geographic extent of the effects and the timeframe in which the effects could be expected to occur. Descriptions of the past, present, and reasonably foreseeable actions and an evaluation of cumulative impacts is provided in Chapter 4.

1.6 Relevant Laws and Regulations

MCIEAST has prepared this EA based upon federal and state laws, statutes, regulations, and policies pertinent to the implementation of the Proposed Action, including the following:

- NEPA (42 U.S.C. sections 4321–4370h)
- Department of the Navy regulations for implementing NEPA (32 CFR part 775)
- MCO 5090.2, Volume 12
- FAA Order 1050.1F, Environmental Impacts: Policies and Procedures
- Clean Air Act (CAA) (42 U.S.C. section 7401 et seq.)
- National Historic Preservation Act (54 U.S.C. section 306108 et seq.)

- Endangered Species Act (ESA) (16 U.S.C. section 1531 et seq.)
- Migratory Bird Treaty Act (MBTA) (16 U.S.C. section 703–712)
- Bald and Golden Eagle Protection Act (16 U.S.C. section 668–668d)
- Executive Order (EO) 13175, Consultation and Coordination with Indian Tribal Governments

1.7 Public and Agency Participation and Intergovernmental Coordination

MCIEAST has prepared this EA to inform the public of the Proposed Action and to allow the opportunity for review and comment. The Draft EA is to be released for public comment for 30 days. A Notice of Availability of the Draft EA will be published in the *Jacksonville Daily Times* (Jacksonville, North Carolina).

In accordance with Section 106 of the National Historic Preservation Act, MCIEAST is consulting with the North Carolina State Historic Preservation Office and eight American Indian Tribes: Catawba Indian Tribe, Chickahominy Indian Tribe, Chickahominy Tribe – Eastern Division, Upper Mattaponi Tribe, Nansemond Indian Nation, Pamunkey Indian Tribe, Rappahannock Tribe, and Tuscarora Nation.

MCIEAST also provided a copy of the Draft EA to the North Carolina State Clearinghouse to accomplish interagency review of the EA.

Copies of public notices, and interagency and intergovernmental correspondence will be provided in **Appendix A.**

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2. Proposed Action and Alternatives

MCIEAST proposes to enhance air and ground training in eastern North Carolina by establishing new restricted areas. Training requirements that are not being met sufficiently with the current configuration of the SUA include: fixed-wing aircraft use of existing targets, employment of long-range lasers, integration of threat emitters, low-altitude air defense training, surface-to-surface artillery training, small arms ranges training, and training with combat-capable Unmanned Aircraft Systems (UAS). Given the nature of this type of training, it must be executed in restricted areas. The configuration and size of the current restricted areas do not support these training requirements.

2.1 Screening Factors

The Navy, Marine Corps, and FAA NEPA implementing regulations provide guidance on the consideration of alternatives to a federally proposed action and requires an evaluation of reasonable alternatives to the Proposed Action. Only those alternatives determined to be reasonable and to meet the purpose and need require detailed analysis.

Potential alternatives were evaluated against the following screening factors:

- Provide adequate expanded aircraft maneuver space around existing ground-based targets in the RTA. Additional space is needed to allow for complex and realistic training scenarios for advanced aircraft that includes use of multiple air-to-ground ranges that would allow for integration of artillery, mortars, small boat teams, small arms units, and naval gunfire. Reasonable alternatives would provide adequate space around existing targets in the southern half of the SUA complex in eastern North Carolina.
- Support use of long-range lasers. The F-35 has advanced sensor systems, including lasers, which provide targeting data for its weapons systems, as well as to C2 units, to enable targeting and intelligence collection. Its primary air to ground weapon system uses lasers from both the aircraft and the weapon itself and has significantly improved long-range capability over legacy aircraft. The use of lasers must occur within restricted areas. The lateral constraints of the existing restricted areas surrounding the targets in the RTA do not allow for the required use of lasers in training thus reasonable alternatives would expand the total volume of restricted areas to support use of long-range lasers.
- Integration with threat emitter systems. The existing SUA is too small to practice realistic tactics against advanced threat systems. The existing local threat emitter systems and the SUA they serve are separated by National Airspace. Because of this, the systems have limited utility to create the complex training environment that is required to maintain survivability in a highly-contested environment. Units must be able to practice modern counter-threat tactic maneuvers at low, medium, and high altitudes. Reasonable alternatives would link current SUA to allow use of the existing threat emitters individually or together.
- Support Low-Altitude Air Defense training above the airfield at MCAS Cherry Point. Currently, there are no air stations with corresponding SUA that allow units to adequately train in these

low-altitude environments above the airfield itself. Reasonable alternatives would provide the ability to have fixed-wing and UAS to train defending an air station.

- Support Surface-to-Surface Artillery Training by linking existing range impact areas to the launch points. Artillery regiments need to fire large caliber weapons. Reasonable alternatives would provide restricted areas to support this artillery training.
- Support use of Small Arms Ranges. Training at these ranges is interrupted when non-military aircraft pass overhead within the designated Danger Zones. Reasonable alternatives would provide required range use without interruption from non-military aircraft.
- Support operations of UAS. The current airspace structure does not provide safe passage for combat-capable UAS. Existing UAS operations are conducted within air traffic controlled airspace and the areas designated for transit to the restricted areas. Currently, only unarmed Intelligence, Surveillance, and Reconnaissance UAS are utilized. However, future combat capabilities usages would require restricted airspace. Reasonable alternatives would provide restricted areas to support combat-capable (or armed) UAS.

2.2 Proposed Action

The Proposed Action would enhance air and ground training. To support the proposed action, MCIEAST would request that the FAA establish additional restricted areas within the confines of the existing SUA in eastern North Carolina (to be identified on aeronautical charts as R-5305A/B/C and R-5307A/B/C) to address shortfalls in: maneuvering space around existing targets, employment of long-range lasers, integration of threat emitters, low-altitude air defense training, surface-to-surface artillery training, small arms ranges training, and training with combat-capable UAS. The specific areas proposed for R-5305A/B/C and R-5307A/B/C would occur within the footprint of the existing SUA in eastern North Carolina as illustrated on **Figure 2.2-1a and b**.

The altitude floor and ceiling and the published times of use for the proposed restricted areas are provided in **Table 2.2-1**. Each area is described in more detail in the following sections.

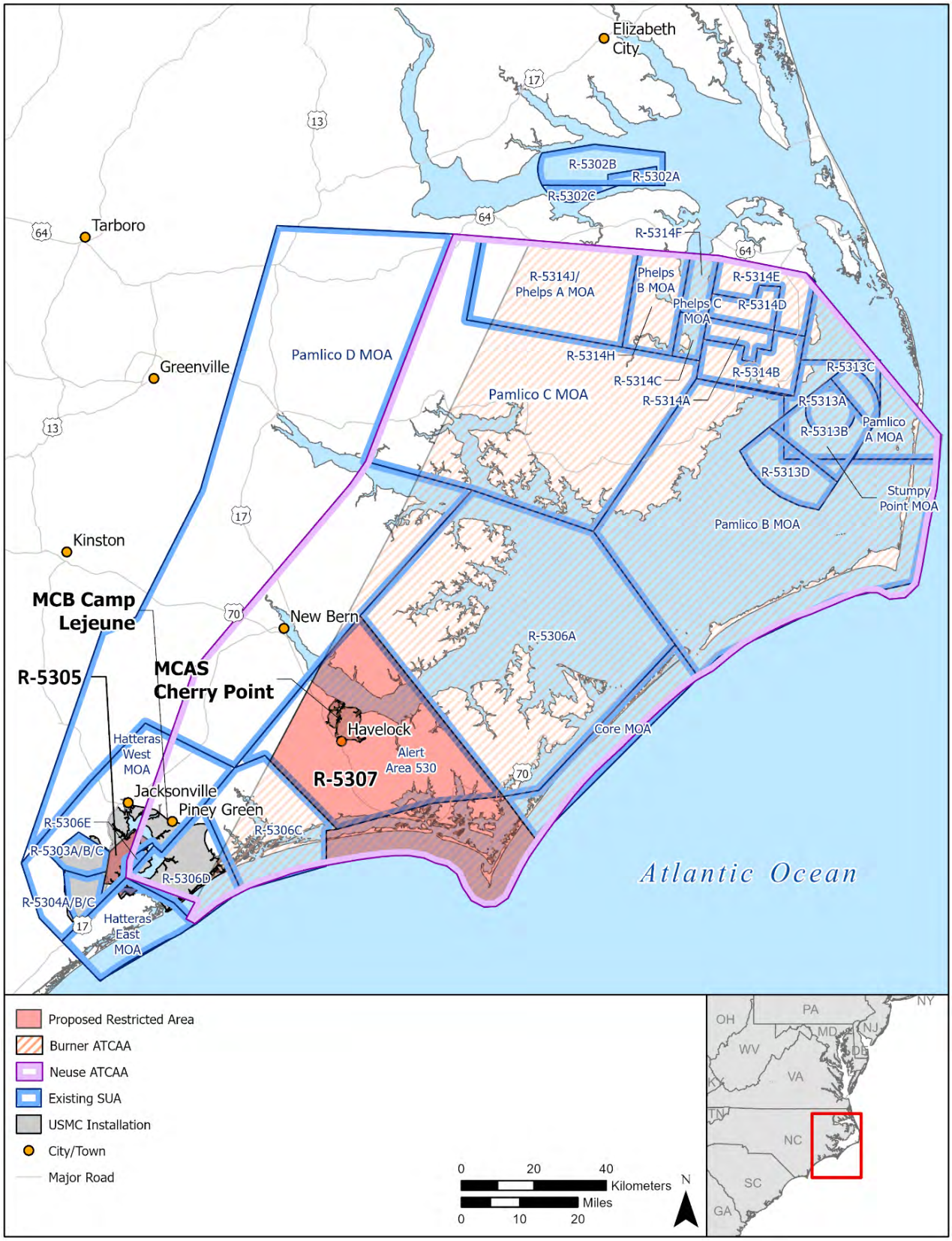

Figure 2.2-1a Proposed Action Overview – 2D View

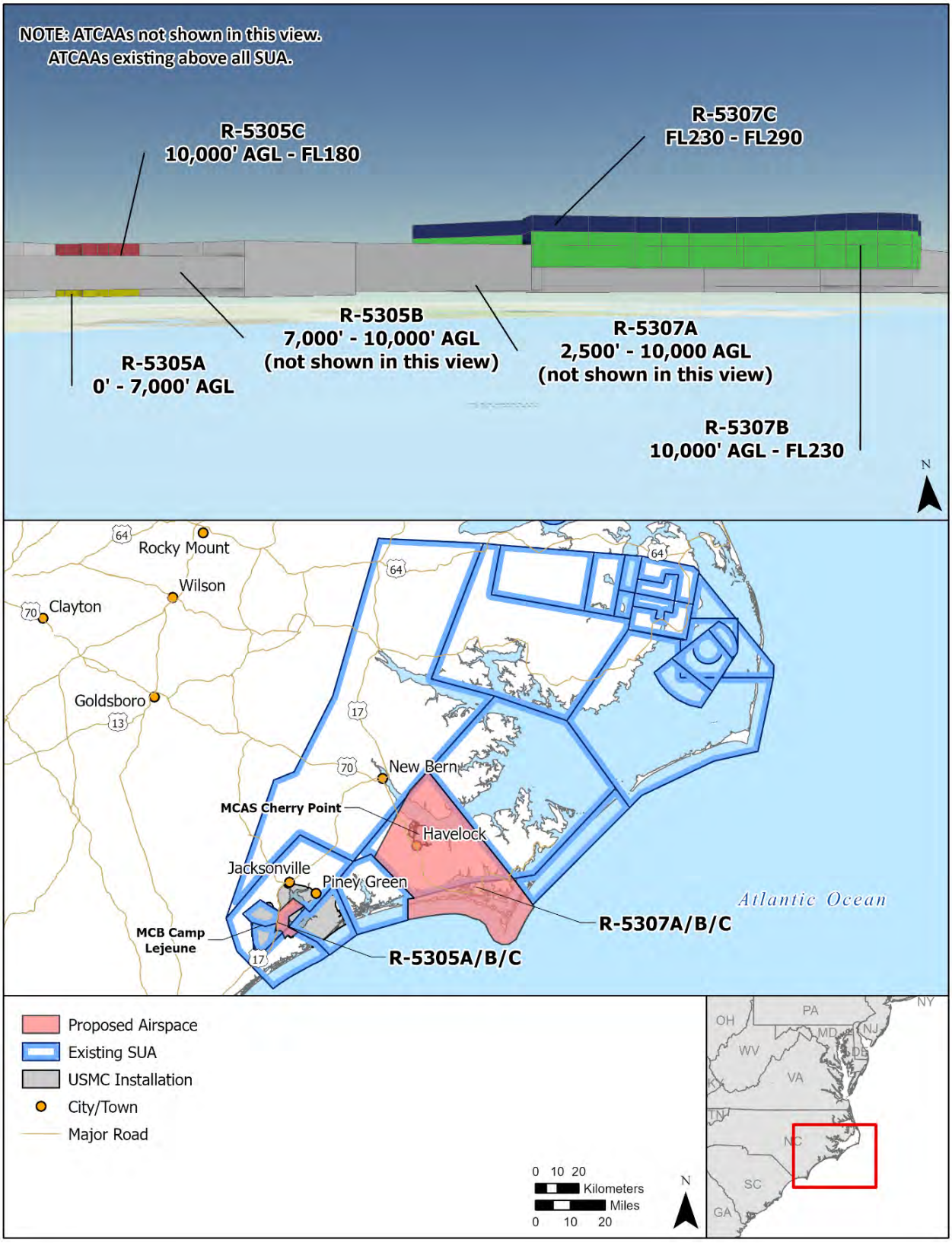

Figure 2.2-1b Proposed Action Overview – 3D View

Table 2.2-1 Proposed Restricted Areas

Name	Floor	Ceiling	Proposed Published Times of Use
R-5305			
R-5305A	Surface	7,000 feet MSL	Monday through Friday, 0600 to 0000 (midnight) local, other times by NOTAM
R-5305B	7,000 feet MSL	10,000 feet MSL	Intermittent by NOTAM
R-5305C	10,000 feet MSL	FL180	Intermittent by NOTAM
R-5307			
R-5307A	2,500 feet AGL	10,000 feet MSL	Intermittent by NOTAM
R-5307B	10,000 feet MSL	FL180	Intermittent by NOTAM
R-5307C	FL180	FL290	Monday through Friday, 0800 to 0000 (midnight) local, other times by NOTAM

Legend: AGL = above ground level; FL = Flight Level; MSL = mean sea level; NOTAM = Notice to Airmen

2.2.1 R-5305

Proposed Airspace

The proposed R-5305 would be in airspace contained above the lateral installation boundaries of MCB Camp Lejeune and the existing SUA complex. R-5305 would be vertically segmented into three components that have the same lateral boundaries: A (surface up to, but not including, 7,000 feet mean sea level [MSL]), B (7,000 feet MSL up to, but not including, 10,000 feet MSL), and C (10,000 feet MSL up to, but not including, Flight Level [FL] 180) (**Figure 2.2-2**). The published times of use for R-5305A would be Monday through Friday, 0600 to 0000 (midnight) local time and other times by Notice to Airmen (NOTAM); R-5305B and R-5305C times of use would be intermittent by NOTAM.

Weekend use of the airspace is expected to be very rare. It should be noted that published times of use does not imply activation the entire time. Military use of the restricted area would be scheduled in advance for discreet blocks of time on any given day to accomplish planned training event(s). On the day of training, the restricted area (or specific component, A, B, or C) is "activated" just before the scheduled event and "deactivated" when the FAA receives notification from the military that the event is complete. The expected activation of each component is detailed in **Table 2.2-2**. Approximately 25 percent of activation time would be at night (after sunset). As shown, activation of the higher altitude components (B and C) would be much less than the lower altitude component (A).

Table 2.2-2 Expected Activation of R-5305

Airspace	Altitudes	Hours per Day	Days per Year	Percent after Sunset
R-5305A	Surface to 7,000 feet MSL	8	150	25
R-5305B	7,000 to 10,000 feet MSL	4	30	25
R-5305C	10,000 feet MSL to FL180	4	30	25

Legend: FL = Flight Level; MSL = mean sea level.

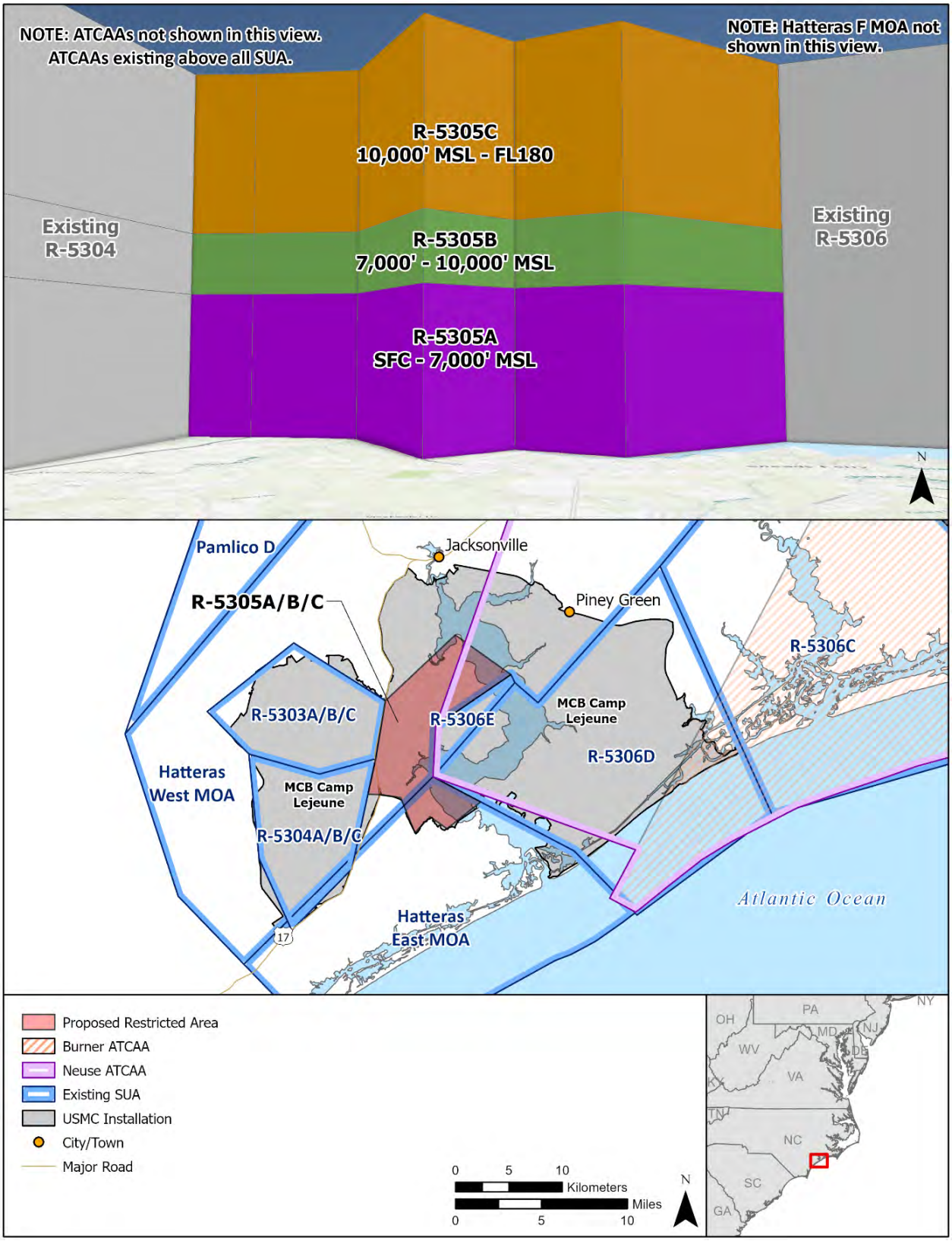

Figure 2.2-2 Proposed R-5305

Proposed Operations

The proposed R-5305 would connect existing restricted airspace, R-5306D/E, R-5303, and R-5304, enhancing training opportunities for surface-to-surface weapons fires, enable uninterrupted aviation training between R-5303/R-5304 and R-5306D, and create a more realistic training environment through incorporation of both un-armed UAS and armed UAS/loitering munitions.

The proposed R-5305 would fill a gap between the existing restricted areas (R-5306D/E, R-5303, R-5304) providing protected airspace between the existing ground-based launch points aboard MCB Camp Lejeune to the existing impact areas (beneath R-5306D) providing larger and more flexible training space. Filling the gap in this area would allow ground artillery regiments to fire large caliber weapons systems from existing launch points through the proposed R-5305 to the existing impact areas within R-5306D/E. Munitions would pass through, but would not detonate within, R-5305. The maximum altitude for launched munitions would be 17,000 feet.

The proposed R-5305, in conjunction with other existing SUA, would provide the space necessary for fixed-wing aircraft to maneuver around the existing targets and impact areas since the more advanced F-35 has significantly longer-range sensors. The expanded maneuver space allows for more complex and realistic scenarios integrating C2 systems, multiple air-to-ground ranges, and ground units.

The operation of armed UAS, even while loitering, is considered a hazardous activity requiring a restricted area. The Marine Corps has also begun training with a family of airborne loitering munitions to enhance the capability of future operations. These are small, man-portable munitions that can be used to target snipers or enemy combatants planting Improvised Explosive Devices. R-5305 would allow for realistic training using armed UAS or loitering munitions.

Lastly, R-5305 would also support uninterrupted use of existing small arms ranges when the restricted area is active. Small arms ranges can and do exist without SUA; however, training at the range must be stopped when civilian aircraft pass overhead. When R-5305 is active, it would have an indirect benefit to the small arms range by allowing range operations to occur without interruption. R-5305 would not be activated solely for small arms range training.

The proposed annual sorties within R-5305 associated with the operations described above are provided in **Table 2.2-3.** A sortie is the takeoff, mission, and landing of one aircraft. Current military aircraft operations within the space proposed as R-5305 (which overlaps with the Hatteras F East/West MOA) total over 1,400 sorties. The proposed sorties in **Table 2.2-3** would be in addition to those current operations.

Table 2.2-3 Annual Sorties in Proposed R-5305

Aircraft	Proposed Sorties[1]
AV-8B / F-35B/C[2]	80
F/A-18 / F-35B/C[2]	60
Rotary Wing/Tilt-Rotor (R-5305A only)[3]	500
UAS[4]	500
Total	***1,140***

Notes: [1] A sortie is the takeoff, mission, and landing of one aircraft.
[2] The F-35 B/C will ultimately replace the AV-8 and F/A-18 aircraft; therefore, both aircraft are listed in this table.
[3] Types of aircraft include: AH-1, AH-64, CH-53, CH-47, MV-22, UH-1, UH-60
[4] Types of UAS include: Puma, Skyraider, Stalker, Skydio, Black Hornet, MQ-9 Reaper
Legend: UAS = Unmanned Aircraft System.

2.2.2 R-5307

Proposed Airspace

The existing Alert Area, A-530, would be changed to R-5307. The restricted area would be segmented into three components. R-5307A would have a slightly smaller lateral footprint as the current A-530 space and exist from 2,500 feet above ground level (AGL) up to, but not including, 10,000 feet MSL. R-5307B/C would exist above R-5307A but would have a larger footprint covering additional areas to the south and east over the barrier islands to align with the eastern boundaries of the Burner and Neuse ATCAAs above (which start at FL180) (see **Table 2.2-4** and **Figure 2.2-3**). R-5307B/C would be vertically segmented as defined in **Table 2.2-4**. Approximately 25 percent of activation time would be after sunset. The proposed times of use of R-5307A/B would be intermittent by NOTAM, and R-5307C would be Monday through Friday, 0800 to 0000 (midnight) Local, other times by NOTAM.

Table 2.2-4 Proposed Altitude and Expected Activation of R-5307

Airspace	Altitudes	Hours per Day	Days per Year	Percent after Sunset
R-5307A	2,500 feet AGL to 10,000 feet MSL	2	25	25
R-5307B	10,000 feet MSL to FL180	4	25	25
R-5307C	FL180 to FL290	4	100	25

Legend: MSL = mean sea level; FL = Flight Level.

Proposed Operations

Converting A-530 to a restricted area would provide maneuverability space around existing bombing targets (BT) 9 and BT-11 in R-5306A/F. Converting this space to a restricted area would join the existing SUA in the northern end and the southern end of the complex allowing for use of the entire complex for certain training scenarios. The newly joined SUA would incorporate multiple air-to-ground ranges, outlying and auxiliary airfields, and threat emitter sites providing realistic training opportunities for the F-35 to incorporate its advanced long-range lasers and weapons systems. These training requirements for the F-35 cannot be met with the current disconnected, small blocks of SUA.

There would be no air-to-ground weapons release in R-5307, only simulated ordnance delivery using lasers. The F-35 would utilize its advanced sensor systems, including lasers, while operating in R-5307 to provide data to C2 systems, as well as providing targeting data for its own weapon systems.

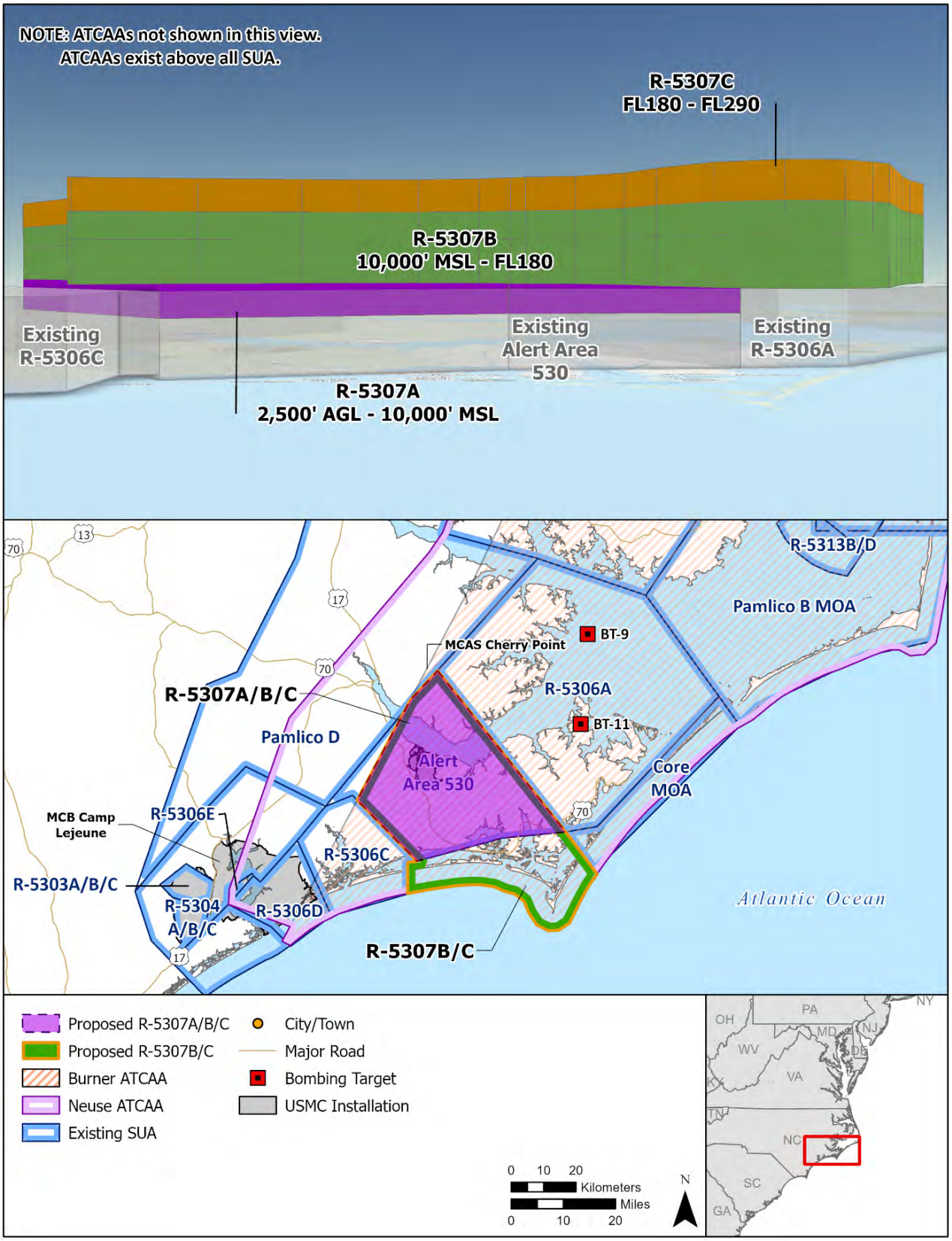

Figure 2.2-3 Proposed R-5307

The F-35's primary air-to-ground weapon system utilizes lasers from both the aircraft and the weapons system itself and is capable of stand-off ranges in excess of 40 nautical miles. The lateral constraints of the existing restricted areas surrounding the target sites at the installations (MCB Camp Lejeune and MCAS Cherry Point) do not currently allow for the use of lasers to simulate use of this weapon system to its full capability.

The current threat emitter systems and the SUA they serve are separated by National Airspace, which prevents them from being used together in complex training scenarios. Establishing R-5307 would link existing SUA blocks (and their associated threat emitters) allowing them to be used together providing a more realistic threat environment in which to train.

Lastly, converting A-530 to a restricted area provides a unique opportunity to support Low-Altitude Air Defense training above the airfield at MCAS Cherry Point which would simulate real-world combat scenarios. Currently, there are no air stations with corresponding SUA that allow units to adequately train in these low-altitude environments above the airfield itself. The low-altitude restricted area (R-5307A) would allow fixed-wing and UAS to perform this defensive training.

Proposed annual sorties associated with the training described above are provided in **Table 2.2-5.** Current military aircraft operations within A-530 total over 4,300 sorties. The proposed sorties in **Table 2.2-5** would be in addition to those current operations.

Table 2.2-5 Annual Sorties in Proposed R-5307

Aircraft	Proposed Sorties[1]
AV-8B / F-35B/C[2]	300
F-15	100
F/A-18 / F-35B/C[2]	150
F-22	10
C-130	10
KC-135	15
KC-10	15
UAS (MQ-9 Reaper)	100
Total	***700***

Notes: [1] A sortie is the takeoff, mission, and landing of one aircraft.
[2] The F-35B/C will ultimately replace the AV-8 and F/A-18 aircraft; therefore, both aircraft are listed in this table.
Legend: UAS = Unmanned Aircraft System.

2.3 No Action Alternative

Under the No Action Alternative, current operations would continue, which would limit the ability of the Marine Corps to effectively train to current threats. The No Action Alternative does not meet the purpose of and need for the Proposed Action and will not allow the Marine Corps to fully meet its training requirements; however, the No Action Alternative is used to provide a comparative baseline for analysis.

2.4 Alternatives Considered but not Carried Forward for Detailed Analysis

Enhancing the air and ground training and readiness to meet the guidelines defined in MCRP 7-20B.1, *Operational Training Ranges Required Capabilities,* and address the existing SUA shortfalls requires airspace modifications to the SUA in eastern North Carolina. Because of the configuration of existing

SUA and the location of ground targets, impact areas, and threat emitters, the location and lateral boundaries of the proposed restricted areas described in the Proposed Action, **Section 2.2**, are the only alternative that meets the purpose and need stated in **Section 1.4** and the screening factors described in **Section 2.1**.

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3. Affected Environment and Environmental Consequences

This chapter presents a description of the environmental resources and baseline conditions that could be affected from implementing the Proposed Action.

All potentially relevant environmental resource areas were initially considered for analysis in this EA. In compliance with Department of the Navy, Marine Corps, and FAA regulations, orders, and guidelines, the discussion of the affected environment (i.e., existing conditions) focuses only on those resource areas potentially subject to impacts. Additionally, the level of detail used in describing a resource is commensurate with the anticipated level of potential environmental impact.

The environmental resources potentially affected by the Proposed Action carried forward and evaluated in this EA are presented in **Table 3.0-1.** The environmental resources evaluated in this EA include those identified in both the Marine Corps NEPA Regulations and the FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* (FAA 2015) and the FAA Order 1050.1F Desk Reference (FAA 2020). As a cooperating agency, the FAA has independently reviewed this EA prepared by MCIEAST and assessed whether it met the agency's standards for adequacy under NEPA. The FAA will adopt the Final EA document, in whole or in part, to fulfill its NEPA obligations and sign its own FONSI, if warranted, for the proposed airspace action.

Table 3.0-1 Environmental Resources Analyzed in the EA

Resource	Carried Forward for Detailed Analysis
Airspace	Yes
Noise; Noise Compatible Land Use	Yes
Air Quality and Greenhouse Gases	Yes
Biological Resources, Migratory Birds	Yes
Land Use	No
Aesthetic and Visual Impacts; Visual Effects	No
Prime or Unique Farmlands	No
Socioeconomics, Protection of Children	No
Cultural Resources	No
Hazardous Materials, Solid Waste, and Pollution Prevention	No
Water Resources, Wetlands, Floodplains	No
Infrastructure	No
Natural Resources and Energy Supply	No
Geology, Topography, and Soils	No
Coastal Zone; Coastal Resources	No
Health and Safety	No

The potential impacts to the following resource areas are negligible or nonexistent so they were not analyzed in detail in this EA:

Land Use: Current land use beneath the proposed restricted areas would not be affected by the training activities that would occur in the new SUA. The anticipated noise from aircraft training activities would not be at a level that would require land use restrictions (see **Section 3.2**, *Noise*). Therefore, land use is not evaluated in detail in this EA.

Aesthetics and Visual Impacts; Visual Effects: Aesthetics includes the natural and built features of the landscape visible from public views that contribute to an area's visual quality. An analysis of visual effects is required in FAA NEPA Desk Reference (FAA 2015) to determine the extent to which a Proposed Action and alternatives would produce light emissions that would create annoyance or interfere with activities or contrast with or detract from the visual character of the existing environment. Military aircraft currently use both of the areas proposed as restricted areas. In FY2022, based on radar flight data from FAA there were 8,896 military flights that crossed the proposed R-5305 and 10,410 military flights that crossed the proposed R-5307 (which is currently A-530). The majority of the proposed use of R-5307 would be in the higher altitudes (above FL180, see **Table 2.2-4** in **Section 2.2.2**) reducing the potential for any visual impact in this area. The area proposed for R-5305 is a small space between two existing restricted areas and overlaps with the larger Hatteras F East/West MOA. The proposed R-5305 would be wholly contained within the MCB Camp Lejeune installation boundary. Changing either of these areas to a restricted area would not change the visual aesthetics of the area as military aircraft would continue to be a primary visual factor in both locations. The Proposed Action would not introduce a new type of aircraft in the region or create a noticeable change in the number of aircraft visible on a given day. Military aircraft activity in all of eastern North Carolina but particularly in these two areas is a common occurrence, and this proposal would not change the visual aesthetic of the area. Therefore, aesthetics and visual impacts are not evaluated in detail in this EA.

Prime or Unique Farmlands: Farmlands are defined as those agricultural areas considered important and protected by federal, state, and local regulations (FAA 2015). The Farmland Protection Policy Act regulates federal actions with the potential to convert farmland to non-agricultural uses. The Proposed Action would not involve any ground disturbance or conversion of farmland to non-agricultural uses; therefore, prime farmlands were not evaluated in detail in this EA.

Socioeconomics, Protection of Children: The training activities within the proposed restricted areas would not affect the socioeconomics of the local area. The restricted areas would be established contiguous with the existing SUA complex and contain similar types of training activities. These activities do not currently pose a significant threat to the public or children. Potential impacts to non-participating aircraft (civil and commercial airspace users) are addressed in **Section 3.1**, *Airspace*. Therefore, socioeconomics and protection of children were not evaluated in detail in this EA.

Cultural Resources: The proposed restricted areas are either located within the boundaries of MCB Camp Lejeune (R-5305) or are currently another type of SUA associated with an existing airfield (R-5307). Both of these areas currently experience military overflights on a routine basis. There are no historic properties beneath R-5305. There are 11 historic properties along the North Carolina coastline beneath R-5307B/C (where the floor would be 10,000 feet MSL). The Burner and Neuse ATCAAs currently exist over these properties. The noise associated with the proposed training in either of the proposed restricted areas would not substantially increase. There would not be a substantial change to the viewshed at any historic property located beneath the proposed airspace as described above in *Aesthetics and Visual Impacts*. Available records indicate there are no sacred sites or traditional cultural properties beneath the proposed restricted areas. MCIEAST is consulting with the North

Carolina State Historic Preservation Office and two federally recognized tribes, the Catawba Indian Tribe and the Tuscarora Nation. MCIEAST is requesting concurrence from those entities on the assessment of "no effect" to historic properties based on the minimal change to the noise environment and visual character beneath the proposed restricted areas. Correspondence between MCIEAST and these entities is provided in **Appendix A**.

Hazardous Materials, Solid Waste, and Pollution Prevention: The Proposed Action would not change hazardous materials use or solid and hazardous waste management, including hazardous waste generation, accumulation, and transportation for any treatment and disposal. Therefore, hazardous materials, solid waste, and pollution prevention were not evaluated in detail in this EA.

Water Resources, Wetlands, Floodplains: The Proposed Action would be limited to military aircraft training activities within the confines of SUA and would not have any impact on surface water, ground water, or wetland resources. Floodplains are protected by EO 11988, *Floodplain Management*, which requires that each federal agency "…take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains." The Proposed Action does not include any activities that would impact floodplains.

Infrastructure. The Proposed Action does not include changes to or otherwise impact any existing infrastructure. Therefore, infrastructure is not evaluated in detail in this EA.

Natural Resources and Energy Supply. A discussion of natural resources and energy supply is required under FAA NEPA guidance to determine a proposal's consumption of natural resources such as water, asphalt, aggregate, wood, etc., and use of energy supplies such as coal for electricity, natural gas for heating, etc. Consumption of natural resources and use of energy supplies would typically result from construction, operation, and maintenance activities of a proposed action. The Proposed Action does not include the construction or maintenance of any facilities. The use of energy supplies would be jet fuel used during training operations which may increase slightly since the aircraft could train within a larger volume of SUA; however, this is not expected to be a substantial increase or use of energy supplies beyond what is used currently. Therefore, natural resources and energy supply are not evaluated in detail in this EA.

Coastal Zone; Coastal Resources. Coastal Zone Management Act imparts an obligation upon federal agencies, whose actions or activities affect any land or water use or natural resource of the coastal zone, be conducted in a manner consistent to the maximum extent practicable with the enforceable policies of federally-approved state coastal management programs. The Proposed Action would not result in any ground disturbance or impacts to the coastal zone or coastal resources. None of the enforceable policies in North Carolina's Coastal Management Program apply to this action; therefore, a federal consistency determination is not required.

Geology, Topography, and Soils. There are no activities proposed that would impact the geology, topography, or soils in the affected environment. As such, these resources are not evaluated in detail in this EA.

Health and Safety. The health and safety analysis includes consideration for any activities, occurrences, or operations that have the potential to affect the safety, well-being, or health of members of the public. A safe environment is one in which there is no, or optimally reduced, potential for death, serious bodily injury or illness, or property damage. The primary goal is to identify and prevent potential accidents or impacts on the general public. The proposed restricted areas are within the confines of the existing SUA complex with routine military training activities. The Proposed Action does not introduce a new type of aircraft or new training activities. All flying would adhere to existing federal, state, and local regulations. Continued adherence to these existing health and safety procedures designed to protect the public from military training or other activities would result in a negligible safety risk. Completion of the FAA aeronautical analysis of the airspace proposal ensures the proposed SUA is compliant with airspace regulations and the safe and efficient use of the navigable airspace (see **Section 1.2**, *Procedures to Establish SUA*). Therefore, this resource is not evaluated in detail in this EA.

3.1 Airspace

Airspace, which is defined in vertical and horizontal dimensions and by time, is considered to be a finite resource that must be managed for the benefit of all aviation sectors including commercial, general, and military aviation. The FAA manages all airspace within the U.S. and the U.S. territories.

3.1.1 Regulatory Setting

Specific aviation and airspace management procedures and policies to be used by the Navy are provided by Chief of Naval Operations Instruction 3710.7, *Naval Aviation Training and Operating Procedure Standardization*. Applicable Marine Corps aviation and airspace management procedures are provided by MCO P3500.14G, *Aviation T&R Manual, Administrative*. Other applicable regulations regarding SUA management include specific FAA Orders.

FAA Order 1050.1F (issued July 16, 2015), *Environmental Impacts: Policies and Procedures*, provides FAA policy and procedures to ensure agency compliance with provisions of the NEPA, Department of Transportation Order 5610.1C, *Procedures for Considering Environmental Impacts*, and other related statutes and directives.

FAA Order JO 7400.2R (issued February 20, 2025), *Procedures for Handling Airspace Matters,* provides procedures for administration of the airspace program. Specifically, Part 5. SUA, Chapter 21, prescribes specific policies and procedures to establish/designate airspace in the interest of National Defense, security, and/or welfare. SUA is published annually in FAA Order JO 7400.10G, *SUA* (current effective publication is February 6, 2025).

3.1.2 Affected Environment

The airspace proposed for the new restricted areas would be congruent to existing SUA. These areas are currently heavily used by military aircraft. In FY2022, there were 8,896 military flights in the proposed R-5305 and 10,410 military flights in the proposed R-5307 (which is currently A-530) based on radar flight data from FAA (see **Appendix B** for additional information on flight data). In addition to

military aircraft, civil aircraft also use the airspace. In FY2022, there were 665 total civil flights in the proposed R-5305 and 5,456 total civil flights in the proposed R-5307.

3.1.3 Environmental Consequences

The analysis of airspace use considers the potential impact to civilian aircraft users from the establishment of SUA where there was not any previously. A detailed Airspace Impact Analysis is provided in **Appendix B**. That analysis describes the potential impacts to Air Carrier traffic and other non-military traffic (Air Taxi and General Aviation); the results of that analysis are summarized here. The impact to non-military users is described in terms of the additional travel time that would be required to avoid an active restricted area. The Airspace Impact Analysis is based on a year's worth of radar data from FY2022 (see **Appendix B** for methodology).

3.1.3.1 No Action Alternative

Under the No Action Alternative, current operations would continue in the SUA in eastern North Carolina as it is currently charted, which would limit the ability of the Marine Corps to effectively train to current threats. There would be no change to existing airspace.

3.1.3.2 Proposed Action Alternative

The use of the restricted areas would be during the proposed published times of use. **Table 3.1-1** provides the expected hours of activation annually and daily based on the proposed times of use and the proposed sorties in each proposed restricted area.

Table 3.1-1 Expected Hours of Activation for Proposed Restricted Areas

Airspace	Published Times of Use	Proposed Sorties (annual)	Expected Hours of Activation (annual/daily)
R-5305A	Monday–Friday, 0600–0000; other times by NOTAM	1,140	1,200/8
R-5305B	Intermittent by NOTAM		70/2
R-5305C	Intermittent by NOTAM		70/2
R-5307A	Intermittent by NOTAM	700	100/4
R-5307B	Intermittent by NOTAM		100/4
R-5307C	Monday–Friday, 0800–0000; other times by NOTAM		400/4

Legend: NOTAM = Notice to Airmen.

As shown in **Table 3.1-1**, the expected activation of R-5305 and R-5307 would be 2–4 hours during published days of use, except R-5305A would be 8 hours. Potential impacts to civil traffic would only occur when the restricted areas are active. Impacts to civil operations are discussed for each of the proposed restricted area segments, A, B, and C.

Impacts to Civil Aircraft Operations in R-5305

In FY2022, there were 665 total civil and unknown flights (which are assumed to be civil traffic and potentially impacted for purposes of this analysis) which traversed the airspace in the proposed R-5305. There were 524 flights which traversed R-5305A, 54 flights in R-5305B, and 87 flights in

R-5305C. The analysis determined the low counts of civil traffic result from the proposed airspace being bound by the existing R-5303 and R-5306D, and most traffic would likely already be routed to circumnavigate existing SUA. Impacts to rerouting traffic in most of these cases resulted in no more than 1 minute of added travel time.

In FY2022, there were 24 Air Carrier and Air Taxi flights which traversed the airspace proposed for R-5305A, about two per month. Most of the civil traffic which entered this airspace were General Aviation traffic and unknown flights (500 operations). Based on the most common origin and destination pairings for known and unknown traffic, rerouting these flights to avoid the proposed restricted area would add 1 minute of travel time for each of those flights.

In FY2022, there were six Air Carrier and Air Taxi flights which traversed the airspace proposed for R-5305B, about one every 2 months. Most of the civil traffic which entered this airspace was General Aviation traffic (47 operations); there was one unknown flight. Based on the most common origin and destination pairings, rerouting these flights would add 1 minute of travel time.

In FY2022, there were 17 Air Carrier and Air Taxi flights which crossed the airspace proposed for R-5305C, less than two flights per month. Most of the civil traffic which entered this airspace was General Aviation traffic (67 operations), there were three unknown flights. Although R-5305C had the highest traffic totals in R-5305, all but one of the most common origin and destination pairings did not incur additional flight time for rerouting to avoid the SUA.

Impacts to Civil Aircraft Operations in R-5307

In FY2022, there were 5,456 total civil and unknown flights (which are assumed to be civil traffic and potentially impacted for purposes of this analysis) which traversed the airspace in the proposed R-5307. There were 4,172 flights which traversed R-5307A, 884 flights in R-5307B, and 400 flights in R-5307C. Impacts to civil operations are discussed by the proposed restricted area segment. These numbers are high largely due to the location of Michael J. Smith Airport in Beaufort, North Carolina, which is beneath the proposed R-5307A. Impacts to R-5307A and R-5307B are summarized together. Expected activation of R-5307A and R-5307B would be intermittent by NOTAM, about 4 hours on published days of use. R-5307C would only be activated 4 hours per day during weekdays and other times by NOTAM.

In FY2022, there were 284 Air Carrier and Air Taxi flights which traversed the airspace proposed for R-5307A and R-5307B, about 24 per month. Most of the civil traffic which entered this airspace were General Aviation traffic and unknown flights (4,772 operations). All of the origin and destination pairings in this airspace were flights arriving or departing Michael J. Smith Airport, thus rerouting is not feasible. Procedural agreements would need to be established to release airspace 5,000 feet MSL and below to MCAS Cherry Point Combined Enroute Radar Approach Control (controlling agency) when R-5307A is active to allow for continued traffic flow arriving and departing into Michael J. Smith Field.

In FY2022, there were 258 Air Carrier and Air Taxi flights which traversed the airspace proposed for R-5307C, about 22 per month. General Aviation and unknown aircraft flights accounted for approximately 36 percent of the traffic in this area. Based on the most common origin and destination

pairings, rerouting these flights would add 1 minute or less of travel time for 50 percent of these flights, the remaining 50 percent would not incur additional travel time as a result of rerouting to avoid the SUA.

The relatively low numbers of air traffic operations in the proposed restricted areas, the existing SUA surrounding it, and the negligible increase in flight times when rerouting becomes necessary, indicate implementation of the Proposed Action would not result in significant impacts to airspace management and operations.

3.2 Noise

Noise is unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. Noise may be intermittent or continuous, steady or impulsive, stationary or transient. Stationary sources are normally related to specific land uses, e.g., housing tracts or industrial plants. Transient noise sources move through the environment, either along relatively established paths (e.g., highways, railroads, and aircraft flight tracks around airports), or randomly. There is wide diversity in responses to noise according to the type of noise and the characteristics of the sound source, the sensitivity and expectations of the receptor, the time of day, and the distance between the noise source (e.g., an aircraft) and the receptor (e.g., a person or animal).

The physical characteristics of noise and sound include its intensity, frequency, and duration. Sound is created by acoustic energy, which produces minute pressure waves that travel through a medium, like air, and are sensed by the eardrum, much like how ripples in water move when a stone is dropped into it. As the acoustic energy increases, the intensity or amplitude of these pressure waves increase, and the ear senses louder noise. The unit used to measure the intensity of sound is the decibel (dB). Sound intensity varies widely (from a soft whisper to a jet engine) and is measured on a logarithmic scale. Human hearing ranges from 0 dB (barely audible) to 120 dB, where physical discomfort is caused by the sound.

The frequency of sound is measured in cycles per second, or hertz (Hz). This measurement reflects the number of times per second the air vibrates from the acoustic energy. Low frequency sounds are heard as rumbles or roars, and high frequency sounds are heard as screeches. Sound measurement is further refined by "weighting." The normal human ear can detect sounds that range in frequency from about 20 Hz to 15,000 Hz, with the human ear most sensitive to frequencies in the 1,000 to 4,000 Hz range. Sound measurements are "A-weighted," and are indicated in terms of A-weighted decibels (dBA). A-weighting accounts for the frequency sensitivity of the human ear. The dBA is also appropriate for measuring continuous sounds.

3.2.1 Noise Metrics

The word "metric" is used to describe a standard of measurement. Many different types of noise metrics have been developed to represent the effects of environmental noise.

The metrics supporting the assessment of noise from aircraft operations used in this EA are the Day-Night Average Sound Level (DNL), Maximum Sound Level (L_{max}), and Sound Exposure Level (SEL). Each metric is briefly explained below.

DNL

The DNL is an A-weighted cumulative noise metric that measures noise based on annual average daily aircraft operations. DNL is the U.S. Government standard for modeling the cumulative noise exposure and assessing community noise impacts. DNL uses two time periods: daytime (acoustic day) and nighttime (acoustic night). Daytime hours are from 7:00 a.m. to 10:00 p.m., and nighttime hours are from 10:00 p.m. to 7:00 a.m. local time. DNL weights operations occurring during its nighttime period by adding 10 dB to their single event sound level.

L_{max} and SEL

A common metric used to describe a single aircraft noise event is the maximum sound level, or L_{max}, measured in dB. L_{max} is the highest A-weighted sound level that occurs during the aircraft overflight. L_{max} describes the maximum level of a noise event but does not take into account its duration. The SEL, measured in dB, is a composite metric that represents both the magnitude and duration of an aircraft overflight. The SEL is a measure of the total acoustic energy in the event, but does not directly represent the sound level heard at any given time. The SEL is the building block for calculating DNL.

3.2.2 Relationship Between Noise and Annoyance

Annoyance, which is based on perception, represents the primary effect associated with aircraft noise. Generally, the louder the noise, the more annoyance it causes. Attitudinal surveys conducted over several decades show a consistent relationship between DNL and the percentages of groups of people who express various degrees of annoyance. This relationship was originally suggested by Schultz (1978) and has been periodically re-examined and reaffirmed. The updated relationship by Finegold et al. (1994), which does not differ substantially from the original, is the current preferred form and is shown in **Table 3.2-1**. While not a determination of significance, the calculated DNL for the proposed restricted areas addressed in this EA can be compared against **Table 3.2-1** to provide an estimate of the percentage of the population that would be "highly annoyed" by the noise. These data provide a perspective on the level of annoyance that might occur. The study results summarized in **Table 3.2-1** are based on outdoor noise levels.

Table 3.2-1 Relationship of Annoyance to DNL

DNL (dBA)	Percentage of Persons Highly Annoyed
45	0.83
50	1.66
55	3.31
60	6.48
65	12.29
70	22.10

Note: Noise impacts on individuals vary as do individual reactions to noise. This is a general prediction of the percentage of the community potentially highly annoyed based on environmental noise surveys conducted around the world.
Legend: dBA = A-weighted decibel; DNL = Day-Night Average Sound Level
Source: Finegold et al. 1994.

In 2021, the FAA completed a multi-year research effort to develop an updated and nationally representative civil aircraft dose-response curve, quantifying the relationship between aircraft noise

exposure and community annoyance based upon Neighborhood Environmental Survey that collected information from a statistically representative number of adult residents living around 20 U.S. airports (FAA 2021a). The resulting dose-response curve from the survey data relating aircraft noise to the percentage of individuals reported as being highly annoyed found that the annoyance may be greater than found in prior studies. **Table 3.2-2** summarizes the calculated National Dose-Response Curve presented in the FAA study at selected DNL levels. As shown, the percent of people highly annoyed at all DNL levels is higher than the original dose-response in **Table 3.2-1**. It should be noted, this survey and the results are specific to areas around airports with routine low-level arriving and departing flights which does not readily apply to airspace actions.

Table 3.2-2 Predicted Percent Highly Annoyed from the National Dose-response Curve

DNL (dB)	Percent Highly Annoyed
50	19.1
55	32.1
60	48.8
65	65.7
70	79.4

Legend: % = percent; dB = decibel; DNL = Day-Night Average Sound Level
Source: FAA 2021a.

3.2.3 Noise Induced Hearing Loss

Noise-induced hearing loss risk has been extensively studied, with the consensus that populations exposed to noise greater than 80 DNL are at the greatest risk of potential hearing loss (DoD 2009). Because no person or place would be exposed to noise levels greater than 80 DNL, noise-induced hearing loss is not discussed further in this analysis.

3.2.4 Noise Modeling Software

The noise associated with aircraft operations can be subsonic or supersonic. Subsonic noise is noise generated by an aircraft's engines and airframe. This is the most familiar form of noise. Supersonic noise is the noise generated when an aircraft flies faster than the speed of sound and has the potential to create sonic booms. A sonic boom is the sound associated with shock waves generated when the aircraft travels at supersonic speeds. This Proposed Action does not include any supersonic activity within the restricted areas; therefore, this analysis focuses only on subsonic noise.

The noise analysis was performed using the accepted suite of noise modeling programs, known as NOISEMAP (Wyle 1998; Wasmer Consulting 2006). The NOISEMAP suite of programs refers to Base Operations (BASEOPS) as the input module with MRNMap being the noise model used to predict noise exposure in SUA. MRNMap takes into account aircraft power settings, aircraft speed, and altitude when calculating average annual noise for the airspace. This software was used to define noise levels associated with military aircraft operations for both baseline (no action) and proposed conditions. Military training within a restricted area is dispersed throughout the confines of the airspace; as such, the software assumes an even distribution of noise across the entire airspace modeled and calculates

a single DNL value. Therefore, noise contour results are not illustrated for subsonic aircraft noise in restricted areas.

3.2.5 Regulatory Setting

The analysis of the acoustic environment involves consideration of many factors including the types, locations, and frequency of aerial operations, the classification of existing airspace, and the amount of air traffic using or transiting through a given area. This analysis quantifies the anticipated subsonic noise from military aircraft activity within the existing and proposed airspace.

The U.S. Environmental Protection Agency (EPA) has identified 55 dB DNL as a level that protects public health and welfare with an adequate margin of safety (EPA 1982). This means that 55 dB DNL is a threshold below which adverse noise effects are not expected to occur. According to the Federal Interagency Committee on Urban Noise (FICUN), noise exposure greater than 65 dB DNL is considered generally incompatible with residential, public use (i.e., schools), or recreational and entertainment areas (FICUN 1980).

Per FAA Order 1050.1F, a noise sensitive area is defined as an area where noise interferes with normal activities associated with its use. Normally, noise sensitive areas include residential, educational, health, religious structures and sites, parks, recreational areas, areas with wilderness characteristics, wildlife and waterfowl refuges, and cultural and historical sites.

For airspace actions, FAA requires that an action proponent identify where noise will change by the following specified amounts in noise sensitive areas (FAA Order 1050.1F):

- For DNL 65 dB and higher: +/- DNL 1.5 dB (significant)
- For DNL 60 dB to greater than (<) 65 dB: +/- DNL 3 dB (reportable)
- For DNL 45 dB to <60 dB: +/- DNL 5 dB (reportable)

3.2.6 Affected Environment

Existing military operations in the airspace proposed as R-5305 are composed of military transit flights through uncharted airspace (surface up to 3,000 feet AGL) and training operations within the larger, overlapping Hatteras F MOA (which exists from 3,000 feet AGL up to FL180). Additionally, A-530 (which exists from the surface up to FL180) and a portion of the Burner ATCAA (which exists from FL180 up to FL500) proposed as R-5307 are currently utilized for military aircraft training. The current subsonic noise exposure from these flights is low, estimated at 50 dB DNL and 40 dB DNL, respectively, with no events exceeding 65 dB SEL (**Table 3.2-3**). Based on this DNL, the Finegold (1994) analysis (see **Table 3.2-1**) predicts 1.66 percent of the population underlying the proposed R-5305 would be highly annoyed with the existing aircraft activity and less than 1 percent would be highly annoyed under proposed R-5307.

Noise levels shown in **Table 3.2-3** are presented for the specific restricted area boundaries and altitudes and when combined with overlying airspace. For example, the unscheduled airspace beneath Hatteras F MOA (proposed R-5305A) has a noise level of 39 DNL. The noise level of Hatteras F MOA is

50 DNL. When these two noise levels are added, the noise level would be 50 DNL within the unscheduled airspace beneath Hatteras F MOA.

Table 3.2-3 Existing Subsonic Noise Exposure

Airspace	dB DNL	Events above 65 dB SEL
Hatteras F MOA (R-5305 A/B/C)	50 (50)[1]	0
Unscheduled Airspace beneath Hatteras F (R-5305A)	39 (50)	0
A-530 (R-5307A)	38 (40)	0
Burner Low/High ATCAA (R-5307 B/C)	35 (40)	0

Note: [1] number in parentheses (XX) = noise level when combined with all airspace vertical segments.
Legend: dB = decibel; dBA = A-weighted decibel; DNL = Day-Night Average Sound Level; SEL = Sound Exposure Level

R-5305A/B/C is located within the MCB Camp Lejeune installation boundary. Land use under the airspace consists primarily of uninhabitable swamp and marsh lands, intertidal waters, and the New River within the boundary of MCB Camp Lejeune. There are no noise sensitive receptors beneath R-5305. The current noise exposure from military aircraft operations in the proposed R-5305 is 50 dB DNL.

Land uses below the existing A-530 that would become R-5307A/B/C consist of the following cities or towns: Havelock, Newport, Minnesott Beach, and Broad Creek (**Figure 3.2-1**). These cities and towns consist of single- and multi-family residences, commercial, and industrial land use present along rural areas and connected via U.S. Route 70 and State Route 24. The Croatan National Forest covers most of the land area of the existing A-530 that would become R-5307A/B/C. There are three wilderness areas within the forest beneath R-5307A/B/C: Sheep Ridge Wilderness, Pond Pine Wilderness, and Pocosin Wilderness. Additionally, below R-5307B/C, are the coastal towns of Morehead City, Emerald Isle, Atlantic Beach, and Harkers Island. There are several churches and public schools throughout the proposed R-5307A/B/C. There are medical facilities in Havelock adjacent to the MCAS Cherry Point installation boundary. Existing military aircraft operations, in addition to roadway and waterway vehicle operations, are the dominant noise sources of the area. The current noise exposure from military aircraft operations in the proposed R-5307A/B/C is 40 dB DNL.

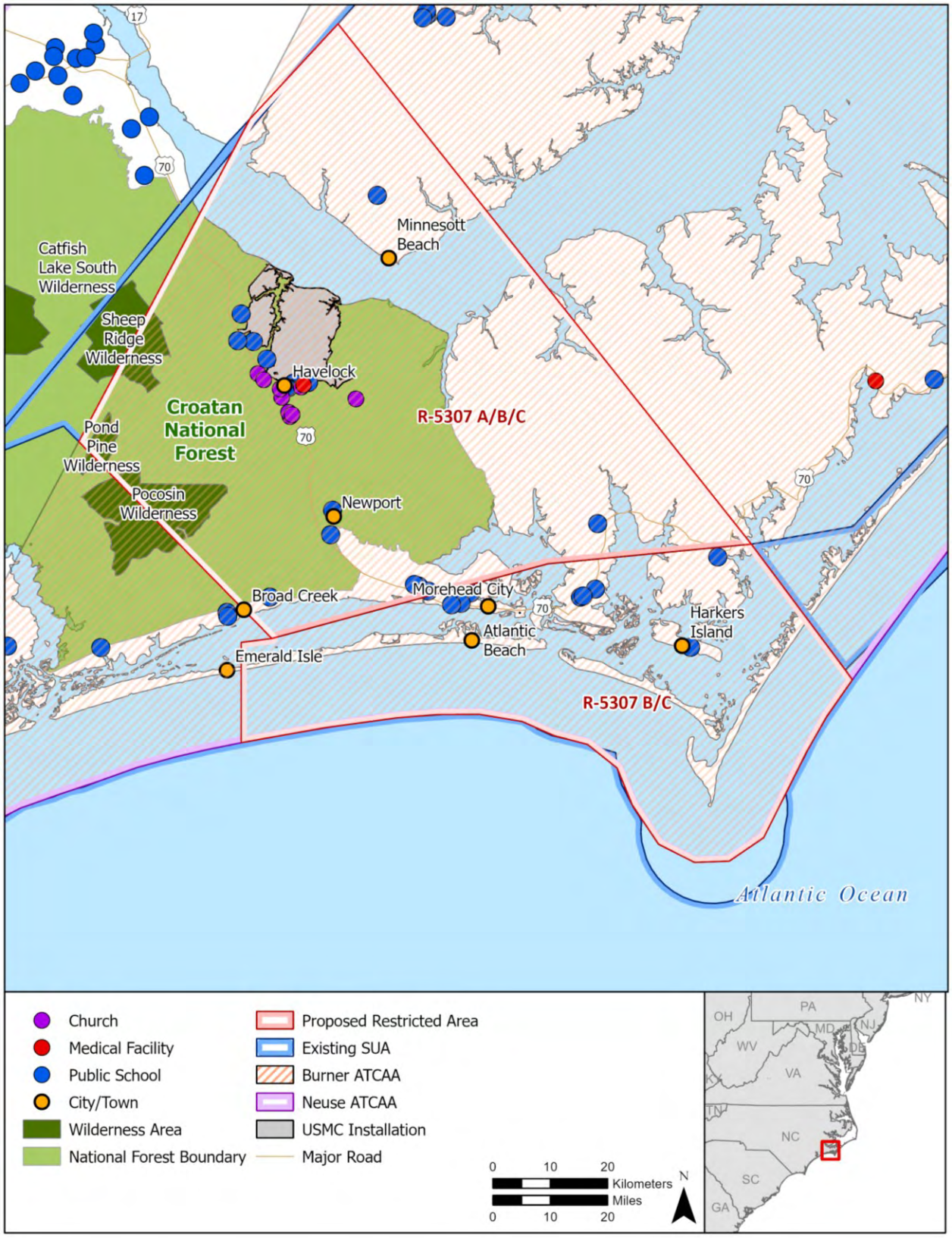

Figure 3.2-1 Noise Receptors Below Proposed Restricted Areas

3.2.7 Environmental Consequences

A detailed description of the methodology for determining noise impacts and a detailed noise report for this Proposed Action is provided in **Appendix C**. A summary of the results is provided in this section. The noise from the proposed aircraft operations could impact other resource areas, such as natural resources. Those impacts are addressed in their respective sections of this document.

3.2.7.1 No Action Alternative

Under the No Action Alternative, military aircraft would continue to use the existing airspace for transit between SUA segments and training in the SUA complex. The current noise environment in the area proposed for the restricted areas would remain unchanged and includes noise exposure from overflight by various types of military and civilian aircraft at various altitudes, military aircraft training, and roadway and waterway vehicle operations. The subsonic military aircraft noise level associated with the No Action Alternative would be the same as the affected environment presented in **Section 3.2.6** and **Table 3.2-3.**

3.2.7.2 Proposed Action Alternative

The noise analysis used approved software to predict the DNL in the proposed restricted areas to compare against the EPA, FICUN, and FAA thresholds described in **Section 3.2.5**. While not a determination of significance, an estimate of the percentage of the population that would be "highly annoyed" by the noise from the resulting DNL is also provided (see **Table 3.2-1**).

While DNL is the DoD standard metric for assessing noise impacts (DoD Instruction 4715.13, *Operational Noise Program*), supplemental metrics are used to provide more detailed noise exposure information for the decision process and to improve communication with the public and stakeholders. Supplemental metrics are not intended to replace the DNL metric as the primary descriptor of cumulative noise exposure and anticipated significance of impacts, but rather are useful tools to supplement the impact information disclosed by the DNL metric. Thus, the noise analysis includes supplemental data for single events to better describe the "loudness" of individual aircraft overflights for the aircraft proposed to operate in the proposed restricted areas at various power settings at the lowest possible altitudes (i.e., the lowest level a training aircraft is allowed to operate within the defined SUA). It should be noted that these metrics are different from DNL and therefore, cannot be compared against **Table 3.2-1** to predict annoyance.

Table 3.2-4 provides the projected sorties to occur in each proposed restricted area (see **Appendix C** for details on use of the proposed restricted areas by aircraft type, time in the airspace, and altitude bands). DNL has two time periods of interest: daytime and nighttime. Daytime hours are from 7:00 a.m. to 10:00 p.m. local time. Nighttime hours are from 10:00 p.m. to 7:00 a.m. local time. DNL weights operations occurring during its nighttime period by adding 10 dB to their single event sound level. Note that "daytime" and "nighttime" in calculation of DNL are sometimes referred to as "acoustical day" and "acoustical night" and always correspond to the times given above. This is different than the "day" and "night" used commonly in military aviation, which are directly related to the times of sunrise and sunset and vary throughout the year with the seasonal changes.

Table 3.2-4 Proposed Day/Night Sorties

Airspace	Proposed Sorties (annual total)	Acoustical Day (7:00 a.m.–10:00 p.m.)	Acoustical Night (10:00 p.m.–7:00 a.m.)
R-5305A/B/C	1,140	1,027	113
R-5307A/B/C	700	631	69

Cumulative Noise Metrics (DNL)

Under the Proposed Action, R-5305 and R-5307 would be established and used for training Monday through Friday. **Table 3.2-5** shows the modeled DNL for annual military aircraft operations within the proposed restricted areas. The subsonic noise level from aircraft operations within the proposed R-5305 and R-5307 would be 54 dB DNL and 43 dB DNL, respectively. These levels would not exceed 65 dB DNL, the significance threshold defined by FAA. Additionally, the noise levels from aircraft operations within either of the proposed restricted areas would not exceed the EPA's identified threshold of 55 dB DNL, a level below which adverse noise effects are not expected to occur. From a land use perspective and according to the FICUN, the FAA, and the EPA, these levels would be compatible with all land use types, including residential, public use (i.e., schools), recreational, and entertainment areas. Based on the DNL, the Finegold (1994) analysis (see **Table 3.2-1**) predicts less than 3.31 percent of the population would be highly annoyed by the subsonic noise within the proposed R-5305 and less than 1.0 percent would be highly annoyed by subsonic noise within R-5307. Further, approximately two daily events within R-5305 would exceed 65 SEL (**Table 3.2-5**). While proposed R-5305 would include the surface to 7,000 feet MSL, fixed-wing aircraft would not operate below 500 feet AGL (see **Appendix C** for details on use of the proposed restricted areas by aircraft type, time in the airspace, and altitude bands).

Table 3.2-5 DNL Values for Proposed Annual Aircraft Operations in Proposed Restricted Areas

Airspace	Existing DNL (dBA)	Proposed DNL (dBA)	Events above 65 dB SEL
R-5305 A/B/C	50	54	2
R-5307 A/B/C	40	43	0

Legend: dB = decibel; dBA = A-weighted decibel; DNL = Day-Night Average Sound Level; SEL = Sound Exposure Level

The projected DNL for the proposed subsonic aircraft activity would increase by 4 dB DNL and 3 dB DNL within R-5305 and R-5307, respectively, over the No Action Alternative. As noted previously, the proposed R-5305 is located over water, swamps, and marshes within the MCB Camp Lejeune installation boundary where the 4 dB DNL increase could be noticeable but there are no sensitive noise receptors beneath this restricted area. The 3 dB DNL increase associated with the proposed R-5307 would not be noticeable to receptors beneath the area and would be compatible with existing land use (i.e., residential, commercial, industrial, and open space). Implementation of the Proposed Action would not result in significant noise impacts as defined in FAA Order 1050.1F. Biological resources beneath the proposed restricted areas are addressed specifically in **Section 3.4**; however, no significant impacts were identified.

Single Event Metrics

The noise analysis calculated single event metrics (i.e., a single overflight directly overhead) for the types of military aircraft that produce the largest noise events given their operating parameters (e.g., altitude, speed, power setting) within the proposed restricted areas. These metrics were calculated for each aircraft at varying power settings at the lowest possible altitude. In general, during training events aircraft do not travel substantial distances at low altitude, but rather start at the floor and quickly climb to higher altitudes. At 500 feet AGL, a direct overflight by any of the aircraft that would be using the airspace would likely be noticeable; however, proposed operations at the lowest level (500 feet AGL) and highest power setting (Afterburner) would be less than 1 percent of operations (see **Tables A-4 and A-5** of **Appendix C**, for the aircraft operation assumptions by aircraft by restricted area and altitude band).

Table 3.2-6 provides only the loudest possible event within each restricted area to provide additional perspective on what an observer on the ground may experience (see **Appendix C** for the full results that detail the single event metrics for all types of aircraft at various altitudes and power settings). As one might expect, aircraft using higher power at lower altitude produces the greatest noise levels as shown. While R-5305 is proposed to start at the surface, fixed-wing aircraft would not operate below an allowable altitude of 500 feet AGL for training, while rotary-wing and small UAS would operate below 500 feet AGL. The floor of R-5307 would be 2,500 feet AGL where all types of aircraft would be required to operate above this level within the airspace.

Table 3.2-6 Maximum Sound Level for Single Overflight by Restricted Area

Airspace	Lowest Altitude	Maximum Sound Level (L_{max}) (dBA)	Aircraft
R-5305	500 feet AGL[1]	124	F-18 E/F with afterburner F-35B with afterburner
R-5307	2,500 feet AGL	106	F-18 E/F with afterburner F-35B with afterburner

Note: [1] The floor of R-5305A would be surface; however, fixed-wing aircraft would not operate below 500 feet AGL for training.

Legend: AGL = above ground level; dBA = A-weighted decibels; L_{max} = maximum sound level

Normally, the most sensitive components of a structure to noise are the windows and, infrequently, the plastered walls and ceilings. Conservatively, only sound lasting more than 1 second above a sound level of 130 dB are potentially damaging to structural components (Committee on Hearing, Bioacoustics, and Biomechanics 1977). Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations or rattling of objects within the dwelling. Windowpanes may also vibrate noticeably when exposed to high levels of airborne noise. Sound levels from normal aircraft operations are typically much less than 130 dB. Even sound from low-altitude flyovers of heavy aircraft do not reach the potential for damage (Sutherland et al. 2000). The highest L_{max} of a single overflight would be 124 dB and would occur in R-5305, which would be within the installation boundary. The highest L_{max} within R-5307 would be 106 dB and occur within the proposed boundary of R-5307A (which aligns with the current A-530 boundary). The floor of overlying R-5307B/C would be 10,000 feet MSL, thus this L_{max} would not occur in the area over the coastline and

barrier islands covered by R-5307B/C. Given these results, structural damage and secondary vibration impacts are not expected to occur with this Proposed Action.

As described above, the cumulative noise (DNL) associated with the proposed aircraft operations would be below the significance levels established by the EPA, FICUN, and FAA. The percentage of the population expected to be highly annoyed by the cumulative noise would be extremely low (0.83 to 3.31 percent). Direct overflights at lower altitudes (500 feet or 2,500 feet) while noticeable would be rare and last for only a few seconds or less. Structural damage or secondary vibration impacts are not expected to occur based on the maximum sound exposure. An individual location is not expected to experience this scenario on a recurring or routine basis since aircraft operations would be distributed over such a wide area, both vertically and horizontally. As such, the Proposed Action would not have significant impacts from noise.

3.3 Air Quality and Greenhouse Gas Emissions

This discussion includes criteria pollutants, standards, sources, permitting, and greenhouse gases (GHGs). Air quality in a given location is defined by the concentration of various pollutants in the atmosphere. A region's air quality is influenced by many factors, including the type and amount of pollutants emitted into the atmosphere, the size and topography of the region of influence (ROI), and the prevailing meteorological conditions.

Most air pollutants originate from human-made sources, including mobile sources (e.g., cars, trucks, buses) and stationary sources (e.g., factories, refineries, power plants), as well as indoor sources (e.g., some building materials and cleaning solvents). Air pollutants are also released from natural sources, such as volcanic eruptions and forest fires.

3.3.1 Regulatory Setting

The principal pollutants defining the air quality, called "criteria pollutants," include carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone, suspended particulate matter less than or equal to 10 microns in diameter (PM_{10}), fine particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead. Some criteria pollutants are emitted directly into the atmosphere from emissions sources. Others are formed through atmospheric chemical reactions that are influenced by weather, ultraviolet light, and other atmospheric processes. Ozone is not directly produced from anthropogenic sources, with few exceptions. Instead, two groups of pollutants that are widely produced are also ozone precursors. The groups are volatile organic compounds (VOCs) and oxides of nitrogen (NO_x). In order to evaluate ozone emissions, air quality analyses evaluate the emissions of these two groups of pollutants from a proposed federal action.

Under the CAA, the EPA has established National Ambient Air Quality Standards (NAAQS) (40 CFR part 50) for these pollutants. NAAQS are classified as primary or secondary. Primary standards protect against adverse health effects; secondary standards protect against welfare effects, such as damage to farm crops and vegetation and damage to buildings. Some pollutants have long-term and short-term standards. Short-term standards are designed to protect against acute, or short-term health effects, while long-term standards were established to protect against chronic health effects.

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

The CAA requires states to develop a general plan to attain and maintain the NAAQS in all areas of the country and a specific plan to attain the standards for each area designated nonattainment for a NAAQS. These plans, known as State Implementation Plans, are developed by state and local air quality management agencies and submitted to EPA for approval.

In addition to the NAAQS for criteria pollutants, national standards exist for hazardous air pollutants, which are regulated under Section 112(b) of the 1990 CAA Amendments. The National Emission Standards for Hazardous Air Pollutants regulate hazardous air pollutants emissions from stationary sources (40 CFR part 61).

3.3.1.1 Greenhouse Gases

GHGs are gas emissions that trap heat in the atmosphere. The accumulation of GHGs in the atmosphere regulates the earth's temperature. These emissions occur from natural processes and human activities. Scientific evidence indicates a trend of increasing global temperature over the past century due to an increase in GHG emissions from human activities. Each GHG is assigned a global warming potential, which is the ability to trap heat, and is standardized to carbon dioxide (CO_2), which has a global warming potential value of one. A GHG is multiplied by its global warming potential to calculate the total equivalent emissions of carbon dioxide (CO_2e). These emissions come mainly from the burning of fossil fuels (coal, oil, and gas), with contributions from forest clearing, agricultural practices, and other activities.

3.3.2 Affected Environment

The North Carolina Department of Environmental Quality (NCDEQ) is responsible for implementing and enforcing state and federal air quality regulations in North Carolina. Through a network of air quality monitoring sites throughout the state, the NCDEQ's Division of Air Quality monitors CO, SO_2, PM_{10}, $PM_{2.5}$, ozone, and NO_2 pollutants.

NCDEQ operates a station in Carteret County that measures ozone. This station monitor is located approximately 13 miles west of the airfield area of MCAS Cherry Point. **Table 3.3-1** presents published design values based on the most current ambient monitoring levels (EPA 2024) for the region. A design value is a statistic that describes the air quality status of a given location relative to the NAAQS. Design values are computed and published annually by EPA's Office of Air Quality Planning and Standards and reviewed in conjunction with the EPA Regional Offices. Lead is not included in this air quality analysis, as there are no sources of lead emissions associated with the Proposed Action and lead is not monitored in North Carolina.

Table 3.3-1 Comparison of 2023 North Carolina Regional Design Values with NAAQS

Pollutant	Averaging Time	NAAQS	Maximum Design Values (Station/ County)	Percent of NAAQS
CO	1-hour	35 ppm	1.7 ppm (Millbrook/ Wake)	5
	8-hour	9 ppm	1.3 ppm (Millbrook/ Wake)	14
NO_2	1-hour	0.100 ppm	0.031 ppm (Triple Oak/ Wake)	31
	Annual	0.053 ppm	0.009 ppm (Millbrook/ Wake)	17
$PM_{2.5}$	24-hour	35 µg/m^3	14 µg/m^3 (Castle Hayne/ New Hanover)	40
	Annual	9 µg/m^3	5.4 µg/m^3 (Castle Hayne/ New Hanover)	60
Ozone	8-hour	0.070 ppm	0.063 ppm (Beaufort/ Carteret County)	90
SO_2	1-hour	75 ppb	11 ppb (Bayview Ferry/ Beaufort County)	15

Note: There are no design values for PM_{10}; the closest monitor (Castle Hayne/ New Hanover) reported 0 exceedances for the 2021-2023 period.

Legend: µg/m^3 =microgram per cubic meter; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; ppb = parts per billion; ppm = parts per million

Source*:* EPA 2024

The air quality design values demonstrate that emission levels are well below the most stringent NAAQS for most of the criteria pollutants, with ozone being an exception. The design value for ozone at the monitoring site in Carteret County is 90 percent of the NAAQS for ozone for the 2022–2023 monitoring period. While the area is currently in attainment for ozone, site trends indicate that over the 5 years (the duration of monitoring), the ozone levels have trended upward in the region by about 8 percent.

3.3.3 Environmental Consequences

Effects on air quality are based on estimated direct and indirect emissions associated with the Proposed Action. The ROI for assessing air quality impacts is Onslow and Craven Counties, 2 of the 13 counties that comprise the Southern Coastal Plain Intrastate Air Quality Control Region (40 CFR section 81.152).

Estimated emissions from a proposed federal action are typically compared with the relevant national and state standards to assess the potential for increases in pollutant concentrations.

3.3.3.1 No Action Alternative

Under the No Action Alternative, current aircraft training operations would continue in the SUA complex as it is currently charted. There would be no change to the air quality as described in **Section 3.3.2.**

3.3.3.2 Proposed Action Alternative

Under the Proposed Action, additional sorties would be added in the new restricted areas to meet current training requirements. The net change in emissions from the existing conditions (the No Action Alternative) is the total emissions estimated for the additional training in R-5303 and R-5307. For criteria pollutants, these emissions would only occur at the lowest altitude bands. These sorties would be associated with R-5305A and R-5307A, where low altitude training would occur. For GHGs, these emissions would occur throughout all the altitude bands. For both areas, the total altitude profile extends beyond the 3,000 feet AGL default value that has been established for the pollutant

mixing height (EPA 1992). The aircraft operation estimates used in the noise study in **Appendix C** have been used to identify what percentage of a sortie would fly below 3,000 feet or above this threshold in order to calculate the low altitude criteria pollutant emissions. The following assumptions were used for the air quality analysis:

- Under the existing conditions, the noise analysis delineates the lowest altitude band for A-530 from 2,500 to 5,000 feet AGL. Because there is no further segregation in this altitude band, the air quality analysis conservatively assigned all time spent in the band to below 3,000 feet AGL.
- Where legacy aircraft are currently flying but will soon be replaced by F-35 B/C aircraft, the emission profiles of the F-35 were used.
- The V-22 was used to represent all rotary-/tilt-wing aircraft under the Proposed Action.
- Small UAS were not included in the analysis. These rely on other power sources (batteries).

Table 3.3-2 presents information on annual emissions from low altitude sortie activities in the airspaces R-5305A and R-5307A under the Proposed Action Alternative, which would be additional emissions generated as compared to the existing conditions or No Action Alternative. Details on the calculations used to assess low altitude criteria pollutant air emissions from training sortie operations in R-5305A and R-5307A can be found in **Appendix D**. The results indicate that there would be a small increase in criteria pollutant emissions annually, resulting from the additional low altitude flights in the ROI. NO_x emissions would increase at an estimated 12.5 tons per year, primarily from V-22 operations. NO_x is a precursor to ozone formation, but this quantity of emissions alone would not be sufficient to cause a demonstrable difference in the ozone levels in the ROI ambient air. As a result, the Proposed Action emissions would not have a significant impact on ambient air quality in the ROI.

Table 3.3-2 Annual Criteria Pollutant Emissions Resulting from Low Altitude Flight Operations in R-5305A and R-5307A Under the Proposed Action

Aircraft	Annual Sorties	Time in hours	Pounds per Year					
			VOCs	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
V-22	500	425	19	844	22,875	1,461	2,549	2,549
F-35 B/C	590	6	0	57	1,753	101	125	113
F-15E	100	1	33	10	256	12	8	7
F-22	10	0.1	0	4	25	2	3	2
MQ-9	100	1	0	0	5	0	1	1
Total Annual Emissions Increase in Pounds per Year			**52**	**916**	**24,915**	**1,578**	**2,686**	**2,672**
Total Annual Emissions Increase in Tons per Year			**0.0**	**0.5**	**12.5**	**0.8**	**1.3**	**1.3**

Note*:* There may be slight variations in totals due to rounding.

Legend: CO = carbon monoxide; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOCs = volatile organic compounds

Table 3.3-3 presents information on the increase in annual CO_2 emissions from all sortie activities in the restricted areas under the Proposed Action. CO_2 represents the total GHGs in the analysis. Aircraft engines produce negligible emissions of methane and nitrous oxide, and therefore would not impact

the results and were not included in the analysis (FAA 2021b). Details on the calculations used to assess CO_2 emissions from training sortie operations in R-5305A and R-5307A can be found in **Appendix D**. As shown, the average annual CO_2 emissions from the proposed sorties are estimated at 20,182 metric tons. To put this quantity of emissions in context, it would be the equivalent of adding 4,058 cars to local roadways each driving the national average of 13,476 miles per year.

Table 3.3-3 GHG Emissions from All Altitude Flight Operations in R-5305 and 5307 under the Proposed Action

Aircraft	# Sorties	Hours	Total CO_2 in Pounds
C-130J	10	10	146,001
V-22	500	500	6,129,496
F-35 B/C	590	590	30,368,995
F-15E	100	100	3,710,110
F-22	10	10	650,073
MQ-9	125	125	131,494
KC-135R	15	15	1,089,885
KC-10	15	15	2,267,781
Total Annual Emissions Increase in Metric Tons			**20,182**

Legend: CO_2 = carbon monoxide; GHG = greenhouse gas

3.4 Biological Resources

Biological resources include living, native, or naturalized plant and animal species, and the habitats within which they occur. For the Proposed Action, biological resources are limited to wildlife that may be impacted by the noise associated with the aircraft operations in the proposed restricted areas.

3.4.1 Regulatory Setting

Special status species are those species listed as threatened or endangered under the ESA, and species afforded federal protection under the MBTA.

The purpose of the ESA is to conserve the ecosystems upon which threatened and endangered species depend and to conserve and recover listed species. Section 7 of the ESA requires action proponents to consult with the U.S. Fish and Wildlife Service (USFWS) to ensure their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species.

Birds, both migratory and most native-resident bird species, are protected under the MBTA, and their conservation by federal agencies is mandated by EO 13186, *Migratory Bird Conservation*. Under the MBTA, it is unlawful to pursue; hunt; take; capture; kill; attempt to take, capture, or kill; or possess migratory birds or their nests or eggs at any time. The 2003 National Defense Authorization Act gave the Secretary of the Interior authority to prescribe regulations exempting the Armed Forces from the incidental taking of migratory birds during military activities. The final rule authorizing the DoD to take migratory birds in such cases includes a requirement that the Armed Forces must confer with the USFWS to develop and implement appropriate conservation measures to minimize or mitigate adverse effects of the Proposed Action, if the action will have a significant negative effect on the sustainability of a population of a migratory bird species.

Bald and golden eagles are protected by the Bald and Golden Eagle Protection Act. This Act prohibits anyone without a permit issued by the Secretary of the Interior from taking bald eagles, including their parts, nests, or eggs. The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

3.4.2 Affected Environment

The affected environment for this EA includes the protected species potentially occurring beneath the proposed restricted areas that have the potential to be affected by aircraft noise.

3.4.2.1 Protected Species

Table 3.4-1 provides a list of federally threatened and endangered species known to occur or potentially occurring beneath the proposed restricted areas that could potentially be affected by the Proposed Action. The table also provides the state listing status for these species. Descriptions of each of these species is provided in the following sections. All but one of the species listed in **Table 3.4-1** apply to both proposed restricted areas. The roseate tern is only associated with the proposed R-5307.

Table 3.4-1 Federally Threatened and Endangered Species Known to Occur or Potentially Occurring in the Region of Influence

Common Name	Scientific Name	Federal Listing Status	State Listing Status	Associated Airspace
Mammals				
Northern Long-eared Bat	*Myotis septentrionalis*	Endangered	Threatened	R-5305 R-5307
Tricolored Bat	*Perimyotis subflavus*	Proposed Endangered	Significantly rare	R-5305 R-5307
West Indian Manatee	*Trichechus manatus*	Threatened	Threatened	R-5305 R-5307
Birds				
Eastern Black Rail	*Laterallus jamaicensis*	Threatened	Special concern	R-5305 R-5307
Piping Plover	*Charadrius melodus*	Threatened	Endangered; Threatened[1]	R-5305 R-5307
Red-cockaded Woodpecker	*Picoides borealis*	Endangered	Endangered	R-5305 R-5307
Rufa Red Knot	*Calidris canutus rufa*	Threatened	Threatened	R-5305 R-5307
Roseate Tern	*Sterna dougallii dougallii*	Endangered	Endangered	R-5307

Note: [1] The Interior subspecies is Endangered; the Atlantic coastal subspecies is Threatened.
Sources: North Carolina Department of Natural Resources and Cultural Resources 2020; USFWS 2024a,b

Species all perceive noise disturbances differently. For example, most invertebrates hear poorly in the frequency range of aircraft noise. One study supports the hypothesis that birds, frogs, and toads tend to shift their vocalizations to higher frequencies in response to man-made noise but generally, little is known about the effects of noise on reptiles and amphibians because response is difficult to study since their heartrates are naturally variable and they do not demonstrate a startle response (Roca et al. 2016; Bowles 1995). Snakes, turtles, and tortoises hear poorly while amphibians are sensitive to

vibration and hearing capacities vary more widely (Bowles 1995). Because the Proposed Action would not involve any ground disturbance and these groups are not particularly sensitive to noise, federally listed reptiles, amphibians, insects, and plants are unlikely to experience any effect from the Proposed Action and have been excluded from this analysis.

Northern Long-eared Bat. The northern long-eared bat was listed as threatened on April 2, 2015 (80 *Federal Register* 17974). This bat is a wide-ranging species found in a variety of forested habitats in summer, and hibernates in caves, mines, and other locations in winter (referred to as the hibernaculum). Like most bats, northern long-eared bats emerge at dusk to feed. They primarily fly through the understory of forested areas feeding on insects, which they catch while in flight using echolocation or by gleaning motionless insects from vegetation. The areas proposed for the restricted areas are located on the southern edge of this species' range.

Tricolored Bat. The tricolored bat was proposed as an endangered species on September 14, 2022 (87 *Federal Register* 56381). This bat has an extensive species range and has a wide array of habitats. They have been found in forests, groves, farmyards, towns, though rarely in heavily populated areas. This species roosts in caves and mines during the colder months, but they mostly roost in vegetation in trees. The tricolored bat is considered a short-distance migratory or residential species. This species is found throughout the state of North Carolina, but in recent years the species has been tracked as significantly rare by the North Carolina Natural Heritage Program.

West Indian Manatee. In 1970, Appendix A to 50 CFR part 17 was amended to include the West Indian manatee to the list of foreign endangered species (35 *Federal Register* 8491). It was reclassified to threatened as of May 5, 2017 (82 *Federal Register* 16668). The West Indian manatee is mostly found along the coast of the southeast U.S. Their habitat includes marine, brackish, and freshwater systems in coastal and riverine areas throughout their range. They frequently travel along channels and shorelines while remaining in warmer waters. This species is considered a seasonal occupant of North Carolina, with most sightings occurring between June and October.

Eastern Black Rail. The eastern black rail was listed as threatened under the ESA on October 8, 2020 (85 *Federal Register* 63764). The eastern black rail is broadly distributed, living in salt and freshwater marshes. Its range extends along the southeastern coastline from Virginia to Texas. North Carolina showed a severe decline in the number of occupied sites between 2010 and 2017 (USFWS 2019).

Piping Plover. The piping plover (Atlantic Coast and Northern Great Plains populations) was listed as threatened on December 11, 1985 (50 *Federal Register* 50726). The piping plover is a small North American shorebird that spends time feeding within the shoreline, washover areas, sandflats, and mudflats. This species' range in North Carolina covers all ocean beaches and barrier island flats. Critical habitat for the piping plover occurs along the barrier islands beneath the proposed R-5307.

Rufa Red Knot. The rufa red knot was listed as threatened on January 12, 2015 (79 *Federal Register* 73706). The rufa red knot is a migratory shorebird that winters in parts of the U.S., and primarily uses well-known spring and fall stopover areas on the Atlantic coast. Six subspecies are recognized, each with distinctive migration routes, and annual cycles. One of the four wintering regions for the rufa red

knot is the southeast U.S./Caribbean which has a core area of Florida to North Carolina. Critical habitat for the rufa red knot occurs along the barrier islands beneath the proposed R-5307.

Red-cockaded Woodpecker. The red-cockaded woodpecker was listed as endangered on October 13, 1970 (35 *Federal Register* 16047). It was proposed for reclassification to threatened on October 8, 2020 (85 *Federal Register* 63474). The red-cockaded woodpecker is a non-migratory, territorial bird that lives in cooperative breeding social units called groups. They are the only North American woodpecker that requires old, living pine trees to excavate roosts and nest cavities, usually in trees infected with a fungus known as red-heart disease. The species range covers all eastern North Carolina. Natural resources staff have intensively monitored the red-cockaded woodpecker population and habitat on MCB Camp Lejeune since 1985 (U.S. Marine Corps 2015). Red-cockaded woodpeckers are located throughout the installation and would occur beneath the proposed R-5305. The proposed R-5307 is also within this species' range.

Roseate Tern. The roseate tern (Northeast U.S. Population) was listed as endangered under the ESA on November 2, 1987 (52 *Federal Register* 42064). The roseate tern is a coastal species that nests on island beaches and often near low vegetation. They forage in ocean waters from coastlines to deep water. Roseate terns are divided into four subspecies based on small differences in size and bill color. The Northeastern U.S. Population of the roseate tern is found near Cape Hatteras, North Carolina, northeast of the study area. The tern could exist beneath the proposed R-5307.

Eastern North Carolina is beneath one of four main bird migration corridors in North America, the Atlantic Flyway. The migratory bird species potentially occurring beneath the proposed restricted areas are listed in **Table 3.4-2**. This list includes the bald eagle (*Haliaeetus leucocephalus)* and the golden eagle (*Aquila chrysaetos)* that are protected by the Bald and Golden Eagle Protection Act. Not all of the migratory bird species breed in this area, and the breeding timeframe for those that do varies greatly throughout the year.

Table 3.4-2 Migratory Birds Beneath Proposed Restricted Areas

Bird	R-5305	R-5307	Breeding Season
American Kestrel	X	X	April 1 to August 31
American Oystercatcher	X	X	April 15 to August 31
Atlantic Puffin		X	April 15 to August 31
Bachman's Sparrow	X	X	May 1 to September 30
Bald Eagle	X	X	September 1 to July 31
Black Scoter		X	Breeds elsewhere
Black Skimmer	X	X	May 20 to September 15
Brown Pelican		X	January 15 to September 30
Brown-headed Nuthatch	X	X	March 1 to July 15
Chimney Swift	X	X	March 15 to August 25
Chuck-will's-widow	X	X	May 10 to July 10
Coastal (Wayne's) Black-throated Green Warbler	X	X	May 1 to August 15
Common Eider		X	June 1 to September 30
Common Loon		X	April 15 to October 31
Cory's Shearwater		X	Breeds elsewhere

Bird	R-5305	R-5307	Breeding Season
Double-crested Cormorant		X	April 20 to August 31
Dovekie		X	Breeds elsewhere
Eastern Whip-poor-will	X	X	May 1 to August 20
Golden Eagle		X	Breeds elsewhere
Grasshopper Sparrow		X	June 1 to August 20
Great Shearwater		X	Breeds elsewhere
Gull-billed Tern	X	X	May 1 to July 31
Henslow's Sparrow		X	Breeds elsewhere
Kentucky Warbler		X	April 20 to August 20
King Rail		X	May 1 to September 5
Le Conte's Sparrow		X	Breeds elsewhere
Least Tern	X	X	April 25 to September 5
Lesser Yellowlegs	X	X	Breeds elsewhere
Long-tailed Duck		X	Breeds elsewhere
Manx Shearwater		X	April 15 to October 31
Marbled Godwit	X	X	Breeds elsewhere
Painted Bunting	X	X	April 25 to August 15
Pectoral Sandpiper	X	X	Breeds elsewhere
Pomarine Jaeger		X	Breeds elsewhere
Prairie Warbler	X	X	May 1 to July 31
Prothonotary Warbler	X	X	April 1 to July 31
Purple Sandpiper		X	Breeds elsewhere
Razorbill		X	June 15 to September 10
Red-breasted Merganser		X	Breeds elsewhere
Red-headed Woodpecker	X	X	May 10 to September 10
Red-throated Loon		X	Breeds elsewhere
Ring-billed Gull		X	Breeds elsewhere
Roseate Tern		X	May 10 to August 31
Royal Tern		X	April 15 to August 31
Ruddy Turnstone	X	X	Breeds elsewhere
Rusty Blackbird	X	X	Breeds elsewhere
Saltmarsh Sparrow	X	X	May 15 to September 5
Semipalmated Sandpiper	X	X	Breeds elsewhere
Short-billed Dowitcher	X	X	Breeds elsewhere
Sooty Shearwater		X	Breeds elsewhere
Sooty Tern		X	March 10 to July 31
South Polar Skua		X	Breeds elsewhere
Surf Scoter		X	Breeds elsewhere
Swallow-tailed Kite	X	X	March 10 to June 30
Whimbrel	X	X	Breeds elsewhere
White-winged Scoter		X	Breeds elsewhere
Willet	X	X	April 20 to August 5
Wilson's Plover	X	X	April 1 to August 20
Wilson's Storm-petrel		X	Breeds elsewhere
Wood Thrush	X	X	May 10 to August 31
Yellow Rail		X	Breeds elsewhere

Source: USFWS 2024a,b

3.4.3 Environmental Consequences

Many animal species use sound to communicate, to detect prey, and to avoid predation. Noise can mask communication, cause behavioral changes, interfere with daily cycles, and can cause stress (Shannon et al. 2016). Increased noise levels reduce the distance and area over which animals can perceive important acoustic signals (Barber et al. 2009). The potential for external noise to mask these important signals is of greater concern for continuous and near continuous noise sources than for intermittent brief noise exposures such as military jet overflight.

Other potential impacts associated with noise may include stress and hypertension; behavioral modifications; interference with mating or reproduction; and impaired ability to obtain adequate food, cover, or water. Other environmental variables (e.g., predators, weather, changing prey base, ground-based disturbance) confound the ability to identify the ultimate factor in limiting productivity of a certain nest, area, or region (Smith et al. 1988). Overall, the literature suggests that species differ in their response to various types, duration, and sources of noise; and that, response of unconfined wildlife and domestic animals to aircraft overflight under most circumstances has minimal biological significance (Manci et al. 1988; Radle 2007; Shannon et al. 2016).

A 1997 review revealed that the noise produced by an aircraft plays a minor role in disturbance to animals when the animal cannot see the aircraft. This was illustrated in examples of nearly soundless paragliders causing panic flights (Kempf and Hüppop 1997). This research indicated that aircraft noise can cause startle responses; but the severity of response depends on the animal's previous exposure to the noise source and does not result in severe consequences. These authors concluded that aside from the rare panic flights causing accidents, negative consequences of aircraft noise on individuals and populations are not ubiquitous (Kempf and Hüppop 1997).

Although concerns listed above have been raised in the literature and examples have been documented, studies of unconfined wildlife and domestic animals to overflight by military jet aircraft at 500 feet AGL or higher have not shown measurable changes in population size or reproductive success at the population level or other significant biological impact under normal conditions.

3.4.3.1 No Action Alternative

Under the No Action Alternative, current operations would continue in the SUA complex as it is currently charted. Terrestrial wildlife, including protected species, would continue to be exposed to military aircraft training and the associated noise (see **Section 3.2.6** for current noise exposure).

3.4.3.2 Proposed Action Alternative

Training within the proposed restricted areas could potentially disturb wildlife residing beneath the airspace; however, any disturbance would not be significant. The restricted areas would support a variety of training activities involving various aircraft types, speeds, and maneuvers within various altitudes, with the resulting noise spread across a large area. The proposed training is episodic, and would not create a consistent, significant noise source in any one location. In addition, the average subsonic DNL from aircraft operations within the proposed R-5305 and R-5307 would be 54 dB DNL and 43 dB DNL, respectively (see **Table 3.2-3, Section 3.2.7.2**). Collectively, these low DNLs, coupled

with the episodic nature of the training over a large geographic area, result in no significant noise exposure or impact to wildlife from the Proposed Action.

While a rare event due to size of the restricted areas and frequency of operation, there is the possibility that wildlife could be subjected to a very brief direct overflight. The peak noise level would vary depending on the altitude of the aircraft (see **Table 3.2-3, Section 3.2.7.2**). In R-5305, the lowest possible overflight would be 500 feet AGL which could result in a peak noise level (L_{max}) of 124 dB for an F-18E/F or F-35B. In R-5307, the lowest possible overflight would be 2,500 feet AGL which could result in a peak noise level (L_{max}) of 106 dB for an F-18E/F or F-35B. These peak levels would not be possible over the barrier islands where the floor of the restricted area would be 10,000 feet. Exposure to these peak noise levels would last only a few seconds and the animal would need to be directly beneath the flight path to experience this level of noise, as the noise reduces drastically the further the animal is from the flight path. These occurrences of maximum noise and lowest elevation flight would represent less than 1 percent of operations. Even at 124 dB, no physical harm is anticipated as damage to hearing only occurs at levels over 140 to 150 dB (Bowles 1995).

Potential impacts to the federally protected mammal and bird species, as well as other migratory birds, throughout the restricted areas would be disturbance from noise. Research on the impacts of noise on the specific ESA-listed species associated with this Proposed Action are not available. The impact discussion relies on available scientific studies on related bird and bat species. Critical habitat for the piping plover and rufa red knot is located beneath R-5307. However, as no ground disturbance is proposed and intermittent, brief noise would not affect the quality of habitat, no effect to these critical habitats would occur.

Bats

Potential disturbance to the northern long-eared bat and the tricolored bat would occur in the hours of dusk when bats would be foraging and potentially exposed to nighttime aircraft operations. Aircraft operations would not physically damage, remove, or otherwise impact habitat or hibernacula for the northern long-eared bat or the tricolored bat. The northern long-eared bat primarily forages in the understory of forested areas and generally would not occur at altitudes where flights would take place. The tricolored bat is found in a variety of habitats but mostly occurs in forested areas. The bats' response to aircraft noise would include startle or alerting to the noise source (Dufour 1980). Another concern would be masking of echolocation pulses that could disrupt flight or foraging. A study on New Zealand long-tailed bats found that low-level aircraft activity did not mask echolocation pulses. There were no statistically significant differences in mean bat activity during and after overflights compared with pre-aircraft activity (Le Roux and Waas 2012). While the proposed operations within the restricted areas would create a noise disturbance for bats, this disturbance is expected to be intermittent and minor. The aircraft activity and associated noise within the proposed restricted areas would be similar to that which is already occurring there and would have *no effect* on the northern long-eared bat or the tricolored bat.

Manatee

The West Indian manatee occurs seasonally off the coast of North Carolina and would therefore not be exposed to noise from flights in the restricted areas year-round. Manatees would experience minimal impacts from noise resulting from the Proposed Action due to the increased distance of these animals from the sound source and the muffling effects on in-air sound translating to underwater. Noise disturbance is not expected to harass or agitate the West Indian manatee. Aircraft overflights are not expected to cause chronic stress as it is unlikely that individual manatees would be repeatedly exposed to low altitude overflight noise. Any exposure would be brief (a matter of seconds as aircraft passed overhead) and infrequent, given the dispersed nature of flights over such a large area. Therefore, the Proposed Action would have *no effect* on the West Indian manatee.

Birds

Most concerns related to the effects of noise on birds involve the masking of communications among members of the same species, reducing the detectability of biologically relevant signals including the sounds of predators and prey, and temporarily or permanently decreasing hearing sensitivity (Dooling and Popper 2007). A study of captive zebra finches given a choice of foraging in noisy and quiet areas found no significant difference in the amount of time birds spent in noisy and quiet areas though those foraging in noisy areas spent more time being vigilant, resulting in less efficient foraging than those in quiet areas (Evans et al. 2018). Given the expected minor noise exposure within the restricted areas, the proposed aircraft operations would have a negligible impact on birds in the ROI. The aircraft activity and associated noise within the proposed restricted areas would be similar to that which is already occurring and have *no effect* on the eastern black rail, piping plover, red-cockaded woodpecker, rufa red knot, or roseate tern.

Migratory Birds

The USFWS Waterfowl Management Handbook (Korschgen and Dahlgren 1992) lists “loud noise” caused by aircraft as the top disturbance category for waterfowl. Several studies showed that migratory waterfowl expend more energy when exposed to repeated aircraft overflights, at least in the short-term (Bowles 1995). Waterfowl are sensitive to disturbance because of their aggregation into large flocks during their migration and overwintering. When at rest, the flocks are typically in water bodies or wetlands exposed to the open sky and subject to aerial and ground predation. Taking flight is their defense against either type of predation. Waterfowl flocks seem to be as sensitive as their most responsive individual in the flock, so that larger flocks would have a greater chance of responding than small flocks (Bowles 1995).

The altitudes of migrating birds vary with winds, weather, terrain elevations, cloud conditions, and other environmental variables. Over 90 percent of reported bird strikes occur at or below 3,000 feet AGL but strikes at higher altitude are common during migration. Ducks and geese have been observed up to 7,000 feet AGL (FAA 2021c). Due to the danger to aircraft and aircrews posed by potential collisions with waterfowl and other flocking birds, Bird/Wildlife Aircraft Strike Hazard (BASH) has received much attention by the military. BASH programs exist at every installation where there is an active flying mission and areas where low-level aircraft flight training takes place. BASH programs

identify locations of seasonal concentrations of waterfowl and provide guidance for pilots with regard to elevational or lateral separation from these sites at specific seasons and times of day to avoid or minimize the potential for collision. This avoidance in turn reduces the potential for disturbance of migratory birds and waterfowl concentrations by military aircraft overflight. Adhering to existing BASH would result in negligible impacts to migratory birds. The proposed aircraft activity within the restricted areas is not expected to take or otherwise disturb migratory birds.

ESA-Listed Species Effects Determinations

The proposed aircraft operations and associated noise within the proposed restricted areas would be similar to that which is already occurring and is expected to have *no effect* on the northern Long-eared bat, tricolored bat, West Indian manatee, eastern black rail, piping plover, red-cockaded woodpecker, rufa red knot, or roseate tern residing beneath the restricted areas. The Proposed Action would have *no effect* to piping plover and rufa red knot critical habitat located beneath R-5307. As such, no consultation between MCIEAST and USFWS is required.

4. Cumulative Impacts and Other Considerations Required by NEPA

4.1 Cumulative Impacts

This section, in part, defines cumulative impacts; describes past, present, and reasonably foreseeable future actions relevant to cumulative impacts; analyzes the incremental interaction the proposed action may have with other actions; and evaluates cumulative impacts potentially resulting from these interactions.

4.1.1 Definition of Cumulative Impacts

The approach taken in the analysis of cumulative impacts follows the objectives of NEPA and Council on Environmental Quality (CEQ) guidance. The terms "effects or impacts" are changes to the human environment from the proposed action or alternatives that are reasonably foreseeable, and "cumulative effects or impacts" are "effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from actions with individually minor but collectively significant effects taking place over a period of time." Consequently, to determine the scope of environmental impacts, the Marine Corps and FAA consider whether the proposed action(s) and other past, present, and reasonably foreseeable future actions may incrementally cause significant incremental additions to cumulative impacts.

In addition, CEQ and USEPA have published guidance addressing implementation of cumulative impact analyses—*Guidance on the Consideration of Past Actions in Cumulative Effects Analysis* (CEQ 2005) and *Consideration of Cumulative Impacts in EPA Review of NEPA Documents* (EPA 1999). CEQ guidance entitled *Considering Cumulative Impacts Under NEPA* (1997) states, in part, that cumulative impact analyses should, when determining the environmental consequences within a cumulative effects analysis, "Determine the magnitude and significance of cumulative effects."

Cumulative impacts are most likely to arise when a relationship exists between a proposed action and other actions expected to occur in a similar location or during a similar time. Actions overlapping with or in proximity to the proposed action would be expected to have more potential for a relationship than those more geographically separated. Similarly, relatively concurrent actions would tend to offer a higher potential for cumulative impacts. To identify cumulative impacts, the analysis needs to address the following three fundamental questions.

- Does a relationship exist such that affected resource areas of the proposed action might interact with the affected resource areas of past, present, or reasonably foreseeable actions?
- If one or more of the affected resource areas of the proposed action and another action could be expected to interact, would the proposed action affect or be affected by impacts of the other action?
- If such a relationship exists, then does an assessment reveal any potentially significant impacts not identified when the proposed action is considered alone?

4.1.2 Scope of Cumulative Impacts Analysis

For this EA, the footprint of the existing SUA in eastern North Carolina, including the proposed restricted areas (R-5305 and R-5307), frames the geographic scope of the cumulative impacts analysis. This is in accordance with FAA 1050.1F Desk Reference which provides guidance on implementing NEPA. Section 15.2 of that reference states: The study area for cumulative impacts analysis is the same area defined for a project's direct and indirect impact analysis. The timeframe for cumulative impacts centers on the anticipated publication and future use of the proposed restricted areas. To identify other actions with a geographic scope and timeframe that interrelate to the Proposed Action, the cumulative analysis employs the measure of "reasonably foreseeable" to include or exclude other actions.

4.1.3 Past, Present, and Reasonably Foreseeable Actions

This section identifies past, present, and reasonably foreseeable future projects within the geographic scope of the cumulative impacts analysis. In determining which projects to include, a preliminary determination was made regarding the past, present, or reasonably foreseeable action. Specifically, using the first fundamental question included in **Section 4.1.1**, it was determined if a relationship exists such that the affected resource areas of the Proposed Action (included in this EA) might interact with the affected resource area of a past, present, or reasonably foreseeable action. If no such potential relationship exists, the project was not carried forward into the cumulative impacts analysis. In accordance with CEQ guidance (CEQ 2005), these actions considered but excluded from further cumulative effects analysis are not catalogued here as the intent is to focus the analysis on the meaningful actions relevant to informed decision-making. Projects included in this analysis are those that establish or modify other SUA in the vicinity of the Proposed Action. Project descriptions are summarized in the following subsections.

4.1.3.1 Past Actions

There has been restricted airspace in eastern North Carolina since 1957 and the complex at that time was much larger than the current complex. The majority of the SUA complex as it looks today was established in the 1970s with minor changes until the addition of the Core MOA in 2009. More recent actions include establishment of R-5306F (charted in 2021), and Pamlico C MOA, Pamlico D MOA, and Hatteras F East/West MOA (all of which were charted in 2023). The addition of the Pamlico C/D and Hatteras F East/West MOAs increased the lateral footprint of the SUA complex to its current 5.3 million acres. The existing SUA complex, the proposed restricted areas addressed in this EA, and the reasonably foreseeable action (R-5306G/H) are illustrated on **Figure 4.1-1**. These more recent past SUA actions and the reasonably foreseeable action are further described below.

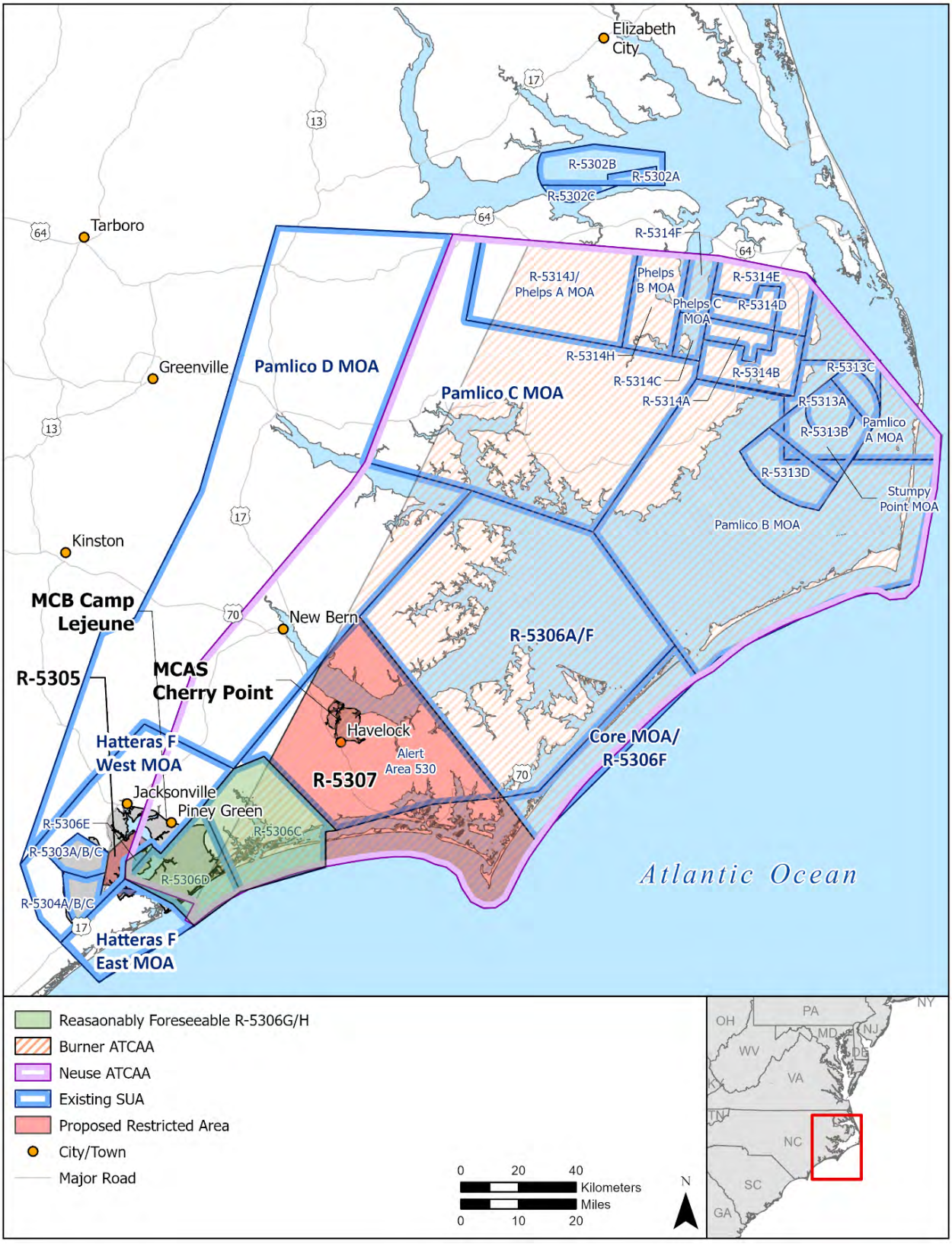

Figure 4.1-1 Past, Present, and Reasonably Foreseeable Actions

R-5306F. R-5306F overlies R-5306A and the Core MOA and provides an increased training altitude in this area from FL180 to FL290 (see **Figure 4.1-1**). This action did not change the lateral footprint of the SUA complex since it overlies other existing SUA. R-5306F is used in conjunction with R-5306A below and enables fighter aircraft to conduct advanced air combat tactics, including use of lasers and ordnance, at higher altitudes (see **Table 4.1-1** for details on training activities in this SUA). The activities within R-5306F are the same as those occurring in R-5306A and other existing SUA and were evaluated in the *EA and FONSI for Marine Corps Air Station Cherry Point Range Operations* (U.S. Marine Corps 2009a). MCAS Cherry Point Environmental staff evaluated the R-5306F proposal for the same resource categories reviewed in the 2009 Range Operations EA (specifically noise and use of lasers) and determined the impact of the higher altitude designation did not warrant a change to the analysis and that no resource would be affected beyond those outlined in the original FONSI. An environmental review by FAA for establishing R-5306F determined it was categorically excluded from further environmental documentation under FAA Order 1050.1F, Paragraph 5-6.5f: *Actions to increase the altitude of special use airspace*. The categorical exclusion was signed in 2020. The proposed R-5307 would be to the south of R-5306A/F and would be used in conjunction with R-5306A/F for some training activities (**Table 4.1-1**).

Table 4.1-1 Training Activities in Recent Past, Proposed, and Reasonably Foreseeable SUA in Eastern North Carolina

Airspace	Training Event/Activity	Used in Conjunction with:
Recent Past		
R-5306F	1) Precision Guided Munition Delivery	R-5306A
	2) Lasers	R-5306A
	3) Close Air Support, actual and simulated deliveries of ordnance on targets in close proximity to friendly forces	R-5306A
	4) Deep Air Support, actual and simulated deliveries of ordnance on targets in close proximity to friendly forces	R-5306A
	5) Suppression of Enemy Air Defenses, simulate delivery of ordnance on electronic transmitting devices that imitate surface to air missile positions below R-5306A/F	R-5306A
	6) Surface Threat Counter Tactics, evasive maneuvers, defensive flares, chaff, and other countermeasures intended to minimize the effectiveness of simulated surface-to-air weapon systems	R-5306A
	7) Aerial Refueling	R-5306A
	8) Air to Air Combat	R-5306A
	9) Air Reconnaissance	R-5306A
Pamlico C MOA	1) Maneuver Space for aircraft conducting Close Air Support, Deep Air Support, Suppression of Enemy Air Defenses, Strike Coordination and Reconnaissance, Forward Air Control (Airborne) Operations, and Tactical Air Coordination (Airborne) Operations training in R-5306A or R-5314	R-5306A or R-5314
	2) Surface Threat Counter Tactics, evasive maneuvers and other countermeasures intended to minimize the effectiveness of surface-to-air weapon systems	None
	3) Air to Air Combat	None
	4) Air Reconnaissance	None

Airspace	Training Event/Activity	Used in Conjunction with:
Pamlico D MOA	1) Maneuver Space for aircraft conducting Close Air Support, Deep Air Support, Suppression of Enemy Air Defenses, Strike Coordination and Reconnaissance, Forward Air Control (Airborne) Operations, and Tactical Air Coordination (Airborne) Operations training in R-5306A or R-5314	Pamlico C and R-5306A or R-5314
	2) Surface Threat Counter Tactics, evasive maneuvers and other countermeasures intended to minimize the effectiveness of surface-to-air weapon systems	None
	3) Air to Air Combat	None
	4) Air Reconnaissance	None
Hatteras F East/West MOA	1) Maneuver Space for aircraft conducting Close Air Support, Deep Air Support, Suppression of Enemy Air Defenses, Strike Coordination and Reconnaissance, Forward Air Control (Airborne) Operations, and Tactical Air Coordination (Airborne) Operations training in R-5306D or R-5303 and R-5304	R-5306D or R5303 and R-5304
	2) Surface Threat Counter Tactics, evasive maneuvers and other countermeasures intended to minimize the effectiveness of surface-to-air weapon systems	None
	3) Air to Air Combat	None
	4) Air Reconnaissance	None
Present (Proposed Action)		
R-5305 A/B/C	1) Surface-to-surface weapons, firing points will be from R-5305 to impact areas in R-5306D (there will be no impact areas within R-5305).	R-5306D
	2) Offensive Air Support, simulated delivery of ordnance (utilizing lasers) and actual weapons may be deployed from R-5305 into R-5306D or R-5303 and R-5304.	R-5306D or R5303 and R-5304
	3) Anti-Air Warfare, Air Defense, Electronic Warfare, Aerial Reconnaissance, and Assault Support	R-5306D or R5303 and R-5304
	4) UASs with munitions will operate from R-5305 to impact areas in R-5306D or R-5303 and R-5304.	R-5306D or R5303 and R-5304
R-5307 A/B/C	1) Offensive Air Support, Simulated deliveries of ordnance (utilizing lasers) for Close and Deep Air Support missions will be conducted in R-5307 in conjunction with adjacent restricted areas.	R-5306A/F
	2) Anti-Air Warfare, Air Defense, Electronic Warfare, Aerial Reconnaissance, and Assault Support	R-5306A/F
	3) Large UAS	None
	4) Ground-Based Low-Altitude Air Defense	None
Reasonably Foreseeable		
R-5306G/H	1) Surface-to-surface weapons, firing points and impact areas will be in R-5306D	R-5306D
	2) Precision Guided Munition Delivery	R-5306C/D/E
	3) Lasers	R-5306C/D/E
	4) Close Air Support, actual and simulated deliveries of ordnance on targets in close proximity to friendly forces	R-5306C/D/E
	5) Deep Air Support, actual and simulated deliveries of ordnance on targets in close proximity to friendly forces	R-5306C/D/E
	6) Suppression of Enemy Air Defenses, simulate delivery of ordnance on electronic transmitting devices that imitate surface to air missile positions below R-5306D	R-5306C/D/E

Airspace	Training Event/Activity	Used in Conjunction with:
	7) Surface Threat Counter Tactics, evasive maneuvers, defensive flares, chaff, and other countermeasures intended to minimize the effectiveness of simulated surface-to-air weapon systems	R-5306C/D/E
	8) Aerial Refueling	R-5306C/D/E
	9) Air to Air Combat	R-5306C/D/E
	10) Air Reconnaissance	R-5306C/D/E

Legend: MOA = Military Operations Area; SUA = Special Use Airspace; UAS = Unmanned Aircraft System

Pamlico C MOA, Pamlico D MOA, and Hatteras F East/West MOA. These MOAs were assessed in an EA in 2023 titled *EA for Enhancement of Pilot Training by Establishing Special Use Airspace in Eastern North Carolina* (U.S. Marine Corps 2023). These permanent MOAs extended the western footprint of the training airspace and provide larger contiguous, over-land airspace, with appropriate altitudes, which provides a more realistic training environment (see **Figure 4.1-1**). These additional SUAs expanded the lateral footprint of the total SUA complex by 2.2 million acres resulting in a new total footprint of just under 5.3 million acres. Pamlico C MOA (which exists from 8,000 feet MSL up to FL180) and Pamlico D MOA (which exists from 10,000 feet MSL up to FL180) both provide medium-altitude space for fixed-wing aircraft to maneuver around targets located at R-5306A and R-5314. Similarly, the Hatteras F East/West MOA (which exists from 3,000 feet AGL to FL180) provides space for fixed-wing aircraft to maneuver around targets in R-5306D as well as around the smaller R-5303 and R-5304 which were not usable by fixed-wing aircraft before. The EA evaluated in detail all relevant resource areas (airspace, noise, biological resources, cultural resources, and environmental justice) and a FONSI was signed on April 2023. The FONSI was accepted by the FAA and the MOAs were published on aeronautical charts on November 30, 2023. The proposed R-5305 would overlap with the existing Hatteras F East/West MOA.

4.1.3.2 Reasonably Foreseeable Actions

R-5306G/H. MCIEAST submitted a proposal to FAA to establish R-5306G/H on March 18, 2020 and the FAA published a Notice of Proposed Rule-Making in the Federal Register on March 29, 2023 (Federal Register Volume 88, No. 60), but a decision has not yet been made. Thus, the establishment of these proposed restricted areas is reasonably foreseeable. R-5306G/H would increase the altitude of existing SUA: R-5306C/D/E (see **Figure 4.1-1**). This reasonably foreseeable action would not change the lateral footprint of the existing SUA complex. The R-5306G/H proposal would raise the altitude ceiling from 17,999 up to 27,000 feet MSL. The type of planned training activities in the proposed R-5306G/H and the total sorties in the airspace would be the same as those occurring in R-5306C/D/E. They would just occupy the new total area from the surface up to 27,000 feet MSL. The training activities that occur in R-5306C/D/E were evaluated in previous EAs titled *EA and FONSI for Marine Corps Air Station Cherry Point Range Operations* (U.S. Marine Corps 2009a) and *EA and FONSI for Marine Corps Base Camp Lejeune Range Operations* (U.S. Marine Corps 2009b). The re-evaluation of those documents determined that the impacts described for the following resources is still valid with the proposed R-5306G/H: civil (non-military) aircraft operations; noise; public health and safety; land use; environmental justice; air quality; cultural resources; hazardous materials and wastes; coastal zone management; socioeconomics; and natural resources. The FAA Eastern Service Center conducted an aeronautical analysis of R-5306G/H and determined there was no significant impact to civil operations. R-5306G/H would only be used in

conjunction with the restricted areas below R-5306C/D/E. The proposed R-5305 and R-5307 would be adjacent to but would not be used in conjunction with this reasonably foreseeable SUA.

4.1.4 Cumulative Impact Analysis

4.1.4.1 Airspace

Each section of SUA has defined altitudes and times of use, some segments are continuous use, and some airspace is primarily used Monday–Friday. The subsections below summarize the airspace impact to each segment of SUA. The cumulative analysis that follows includes a discussion on impacts to civil aviation resulting from all SUA being active at the same time.

R-5306F

In 2020, the FAA declared a categorical exclusion resulting from the establishment of R-5306F. R-5306F was established to be used in conjunction with R-5306A at altitudes between FL180 and FL290. The hours of use for this SUA are published as continuous, and there are no established Air Traffic Service routes traversing this airspace. VFR traffic is not permitted to fly through restricted areas and VFR operations are not permitted above FL180. The Categorical Exclusion found that establishing this SUA would have minimal to no impact on general or commercial aviation.

Pamlico C/D MOAs

Pamlico C/D MOAs were formally charted in November 2023, and the hours of use are intermittent Monday–Friday from 0800 to 2200 for Pamlico C and Pamlico D is intermittent by NOTAM. The analysis for the establishment of Pamlico C MOA and Pamlico D MOA reported that in FY2019, there was less than one civil air carrier flight per month which traversed the Pamlico C MOA and there were approximately 10 flights per day traversing the Pamlico D MOA during the same time. There was additional air traffic noted in the MOAs consisting of air taxi, general aviation, and unknown flights. There were approximately four of these types of flights per weekday traversing the Pamlico C MOA and about 17 flights traversing the Pamlico D MOA during the same time. Given the limited activation time and limited civil traffic in this space that could be impacted when the MOAs were active, the establishment and use of these MOAs was found to have minimal impact to civil aviation (U.S. Marine Corps 2023).

Hatteras F East/West MOA

The Hatteras F East/West MOA was formally charted in November 2023. The hours of operation for Hatteras F East are 0800 to 2200 Monday–Friday and Hatteras F West is intermittent from 0800 to 2200 Monday–Friday. The analysis for the expansion of the Hatteras F MOA reported that in FY2019, there were about eight civil air carrier flights per month which traversed the MOA. In addition, there were approximately 17 Air Taxi, General Aviation, or unknown flights per weekday which traversed the MOA. Given the limited civil traffic in this space that could be impacted when the MOA is active, the establishment and use of this MOA was found to have minimal impact to civil aviation (U.S. Marine Corps 2023).

R-5306G/H

On March 29, 2023, the FAA published a Notice of Proposed Rule-Making for establishing the restricted areas R-5306G and R-5306H in the Federal Register, but a decision has not yet been made. If established, R-5306G/H would overlie R-5306C/D/E. R-5306G would extend from 18,000 feet MSL to 23,000 feet MSL and R-5306H would extend from 23,001 feet MSL to 27,000 feet MSL. There is a single Area Navigation Route (Q-101) which traverses this area. Aircraft operating on this route are normally assigned an altitude above 27,000 feet by Air Traffic Control. In the winter months, aircraft may be assigned an altitude as low as 24,000 feet MSL; however, R-5306H (23,001 feet MSL to 27,000 feet MSL) would only be activated between May 1–October 31. No other SUA in the existing complex affects Q-101. The FAA Eastern Service Center Operational Support Group conducted an aeronautical analysis of R-5306G/H and determined there is no significant impact to commercial aircraft.

It would be very unlikely that all of the SUA in the complex would be activated simultaneously. In reality, SUA may only have military training present during its expected time of activation and not the entirety of the published times of use. All of the SUA is subject to a joint-use LOA between the controlling agencies, Washington Air Route Traffic Control Center and MCAS Cherry Point Combined Center and Approach Control, and the Marine Corps using agencies. These joint-use LOAs include provisions for real-time activation/deactivation of the airspace and timely notification to the controlling agencies when the scheduled activity has changed, been cancelled, or completed for the day. These procedures minimize the probability of a cumulative impact by ensuring that the airspace would be returned in part or in whole to the controlling agencies in real-time so that non-participating aircraft may be permitted to operate within the airspace. Furthermore, provisions are added in the joint-use LOA for recall of the SUA by the controlling agency to accommodate air traffic flows impacted by weather conditions or other factors.

The aeronautical analyses in the NEPA documents for the past actions, the analysis in this EA for the proposed action, and the FAA aeronautical analysis for the reasonably foreseeable action all indicate no significant impact to commercial aircraft. Based on those individual insignificant analyses and the implementation of FAA mandated joint-use procedures defined in FAA Order JO 7400.2R, there would not be a significant cumulative impact to airspace.

4.1.4.2 Noise

A significant cumulative impact from noise resulting from the past and reasonably foreseeable projects in combination with the Proposed Action would require the noise levels to exceed FAA significance criteria defined in FAA Order 1050.1F. For airspace actions, the FAA requires that an action proponent identify where noise will change by the following specified amounts in noise sensitive areas (FAA Order 1050.1F):

- For DNL 65 dB and higher: +/- DNL 1.5 dB (significant)
- For DNL 60 dB to <65 dB: +/- DNL 3 dB (reportable)
- For DNL 45 dB to <60 dB: +/- DNL 5 dB (reportable)

R-5306F

R-5306F was established to be used in conjunction with R-5306A at altitudes between FL180 and FL290. The action did not change the number of operations occurring in the area or the type of aircraft using the SUA, but rather extended the usable altitude and moved those operations higher. As evaluated in previous NEPA documents, the average DNL of R-5306A is 57 dB DNL which is considered compatible with all land uses as determined by FICUN and is also close to the value determined by EPA to not have adverse impacts (U.S. Marine Corps 2009a). The categorical exclusion determined no anticipated environmental consequences would occur, including noise, based on the number of operations and the high altitude (FL180 to FL290) at which those operations would occur. Extending aircraft operations to higher altitudes would not increase noise levels on the ground or expose new areas to noise from those operations and this action would not exceed significance thresholds.

Proposed R-5305 would not be utilized in conjunction with R-5306F and these two spaces are not adjacent or near each other. Thus, proposed R-5305 noise levels would not have a cumulative impact or change the noise exposure in R-5306F.

Proposed R-5307A/B/C would be used in conjunction with R-5306A/F for some training activities but would also be used independently. The proposed operations in R-5307 are low (700 annual sorties) most of which would be in the higher altitudes of R-5307C (FL180 to FL290) resulting in a low anticipated DNL of 43 dB. A fraction of the total sorties of R-5307 would be in conjunction with R-5306F and would not have a perceivable increase in the noise exposure in R-5306F given the higher altitudes where operations would occur and relative low utilization of the spaces together. Thus, the proposed R-5307 would not have a significant cumulative impact when combined with R-5306F.

Pamlico C/D and Hatteras F East/West MOAs

Pamlico C/D and Hatteras F East/West MOAs were formally charted in November 2023. The anticipated noise levels from training operations within Pamlico C/D and Hatteras F East/West MOAs were analyzed in an EA (U.S. Marine Corps 2023) and are presented in **Table 4.1-2.** The Pamlico C/D MOAs do not overlap either proposed R-5305 or R-5307 and there would be no cumulative impact. The Hatteras F East/West MOA would not overlap proposed R-5307, but it would overlap the proposed R-5305.

Table 4.1-2 Noise Levels in Pamlico C/D, Hatteras F East/West MOAs, with R-5305

Airspace	DNL (dBA)	Estimated Percentage of Population "Highly Annoyed"[1]	DNL (dBA) with R-5305	Estimated Percentage of Population "Highly Annoyed"
Pamlico C MOA	41	<0.83	N/A	N/A
Pamlico D MOA	<35	<0.83	N/A	N/A
Hatteras F East/West MOA	48	<1.66	54	<3.31

Note: [1] The estimated percentage of the population that would be "highly annoyed" is derived from Finegold et al. 1994; methodology described in Section 3.2.2.

Legend: < = greater than; dBA = A-weighted decibel; DNL = Day-Night Average Sound Level; MOA = Military Operations Area; N/A = not applicable

The Hatteras F East/West MOA would overlap the proposed R-5305A/B/C and a cumulative noise level of 54 DNL could be possible with implementation of the Proposed Action (see **Table 4.1-2**). This noise level would not exceed the FAA significance criteria. In addition, this level would not exceed the EPA's identified threshold of 55 dB DNL, a level below which adverse noise effects are not expected to occur. From a land use perspective and according to the FICUN, the FAA, and the EPA, this level would be compatible with all land use types to include residential, public use (i.e., schools), recreational, and entertainment areas.

R-5306G/H

There is a reasonably foreseeable action to establish higher altitudes over the existing lateral dimensions of R-5306C/D/E by designating a proposed R-5306G/H from 18,000 feet MSL to 27,000 feet MSL. Future implementation and use of R-5306G/H would not result in a change to noise levels in the proposed R-5305A/B/C or R-5307A/B/C since R-5306G/H would not overlap R-5305 or R-5307 nor would it be used in conjunction with either of these areas. As defined in the submitted proposal, the planned activities to take place in the reasonably foreseeable R-5306G/H and the total sorties in the space would be the same as those currently occurring in R-5306C/D/E, they would just occupy the new total area from the surface up to 27,000 feet MSL. The noise exposure from activities in R-5306C/D/E were evaluated in previous EAs and found to not be significant (average 58 dB DNL) and do not exceed 65 dB DNL (U.S. Marine Corps 2009b). Extending the space to higher altitudes would have no change to the noise exposure at the ground level.

In summary, the Proposed Action in combination with the Hatteras F East/West MOA would result in a cumulative noise increase (+ 6.0 dB), but the resulting DNL would not be a significant impact. This increase would be considered "reportable" according to criteria defined in FAA Order 1050.1F, but R-5305 is over an area that is within the MCB Camp Lejeune installation boundary and without sensitive receptors. The cumulative impact from aircraft noise of past and reasonably foreseeable projects along with the Proposed Action would not be significant.

4.1.4.3 Air Quality

Cumulative impacts on air quality would result from the emissions increase associated with the proposed airspaces in combination with other projects emitting similar emissions and occurring at the same time within the ROI. R-5306F, Pamlico C/D MOA, Hatteras F East/West MOAs, and reasonably foreseeable R-5306G/H all have floors above the standard mixing height (3,000 feet), thus aircraft activity in these spaces would not contribute to criteria pollutant emissions. The Proposed Action would have a negligible increase in NO_x emissions, but the contribution of this action in conjunction with emissions in the other SUA would not alter the ambient air quality in the ROI. Thus, a significant cumulative impact to air quality is not anticipated.

4.1.4.4 Biological Resources

The proposed restricted areas (R-5305 and R-5307) would not change the overall lateral footprint of the existing SUA complex and no new areas would be exposed to the noise from training activities. Wildlife beneath all of the SUA could temporarily be disturbed during aircraft overflights, particularly those at lower altitudes. All of the recent past SUA actions established airspace in higher altitudes with minimal

to no impact to wildlife. Similarly, the reasonably foreseeable R-5306G/H would be established in the higher altitudes with no expected change to the noise exposure or disturbance to wildlife residing beneath the airspace. As such, proposed aircraft operations within the proposed restricted areas addressed in this EA along with reasonably foreseeable proposals would not have a significant cumulative impact to biological resources.

4.2 Irreversible or Irretrievable Commitments of Resources

NEPA requires that environmental analysis include the identification of any irreversible and irretrievable commitments of resources that would be involved if the Proposed Action is implemented. Resources that are irreversibly or irretrievably committed to a project are those that are used on a long-term or permanent basis. This includes the use of nonrenewable resources such as metal and fuel, and natural or cultural resources. Another impact that falls under this category is the unavoidable destruction of natural resources that could limit the range of potential uses of that particular environment.

The Proposed Action would involve enhancing training and readiness by establishing SUA in support of MCIEAST. There would be no irreversible or irretrievable commitment of resources. Likewise, there would be no unavoidable destruction of natural resources.

4.3 Unavoidable Adverse Impacts

NEPA requires a description of any significant impacts resulting from implementation of a proposed action, including those that can be mitigated to a less than significant level. Based on the analysis in this EA, the Proposed Action would not result in any significant or unavoidable adverse impacts to any resource area. As such, no mitigation actions are required.

4.4 Relationship between Short-Term Use of the Environment and Long-Term Productivity

NEPA requires an analysis of the relationship between a project's short-term impacts on the environment and the effects that these impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. This refers to the possibility that choosing one development site reduces future flexibility in pursuing other options or other uses at that site.

The Proposed Action would involve enhancing training and readiness by establishing SUA in support of MCIEAST. The proposed R-5307 and R-5305 would be within the confines of the existing SUA complex and would not expose new land areas to military training activities or the associated noise from these activities. While establishing these areas would limit non-military use of the airspace during times the restricted areas are active, this impact would not be significant (see **Section 3.1.3**, *Airspace Environmental Consequences*) or impact the long-term productivity of the area.

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This EA was prepared collaboratively between the Navy, MCIEAST, and contractor preparers.

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Appendix A
Public and Interagency Coordination

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UNITED STATES MARINE CORPS
MARINE CORPS INSTALLATIONS EAST-MARINE CORPS BASE
PSC BOX 20005
CAMP LEJEUNE NC 28542-0005

5090
G-F
8 Apr 25

Ms. Ramona Bartos
Deputy State Historic Preservation Officer
NC Division of Archives and History
(ATTN: Renee Gledhill-Earley)
4617 Mail Service Center
Raleigh, NC 27699-4617

Dear Ms. Bartos:

Marine Corps Installations East-Marine Corps Base Camp Lejeune is preparing an Environmental Assessment (EA) to evaluate the potential environmental impacts associated with establishing two additional restricted airspace areas. The purpose of this letter is to initiate consultation with your office pursuant to Section 106 of the National Historic Preservation Act for any effects on historic properties located on land beneath the proposed restricted areas.

The proposed restricted airspace areas would be part of a Special Use Airspace (SUA) complex in Eastern Carolina. The SUA complex primarily supports pilot training for Marines stationed at Marine Corps Base Camp Lejeune, Marine Corps Air Station (MCAS) New River, and MCAS Cherry Point. The proposed restricted airspace would not include changes to infrastructure or personnel at any Marine Corps installations, airfield or runway operations (frequency or types of aircraft), aircraft inventory or squadron assignments at the installations, or ground disturbances beneath the proposed restricted airspace areas. Please see the enclosure for more information.

My point of contact for this request is Mr. Scott Williams, Marine Corps Installations East-Marine Corps Base Camp Lejeune, Regional Environmental Program Manager, at (910) 451-0151; scott.r.williams1@usmc.mil; or 12 Post Lane, Camp Lejeune, NC, 28547.

Sincerely,

SHOLAR.ANTHONY.G.1229762202
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Date: 2025.04.08 15:39:15 -04'00'

A. G. Sholar
Deputy Assistant Chief of Staff, G-F
By direction
of the Commanding General

Enclosure: 1. Proposed Action Description

Proposed Action Description

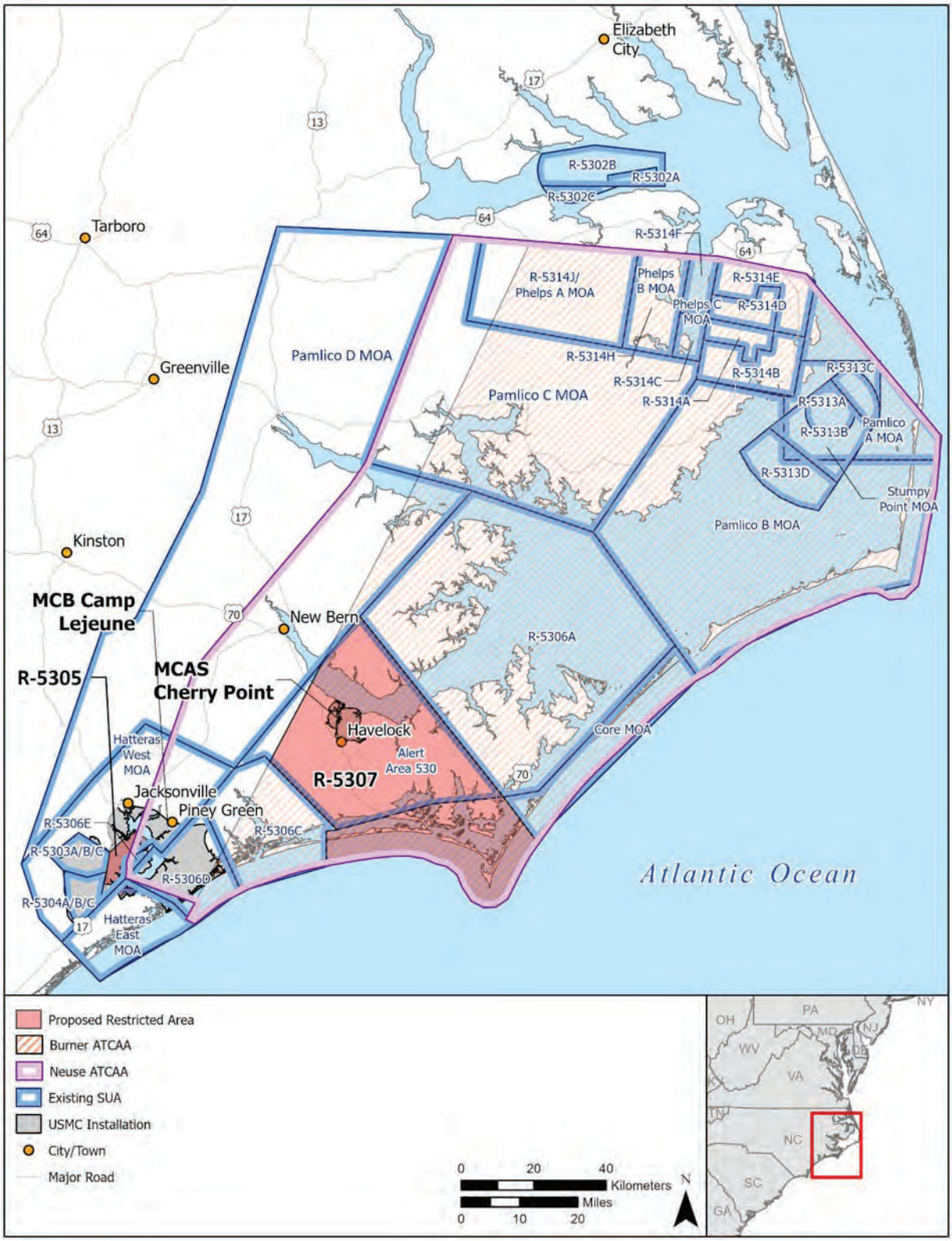
Training requirements are not being met sufficiently with the current configuration of the Special Use Airspace (SUA) complex. The existing training airspace in eastern North Carolina is a large complex that includes restricted areas, Military Operations Areas, an Alert Area, and Air Traffic Control Assigned Airspace shown on **Figure 1** on the next page. Under the Proposed Action, Marine Corps Installations East-Marine Corps Base Camp Lejeune (USMC or Marine Corps) seeks to establish two restricted areas, to be named on aeronautical charts, R-5305 and R-5307, shown in pink on **Figure 1**. The establishment of the restricted areas is the responsibility of the Federal Aviation Administration, and they are a cooperating agency for an Environmental Assessment (EA) of the proposed action for enhancing air and ground training within the existing SUA complex in eastern North Carolina.

The Proposed Action does not include changes to infrastructure or personnel at any of the USMC installations, airfield or runway operations (frequency or types of aircraft), aircraft inventory or squadron assignments at the bases, or ground disturbance beneath the proposed restricted areas. The Area of Potential Effects (APE) for this undertaking is, therefore, defined as the lands beneath the proposed lateral boundaries of R-5305 and R-5307 that would be potentially exposed to noise and visual intrusions from aircraft operations. (**Figure 1**)

Request for Concurrence

The USMC requests your review of the information found in this enclosure. After reviewing the information, we seek your concurrence with our findings of effect made under 36 CFR 800.5(b), our definition of the APE (36 CFR 800.4(a), and reasonable and good faith efforts to identify historic properties, in accordance with 36 CFR 800.4(b)(1) and 800.4(c)(2). In accordance with 36 CFR 800.3(f), we also request your assistance in identifying any additional potential consulting parties that you feel the USMC should contact regarding the proposed SUA. Any information or assistance you can provide would be appreciated and carefully considered.

Figure 1 – Area of Potential Effects (Proposed Restricted Areas: R-5305 and R-5307)



The Proposed Action

The Marine Corps proposes to enhance air and ground training within the existing SUA complex in eastern North Carolina with two additional restricted areas. A restricted area is a type of SUA, established under 14 CFR Part 73 within which the flight of non-participating aircraft is subject to restriction (but is not wholly prohibited).

Restricted areas (designated with an "R-" on aeronautical charts) are established to segregate military activities considered hazardous from non-participating aircraft. Training requirements that are not being met sufficiently with the current configuration of the SUA include: fixed wing aircraft use of existing targets, employment of long-range lasers, integration of threat emitters, low-altitude air defense training, surface-to-surface artillery training, small arms ranges training, and training with combat-capable Unmanned Aircraft System (UAS). Given the nature of this type of training, it must be carried out in restricted areas. The configuration and size of the current restricted areas do not support these training requirements.

Proposed R-5305

The proposed R-5305 would be in airspace contained above the lateral installation boundaries of Marine Corps Base (MCB) Camp Lejeune. See **Figure 2** on the next page. The proposed R-5305 would connect existing restricted areas of the complex known as R-5303A/B/C and R-5304A/B/C to the west and R-5306D/E to the east. R-5305 would be vertically segmented into three components (A, B, and C) with the same designated altitudes as the adjacent restricted areas starting at the surface and extending up to approximately 18,000 feet (referred to as Flight Level [FL] 180 in aeronautical terms). **Figure 2** provides a 3D view of the vertical segmentation of the restricted area.

As illustrated on **Figure 2**, R-5305 would fill the gap between these existing restricted areas providing protected airspace between the ground-based launch points and impact areas. The additional restricted area would also provide more maneuver space for fixed-wing aircraft to better use the ground-based targets associated with R-5303 and R-5304. This proposed restricted area would also support combat-capable (i.e., armed) UAS operations. There would be no weapons release within R-5305. Aircraft operations within R-5305 are reported as "sorties." A sortie is the takeoff, operation, and landing of a single aircraft. There would be approximately 1,140 sorties per year in the proposed R-5305 (**Table 1**). There are currently several thousand military aircraft flights in this general area over the installation.

Figure 2 – Detailed Figure of Proposed R-5305

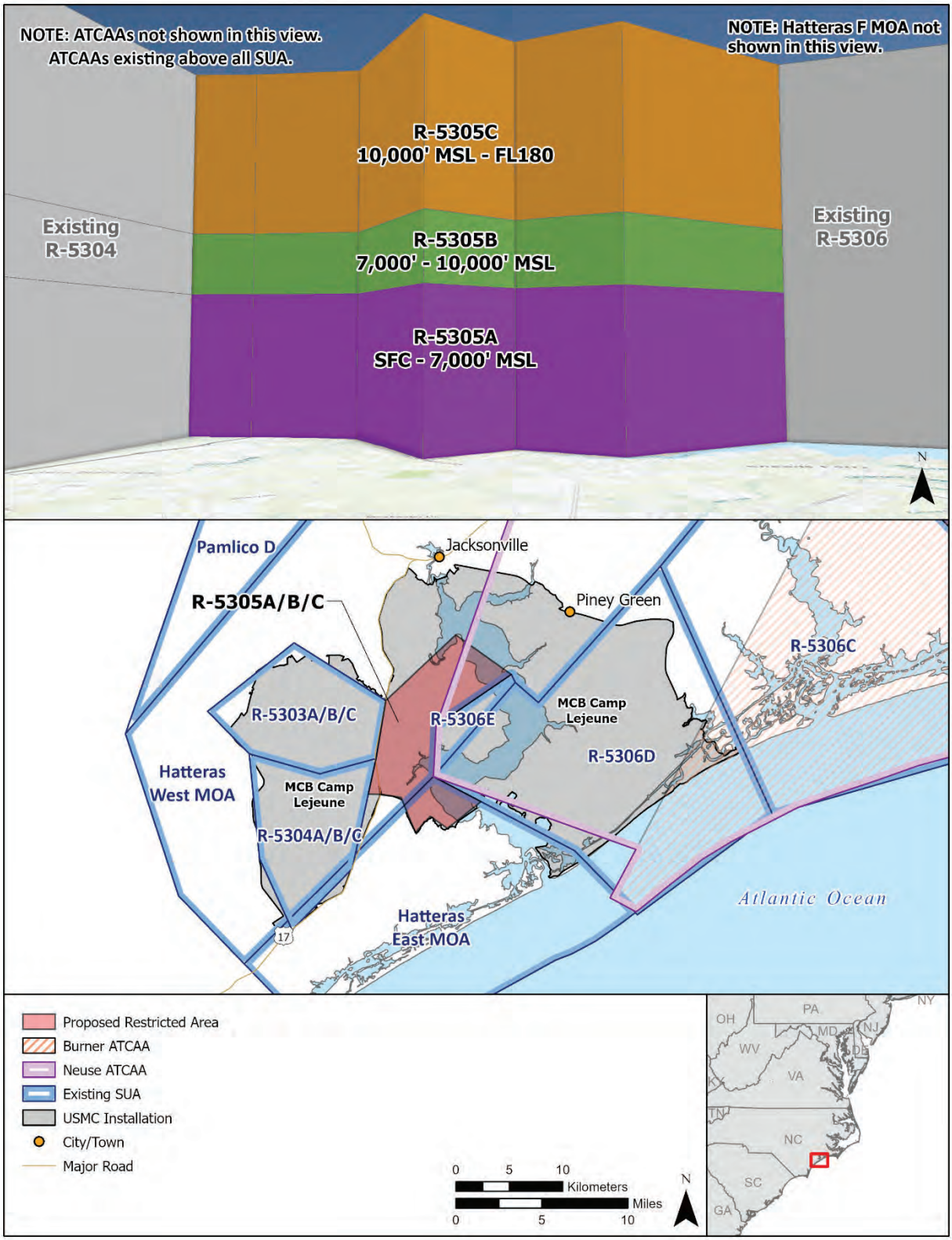


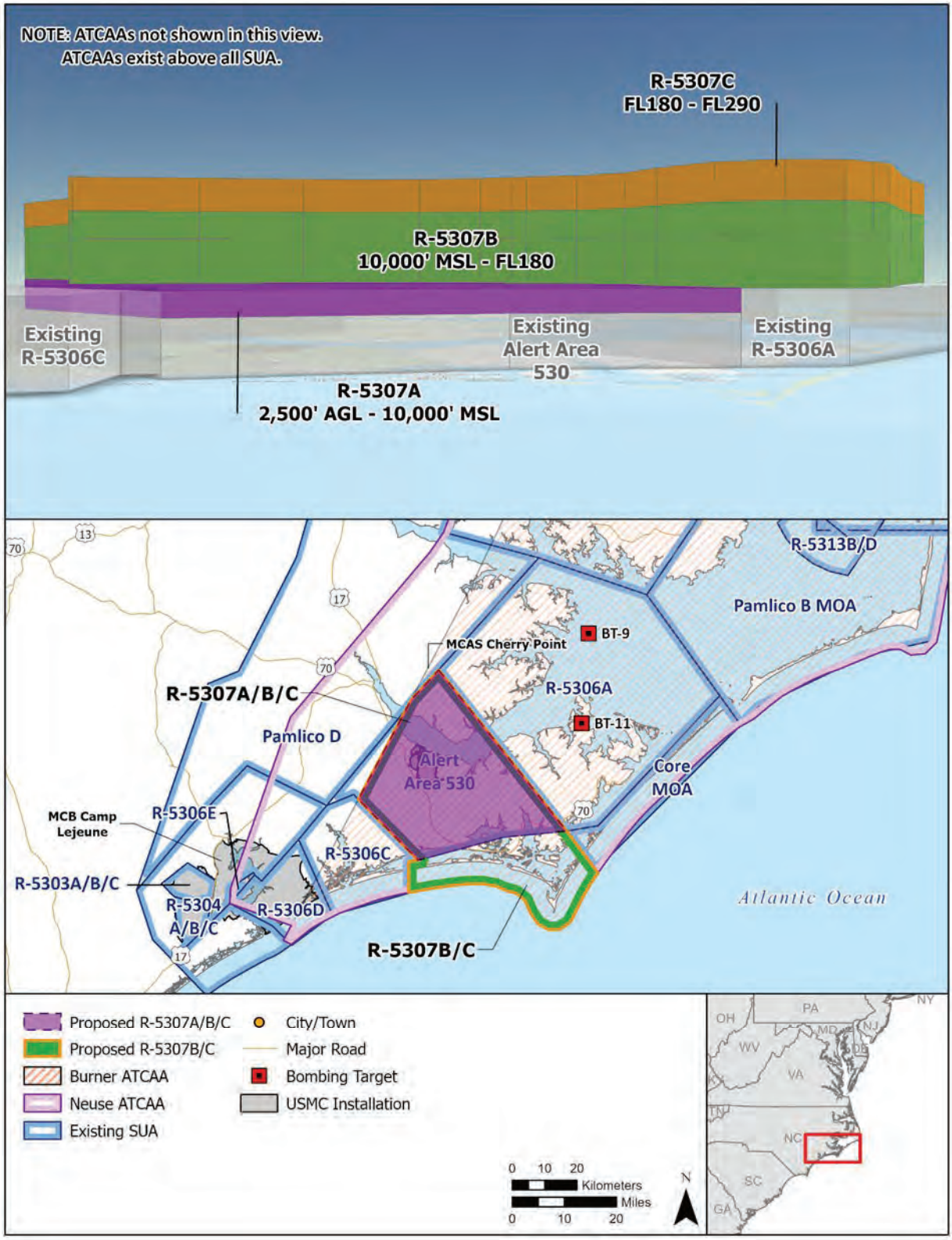
Table 1. Proposed R-5305 Altitudes and Operations				
Airspace	**Altitudes**	**Expected Activation (Hours per Day)**	**Expected Activation (Days per Year)**	**Proposed Annual Sorties**
R-5305A	Surface to 7,000 feet MSL	8	150	1,140
R-5305B	7,000 to 10,000 feet MSL	4	30	
R-5305C	10,000 feet MSL to FL180	4	30	

Proposed R-5307

The existing Alert Area (another type of SUA) known as "A-530," which currently exists from the surface up to 18,000 feet (FL180), would be changed to a restricted area named "R-5307" (**Figure 3** on the next page). The restricted area would be vertically segmented into three components (A, B, and C) that would be stacked on top of each other. R-5307A (shown in purple on **Figure 3**) would begin at 2,500 feet above ground level (AGL) and extend up to 10,000 feet above mean sea level (MSL). R-5307 B and C would exist above R-5307A but would have a larger footprint covering additional areas to the south and east over the barrier islands (shown as a green and orange outline on Figure 3). R-5307B/C would begin at 10,000 feet MSL and extend up to approximately 29,000 feet (FL290). Converting the alert area (A-530) to a restricted area would join the existing restricted areas to the south (R-5306C) and the north (R-5306A) allowing for use of the entire complex for training scenarios. The newly joined restricted areas would incorporate multiple air-to-ground ranges, outlying and auxiliary airfields, and threat emitter sites providing realistic training opportunities. There would be no weapons release within R-5307. This restricted area would support approximately 700 aircraft sorties per year (**Table 2**). As an Alert Area, several thousand military aircraft currently traverse this space each year.

Table 2. Proposed R-5307 Altitudes and Operations				
Airspace	**Altitudes**	**Expected Activation (Hours per Day)**	**Expected Activation (Days per Year)**	**Proposed Annual Sorties**
R-5307A	2,500 feet AGL to 10,000 feet MSL	2	25	700
R-5307B	10,000 feet MSL to FL180	4	25	
R-5307C	FL180 to FL290	4	100	

Figure 3 – Detailed Figure of Proposed R-5307



Historic Properties Located Under the Airspace

Pursuant to 36 CFR 800.4(b)(1), the USMC has made a reasonable and good faith effort to identify historic properties beneath the proposed restricted areas.

R-5305

There are no historic properties beneath R-5305 A/B/C. This restricted area is wholly contained within the MCB Camp Lejeune installation boundary.

R-5307

There are no historic properties located beneath R-5307A (which aligns with the current A-530 footprint, shown in purple on **Figure 3**). There are 11 historic properties located along the North Carolina coastline beneath the proposed R-5307B/C. The floor of R-5307B starts at 10,000 feet MSL which means there would be no aircraft operations below this altitude. **Table 3** provides the list of historic properties beneath R-5307B/C.

Table 3. Historic Properties beneath R-5307B/C

Resource Name	Resource Type	NRIS Reference Number	Location (County)
Carteret County Home	Buildings	84000528	Carteret
Earle W. Webb, Jr. Memorial Civic Center and Library	Buildings	100006852	Carteret
Fort Macon	Buildings	70000445	Carteret
Gibbs House	Buildings	73001302	Carteret
Jacob Henry House	Buildings	73001303	Carteret
Morehead City Municipal Building	Buildings	4000828	Carteret
Beaufort Historic District	Historic District	74001331	Carteret
Cape Lookout Coast Guard Station	Historic District	176006872	Carteret
Cape Lookout Village Historic District	Historic District	1384	Carteret
Morehead City Historic District	Historic District	3000266	Carteret
Old Burying Ground	Historic Site	74001332	Carteret

Note: NRIS=National Register Information System

Effects Analysis

There are no historic properties beneath the proposed R-5305; thus, the effects analysis focuses on the proposed R-5307. Military aircraft training would be dispersed throughout the proposed airspace and occur within the confines of the restricted area. Specifically, in the restricted area above the historic properties (R-5307B/C), aircraft operations would be limited to above 10,000 feet MSL. Aircraft training at this altitude would not result in a visual impact to the historic properties below. Military aircraft and civilian aircraft are routinely present in eastern North Carolina along the coastline and would not have a new visual impact. There would be no weapons release in this restricted area and no ground disturbing activities would occur. Therefore, the potential effects to historic properties would be limited to noise from military aircraft training within the airspace.

Aircraft training within the restricted area would not follow designated patterns or routes but rather would occur somewhat randomly throughout the designated volume of airspace. An individual historic property beneath R-5307B/C would not be exposed to repetitive aircraft operations, and these operations would happen at a variety of altitudes beginning at 10,000 feet MSL and extending upward. As shown in **Table 2**, most aircraft use would be in the higher altitude of R-5307C (which would be above 18,000 feet).

The Marine Corps prepared a Noise Analysis for the proposed action using the Department of Defense prescribed suite of software programs, known as NOISEMAP, to predict the noise exposure from military aircraft activity. The software model inputs include the type of aircraft to be flown, power settings, and time spent at specified altitude bands. Based on the proposed aircraft training, the R-5307B/C is expected to be activated four hours per weekday for approximately 25 days (R-5307B) and 100 days (R-5307C) per year (see **Table 2**) (weekend activation would be rare in the restricted areas).

The United States Government standard for assessing community noise impacts is the noise metric known as the Day-Night Level (DNL), reported in decibels (dB). The DNL is an A-weighted cumulative noise metric that measures noise based on annual average daily aircraft operations. The U.S. Environmental Protection Agency (USEPA) has identified 55 DNL as a level that protects public health and welfare with an adequate margin of safety (USEPA 1982). This means that 55 DNL is a threshold below which adverse noise effects are not expected to occur. With respect to land-use, noise exposure greater than 65 DNL is considered generally incompatible with residential, public use (i.e., schools), or recreational and entertainment areas (Federal Interagency Committee on Urban Noise 1980). As determined by the Noise Analysis for the EA, the noise associated with the proposed military aircraft operations in R-5307 would be 43 db DNL. There would be no single event (i.e., individual overflight) that would exceed a maximum sound exposure level of 65 dB. These results apply to the entirety of the restricted area, the noise exposure to the historic properties along the coastline below R-5307B/C would be less since all aircraft activity would be will above 10,000 feet. Therefore, the noise associated with military aircraft training within R-5307 is not expected to have a significant noise impact to the historical properties or any persons at these properties.

While DNL is the standard metric for assessing the significance of noise impacts in the EA, supplemental metrics are used to produce more detailed noise exposure information for the decision process and to improve communication with the public and stakeholders. Supplemental metrics are not intended to replace the DNL metric as the primary descriptor of cumulative noise exposure, but rather are useful tools to supplement the impact information disclosed by the DNL metric. For this proposed action, the Noise Analysis also included an analysis of the peak noise exposure to better describe the loudness of a single overflight event at the lowest proposed altitude (the floor) in each restricted area. In general, during training events, aircraft do not travel substantial distances on the floor of the restricted area, but rather start at the floor and climb to higher altitudes so the peak exposures reported in the Noise Analysis are not expected to occur frequently and would only last for a few seconds. It is estimated that aircraft would operate in the lowest altitude bands of each restricted area for only 10 to 15 percent of the training time. The peak noise exposure would vary depending on the type of aircraft and the engine power. In the proposed R-5307B/C (where the floor would be 10,000 feet), the maximum sound level that could be experienced by a receptor during an overflight, a metric known as L_{max},

would be 87 dB. The L_{max} lasts for only a fraction of a second, but an aircraft could be heard for several seconds or a few minutes depending on the surroundings of the receptor. This value represents outside noise. Outdoor-to-indoor noise level reduction provided by a building ranges from 25 dB (windows closed) to 15 dB (windows open); reducing the L_{max} to 62 dB (windows closed) to 72 dB (windows open).

Normally, the most sensitive components of a structure to noise are the windows and, infrequently, the plastered walls and ceilings. Conservatively, only sound lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (Committee on Hearing, Bioacoustics, and Biomechanics 1977). Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations or rattling of objects within the dwelling. Windowpanes may also vibrate noticeably when exposed to high levels of airborne noise. In general, such noise-induced vibrations occur at peak sound levels of 110 dB or greater. The maximum peak sound exposure of a single overflight at the lowest possible altitude (10,000 feet) in the proposed R-5307B/C would be 87 dB; therefore, structural damage and secondary vibration impacts to historic properties beneath R-5307B/C are not expected to occur with this proposed action.

Finding of Effect

Based on previous identification efforts, the USMC has determined that 11 historic properties are located within the APE. In accordance with 36 CFR 800 5(a)(1), the USMC applied the criteria for adverse effects and found that the qualifying characteristics of these buildings will not be adversely affected by structural damage and secondary vibration from noise exposure under the proposed action. Subject to 36 CFR 800.5(b), the USMC has made a finding of "**No Adverse Effects**" to historic properties regarding the establishment of the two proposed restricted areas. The USMC recognizes that other cultural resources, some documented and some not yet discovered, exist under the proposed airspace. However, the undertaking will not affect historic structures and districts where setting is an important criterion for significance and where noise vibrations from noise could adversely impact those types of resources.

Consultation with Tribes

Government-to-government consultation with federally recognized Tribal Nations is also being conducted for this proposed undertaking per Executive Order 13175: *Memorandum on Government-to-Government Relations with Native American Tribal Governments*; Department of Defense (DoD) Instruction 4710.02: *DoD Interactions with Federally-Recognized Tribes*; Marine Corps Order 5090.2-Volume 8: *Cultural Resources Management;* and the NHPA implementing regulations at 36 CFR Part 800(f)(2). The USMC has identified the Catawba Indian Tribe and the Tuscarora Nation as federally recognized Tribal Nations that may have cultural, historic, and/or religious affiliation to lands beneath the proposed SUA. Based on our evaluation of currently known historic properties data for the proposed APE, we have applied the Assessment of Adverse Effects (36 CFR Part 800.5) to the proposed undertaking, and we have determined that the proposed action will not result in an adverse effect to significant cultural resources. However, the USMC is seeking input from the tribes listed above to ensure that we have adequately identified historic properties of religious and cultural significance to their Tribal Nations.

References

Committee on Hearing, Bioacoustics, and Biomechanics 1977. Guidelines for Preparing Environmental Impact Statements on Noise: Report of Working Group 69.

Federal Interagency Committee on Urban Noise 1980. Guidelines for Considering Noise in Land Use Planning and Control. June.

U.S. Environmental Protection Agency (USEPA). 1982. Guidelines for Noise Impact Analysis. EPA Report No. 55/9-82-105. April.

UNITED STATES MARINE CORPS
MARINE CORPS INSTALLATIONS EAST-MARINE CORPS BASE
PSC BOX 20005
CAMP LEJEUNE NC 28542-0005

5090
G-F
8 Apr 25

Chief Brian Harris
Chief, The Catawba Nation
996 Avenue of the Nations
Rock Hill, South Carolina 29730

Dear Chief Harris:

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My point of contact for this request is Mr. Scott Williams, Marine Corps Installations East-Marine Corps Base Camp Lejeune, Regional Environmental Program Manager, at (910) 451-0151; scott.r.williams1@usmc.mil; or 12 Post Lane, Camp Lejeune, NC, 28547.

Sincerely,

SHOLAR.ANTHONY.G.1229762202 Digitally signed by SHOLAR.ANTHONY.G.1229762202 Date: 2025.04.08 15:38:30 -04'00'

A. G. Sholar
Deputy Assistant Chief of Staff, G-F
By direction
of the Commanding General

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Figure 1 – Area of Potential Effects (Proposed Restricted Areas: R-5305 and R-5307)

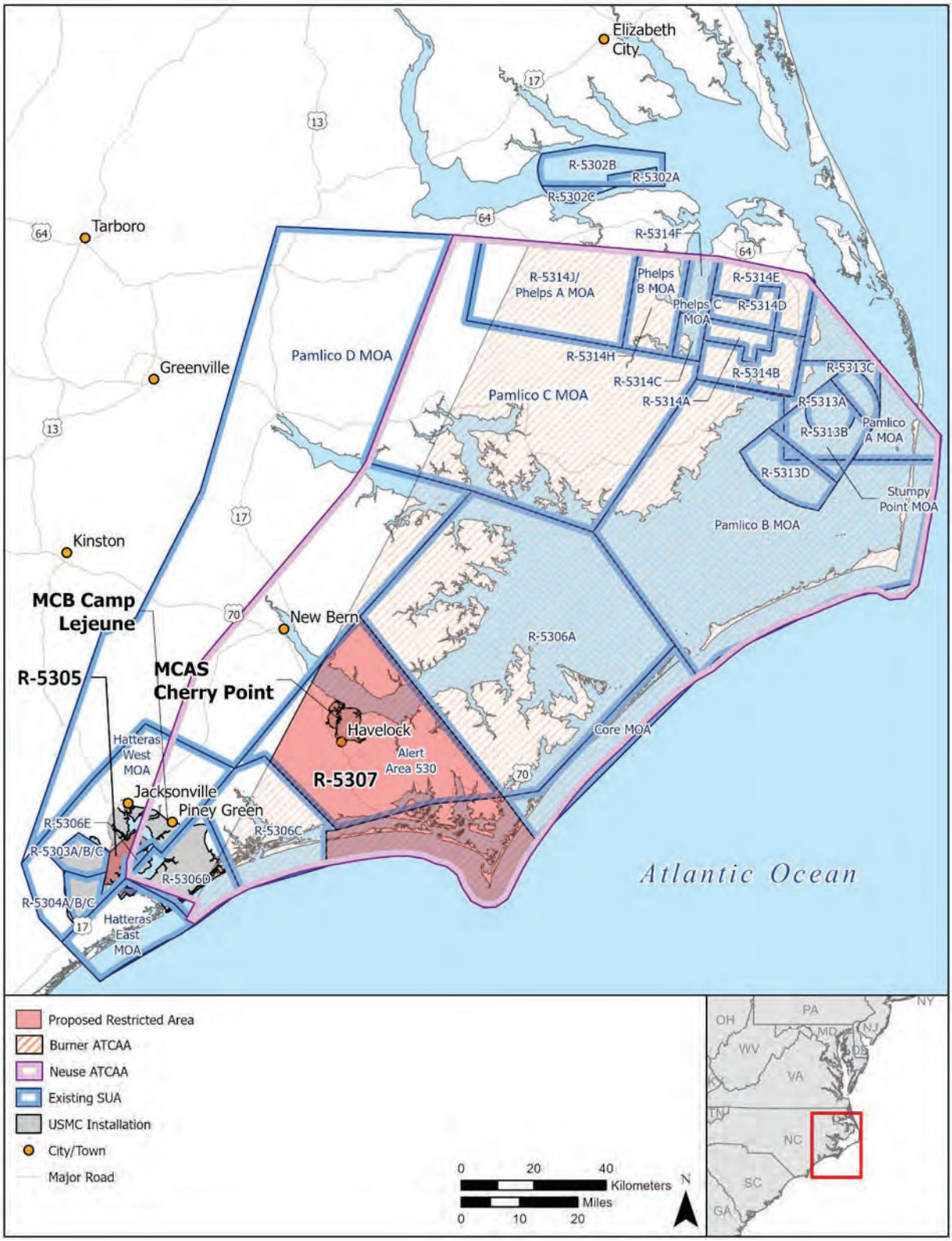

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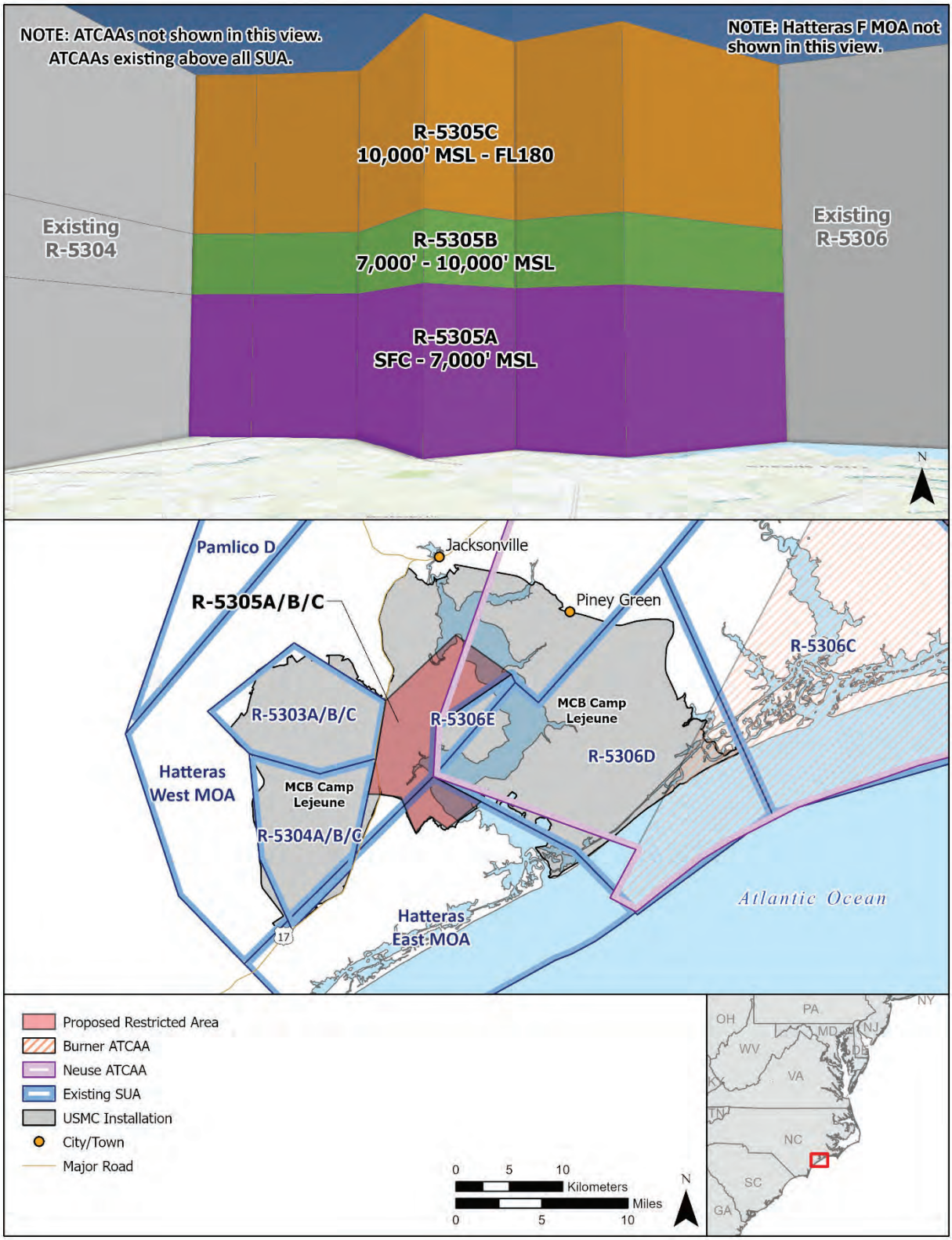
Figure 2 – Detailed Figure of Proposed R-5305



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Proposed R-5307

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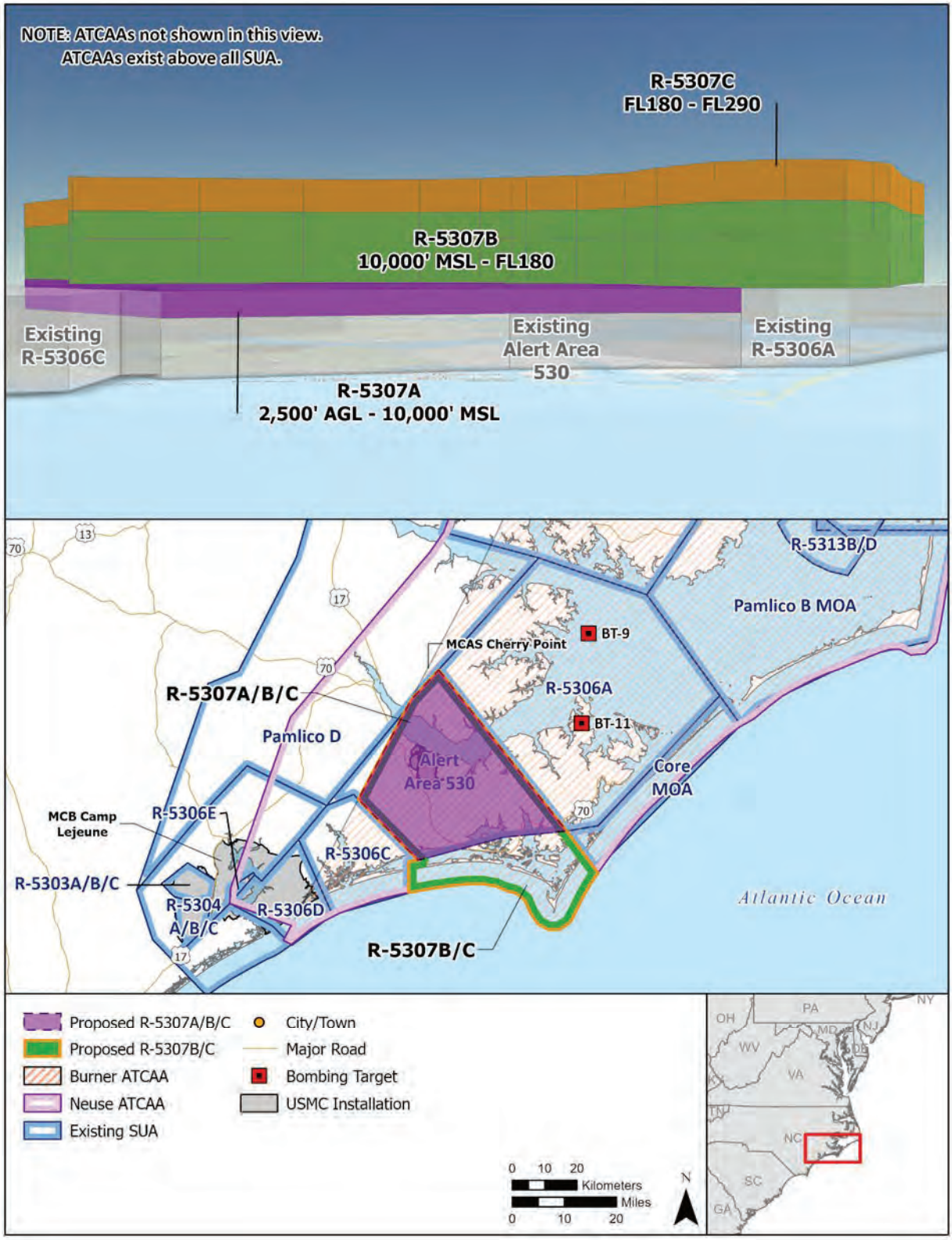
Table 2. Proposed R-5307 Altitudes and Operations				
Airspace	**Altitudes**	**Expected Activation (Hours per Day)**	**Expected Activation (Days per Year)**	**Proposed Annual Sorties**
R-5307A	2,500 feet AGL to 10,000 feet MSL	2	25	700
R-5307B	10,000 feet MSL to FL180	4	25	
R-5307C	FL180 to FL290	4	100	

Figure 3 – Detailed Figure of Proposed R-5307



Historic Properties Located Under the Airspace

Pursuant to 36 CFR 800.4(b)(1), the USMC has made a reasonable and good faith effort to identify historic properties beneath the proposed restricted areas.

R-5305

There are no historic properties beneath R-5305 A/B/C. This restricted area is wholly contained within the MCB Camp Lejeune installation boundary.

R-5307

There are no historic properties located beneath R-5307A (which aligns with the current A-530 footprint, shown in purple on **Figure 3**). There are 11 historic properties located along the North Carolina coastline beneath the proposed R-5307B/C. The floor of R-5307B starts at 10,000 feet MSL which means there would be no aircraft operations below this altitude. **Table 3** provides the list of historic properties beneath R-5307B/C.

Table 3. Historic Properties beneath R-5307B/C

Resource Name	Resource Type	NRIS Reference Number	Location (County)
Carteret County Home	Buildings	84000528	Carteret
Earle W. Webb, Jr. Memorial Civic Center and Library	Buildings	100006852	Carteret
Fort Macon	Buildings	70000445	Carteret
Gibbs House	Buildings	73001302	Carteret
Jacob Henry House	Buildings	73001303	Carteret
Morehead City Municipal Building	Buildings	4000828	Carteret
Beaufort Historic District	Historic District	74001331	Carteret
Cape Lookout Coast Guard Station	Historic District	176006872	Carteret
Cape Lookout Village Historic District	Historic District	1384	Carteret
Morehead City Historic District	Historic District	3000266	Carteret
Old Burying Ground	Historic Site	74001332	Carteret

Note: NRIS=National Register Information System

Effects Analysis

There are no historic properties beneath the proposed R-5305; thus, the effects analysis focuses on the proposed R-5307. Military aircraft training would be dispersed throughout the proposed airspace and occur within the confines of the restricted area. Specifically, in the restricted area above the historic properties (R-5307B/C), aircraft operations would be limited to above 10,000 feet MSL. Aircraft training at this altitude would not result in a visual impact to the historic properties below. Military aircraft and civilian aircraft are routinely present in eastern North Carolina along the coastline and would not have a new visual impact. There would be no weapons release in this restricted area and no ground disturbing activities would occur. Therefore, the potential effects to historic properties would be limited to noise from military aircraft training within the airspace.

Aircraft training within the restricted area would not follow designated patterns or routes but rather would occur somewhat randomly throughout the designated volume of airspace. An individual historic property beneath R-5307B/C would not be exposed to repetitive aircraft operations, and these operations would happen at a variety of altitudes beginning at 10,000 feet MSL and extending upward. As shown in **Table 2**, most aircraft use would be in the higher altitude of R-5307C (which would be above 18,000 feet).

The Marine Corps prepared a Noise Analysis for the proposed action using the Department of Defense prescribed suite of software programs, known as NOISEMAP, to predict the noise exposure from military aircraft activity. The software model inputs include the type of aircraft to be flown, power settings, and time spent at specified altitude bands. Based on the proposed aircraft training, the R-5307B/C is expected to be activated four hours per weekday for approximately 25 days (R-5307B) and 100 days (R-5307C) per year (see **Table 2**) (weekend activation would be rare in the restricted areas).

The United States Government standard for assessing community noise impacts is the noise metric known as the Day-Night Level (DNL), reported in decibels (dB). The DNL is an A-weighted cumulative noise metric that measures noise based on annual average daily aircraft operations. The U.S. Environmental Protection Agency (USEPA) has identified 55 DNL as a level that protects public health and welfare with an adequate margin of safety (USEPA 1982). This means that 55 DNL is a threshold below which adverse noise effects are not expected to occur. With respect to land-use, noise exposure greater than 65 DNL is considered generally incompatible with residential, public use (i.e., schools), or recreational and entertainment areas (Federal Interagency Committee on Urban Noise 1980). As determined by the Noise Analysis for the EA, the noise associated with the proposed military aircraft operations in R-5307 would be 43 db DNL. There would be no single event (i.e., individual overflight) that would exceed a maximum sound exposure level of 65 dB. These results apply to the entirety of the restricted area, the noise exposure to the historic properties along the coastline below R-5307B/C would be less since all aircraft activity would be will above 10,000 feet. Therefore, the noise associated with military aircraft training within R-5307 is not expected to have a significant noise impact to the historical properties or any persons at these properties.

While DNL is the standard metric for assessing the significance of noise impacts in the EA, supplemental metrics are used to produce more detailed noise exposure information for the decision process and to improve communication with the public and stakeholders. Supplemental metrics are not intended to replace the DNL metric as the primary descriptor of cumulative noise exposure, but rather are useful tools to supplement the impact information disclosed by the DNL metric. For this proposed action, the Noise Analysis also included an analysis of the peak noise exposure to better describe the loudness of a single overflight event at the lowest proposed altitude (the floor) in each restricted area. In general, during training events, aircraft do not travel substantial distances on the floor of the restricted area, but rather start at the floor and climb to higher altitudes so the peak exposures reported in the Noise Analysis are not expected to occur frequently and would only last for a few seconds. It is estimated that aircraft would operate in the lowest altitude bands of each restricted area for only 10 to 15 percent of the training time. The peak noise exposure would vary depending on the type of aircraft and the engine power. In the proposed R-5307B/C (where the floor would be 10,000 feet), the maximum sound level that could be experienced by a receptor during an overflight, a metric known as L_{max},

would be 87 dB. The L_{max} lasts for only a fraction of a second, but an aircraft could be heard for several seconds or a few minutes depending on the surroundings of the receptor. This value represents outside noise. Outdoor-to-indoor noise level reduction provided by a building ranges from 25 dB (windows closed) to 15 dB (windows open); reducing the L_{max} to 62 dB (windows closed) to 72 dB (windows open).

Normally, the most sensitive components of a structure to noise are the windows and, infrequently, the plastered walls and ceilings. Conservatively, only sound lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (Committee on Hearing, Bioacoustics, and Biomechanics 1977). Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations or rattling of objects within the dwelling. Windowpanes may also vibrate noticeably when exposed to high levels of airborne noise. In general, such noise-induced vibrations occur at peak sound levels of 110 dB or greater. The maximum peak sound exposure of a single overflight at the lowest possible altitude (10,000 feet) in the proposed R-5307B/C would be 87 dB; therefore, structural damage and secondary vibration impacts to historic properties beneath R-5307B/C are not expected to occur with this proposed action.

Finding of Effect

Based on previous identification efforts, the USMC has determined that 11 historic properties are located within the APE. In accordance with 36 CFR 800 5(a)(1), the USMC applied the criteria for adverse effects and found that the qualifying characteristics of these buildings will not be adversely affected by structural damage and secondary vibration from noise exposure under the proposed action. Subject to 36 CFR 800.5(b), the USMC has made a finding of "**No Adverse Effects**" to historic properties regarding the establishment of the two proposed restricted areas. The USMC recognizes that other cultural resources, some documented and some not yet discovered, exist under the proposed airspace. However, the undertaking will not affect historic structures and districts where setting is an important criterion for significance and where noise vibrations from noise could adversely impact those types of resources.

Consultation with Tribes

Government-to-government consultation with federally recognized Tribal Nations is also being conducted for this proposed undertaking per Executive Order 13175: *Memorandum on Government-to-Government Relations with Native American Tribal Governments*; Department of Defense (DoD) Instruction 4710.02: *DoD Interactions with Federally-Recognized Tribes*; Marine Corps Order 5090.2-Volume 8: *Cultural Resources Management;* and the NHPA implementing regulations at 36 CFR Part 800(f)(2). Based on our evaluation of currently known historic properties data for the proposed APE, we have applied the Assessment of Adverse Effects (36 CFR Part 800.5) to the proposed undertaking, and we have determined that the proposed action will not result in an adverse effect to significant cultural resources. However, we are seeking your input to ensure that we have adequately identified historic properties of religious and cultural significance.

References

Committee on Hearing, Bioacoustics, and Biomechanics 1977. Guidelines for Preparing Environmental Impact Statements on Noise: Report of Working Group 69.

Federal Interagency Committee on Urban Noise 1980. Guidelines for Considering Noise in Land Use Planning and Control. June.

U.S. Environmental Protection Agency (USEPA). 1982. Guidelines for Noise Impact Analysis. EPA Report No. 55/9-82-105. April.

UNITED STATES MARINE CORPS
MARINE CORPS INSTALLATIONS EAST-MARINE CORPS BASE
PSC BOX 20005
CAMP LEJEUNE NC 28542-0005

5090
G-F
8 Apr 25

Chief Tom Jonathan
Chief, The Tuscarora Nation
5226 Walmore Road
Lewiston, New York 14092

Dear Chief Jonathan:

Marine Corps Installations East-Marine Corps Base Camp Lejeune is preparing an Environmental Assessment (EA) to evaluate the potential environmental impacts associated with establishing two additional restricted airspace areas. The purpose of this letter is to initiate consultation with your office pursuant to Section 106 of the National Historic Preservation Act for any effects on historic properties located on land beneath the proposed restricted areas.

The proposed restricted airspace areas would be part of a Special Use Airspace (SUA) complex in Eastern Carolina. The SUA complex primarily supports pilot training for Marines stationed at Marine Corps Base Camp Lejeune, Marine Corps Air Station (MCAS) New River, and MCAS Cherry Point. The proposed restricted airspace would not include changes to infrastructure or personnel at any Marine Corps installations, airfield or runway operations (frequency or types of aircraft), aircraft inventory or squadron assignments at the installations, or ground disturbances beneath the proposed restricted airspace areas. Please see the enclosure for more information.

My point of contact for this request is Mr. Scott Williams, Marine Corps Installations East-Marine Corps Base Camp Lejeune, Regional Environmental Program Manager, at (910) 451-0151; scott.r.williams1@usmc.mil; or 12 Post Lane, Camp Lejeune, NC, 28547.

Sincerely,

SHOLAR.ANTHONY.G.1229762202
Digitally signed by SHOLAR.ANTHONY.G.1229762202
Date: 2025.04.08 15:37:52 -04'00'

A. G. Sholar
Deputy Assistant Chief of Staff, G-F
By direction
of the Commanding General

Enclosure: 1. Proposed Action Description

Proposed Action Description

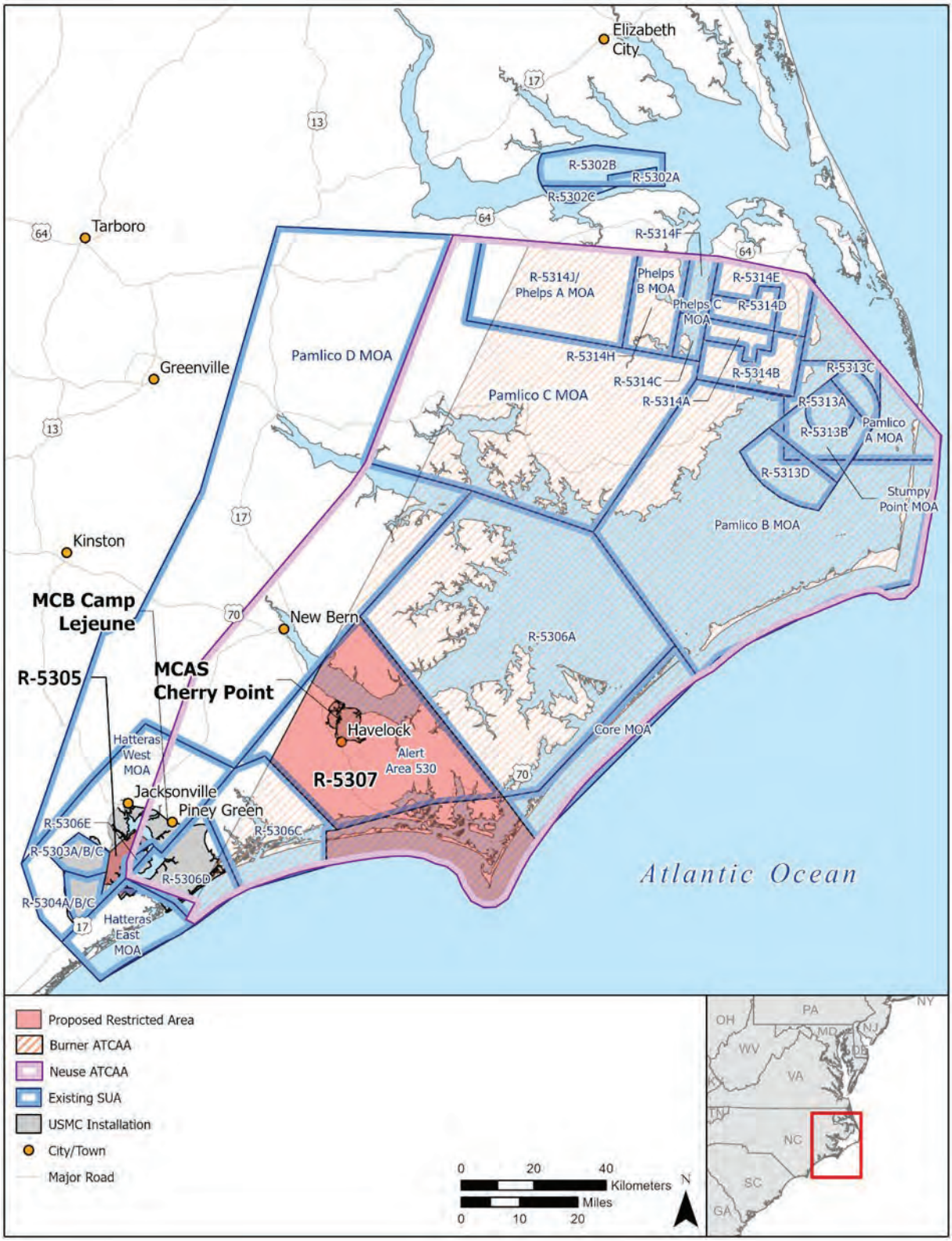
Training requirements are not being met sufficiently with the current configuration of the Special Use Airspace (SUA) complex. The existing training airspace in eastern North Carolina is a large complex that includes restricted areas, Military Operations Areas, an Alert Area, and Air Traffic Control Assigned Airspace shown on **Figure 1** on the next page. Under the Proposed Action, Marine Corps Installations East-Marine Corps Base Camp Lejeune (USMC or Marine Corps) seeks to establish two restricted areas, to be named on aeronautical charts, R-5305 and R-5307, shown in pink on **Figure 1**. The establishment of the restricted areas is the responsibility of the Federal Aviation Administration, and they are a cooperating agency for an Environmental Assessment (EA) of the proposed action for enhancing air and ground training within the existing SUA complex in eastern North Carolina.

The Proposed Action does not include changes to infrastructure or personnel at any of the USMC installations, airfield or runway operations (frequency or types of aircraft), aircraft inventory or squadron assignments at the bases, or ground disturbance beneath the proposed restricted areas. The Area of Potential Effects (APE) for this undertaking is, therefore, defined as the lands beneath the proposed lateral boundaries of R-5305 and R-5307 that would be potentially exposed to noise and visual intrusions from aircraft operations. (**Figure 1**)

Request for Concurrence

The USMC requests your review of the information found in this enclosure. After reviewing the information, we seek your concurrence with our findings of effect made under 36 CFR 800.5(b), our definition of the APE (36 CFR 800.4(a), and reasonable and good faith efforts to identify historic properties, in accordance with 36 CFR 800.4(b)(1) and 800.4(c)(2). In accordance with 36 CFR 800.3(f), we also request your assistance in identifying any additional potential consulting parties that you feel the USMC should contact regarding the proposed SUA. Any information or assistance you can provide would be appreciated and carefully considered.

Figure 1 – Area of Potential Effects (Proposed Restricted Areas: R-5305 and R-5307)



The Proposed Action

The Marine Corps proposes to enhance air and ground training within the existing SUA complex in eastern North Carolina with two additional restricted areas. A restricted area is a type of SUA, established under 14 CFR Part 73 within which the flight of non-participating aircraft is subject to restriction (but is not wholly prohibited).

Restricted areas (designated with an "R-" on aeronautical charts) are established to segregate military activities considered hazardous from non-participating aircraft. Training requirements that are not being met sufficiently with the current configuration of the SUA include: fixed wing aircraft use of existing targets, employment of long-range lasers, integration of threat emitters, low-altitude air defense training, surface-to-surface artillery training, small arms ranges training, and training with combat-capable Unmanned Aircraft Systems (UAS). Given the nature of this type of training, it must be carried out in restricted areas. The configuration and size of the current restricted areas do not support these training requirements.

Proposed R-5305

The proposed R-5305 would be in airspace contained above the lateral installation boundaries of Marine Corps Base (MCB) Camp Lejeune. See **Figure 2** on the next page. The proposed R-5305 would connect existing restricted areas of the complex known as R-5303A/B/C and R-5304A/B/C to the west and R-5306D/E to the east. R-5305 would be vertically segmented into three components (A, B, and C) with the same designated altitudes as the adjacent restricted areas starting at the surface and extending up to approximately 18,000 feet (referred to as Flight Level [FL] 180 in aeronautical terms). **Figure 2** provides a 3D view of the vertical segmentation of the restricted area.

As illustrated on **Figure 2**, R-5305 would fill the gap between these existing restricted areas providing protected airspace between the ground-based launch points and impact areas. The additional restricted area would also provide more maneuver space for fixed-wing aircraft to better use the ground-based targets associated with R-5303 and R-5304. This proposed restricted area would also support combat-capable (i.e., armed) UAS operations. There would be no weapons release within R-5305. Aircraft operations within R-5305 are reported as "sorties." A sortie is the takeoff, operation, and landing of a single aircraft. There would be approximately 1,140 sorties per year in the proposed R-5305 (**Table 1**). There are currently several thousand military aircraft flights in this general area over the installation.

Figure 2 – Detailed Figure of Proposed R-5305

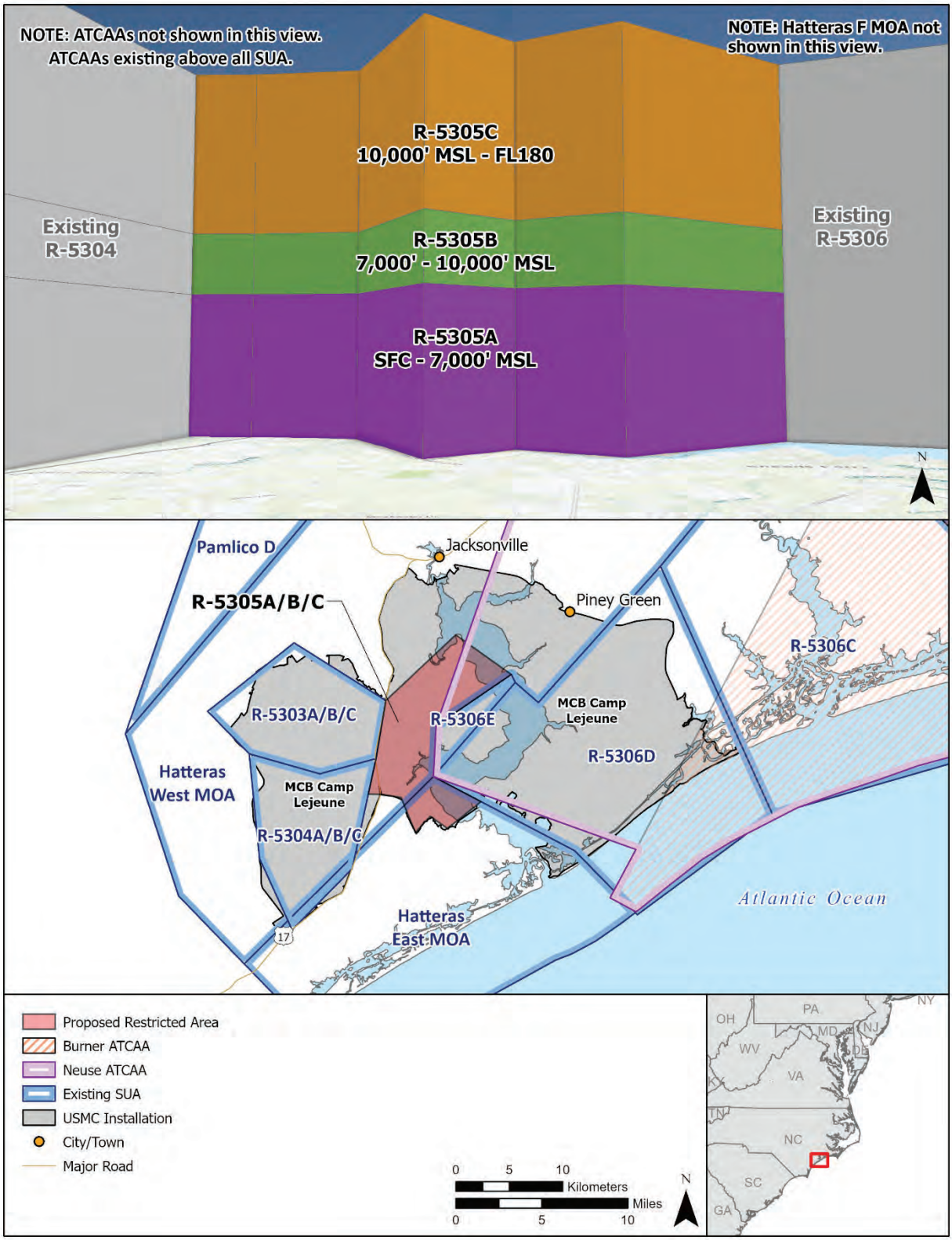


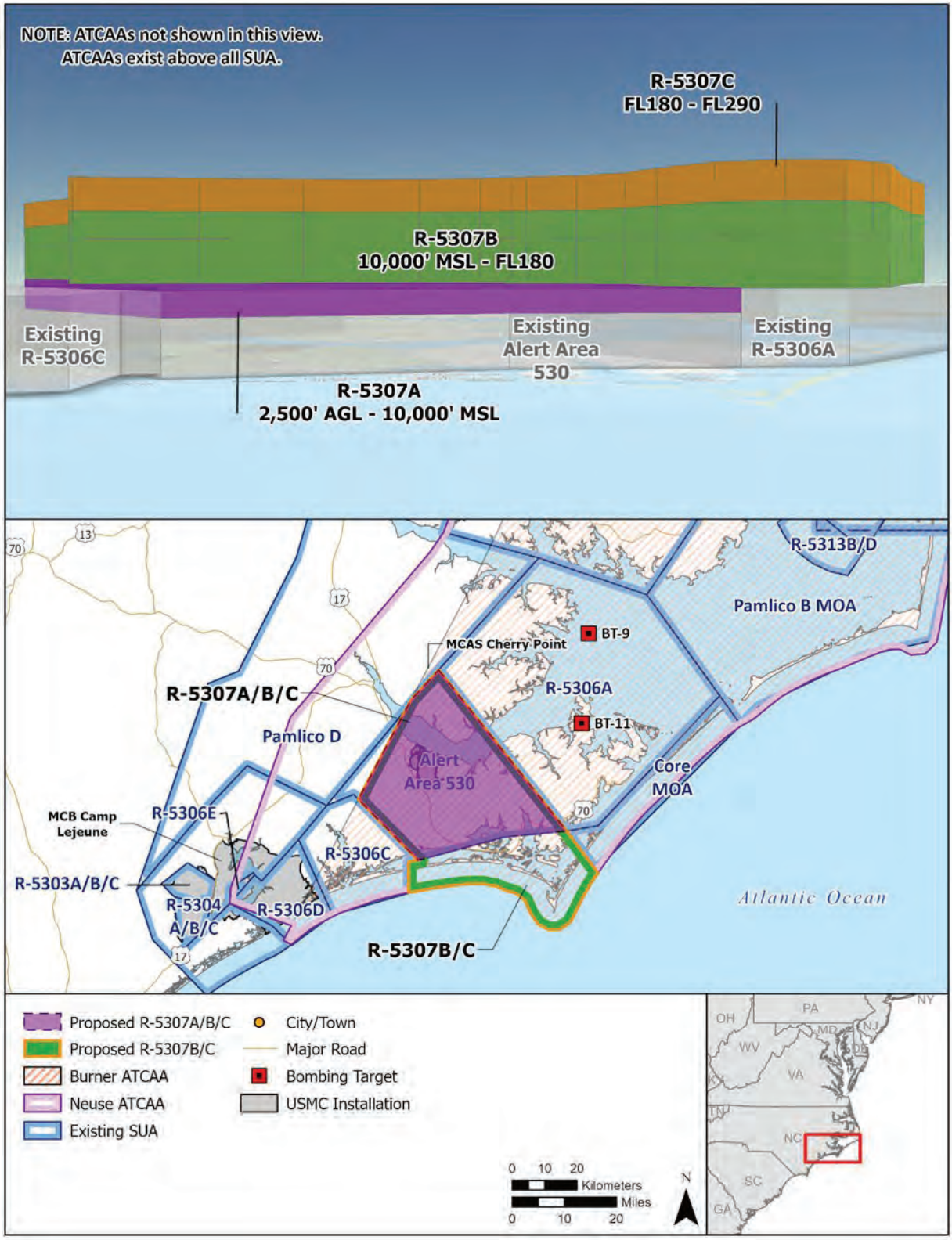
Table 1. Proposed R-5305 Altitudes and Operations				
Airspace	**Altitudes**	**Expected Activation (Hours per Day)**	**Expected Activation (Days per Year)**	**Proposed Annual Sorties**
R-5305A	Surface to 7,000 feet MSL	8	150	1,140
R-5305B	7,000 to 10,000 feet MSL	4	30	
R-5305C	10,000 feet MSL to FL180	4	30	

Proposed R-5307

The existing Alert Area (another type of SUA) known as "A-530," which currently exists from the surface up to 18,000 feet (FL180), would be changed to a restricted area named "R-5307" (**Figure 3** on the next page). The restricted area would be vertically segmented into three components (A, B, and C) that would be stacked on top of each other. R-5307A (shown in purple on **Figure 3**) would begin at 2,500 feet above ground level (AGL) and extend up to 10,000 feet above mean sea level (MSL). R-5307 B and C would exist above R-5307A but would have a larger footprint covering additional areas to the south and east over the barrier islands (shown as a green and orange outline on Figure 3). R-5307B/C would begin at 10,000 feet MSL and extend up to approximately 29,000 feet (FL290). Converting the alert area (A-530) to a restricted area would join the existing restricted areas to the south (R-5306C) and the north (R-5306A) allowing for use of the entire complex for training scenarios. The newly joined restricted areas would incorporate multiple air-to-ground ranges, outlying and auxiliary airfields, and threat emitter sites providing realistic training opportunities. There would be no weapons release within R-5307. This restricted area would support approximately 700 aircraft sorties per year (**Table 2**). As an Alert Area, several thousand military aircraft currently traverse this space each year.

Table 2. Proposed R-5307 Altitudes and Operations				
Airspace	**Altitudes**	**Expected Activation (Hours per Day)**	**Expected Activation (Days per Year)**	**Proposed Annual Sorties**
R-5307A	2,500 feet AGL to 10,000 feet MSL	2	25	700
R-5307B	10,000 feet MSL to FL180	4	25	
R-5307C	FL180 to FL290	4	100	

Figure 3 – Detailed Figure of Proposed R-5307



Historic Properties Located Under the Airspace

Pursuant to 36 CFR 800.4(b)(1), the USMC has made a reasonable and good faith effort to identify historic properties beneath the proposed restricted areas.

R-5305

There are no historic properties beneath R-5305 A/B/C. This restricted area is wholly contained within the MCB Camp Lejeune installation boundary.

R-5307

There are no historic properties located beneath R-5307A (which aligns with the current A-530 footprint, shown in purple on **Figure 3**). There are 11 historic properties located along the North Carolina coastline beneath the proposed R-5307B/C. The floor of R-5307B starts at 10,000 feet MSL which means there would be no aircraft operations below this altitude. **Table 3** provides the list of historic properties beneath R-5307B/C.

Table 3. Historic Properties beneath R-5307B/C

Resource Name	Resource Type	NRIS Reference Number	Location (County)
Carteret County Home	Buildings	84000528	Carteret
Earle W. Webb, Jr. Memorial Civic Center and Library	Buildings	100006852	Carteret
Fort Macon	Buildings	70000445	Carteret
Gibbs House	Buildings	73001302	Carteret
Jacob Henry House	Buildings	73001303	Carteret
Morehead City Municipal Building	Buildings	4000828	Carteret
Beaufort Historic District	Historic District	74001331	Carteret
Cape Lookout Coast Guard Station	Historic District	176006872	Carteret
Cape Lookout Village Historic District	Historic District	1384	Carteret
Morehead City Historic District	Historic District	3000266	Carteret
Old Burying Ground	Historic Site	74001332	Carteret

Note: NRIS=National Register Information System

Effects Analysis

There are no historic properties beneath the proposed R-5305; thus, the effects analysis focuses on the proposed R-5307. Military aircraft training would be dispersed throughout the proposed airspace and occur within the confines of the restricted area. Specifically, in the restricted area above the historic properties (R-5307B/C), aircraft operations would be limited to above 10,000 feet MSL. Aircraft training at this altitude would not result in a visual impact to the historic properties below. Military aircraft and civilian aircraft are routinely present in eastern North Carolina along the coastline and would not have a new visual impact. There would be no weapons release in this restricted area and no ground disturbing activities would occur. Therefore, the potential effects to historic properties would be limited to noise from military aircraft training within the airspace.

Aircraft training within the restricted area would not follow designated patterns or routes but rather would occur somewhat randomly throughout the designated volume of airspace. An individual historic property beneath R-5307B/C would not be exposed to repetitive aircraft operations, and these operations would happen at a variety of altitudes beginning at 10,000 feet MSL and extending upward. As shown in **Table 2**, most aircraft use would be in the higher altitude of R-5307C (which would be above 18,000 feet).

The Marine Corps prepared a Noise Analysis for the proposed action using the Department of Defense prescribed suite of software programs, known as NOISEMAP, to predict the noise exposure from military aircraft activity. The software model inputs include the type of aircraft to be flown, power settings, and time spent at specified altitude bands. Based on the proposed aircraft training, the R-5307B/C is expected to be activated four hours per weekday for approximately 25 days (R-5307B) and 100 days (R-5307C) per year (see **Table 2**) (weekend activation would be rare in the restricted areas).

The United States Government standard for assessing community noise impacts is the noise metric known as the Day-Night Level (DNL), reported in decibels (dB). The DNL is an A-weighted cumulative noise metric that measures noise based on annual average daily aircraft operations. The U.S. Environmental Protection Agency (USEPA) has identified 55 DNL as a level that protects public health and welfare with an adequate margin of safety (USEPA 1982). This means that 55 DNL is a threshold below which adverse noise effects are not expected to occur. With respect to land-use, noise exposure greater than 65 DNL is considered generally incompatible with residential, public use (i.e., schools), or recreational and entertainment areas (Federal Interagency Committee on Urban Noise 1980). As determined by the Noise Analysis for the EA, the noise associated with the proposed military aircraft operations in R-5307 would be 43 db DNL. There would be no single event (i.e., individual overflight) that would exceed a maximum sound exposure level of 65 dB. These results apply to the entirety of the restricted area, the noise exposure to the historic properties along the coastline below R-5307B/C would be less since all aircraft activity would be will above 10,000 feet. Therefore, the noise associated with military aircraft training within R-5307 is not expected to have a significant noise impact to the historical properties or any persons at these properties.

While DNL is the standard metric for assessing the significance of noise impacts in the EA, supplemental metrics are used to produce more detailed noise exposure information for the decision process and to improve communication with the public and stakeholders. Supplemental metrics are not intended to replace the DNL metric as the primary descriptor of cumulative noise exposure, but rather are useful tools to supplement the impact information disclosed by the DNL metric. For this proposed action, the Noise Analysis also included an analysis of the peak noise exposure to better describe the loudness of a single overflight event at the lowest proposed altitude (the floor) in each restricted area. In general, during training events, aircraft do not travel substantial distances on the floor of the restricted area, but rather start at the floor and climb to higher altitudes so the peak exposures reported in the Noise Analysis are not expected to occur frequently and would only last for a few seconds. It is estimated that aircraft would operate in the lowest altitude bands of each restricted area for only 10 to 15 percent of the training time. The peak noise exposure would vary depending on the type of aircraft and the engine power. In the proposed R-5307B/C (where the floor would be 10,000 feet), the maximum sound level that could be experienced by a receptor during an overflight, a metric known as L_{max},

would be 87 dB. The L_{max} lasts for only a fraction of a second, but an aircraft could be heard for several seconds or a few minutes depending on the surroundings of the receptor. This value represents outside noise. Outdoor-to-indoor noise level reduction provided by a building ranges from 25 dB (windows closed) to 15 dB (windows open); reducing the L_{max} to 62 dB (windows closed) to 72 dB (windows open).

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Finding of Effect

Based on previous identification efforts, the USMC has determined that 11 historic properties are located within the APE. In accordance with 36 CFR 800 5(a)(1), the USMC applied the criteria for adverse effects and found that the qualifying characteristics of these buildings will not be adversely affected by structural damage and secondary vibration from noise exposure under the proposed action. Subject to 36 CFR 800.5(b), the USMC has made a finding of "**No Adverse Effects**" to historic properties regarding the establishment of the two proposed restricted areas. The USMC recognizes that other cultural resources, some documented and some not yet discovered, exist under the proposed airspace. However, the undertaking will not affect historic structures and districts where setting is an important criterion for significance and where noise vibrations from noise could adversely impact those types of resources.

Consultation with Tribes

Government-to-government consultation with federally recognized Tribal Nations is also being conducted for this proposed undertaking per Executive Order 13175: *Memorandum on Government-to-Government Relations with Native American Tribal Governments*; Department of Defense (DoD) Instruction 4710.02: *DoD Interactions with Federally-Recognized Tribes*; Marine Corps Order 5090.2-Volume 8: *Cultural Resources Management;* and the NHPA implementing regulations at 36 CFR Part 800(f)(2). Based on our evaluation of currently known historic properties data for the proposed APE, we have applied the Assessment of Adverse Effects (36 CFR Part 800.5) to the proposed undertaking, and we have determined that the proposed action will not result in an adverse effect to significant cultural resources. However, we are seeking input from the tribes listed above to ensure that we have adequately identified historic properties of religious and cultural significance.

References

Committee on Hearing, Bioacoustics, and Biomechanics 1977. Guidelines for Preparing Environmental Impact Statements on Noise: Report of Working Group 69.

Federal Interagency Committee on Urban Noise 1980. Guidelines for Considering Noise in Land Use Planning and Control. June.

U.S. Environmental Protection Agency (USEPA). 1982. Guidelines for Noise Impact Analysis. EPA Report No. 55/9-82-105. April.

Appendix B
Airspace Impact Analysis

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AIRSPACE IMPACT ANALYSIS TO SUPPORT PROPOSED RESTRICTED AREAS, R-5305 AND R-5307

April 2025

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AIRSPACE IMPACT ANALYSIS TO SUPPORT PROPOSED RESTRICTED AREAS, R-5305 AND R-5307

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ACRONYMS AND ABBREVIATIONS

~	approximately
A-	Alert Area
AGL	above ground level
ARTCC	Air Route Traffic Control Center
ATC	Air Traffic Control
DoD	Department of Defense
EA	Environmental Assessment
FAA	Federal Aviation Administration
FL	Flight Level
FY	Fiscal Year
IFR	Instrument Flight Rules
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCIEAST	Marine Corps Installations East
MSL	mean sea level
MOA	Military Operations Area
NAVAID	navigational aid
NOTAM	Notice to Air Missions
OPAREA	Operations Area
PDARS	Performance Data Analysis and Reporting System
R-	Restricted Area
SUA	Special Use Airspace
SWIM	System Wide Information Management
U.S.	United States
UAS	Unmanned Aircraft Systems
USAF	U.S. Air Force
USMC	U.S. Marine Corps
USN	U.S. Navy
VFR	Visual Flight Rules
W-	Warning Area

1.0 INTRODUCTION

This airspace impact analysis is in support of an Environmental Assessment (EA) and a proposal to the Federal Aviation Administration (FAA) to establish new Special Use Airspace (SUA) in eastern North Carolina to support current and future training requirements of the Marine Corps. The current SUA does not meet the criterion established in Marine Corps Reference Publication 7-20B.1, *Operational Training Ranges Required Capabilities*, or meet future weapon system requirements to meet the Marine Corps Title 10 United States (U.S.) Code Section 5063 requirements. The Marine Corps Installations East (MCIEAST) seeks to acquire only that airspace which is essential to support Marine Corps missions and use that airspace in a responsible manner. This analysis provides a detailed assessment of the potential impacts to civil aviation associated with the proposed Restricted Area (R-) 5305 and R-5307.

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2.0 REGION OF INFLUENCE

2.1 DESCRIPTION OF PROPOSED RESTRICTED AREAS

As shown in **Figure 2.1-1**, the two restricted area proposals analyzed in this assessment are contiguous to existing SUA (other restricted areas and Military Operations Areas [MOAs] collectively known as the Cherry Point Operations Area [OPAREA]) and would provide a continuity of training operations for the Marine Corps.

2.1.1 Restricted Area 5305

The proposed R-5305 would be located approximately 1 mile south of McCuthcheon Field at Marine Corps Air Station (MCAS) New River (Airport ID: KNCA) and west of Marine Corps Base (MCB) Camp Lejeune. R-5305 would be further subdivided into three separate blocks of airspace: R-5305A, R-5305B, and R-5305C. The altitudes of R-5305 would be surface up to but not including Flight Level (FL) 180 or 18,000 feet mean sea level (MSL). However, when subdivided, R-5305A would be surface up to but not including 7,000 feet MSL, R-5305B would be 7,000 feet MSL up to but not including 10,000 feet MSL, and R-5305C would be 10,000 feet MSL up to but not including FL180 (**Figure 2.1-2).** For reference, the proposed R-5305 has been overlaid on Visual Flight Rules (VFR) sectional chart (**Figure 2.1-3)** and on Instrument Flight Rules (IFR) Low chart (**Figure 2.1-4**).

R-5305 would be located in between the eastern boundary of R-5303/R-5304 and western boundary of R-5306. Essentially, the proposed R-5305 would fill in the gap between R-5303, R-5304, R-5306, and Hatteras MOA. The northern boundary of R-5305A penetrates the MCAS New River Air Traffic Control (ATC) Tower's Class "D" airspace and would allow for seamless transition between the airport environment and SUA with coordination. Furthermore, connecting these sections of SUA would create a more robust training environment for legacy and next generation aircraft, increase maneuverability around target areas along with reducing the potential for airspace spill-outs. R-5305 would support operations from various military aircraft to include AV-8B, AH-1, CH-53, MV-22, UH-1, F-18A/C, fifth generation (F-35B/C) aircraft and Unmanned Aircraft Systems (UAS). Other users may include U.S. Air Force (USAF), U.S. Navy (USN) jet aircraft, and U.S. Army rotary-wing aircraft.

The published times of use would for R-5305A would be Monday through Friday, 0600–0000 (midnight) local and other times by Notice to Air Missions (NOTAM), R-5305B and R-5305C times of use would be intermittent by NOTAM. The Controlling Agency for R-5305A and R-5305B would be U.S. Marine Corps (USMC), MCAS Cherry Point Center Radar Approach Control, and for R-5305C, Washington Air Route Traffic Control Center (ARTCC). The Using Agency would be USMC, Commanding General, MCB Camp Lejeune, North Carolina.

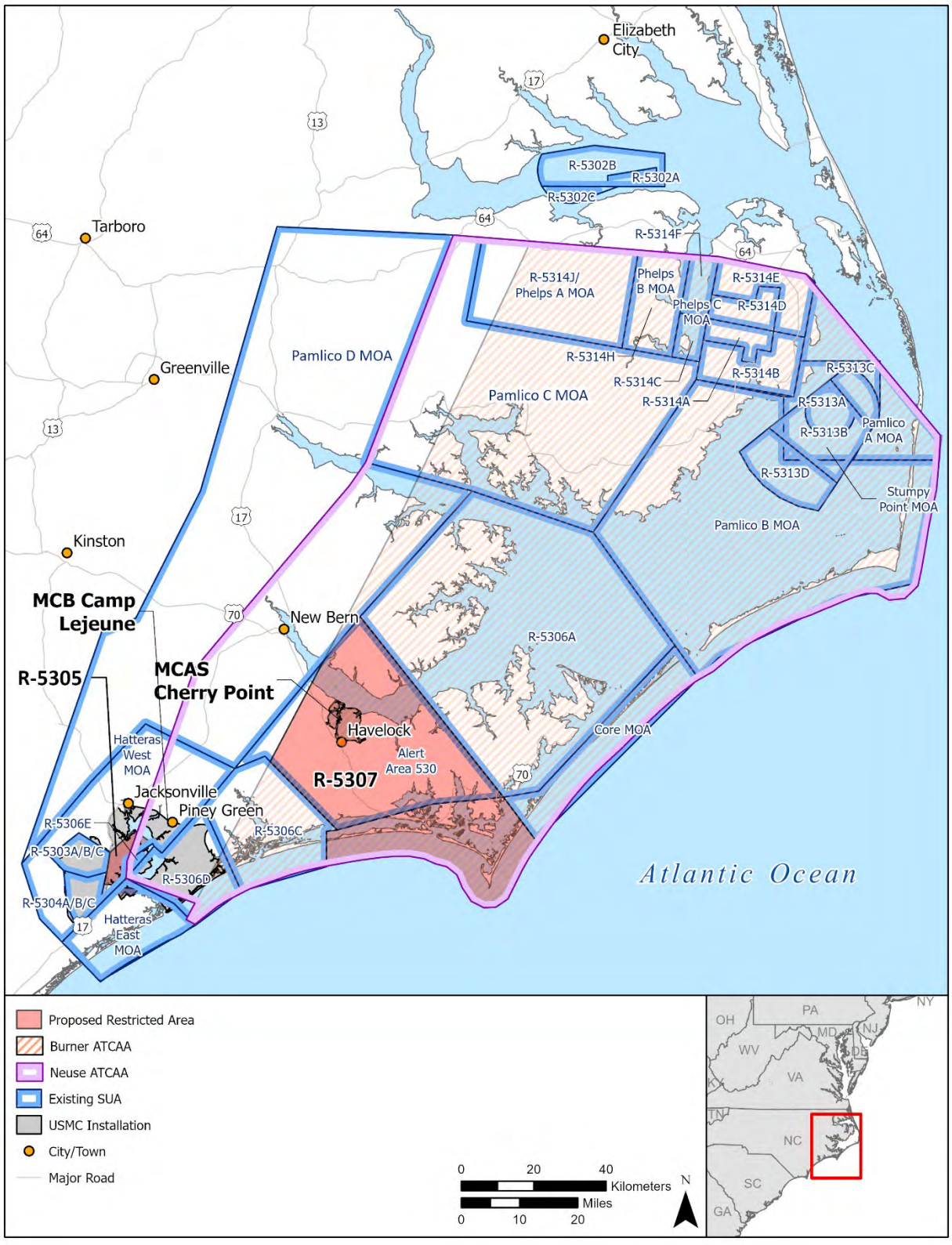

Figure 2.1-1 Overview of Proposed Restricted Areas

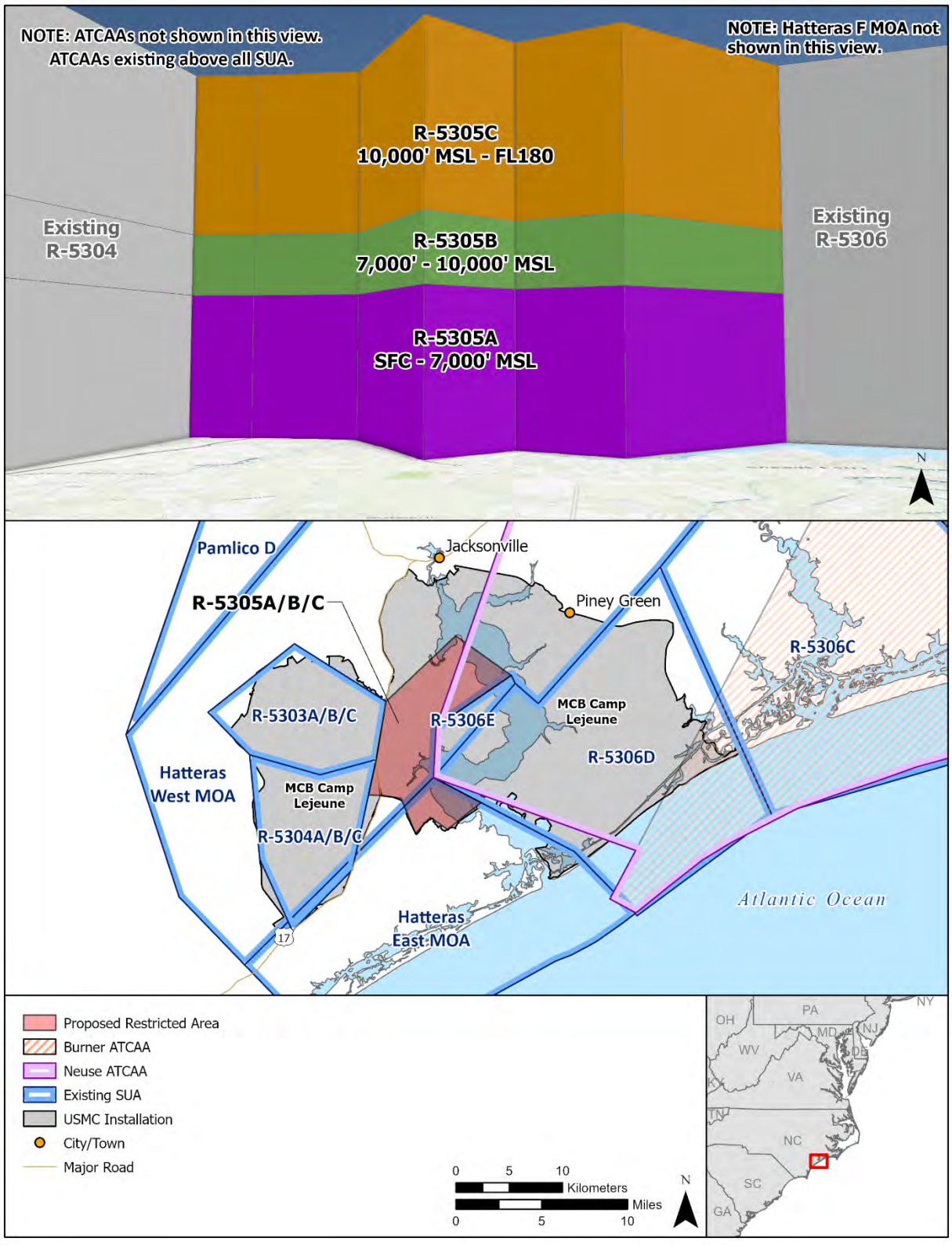

Figure 2.1-2 Proposed Restricted Area R-5305

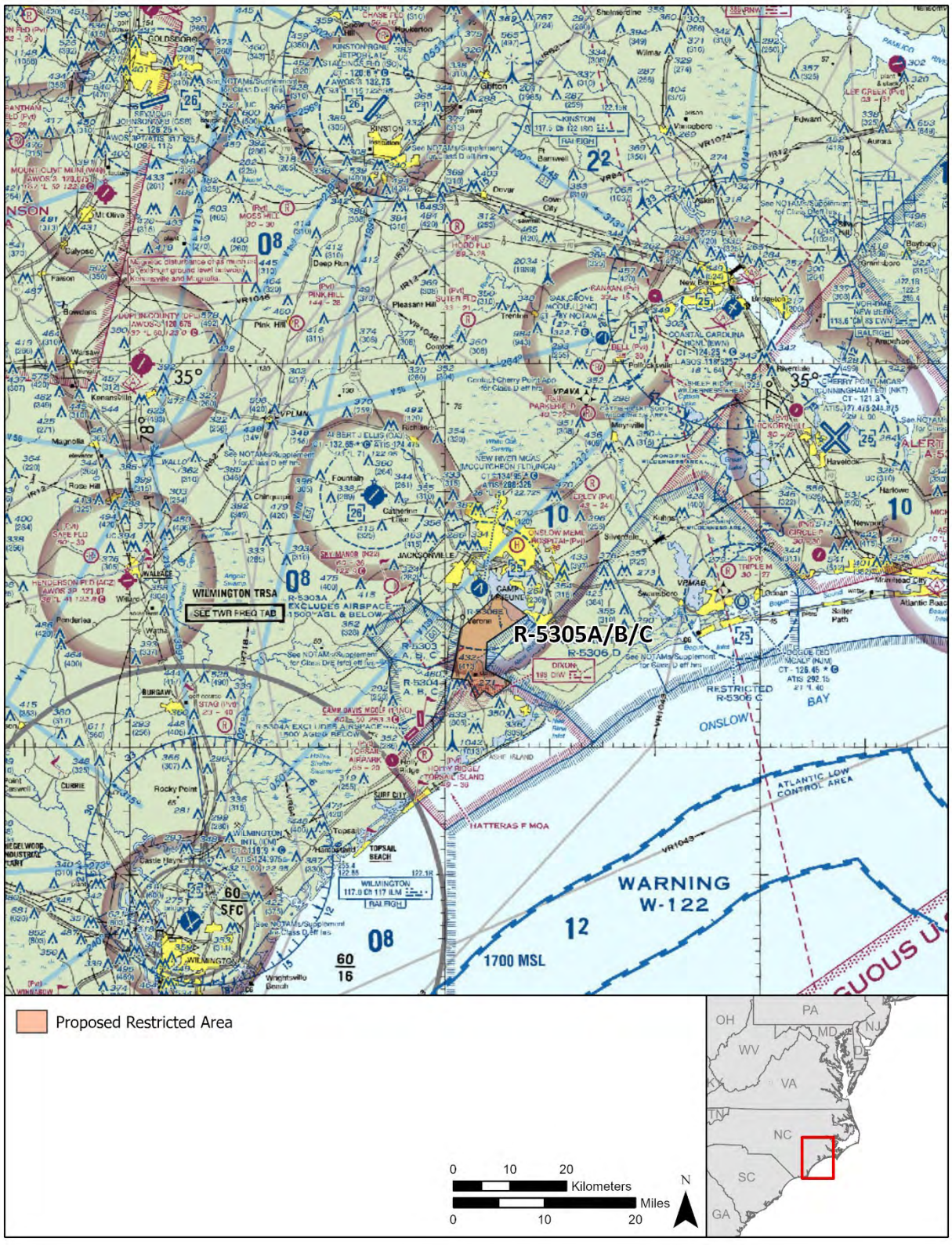

Figure 2.1-3 Proposed Restricted Area R-5305 (VFR Sectional Chart View)

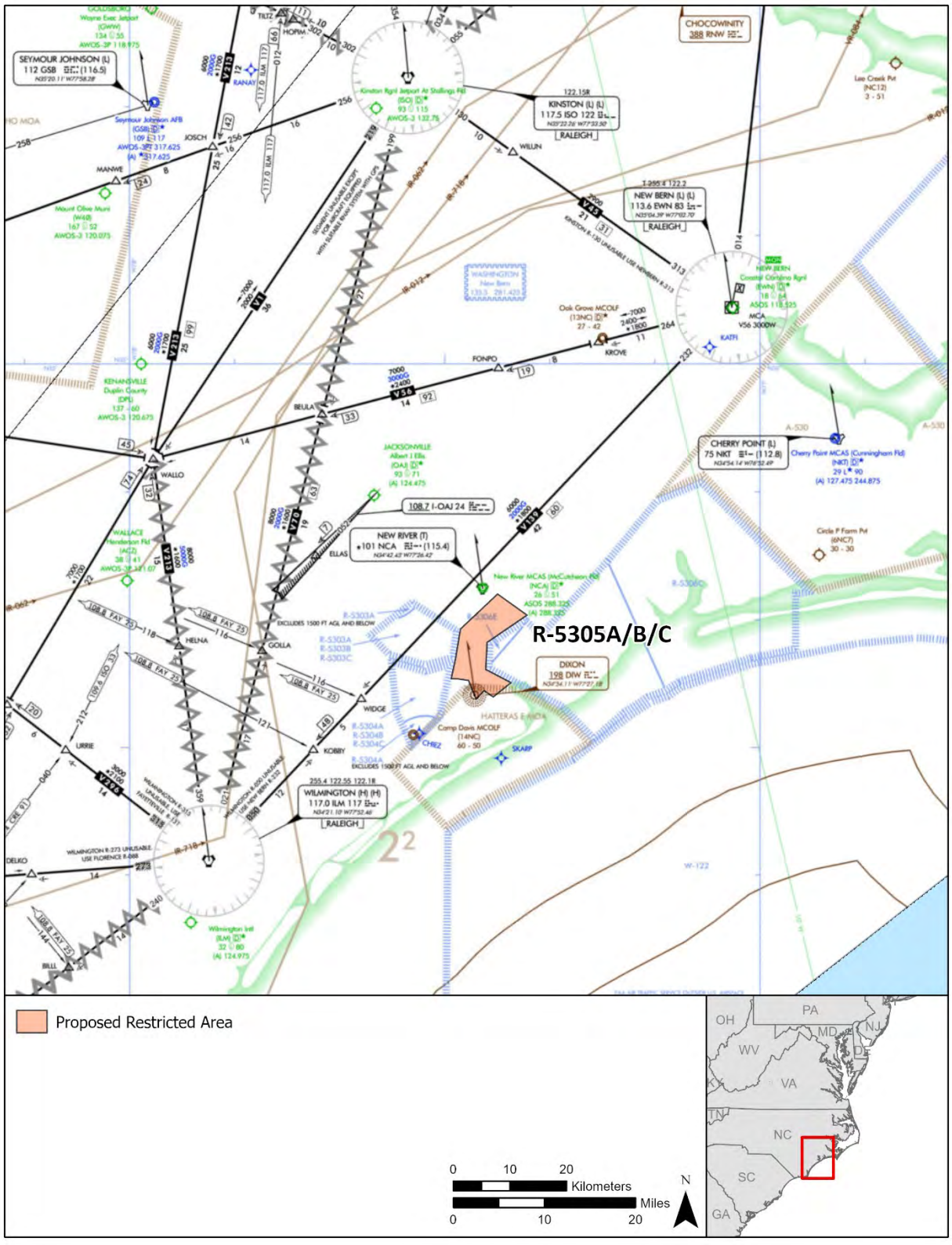

Figure 2.1-4 Proposed Restricted Area R-5305 (IFR Low Chart View)

2.1.2 Restricted Area 5307

The proposed R-5307 would replace the existing Alert Area (A-) 530 and expand the lateral and vertical boundary. An Alert Area is established to inform non-participating pilots of areas that contain a high volume of pilot training operations, or an unusual type of aeronautical activity, that they might not otherwise expect to encounter. Pilots are advised to be particularly alert when flying in this area. Alert Areas do not impose restrictions on aircraft, while restricted areas do. The proposed R-5307 altitude in whole would be 2,500 feet above ground level (AGL) up to FL290. However, R-5307 would be subdivided by altitude blocks into three subsections: R-5307A, R-5307B, and R-5307C. The proposed R-5307A would have almost the same footprint of the current A-530 and exist from 2,500 feet AGL up to but not including 10,000 feet MSL. The altitudes of R-5307A would be established above the MCAS Cherry Point ATC Tower's Class "D" airspace. R-5307 B/C would exist above R-5307A but would have a larger footprint covering additional areas to the south and east over the barrier islands. R-5307B would be 10,000 feet MSL up to but not including FL180, and R-5307C would be FL180 up to FL290 (**Figure 2.1-5**). For reference, the proposed R-5307A/B/C is overlain on the VFR section chart (**Figure 2.1-6**) and the IFR low chart (**Figure 2.1-7**).

R-5307B and R-5307C would expand the lateral confines of the eastern boundary to the Warning Area (W-) 122 boundary. The proposed R-5307 would be adjacent to existing R-5306 areas, Core MOA and W-122. Establishing R-5307 would link adjacent SUA enabling the use of a much larger section of airspace. By doing so allows the user to operate in a larger airspace with more training capabilities. Additionally, changing A-530 into a restricted area would increase flight safety due to restricting non-participating aircraft from entering the airspace. R-5307 would serve the USMC and would also support FA-18E/Fs from several USN Carrier Air Wings. Additionally, the airspace would serve various other platforms like the F-15E, F-22, C-130, KC-135, KC-10, and UAS.

The published times of use would be: R-5307A and R-5307B, intermittent by NOTAM; and R-5307C, Monday through Friday, 0800 through 0000 (midnight) local, other times by NOTAM. The Controlling Agency for R-5307A and R-5307B would be USMC, MCAS Cherry Point Center Radar Approach Control, and for R-5307C Washington ARTCC. The Using Agency would be USMC, Commanding Officer, MCAS Cherry Point, North Carolina.

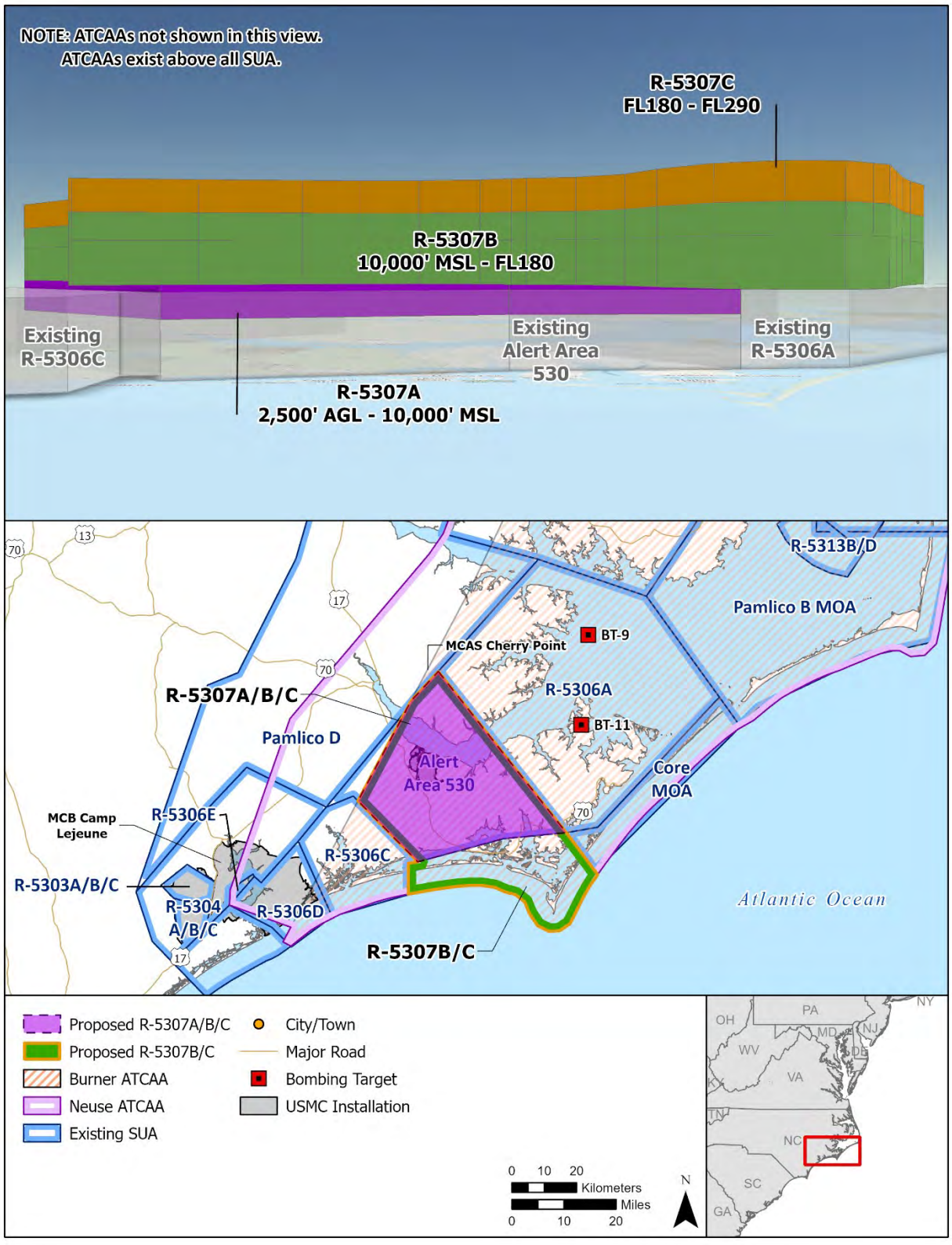

Figure 2.1-5 Proposed Restricted Area R-5307

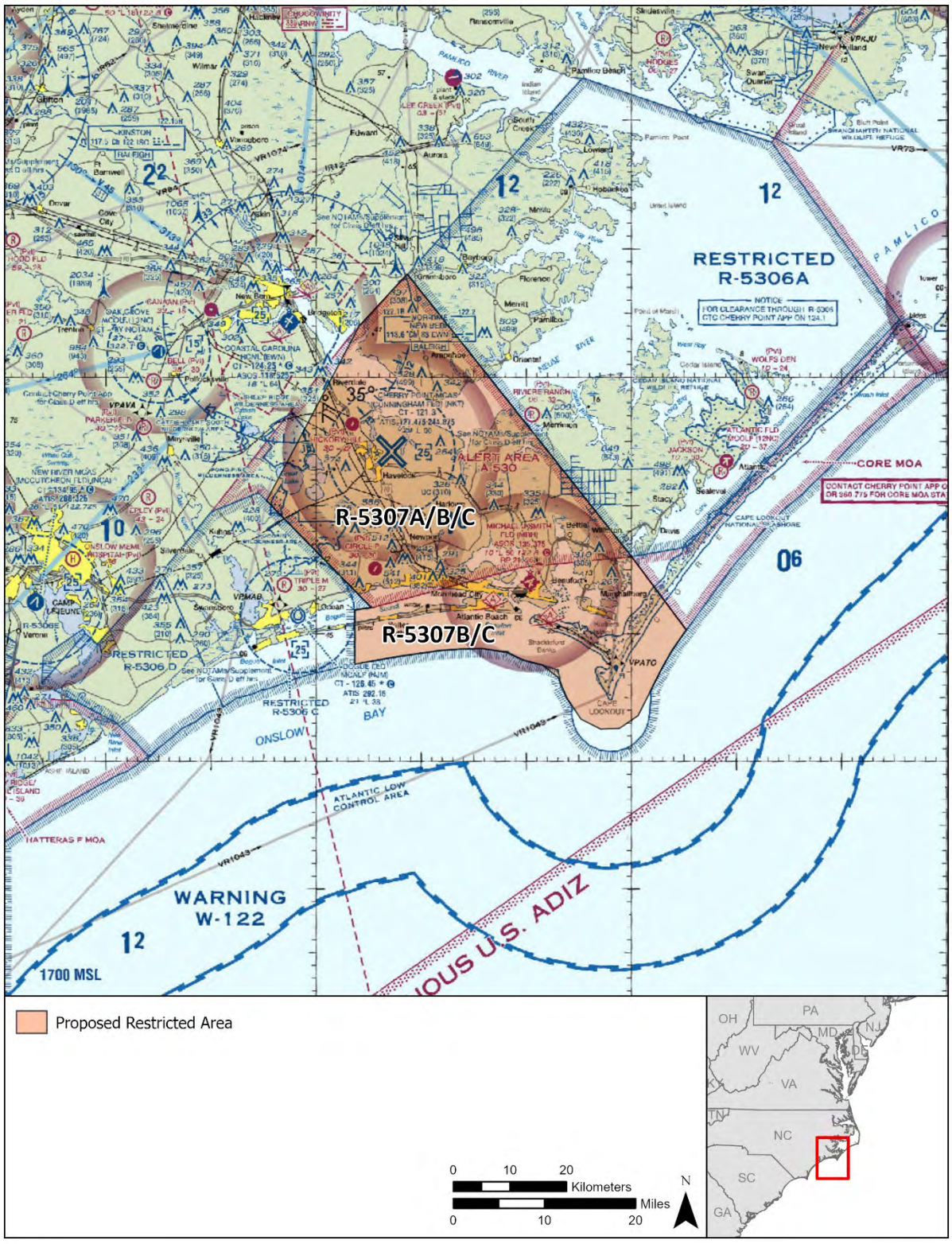

Figure 2.1-6 Proposed Restricted Area R-5307 (VFR Sectional Chart View)

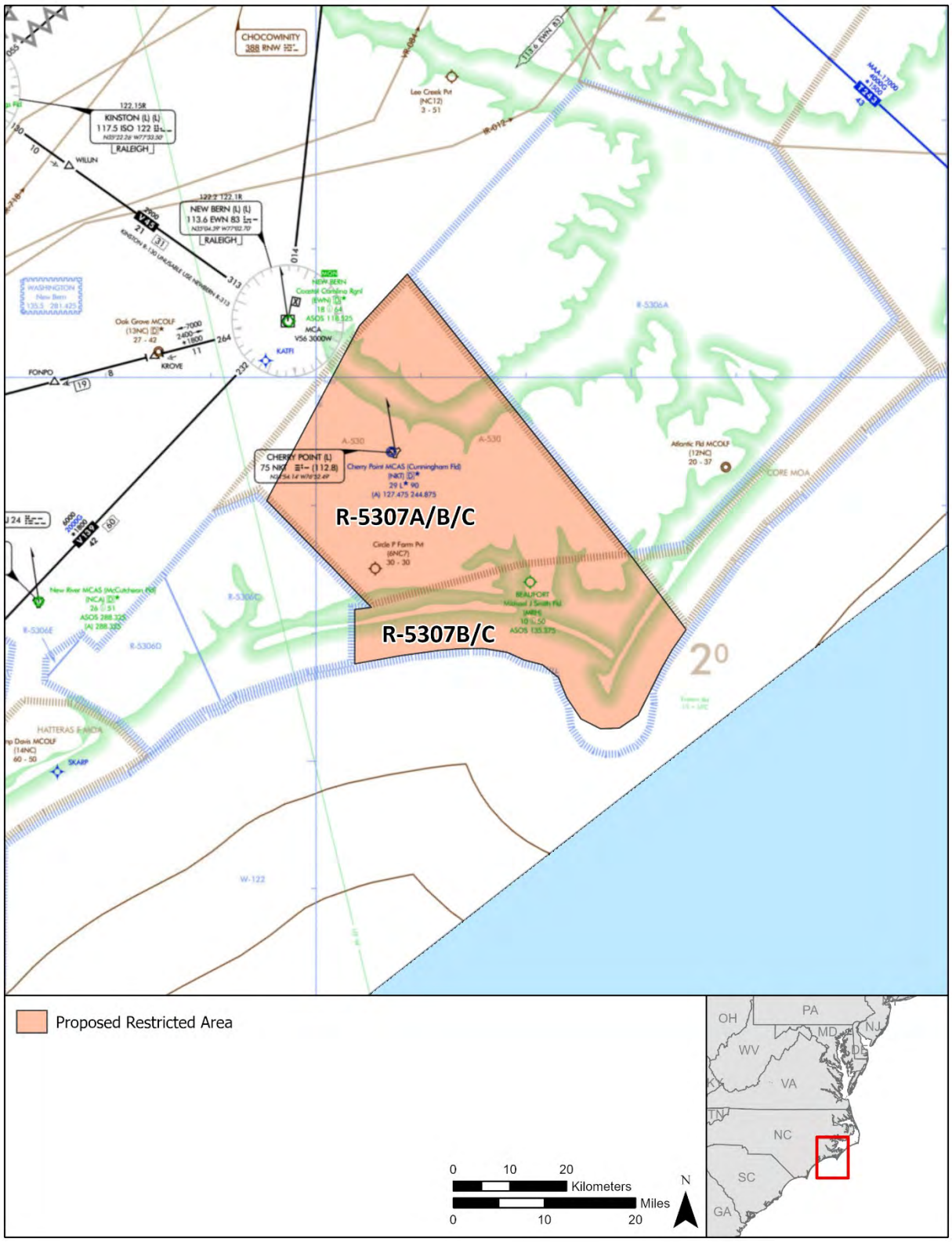

Figure 2.1-7 Proposed Restricted Area R-5307 (IFR Low Chart View)

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3.0 METHODOLOGY

3.1 DATA SOURCE

To analyze the existing traffic in the region of influence, a request was made to the FAA to use its Performance Data Analysis and Reporting System (PDARS) data from Washington Center in conjunction with System Wide Information Management (SWIM) radar data from Raleigh-Durham Tower, Jacksonville Tower, and Terminal Radar Approach Control. PDARS and SWIM data contain flight track data, as well as flight plan information. These two sets of radar data (PDARS and SWIM) had overlapping coverage of the region of influence and were merged to form a single dataset for the analysis. The dataset was reviewed for errors and omissions through a data validation process. A year's worth of daily flight track data was collected (Fiscal Year [FY] 2022: October 1, 2021 through September 30, 2022) (ATAC 2023). The information in the combined dataset includes the elements in **Table 3.1-1**.

Table 3.1-1 Data Elements Included in PDARS/SWIM List

Sector	Aircraft Type
Enter Sector (Date/Time)	Exit Sector (Date/Time)
Enter Location (Lat/Long)	Exit Location (Lat/Long)
Enter Speed	Exit Speed
Enter Altitude	Exit Altitude
Beacon Code	IFR/VFR
Category of Aircraft	Military/Civilian
Origin Airport	Destination Airport

Legend: Lat/Long = Latitude/Longitude; IFR/VFR = Instrument Flight Rules/Visual Flight Rules; PDARS = Performance Data Analysis and Reporting System; SWIM = System Wide Information Management

3.2 FILTERING OF FLIGHT TRACKS

For each proposed restricted area, all historical flight tracks from the radar data that passed through the proposed lateral boundaries and within the proposed altitudes were identified. The intent of this is to determine the number of aircraft that would be impacted by activation of the proposed airspace. The magnitude of the impact will be determined based on the changes required to avoid the proposed airspace during times of activation.

For each of the flight tracks that crossed the proposed SUA, the origin and destination airport were identified and counted—providing a list of the number of flights per year traveling to and from each airport. The number of unique combinations of origin and destination airports was in the hundreds, with many combinations occurring only once. The list was reduced to focus on the most frequently occurring airport origin-destination pairings, to represent the majority of traffic potentially affected by the proposed airspace and produce a manageable and meaningful analysis. Impacts to military aircraft are not considered—the assumption is that Department of Defense (DoD) activation of the proposed restricted areas indicates acceptance of the impacts to their other aircraft for the duration of the airspace activation. Impacts are counted for non-military aircraft only.

One characteristic of the PDARS/SWIM dataset is that there are a lot of aircraft for which the category is listed as "Unknown," indicating that there are one or more data fields missing, to properly identify them. In this analysis, the unknowns were further filtered to determine if some were identifiable based

on other data fields. The following steps were conducted to categorize as many unknown flight tracks as possible:

1. Unknown aircraft flying on local military-assigned ATC beacon codes were considered military aircraft.
2. Any unknown aircraft which departed from and landed at a military airfield was considered military.
3. Any unknown aircraft below 10,000 feet MSL traveling at a speed more than 300 knots was classified as military.
4. Any unknown aircraft seen to be using the Landing Helicopter Deck or dirt strip at MCB Camp Lejeune was considered a military aircraft.

3.3 IMPACTS TO FLIGHTS

The distance between each of the most common origin-destination pairings was calculated point to point in a straight line. Though this is not likely the actual routing used, it represents a best-case straight line distance directly from the origin airport to the destination airport. An advanced electronic flight planning software program was used to determine the shortest distance (between two points) for the route between the two airports to serve as the baseline.

To determine the potential impact to these common flights that cross the proposed restricted area, an alternative routing was calculated using a navigational aid (NAVAID) or intermediate "fix" that would route these flights outside the proposed restricted area. Routes were identified from origin to the intermediate fix, and from the intermediate fix to the destination, and added together to produce the total distance between the origin and destination that would result from rerouting flights around the proposed restricted areas. The change in distance was calculated by comparing the baseline straight line routing to the alternative routing using NAVAIDs. The change in flight time (i.e., "extra minutes" needed to navigate around proposed SUA) was determined using a speed estimate. For aircraft crossing the Restricted Area altitudes, the assumed true airspeed is 180 or 220 knots (dependent on type) for aircraft below 10,000 feet, and 330 knots for those between 10,000 and 18,000 feet MSL. These airspeed numbers are based on the averages in the dataset for the particular altitude bands. All calculations assume no wind.

An example of this rerouting methodology is depicted in **Figure 3.3-1**. The green line shows the direct routing between New Bern (KEWN) and Wilmington International Airport (KILM). This line intersects the proposed R-5305A area, depicted with blue shaded edges. The intermediate fix required to ensure an aircraft remains clear of R-5305A would be the GOLLA intersection. The course shown in blue is the flight track that goes from KEWN–GOLLA–KILM as an alternative to flying through the proposed R-5305A. GOLLA intersection would provide the required 3-mile lateral separation from R-5303. This route change adheres to existing separation requirements for R-5303. Internal ATC coordination procedures would allow for various deconfliction measures to ensure non-participating aircraft and restricted airspace separation. This methodology is representative of the approach taken for all sections of restricted area in this study. In this way, a flight plan that allows for avoidance of the proposed airspace can be compared in distance and time to the best/shortest possible routing available in the absence of the proposed airspace.

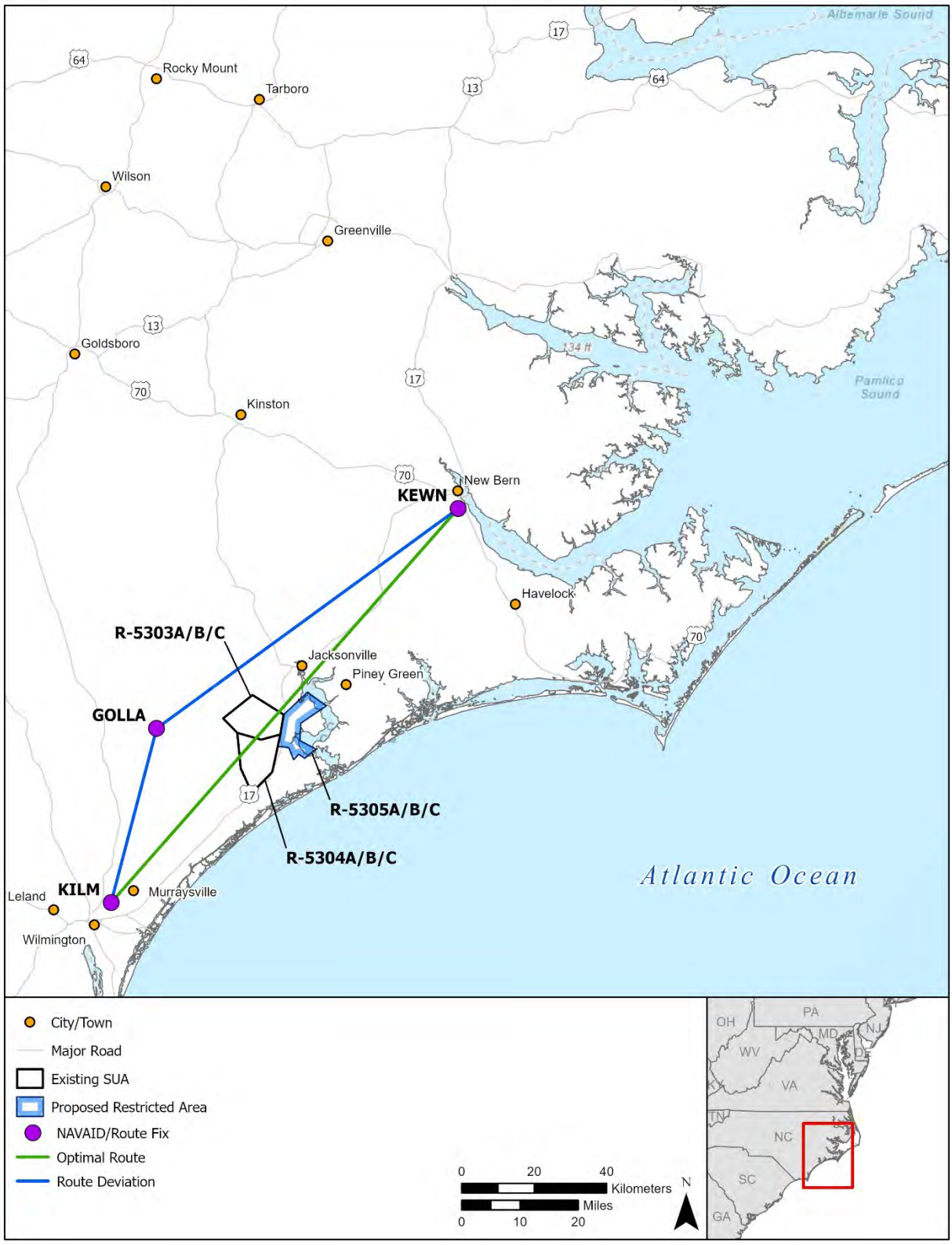

Figure 3.3-1 Example of Direct Flight Plan Compared to Route Deviation to Avoid SUA

3.4 SUA SCHEDULING AND ACTIVATION

In this document, several different terms are used to describe the use of the proposed restricted areas at various times during the day. The definitions are below and reference **Figure 3.4-1**, which shows a notional depiction of the calendar for part of a fictional day regarding use of a particular SUA.

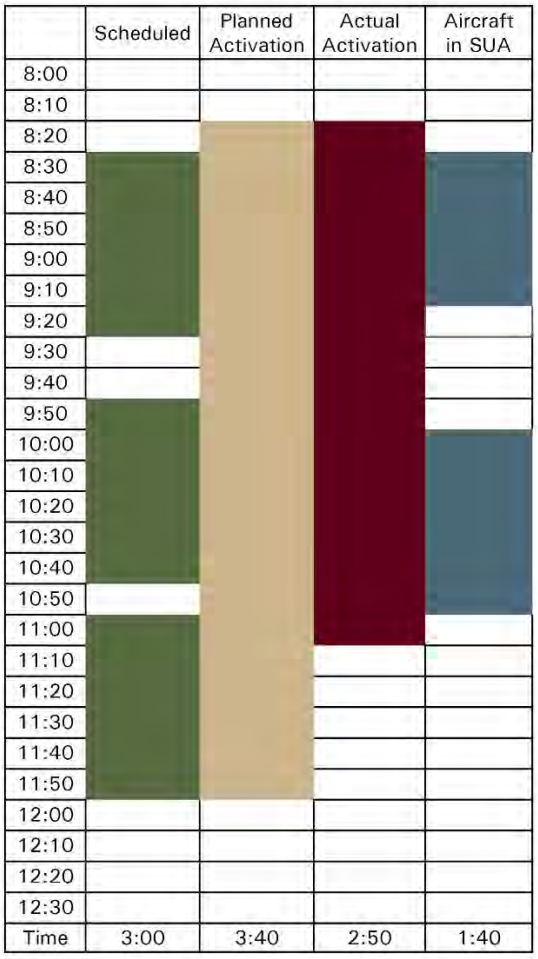

Figure 3.4-1 Notional Partial-Day Schedule for SUA

Scheduled. When a military flying unit wants to use a particular restricted area, it will be scheduled ahead of time with central scheduling for discreet time blocks. For instance, in order to accomplish a particular training event, a squadron may schedule a restricted area for 1 hour, with the intent to have multiple aircraft use it for that hour. In **Figure 3.4-1**, the green bars show three separate 1 hour periods.

Planned Activation. When military users schedule a particular restricted area for discreet blocks of time, with only short times in between, the airspace will generally be considered "active" during this down period. The process of returning airspace for a short period of time would generate more work for controllers while not providing appreciable benefit to potential airspace users. In the example shown in **Figure 3.4-1**, there are two short "gap" times between military scheduled use, one of 20 minutes, and one of 30 minutes. In cases like these, the planned activation time (shown as tan in color) will include those small gaps. It is generally more efficient for all users of the airspace to plan for airspace activation

times that cover these small discreet gaps. Also note that the activation typically begins slightly before the arrival of the first military user, so essentially there should be no delay for entering into the SUA. In the example shown in **Figure 3.4-1**, the planned activation would begin 10 minutes prior to the first user, and last until the last user leaves the airspace, per the schedule. SUA activation times can be retrieved from the FAA's SUA website, sua.faa.gov.

Actual Activation. This is the amount of time that the SUA is activated in real time, and accounts for any changes from the plan. In the example shown in **Figure 3.4-1**, the actual activation time is shown in maroon. The airspace is activated as planned at 8:20, 10 minutes prior to the first scheduled user's arrival in the airspace. It is kept activated (per the plan) until it is apparent that the third user, scheduled to begin at 11:00, will not be using the airspace, at which time the SUA is deactivated, and is therefore available for other uses. A cancellation of scheduled SUA time can happen for a multitude of reasons, including maintenance problems with the aircraft or weather conditions that preclude the aircraft from either flying or completing the training as planned. Actual activation of a restricted area is what would restrict VFR/IFR aircraft from flying through that section of airspace.

Aircraft in SUA. This is simply the time that military aircraft are present in the activated SUA. In the example shown in **Figure 3.4-1**, aircraft presence in the SUA is shown with the blue bars. The first scheduled user arrives on time at 8:30 and departs about 10 minutes early at 9:20 (perhaps from training being complete, being low on fuel, or some other reason). The second event shown is scheduled from 9:50 until 10:50, but the aircraft arrives to the airspace late (at 10:00), and leaves per their schedule. The third event is cancelled and will not use the airspace as scheduled. When the ATC learns that the SUA will not be used as scheduled, the FAA is informed through internal coordination procedures, and the SUA deactivated. Once deactivated, ATC will allow aircraft to travel through the confines of the SUA. Non-participating aircraft will be rerouted or vectored by ATC to ensure approved separation exits. Aircraft using a MEDEVAC callsign are afforded priority handling where the restricted area would be required to go "cold" to allow a transition through. Emergency aircraft have the right of way over all other air traffic and would also have the restricted area go "cold" to allow a transition. The pilot of civil aircraft should always plan for deviations around active restricted areas.

In summary, **Figure 3.4-1** shows four different schedule terms that will be discussed in this document. In this example, the hypothetical SUA was "Scheduled" for 3 hours. It was planned to be activated for a single long block of 3 hours, 40 minutes. Its actual activation time (in real time) was just 2 hours and 50 minutes. And of that, there were military aircraft actively present in the MOA for 1 hour and 40 minutes. These numbers will change every day—and the sections that follow will use these terms to describe the impacts of the proposed action on civil traffic (to include Air Carrier, Air Taxi, and General Aviation).

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4.0 POTENTIAL IMPACTS TO NON-PARTICIPATING AIRCRAFT

4.1 RESTRICTED AREA 5305

4.1.1 Proposal

Table 4.1-1 shows that the proposed R-5305 would be used for up to 1,140 sorties per year. This results in a requirement for airspace activation of R-5305A for 8 hours per day for up to 150 days annually. R-5305B and R-5305Cwould be active for 4 hours a day for up to 30 days annually. The 1,440 hours of total annual activation (which includes gaps anticipated between flights) represent about 31% of the total time available between Monday and Friday, 0600 – 0000 Local (proposed times of use for R-5305A).

Table 4.1-1 Military Usage of Proposed R-5305

Metric	R-5305	Assumptions
Number of Proposed Sorties	1,140	
Hours per Year – Activation R-5305A R-5305B R-5305C	 1,200 120 120	 Total activation time = 1,440 hours
Hours per Day - Activation R-5305A R-5305B R-5305C	 8 4 4	 150 days per year 30 days per year 30 days per year
% Time Military Aircraft Present	~ 31%	Monday to Friday, 0600–0000 Local
% Time SUA Activated R-5305A R-5305B R-5305C	 ~ 26% ~ 2% ~ 2%	 Monday to Friday, 0600–0000 Local

Note: One sortie includes the takeoff, mission, and landing of one aircraft averaging 1.3 hours each.
Legend: ~ = approximately; % = percent; SUA = Special Use Airspace

4.1.2 Flights Impacted by the Proposal

4.1.2.1 Total Traffic

During the year examined (FY22), 9,180 flights transited the area of the proposed R-5305A during the proposed times of use (Monday through Friday,0600–0000 Local). The categories of flights are illustrated in **Table 4.1-2**. Of those, 524 (approximately [~] 6 percent) of the flights through this airspace on an annual basis were civilian or unknown flights.

Table 4.1-2 FY22 Flights in Proposed R-5305A

Category	Traffic Count (FY22)	Filtered Dataset for Analysis
Air Carrier	4	4
Air Taxi	20	20
General Aviation	168	168
Military	8656	0
Unknown	332	332
TOTAL	**9,180**	**524**

Legend: FY = Fiscal Year

The area of the proposed R-5305B had 135 flights transit this airspace. Of those, 54 (40 percent) were identified as civilian or unknown. The categories of flights are illustrated in **Table 4.1-3**.

Table 4.1-3 FY22 Flights in Proposed R-5305B

Category	Traffic Count (FY22)	Filtered Dataset for Analysis
Air Carrier	3	3
Air Taxi	3	3
General Aviation	47	47
Military	81	0
Unknown	1	1
TOTAL	**135**	**54**

Legend: FY = Fiscal Year

The area of the proposed R-5305C had 246 flights transit this airspace. Of those, 87 (35 percent) were identified as civilian or unknown. The categories of flights are illustrated in **Table 4.1-4**.

Table 4.1-4 FY22 Flights in Proposed R-5305C

Category	Traffic Count (FY22)	Filtered Dataset for Analysis
Air Carrier	11	11
Air Taxi	6	6
General Aviation	67	67
Military	159	0
Unknown	3	3
TOTAL	**246**	**87**

Legend: FY = Fiscal Year

The result of filtering the FY22 dataset determined that there were 524 non-military flights that crossed R-5305A, 54 non-military flights that crossed R-5305B, and 87 non-military flights that crossed R-5305C. These aircraft could potentially be impacted by the establishment of this airspace. These are low numbers, primarily because the proposed restricted areas are bounded by the R-5303/5304 and R-5306D areas, and most civil traffic would already be most often routed around the geographic area of the proposed R-5305.

4.1.2.2 Potential Impacts to Civil/Unknown Traffic in the Proposed R-5305A

Of the 524 recorded civil/unknown flights in FY22 that flew through the airspace encompassing the proposed R-5305A, a majority of them had no origin or destination airport, or aircraft type recorded. It is expected that many of these are pop-up contacts from military helicopters operating in the adjacent airspace, based on the locations and recorded airspeeds. Since they are categorized as "unknown," however, it was assumed that they could be civil aircraft and have been counted in the totals of potentially impacted flights. Fifty-seven percent of them, where there were known origins and destinations and were flown more than three times per year fell into the pairings listed in **Table 4.1-5**.

Table 4.1-5 Airport Pairings for Civil/Unknown Flights Through Proposed R-5305A

Origin	Destination
KEWN	KILM
KILM	KEWN
KEWN	KEWN
KILM	KMRH
KOAJ	NR32
KOAJ	KOAJ
KSUT	KEWN
KILM	KILM
KMQI	KILM
KMRH	KILM
KN21	NR32

Legend: KEWN = New Bern; KILM = Wilmington; KMQI = Dare County Regional; NR32 = Topsail Island; KMRH = Michael J. Smith (Beaufort, NC); KOAJ = Jacksonville, NC; KSUT = Cape Fear Regional Jetport; KN21 = Holly Ridge

Some of these pairings were "Round-Robin" flights, with the aircraft taking off and landing at the same location. It is assumed that these flights would not be burdened (by additional flight time or fuel cost) by activation of a new restricted area. Additionally, avoidance procedures to go around the proposed R-5305A would be the same in either direction, so those are opposite pairings and are analyzed as one. Note that two of these pairings do not have direct routing that goes through this airspace and would not necessarily require a longer route if the proposed SUA was activated. The fact that they flew through this area in the past may be due to a combination of reasons, ranging from VFR operations (or cancellation of IFR), non-optimal routing due to weather or traffic, or other reasons. Note that the R-5305 is in a location bounded by the R-5303A/B/C, R-5304 A/B/C, and R-5306D airspace, and the low numbers of flights in this area in FY22 is likely due to aircraft avoiding the surrounding SUA.

Table 4.1-6 Potential Impacts to Civil/Unknown Operations Due to Proposed R-5305A

Airport Pair	Straight Line Distance (nm)	Intermediate Fix	Distance via Intermediate Fix (nm)	%Change in distance	Extra Minutes
KEWN - KILM	64	GOLLA	68	3%	1
KILM-KMRH	67	WIDGE	71	4%	1
KOAJ-NR32	21	Not needed	-	0	0
KSUT-KEWN	85	GOLLA	90	4%	1
KMQI-KILM	147	GOLLA	151	4%	1

Legend: % = percent; KEWN = New Bern; KILM = Wilmington; KOAJ = Jacksonville, NC; KSUT = Cape Fear; KMQI = Dare County Regional; KMRH = Michael J. Smith (Beaufort, NC); NR32 = Holly Ridge/Topsail Island; nm = nautical miles

4.1.2.3 Potential Impacts to Civil/Unknown Traffic in the Proposed R-5305B

There were 54 recorded civil/unknown flights in FY22 that flew through the airspace encompassing the proposed R-5305B. Many airport pairings were only used once in the year. **Table 4.1-7** shows the airport pairings which were used more than once in the year.

Table 4.1-7 Airport Pairings for Civil/Unknown Flights Through Proposed R-5305B

Origin	Destination
KILM	KEWN
KILM	KILM
KMQI	KILM
KCRE	KOAJ
KILM	KMRH

Legend: KEWN = New Bern; KILM = Wilmington; KMQI = Dare County Regional; KCRE = Myrtle Beach; KMRH = Michael J. Smith (Beaufort, NC); KOAJ = Jacksonville, NC

One of these pairings was a "Round-Robin" flight, with the aircraft taking off and landing at the same location. It is assumed that these flights would not be burdened (by additional flight time or fuel cost) by activation of a new restricted area. Additionally, avoidance procedures to go around the proposed R-5305B would be the same in either direction, so those opposite pairings are analyzed as one. Note that one of these pairings does not have direct routing that goes through this airspace and would not necessarily require a longer route if the proposed SUA was activated. The fact that they flew through this area in the past may be due to a combination of reasons, ranging from VFR operations (or cancellation of IFR), non-optimal routing due to weather or traffic, or other reasons. Note that the R-5305 is in a location bounded by the R-5303A/B/C, R-5304 A/B/C, and R-5306D airspace, and the low numbers of flights in this area in FY22 is likely due to aircraft avoiding the surrounding SUA.

Table 4.1-8 Potential Impacts to Civil/Unknown Operations Due to Proposed R-5305B

Airport Pair	Straight Line Distance (nm)	Intermediate Fix	Distance via Intermediate Fix (nm)	%Change in distance	Extra Minutes
KILM-KEWN	64	GOLLA	68	3%	1
KMQI-KILM	147	GOLLA	151	4%	1
KCRE-KOAJ	82	Not needed	-	0	0
KILM-KMRH	67	WIDGE	71	4%	1

Legend: % = percent; KCRE = Grand Strand; KEWN = New Bern; KILM = Wilmington; KMQI = Dare County Regional; KMRH = Michael J. Smith (Beaufort, NC); KOAJ = Jacksonville, NC; nm = nautical miles

4.1.2.4 Potential Impacts to Civil/Unknown Traffic in the Proposed R-5305C

There were 87 recorded civil/unknown flights in FY22 that flew through the airspace encompassing the proposed R-5305C. Many airport pairings were only used once in the year. **Table 4.1-9** shows the airport pairings which were used more than once in the year.

Table 4.1-9 Airport Pairings for Civil/Unknown Flights Through Proposed R-5305C

Origin	Destination
KEWN	KCLT
KILM	KHSE
KILM	KILM
KILM	KMQI
KILM	KPHL
KILM	TXKF
KILM	EGPH
KLGA	KILM
KMIA	KMRH
KMRH	KMIA
KMQI	KILM
KSUA	KMRH
KAPF	KILM
TXKF	KILM

Legend: KEWN = New Bern; KCLT = Charlotte Douglas; KILM = Wilmington; KHSE = Hatteras, NC;KMQI = Dare County Regional; TXKF = Bermuda; KLGA = LaGuardia; KMRH = Michael J. Smith (Beaufort, NC); KSUA = Witham Field; KPHL = Philadelphia International; EGPH = Edinburgh; KMIA = Miami International; KAPF = Naples Municipal, FL

One of these pairings was a "Round-Robin" flight, with the aircraft taking off and landing at the same location. It is assumed that these flights would not be burdened (by additional flight time or fuel cost) by activation of a new restricted area. Additionally, avoidance procedures to go around the proposed R-5305C would be the same in either direction, so those opposite pairings are analyzed as one. Note that eight of these pairings do not have direct routing that goes through this airspace and would not necessarily require a longer route if the proposed SUA was activated. The fact that they flew through this area in the past may be due to a combination of reasons, ranging from VFR operations (or cancellation of IFR), non-optimal routing due to weather or traffic, or other reasons. Note that the R-5305 is in a location bounded by the R-5303A/B/C, R-5304 A/B/C, and R-5306D areas, and the low numbers of flights in this area in FY22 is likely due to aircraft avoiding the surrounding SUA.

Table 4.1-10 Potential Impacts to Civil/Unknown Operations Due to Proposed R-5305C

Airport Pair	Straight Line Distance (nm)	Intermediate Fix	Distance via Intermediate Fix (nm)	%Change in distance	Extra Minutes
KEWN-KCLT	192	Not needed	-	0	0
KILM-KHSE	127	Not needed	-	0	0
KILM-KMQI	147	FONPO	150	2%	1
KILM-TXKF	673	Not needed	-	0	0
KLGA-KILM	435	Not needed	-	0	0
KMIA-KMRH	569	Not needed	-	0	0
KILM-KPHL	362	Not needed	-	0	0
KILM-EGPH	3,233	GOLLA	3,235	0	0
KAPF-KILM	579	Not needed	-	0	0
KSUA-KMRH	489	Not needed	-	0	0

Legend: % = percent; KCLT = Charlotte; KEWN = New Bern; KHSE = Billy Mitchell (Hatteras); KILM = Wilmington; KLGA = LaGuardia; KMIA = Miami International; NR32 = Dare County Regional; KMRH = Michael J. Smith (Beaufort, NC); KSUA = Stuart, FL; TXKF = Hamilton, Bermuda; KPHL = Philadelphia International; EGPH = Edinburgh; KAPF = Naples Municipal, FL nm = nautical miles

4.1.3 R-5305 Summary

4.1.3.1 R-5305A Summary

If established prior to FY22, the R-5305A would have resulted in up to 524 civil or unknown types of flights potentially being affected. That is up to 2 per day during all the hours of the year from Monday-Friday, between 0600 - 0000 (midnight) Local. Because the airspace is not proposed to be open for that entire time, the actual number of affected flights would be much lower. The R-5305A is expected to be used for only up to 8 hours per day and up to 150 days per year (not the full 18 hours per day [0600–0000] for 261 days per year [all Monday–Friday days] that are included in proposed windows for use). The proposed total hours of activation are only 26 percent of the full window analyzed, meaning that on average, **less than one flight per day** would be affected, with the impact of 3–4 percent more distance flown, and an extra 1 minute spent enroute to be routed around the airspace.

4.1.3.2 R-5305B Summary

If established prior to FY22, the R-5305B would have resulted in up to 54 civil or unknown types of flights potentially being affected. That is up to about one per week (0.21 per day) during all the hours of the year from Monday–Friday, between 0600–0000 (midnight) Local (official times of use would be Intermittent by NOTAM). Because the airspace is not proposed to be open for that entire time, the actual number of affected flights would be much lower. The R-5305B is expected to be used for only up to 4 hours per day and up to 30 days per year (not the full 18 hours per day [0600–0000] for 261 days per year [all Monday–Friday days] that are included in proposed windows for use. The proposed total hours of activation are only about 2 percent of the full window analyzed, meaning that on average, **less than one flight per year** would be affected, with the impact of 3–4 percent more distance flown, and an extra 1 minute spent enroute to be routed around the airspace.

4.1.3.3 R-5305C Summary

If established prior to FY22, the R-5305C would have resulted in up to 87 civil or unknown types of flights potentially being affected. That is up to less than one every 3 days (0.3 per day) during all the hours of the year from Monday–Friday, between 0600–0000 (midnight) Local (official times of use would be Intermittent by NOTAM). Because the airspace is not proposed to be open for that entire time, the actual number of affected flights would be much lower. The R-5305C is expected to be used for only up to 4 hours per day and up to 30 days per year (not the full 18 hours per day [0600–0000] for 261 days per year [all Monday–Friday days] that are included in proposed windows for use. The proposed total hours of activation are only about 2 percent of the full window analyzed, meaning that on average, **less than two flights per year** would be affected, with the impact of 2 percent more distance flown, and an extra 1 minute spent enroute to be routed around the airspace.

4.2 RESTRICTED AREA 5307

4.2.1 Proposal

Table 4.2-1 shows that the proposed R-5307 would be used for up to 700 training sorties per year. R-5307A/B would be activated for 100 hours per year. R-5307C would be activated for 400 hours total time per year between Monday through Friday, 25 percent of operations would occur after sunset for

night training. The airspace would have almost the same footprint as the current A-530 with R-5307A designated at 2,500 feet AGL up to but not including 10,000 feet MSL. R-5307B would be 10,000 feet MSL up to but not including FL180 and lastly, R-5307C with altitudes FL180 up to FL290. This proposal would essentially link the north side of the OPAREA to the south side of the OPAREA via restricted area.

Table 4.2-1 Military Usage of Proposed R-5307

Metric	R-5307	Assumptions
Number of Sorties	700	
Hours per Year – Activation R-5307A R-5307B R-5307C	 100 100 400	Total activation time = 600 hours
Hours per Day R-5307A R-5307B R-5307C	 4 4 4	 Up to 25 training days per year Up to 25 training days per year Up to 100 training days per year
% Time Military Aircraft Present	14% or less	Monday to Friday, 0800–0000 Local
% Time SUA Activated R-5307A* R-5307B* R-5307C	 ~2% ~ 2% ~ 2%	 Monday to Friday, 0800–0000 Local

Note: *R-5307A/B actual proposed time of use would be intermittent by NOTAM, but it would be activated during the same times as C.

Legend: ~ = approximately; % = percent; SUA = Special Use Airspace

4.2.2 Flights Impacted by the Proposal

4.2.2.1 Total Traffic

During the year examined (FY22), 9,962 total flights transited the area of the proposed R-5307A during Monday through Friday, 0800–0000 Local. Actual proposed times of use for R-5307A and R-5307B would be intermittent by NOTAM but they would be activated during the same times as C. The categories of flights are illustrated in **Table 4.2-2**. Of those, 4,172 (~42 percent) of the flights through this area were civilian or unknown flights.

Table 4.2-2 FY22 Flights in Proposed R-5307A

Category	Traffic Count (FY22)	Filtered Dataset for Analysis
Air Carrier	7	7
Air Taxi	178	178
General Aviation	3752	3752
Military	5790	0
Unknown	235	235
TOTAL	**9,962**	**4,172**

Legend: FY = Fiscal Year

The area of the proposed R-5307B had 4,534 total flights transit this airspace during the proposed times of use Monday through Friday, 0800–0000 Local (R-5307B actual proposed time of use would be intermittent by NOTAM, but it would be activated during the same times as A and C). The categories of

flights are illustrated in **Table 4.2-3**. Of those, 884 (~19 percent) of the flights through this area were civilian or unknown flights.

Table 4.2-3 FY22 Flights in Proposed R-5307B

Category	Traffic Count (FY22)	Filtered Dataset for Analysis
Air Carrier	2	2
Air Taxi	97	97
General Aviation	674	674
Military	3,650	0
Unknown	111	111
TOTAL	**4,534**	**884**

Legend: FY = Fiscal Year

The area of the proposed R-5307C had 1,370 total flights transit this airspace during the proposed times of use (Monday through Friday, 0800–0000 Local). The categories of flights are illustrated in **Table 4.2-4**. Of those, 400 (~29 percent) of the flights through this area were civilian or unknown flights.

Table 4.2-4 FY22 Flights in Proposed R-5307C

Category	Traffic Count (FY22)	Filtered Dataset for Analysis
Air Carrier	235	235
Air Taxi	23	23
General Aviation	58	58
Military	970	0
Unknown	84	84
TOTAL	**1,370**	**400**

Legend: FY = Fiscal Year

The result of filtering the FY22 dataset determined that there were 4,172 non-military flights that crossed R-5307A, 884 non-military flights that crossed R-5307B and 400 non-military flights that crossed R-5307C. These aircraft could potentially be impacted by the establishment of this airspace. These numbers are high largely due to the location of KMRH/Michael J. Smith airport in Beaufort, North Carolina, which is beneath the proposed R-5307A.

4.2.2.2 Potential Impacts to Civil/Unknown Traffic in the Proposed R-5307A

There were 4,172 recorded civil/unknown flights in FY22 that flew through the airspace encompassing the proposed R-5307A. Some of these flights had no origin or destination airport, or aircraft type recorded. Since they are categorized as “unknown,” however, it was assumed that they could be civil aircraft and have been counted in the totals of potentially impacted flights. Of the remaining flights that did have origin and destination airports listed in the data, a total of 11 combinations appeared more than once per week in FY22. These pairings are listed in **Table 4.2-5**.

Table 4.2-5 Airport Pairings for Civil/Unknown Flights Through Proposed R-5307A

Origin	Destination
KRDU	KMRH
KMRH	KRDU
KMRH	KGSO
KGSO	KMRH
KMRH	KISO
KMRH	KTTA
KTTA	KMRH
KJNX	KMRH
KSOP	KMRH
KMRH	KRWI

Legend: KRDU = Raleigh-Durham International Airport; KMRH = Michael J. Smith (Beaufort, NC); KGSO = Piedmont Triad International Airport; KISO = Kinston Regional Jetport; KTTA = Raleigh Executive Jetport; KJNX = Johnston Regional Airport; KSOP = Moore County Airport; KRWI = Rocky Mount-Wilson Regional Airport

Procedures to avoid the proposed R-5307A would be the same in either direction, so opposite pairings are analyzed as one. Note that all of these pairings have direct routing that goes through this airspace due to the Michael J. Smith (KMRH) airport location beneath the proposed SUA. There is no possible rerouting option for flights originating from or arriving to KMRH. Procedural agreements would need to be established to release airspace 5,000 feet MSL and below to MCAS Cherry Point Radar Approach Control (controlling agency) when R-5307A is active to avoid impact to arriving and departing traffic into KMRH.

4.2.2.3 Potential Impacts to Civil/Unknown Traffic in the Proposed R-5307B

There were 884 recorded civil/unknown flights in FY22 that flew through the airspace encompassing the proposed R-5307B. Many airport pairings were only used once in the year. **Table 4.2-6** shows the airport pairings which were used more than ten times in the year.

Table 4.2-6 Airport Pairings for Civil/Unknown Flights Through Proposed R-5307B

Origin	Destination
KMRH	KRDU
KMRH	KLKU
KMRH	KGSO
KMRH	KBUY
KMRH	KVUJ
KMRH	KINT
KMRH	KTEB
KMRH	KSIF
KMRH	KTTA

Legend: KMRH = Michael J. Smith (Beaufort, NC); KRDU = Raleigh-Durham International Airport KLKU = Louisa County Airport; KGSO = Piedmont Triad International Airport; KBUY = Burlington Alamance Regional Airport; KVUJ = Stanly County Airport; KINT = Smith Reynolds Airport; KTEB = Teterboro Airport; KSIF = Rockingham County NC Shiloh Airport; KTTA = Raleigh Executive Jetport.

Procedures to avoid the proposed R-5307B would be the same in either direction, so opposite pairings are analyzed as one. Note that all of these pairings have direct routing that goes through this airspace due to location of KMRH beneath the proposed SUA. There is no possible rerouting option for flights

originating from or arriving to KMRH. Procedural agreements would need to be established to ensure flights remain clear of R-5307B and adjacent protected airspace to avoid impacts to arriving and departing traffic into KMRH.

There are two charted aerobatic practice areas south of KMRH beneath the proposed R-5307B and R-5307C airspace. Operations in these practice areas are conducted below the proposed floor altitude of 10,000 feet MSL in R-5307B and would not be impacted.

4.2.2.4 Potential Impacts to Civil/Unknown Traffic in the Proposed R-5307C

There were 400 recorded civil/unknown flights in FY22 that flew through the airspace encompassing the proposed R-5307C. Many airport pairings were only used once in the year. **Table 4.2-7** shows the airport pairings which were used more than five times in the year.

Table 4.2-7 Airport Pairings for Civil/Unknown Flights Through Proposed R-5307C

Origin	Destination
KMIA	KPHL
KJFK	KFLL
KMIA	KJFK
TXKF	KILM
KFLL	KPHL
KJFK	KMIA
KMIA	KBOS
KPBI	KPHL
KPHF	KPHF
KBOS	KMIA
KLGA	KMIA

Legend: KMIA = Miami International Airport; KPHL = Philadelphia International Airport; KJFK = John F. Kennedy International Airport, Queens; KFLL = Fort Lauderdale-Hollywood International Airport; KBOS = Boston Logan International Airport; KPBI = Palm Beach International Airport; KPHF = Newport News/Williamsburg International Airport; KLGA = LaGuardia Airport; TXKF Hamilton, Bermuda; KILM = Wilmington

One of these pairings was a “Round-Robin” flight, with the aircraft taking off and landing at the same location. It is assumed that these flights would not be burdened (by additional flight time or fuel cost) by activation of a new restricted area. **Table 4.2-8** contains the common pairings that resulted in flights through the proposed R-5307C airspace in FY22. Note that four of these pairings do not have direct routing that goes through this airspace and would not necessarily require a longer route if the proposed SUA was activated. The fact that they flew through this area in the past may be due to a combination of reasons, including non-optimal routing due to weather or traffic. Note that the R-5307 is in a location bounded by the R-5306A and R-5306D areas, and the low numbers of flights in this area in FY22 is likely due to aircraft avoiding the surrounding SUA.

Table 4.2-8 Potential Impacts to Civil/Unknown Operations Due to Proposed R-5307C

Airport Pair	Straight Line Distance (nm)	Intermediate Fix	Distance via Intermediate Fix (nm)	%Change in distance (nm)	Extra Minutes
KMIA-KPHL	885	Not needed	-	0	0
KJFK-KFLL	931	ILM	936	1%	1
KMIA-KJFK	949	ILM	954	1%	1
KFLL-KPHL	867	Not needed	-	0	0
KMIA-KBOS	1,095	Not needed	-	0	0
KPBI-KPHL	831	ILM	832	0.2%	<1
TXKF-ILM	673	Not needed	-	0	0
KLGA-KMIA	955	ILM	959	0.5%	1

Legend: % = percent; < = less than; KBOS = Boston; KFLL = Ft. Lauderdale; KJFK = JFK; KLGA = Laguardia; KMIA = Miami International; KMRH = Michael J. Smith (Beaufort, NC); KPBI = Palm Beach, FL; KPHF = fix; KPHL = Philadelphia; TTA = Raleigh Exec Lee County; ILM = Wilmington VORTAC; TXKF Hamilton, Bermuda; KILM = Wilmington; nm = nautical miles

4.2.3 R-5307 Summary

4.2.3.1 R-5307A Summary

If established prior to FY22, the R-5307A would have resulted in up to 4,172 civil or unknown types of flights potentially being affected. That is up to 16 per day during all the hours of the year from Monday–Friday, between 0800–0000 (midnight). Because the airspace's proposed use is intermittent by NOTAM, the actual number of affected flights would be much lower. The R-5307A is expected to be used for only up to 4 hours per day and up to 25 days per year. The proposed total hours of activation are only 4 percent of the full window analyzed, meaning that on average, **less than one flight per day** would be affected, with the impact of needing to remain below 2,500 feet AGL while transiting underneath the R-5307A. The proposed altitudes in R-5307A would impact arriving and departing traffic into KMRH. Procedural agreements would need to be established to release airspace to the controlling agency to allow continued traffic flow into the airport.

4.2.3.2 R-5307B Summary

If established prior to FY22, the R-5307B would have resulted in up to 884 civil or unknown types of flights potentially being affected. That is up to about 4.5 flights per day during all the hours of the year from Monday–Friday, between 0800–0000 (midnight). Because the airspace's proposed use is intermittent by NOTAM, the actual number of affected flights would be much lower. The R-5307B is expected to be used for only up to 4 hours per day and up to 25 days per year. The proposed total hours of activation are only about 2 percent of the full window analyzed, meaning that on average, **less than one flight every 2 days** would be affected, with the impact being that the flight would remain below 10,000 feet AGL while transiting the area bounded by the R-5307B. The proposed altitudes for R-5307B would impact arriving and departing traffic into KMRH. Procedural agreements would need to be established to ensure flights remain clear of R-5307B and adjacent protected airspace to avoid impacts to arriving and departing traffic into KMRH.

4.2.3.3 R-5307C Summary

If established prior to FY22, the R-5307C would have resulted in up to 400 civil or unknown types of flights potentially being affected. That is one and a half per day during all the hours of the year from Monday–Friday, between 0800–0000 (midnight). Because the airspace is not proposed to be open for that entire time, the actual number of affected flights would be much lower. The R-5307C is expected to be used for only up to 4 hours per day on up to 100 days per year (not the full 16 hours per day [0800–0000]) for 261 days per year [all Monday–Friday days] that are included in proposed windows for use. The proposed total hours of activation are only about 10% of the full window analyzed, meaning that on average, **less than one flight per week** would be affected, with the impact of 1 percent more distance flown, and an extra 1 minute spent enroute to be routed around the airspace. As an alternative for most Air Carriers or other aircraft with sufficient performance, the R-5307C can be overflown above FL300.

5.0 REFERENCES

ATAC. 2023. Airspace Analysis in Support of in Support of the Environmental Assessment for Enhancement of Air and Ground Training and Readiness by Establishing Restricted Areas in Eastern North Carolina.

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Appendix C
Noise Analysis

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FINAL NOISE ANALYSIS FOR ENVIRONMENTAL ASSESSMENT FOR ENHANCEMENT OF AIR AND GROUND TRAINING AND READINESS

EASTERN NORTH CAROLINA

April 2025

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FINAL NOISE ANALYSIS
ENVIRONMENTAL ASSESSMENT FOR ENHANCEMENT OF AIR AND GROUND TRAINING AND READINESS
EASTERN NORTH CAROLINA

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ACRONYMS AND ABBREVIATIONS

A-	Alert Area
AGL	above ground level
ATCAA	Air Traffic Control Assigned Airspace
BASEOPS	Base Operations
dB	decibels
DNL	Day-Night Average Sound Level
DoD	Department of Defense
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FICON	Federal Interagency Committee on Noise
FL	Flight Level
Hz	hertz
L_{dnmr}	Adjusted Day-Night Average Sound Level
L_{max}	Maximum Sound Level
MCB	Marine Corps Base
MCIEAST	Marine Corps Installations East
MOA	Military Operation Area
MSL	mean sea level
NIPTS	Noise Induced Permanent Threshold Shift
OPAREA	Operations Area
PHL	potential for hearing loss
R-	Restricted Area
RTA	Range and Training Area
SEL	Sound Exposure Level
SUA	Special Use Airspace
U.S.	United States
UAS	Unmanned Aircraft System

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1.0 INTRODUCTION

1.1 BACKGROUND

The Marine Corps Installations East (MCIEAST) (hereinafter, referred to as the Marine Corps) proposes to enhance air and ground training and readiness within the Cherry Point Operations Area (OPAREA) in eastern North Carolina. The Cherry Point OPAREA is the training airspace associated with the ground-based Marine Corps Base (MCB) Camp Lejeune Range and Training Areas (RTAs) and is the only location on the United States (U.S.) East Coast where U.S. Marines, Navy, and other Joint and Combined Forces can conduct large force, combined-arms, amphibious training. The existing Cherry Point OPAREA includes a complex of different types of airspace, including special use airspace (SUA) (**Figure 1-1**), that are integrated with ground training areas and targets.

1.2 PROPOSED SPECIAL USE AIRSPACE

The Marine Corps proposes to enhance air and ground training within the Cherry Point OPAREA in eastern North Carolina. Training requirements that are not being met sufficiently with the current configuration of the SUA in the Cherry Point OPAREA include: fixed-wing aircraft use of existing targets; employment of long-range lasers; integration of threat emitters; low-altitude air defense training; surface-to-surface artillery training; small arms ranges training; and training with combat capable Unmanned Aircraft Systems (UAS). Given the nature of this type of training, it must be executed in restricted areas. The configuration and size of the current restricted areas within the Cherry Point OPAREA do not support these training requirements. The Federal Aviation Administration (FAA), as a cooperating agency, is responsible for formally establishing new or modified SUA in support of the Marine Corps.

To increase the SUA available to support essential Marine Corps aviation training, the Marine Corps seeks to establish the two separate restricted areas within existing Cherry Point OPAREA: (1) R-5305 (vertically segmented into A, B, and C components) and (2) R-5307 (vertically segmented in A, B, and C components). The location of the proposed Restricted Areas in relation to existing SUA is shown on **Figure 1-2**.

Figure 1-3 provides a two-dimensional view of the proposed R-5305 as well as a three-dimensional view to illustrate the vertical segmentation. As shown, R-5305 would provide a restricted area in the gap between other existing restricted areas (R-5303A/B/C, R-5304A/B/C, R-5306E, and R-5306D). The Hatteras F Military Operations Area (MOA) overlaps and surrounds R-5303 and R-5304 and aligns with the western edge of R-5306D, shown in the two-dimensional view on **Figure 1-3**. The Hatteras F MOA is charted from 3,000 feet mean sea level (MSL) up to Flight Level (FL) 180.

The proposed establishment of R-5307 would convert the existing Alert Area (A-530) to a restricted area. As shown on **Figure 1-4**, the proposed R-5307A would have almost the same lateral footprint as the current A-530 airspace and exist from 2,500 feet above ground level (AGL) up to but not including 10,000 feet MSL. R-5307 B/C would exist above R-5307A but would have a larger footprint covering additional areas to the south and east over the barrier islands.

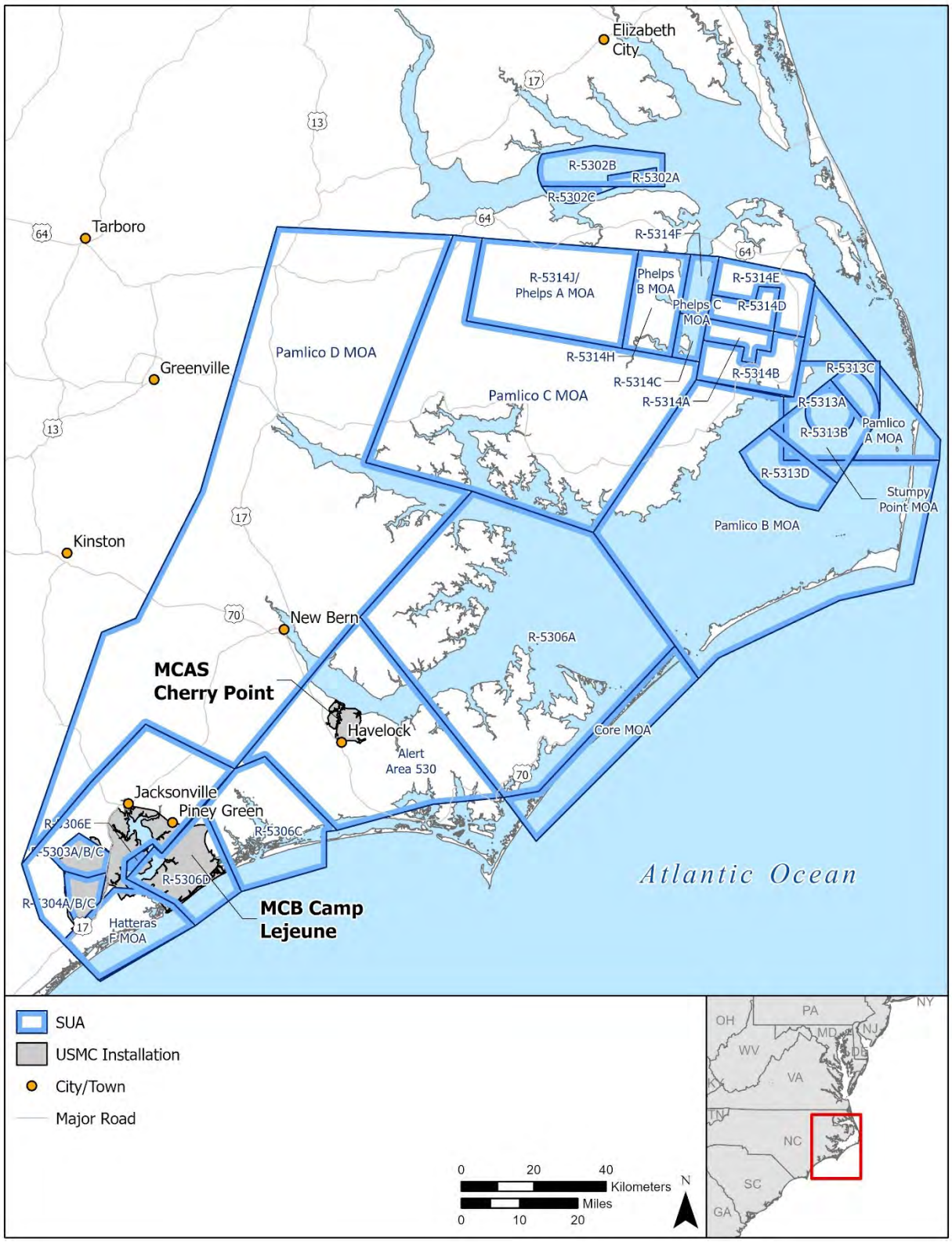

Figure 1-1 Special Use Airspace within the Cherry Point OPAREA

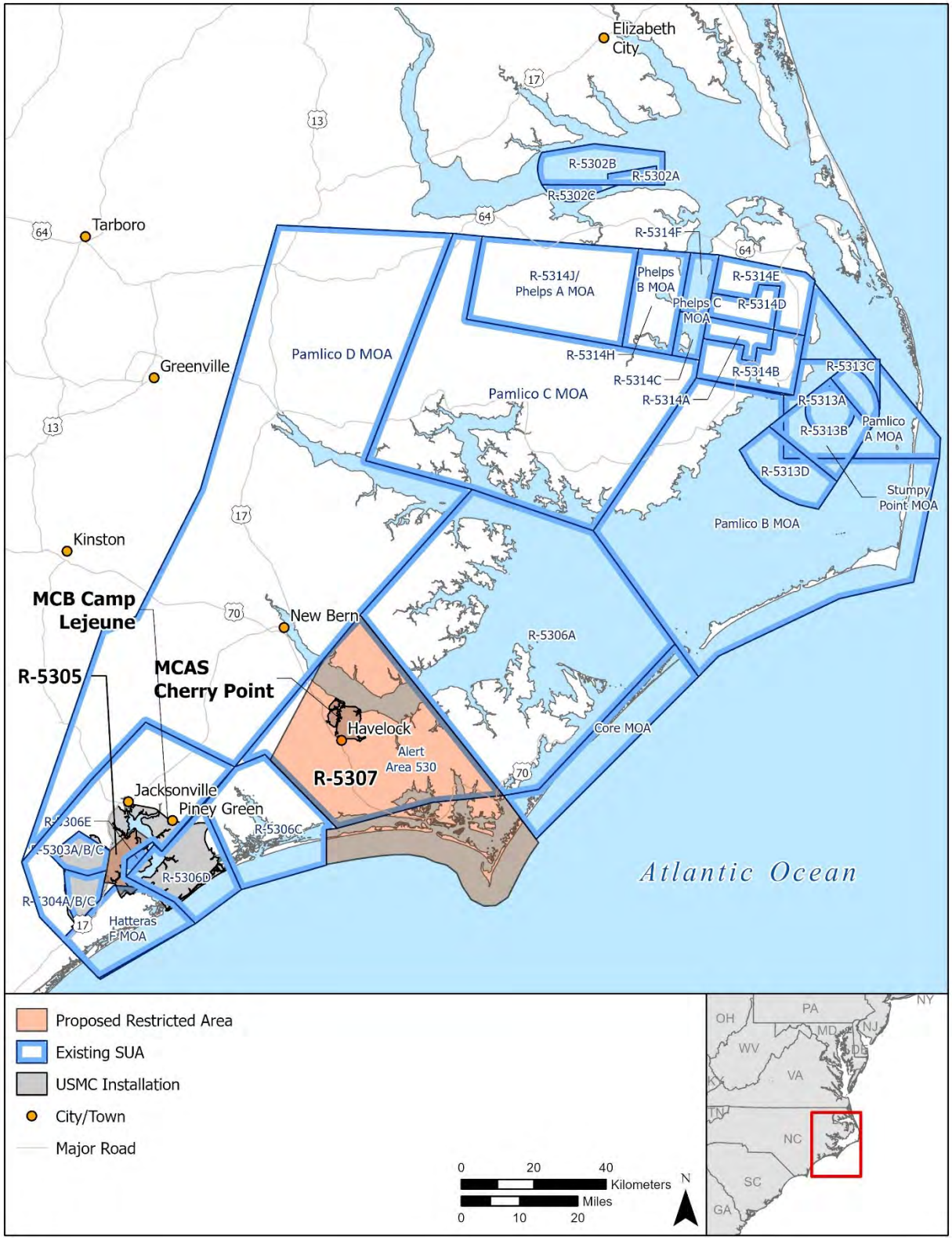

Figure 1-2 Location of Proposed SUA in Eastern North Carolina

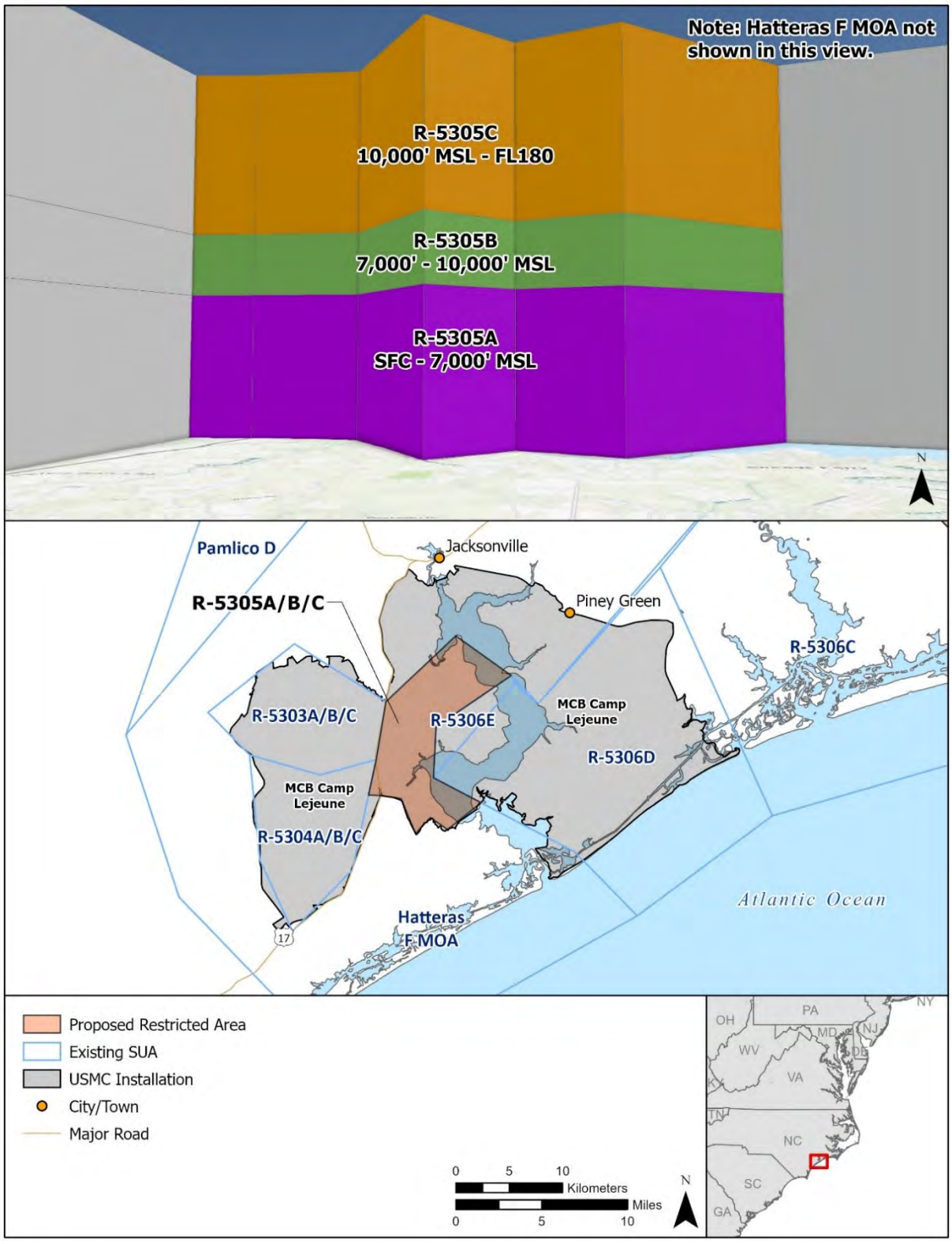

Figure 1-3 Proposed R-5305

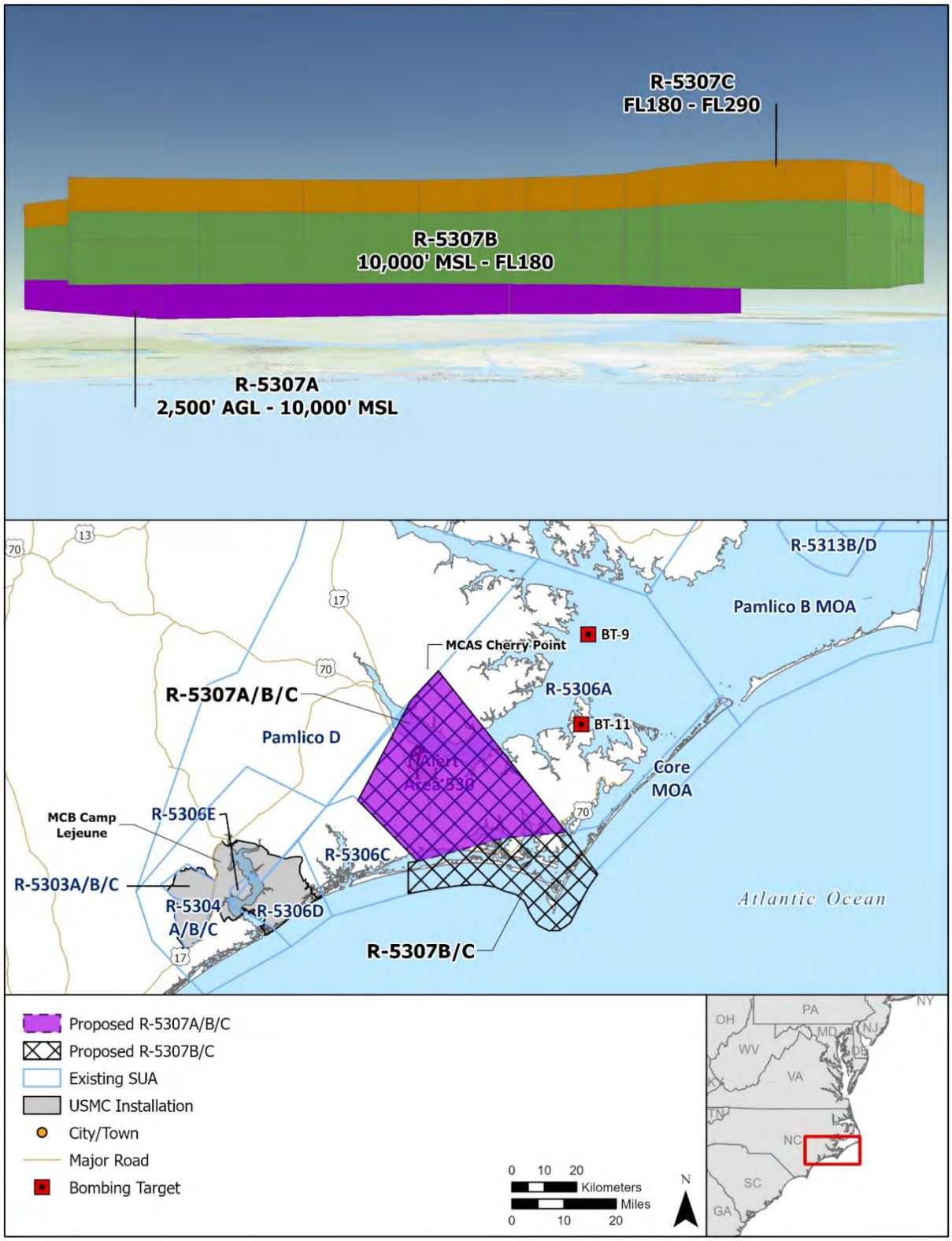

Figure 1-4 Proposed R-5307

A summary of the altitude floor and ceiling[1] and the published times of use for the proposed restricted areas are provided in **Table 1-1**.

Table 1-1 Proposed Restricted Airspace

Name	Floor	Ceiling	Proposed Published Times of Use
R-5305A/B/C	Surface	Up to but not including FL180	A; Monday through Friday 0600–0000L, other times by NOTAM B/C: Intermittent by NOTAM
R-5307A/B/C	2,500 feet AGL	Up to FL290	A/B: Intermittent by NOTAM C: Monday through Friday 0800–000L, other times by NOTAM

Legend: AGL = above ground level; FL = Flight Level; L = Local; NOTAM = Notice to Airmen

1.3 DOCUMENT STRUCTURE

Section 1.0 introduces this study; while Section 2.0 describes the methodology used in the analysis. Section 3.0 provides the modeling data and the noise exposure for the Existing Conditions Scenario. Section 4.0 provides the modeling data and the noise exposure for the Proposed Action Alternatives. Section 5.0 summarizes the additional noise metrics analysis and the results calculated for this study. Section 6.0 provides a conclusion, and references are in Section 7.0.

[1] Altitude references for aircraft operations are presented in several units of measure: above ground level (AGL), above mean sea level (MSL), and Flight Level (FL):

- AGL references are usually used at lower altitudes (almost always below 10,000 feet), when clearance from terrain is more of a concern for aircraft operation.
- MSL altitudes are used most across aviation when operating at or below 18,000 feet when clearance from terrain is less of a concern for aircraft operation.
- FL is used to describe the cruising altitudes for aircraft traveling long distances above 18,000 feet. Flight Levels are given in hundreds of feet, e.g. FL300 is 30,000 feet.

2.0 METHODOLOGY

2.1 NOISE ANALYSIS

The Department of Defense (DoD) and the Federal Interagency Committee on Noise (FICON) (1978) outline three types of metrics to describe noise exposure for environmental impact assessment:

- A measure of the greatest sound level generated by single aircraft events: Maximum Sound Level (L_{max}),
- A combination of the sound level and duration: Sound Exposure Level (SEL), and
- A cumulative measure of multiple flight and engine maintenance activity: Day-Night Average Sound Level (L_{dn}, also written as DNL).

Human hearing sensitivity to differing sound pitch, measured in cycles per second or hertz (Hz), is not constant. To account for this effect, sound measured for environmental analysis of most aircraft noise utilizes A-weighting, which emphasizes sound roughly within the range of typical speech and de-emphasizes very low and very high frequency sounds. The exception to this is the noise produced by sonic booms, which utilizes C-weighting, to emphasize the low frequencies that are more characteristic of low-duration, percussive sounds. The Proposed Action does not include supersonic flight or sonic booms, therefore, this will not be discussed further.

Environmental assessment of proposed scenario conditions often requires prediction of future conditions that cannot be easily measured until after implementation. The solution to this predicament includes the use of computer software to simulate future conditions, as detailed in the following sections.

2.2 NOISE MODELING AND PRIMARY NOISE METRICS

The DoD prescribes use of the NOISEMAP suite of computer programs (Wyle 1998; Wasmer Consulting 2006) containing the core computational programs called “NMAP,” version 7.3, and “MRNMap,” version 3.0 for environmental analysis of aircraft noise. For this noise study, the NOISEMAP suite of programs refers to Base Operations (BASEOPS) as the input module, NOISEMAP as the noise model for predicting noise exposure in the installation environment, and MRNMap as the noise model used to predict noise exposure in the SUA. NMPLOT is the tool used to combine the noise contours produced by NOISEMAP into a single noise exposure map. As indicated in **Table 2-1**, the grid spacing used for calculating noise exposure for each model was 1,000 feet.

Table 2-1 Noise Modeling Parameters

Software	Analysis	Version
NMAP	Airfield Noise – military aircraft	7.3
MR_NMAP	Airspace Noise	3.0
Parameter	**Description**	
Receiver Grid Spacing	1,000 ft in x and y	
Metrics	DNL (primary) SEL, L_{max} (secondary)	
Basis	AAD Operations (NMAP)	
Modeled Weather (Monthly Averages 2019; April selected)		
Temperature	61°F	
Relative Humidity	60%	
Barometric Pressure	29.98 in Hg	

Legend*:* ft = feet; DNL = Day-Night Average Sound Level; SEL = Sound Exposure Level; L_{max} = maximum sound level; L_{eq} = Equivalent Sound Level; AAD = Average Annual Day; USGS = U.S. Geological Survey; m = meters; NED = National Elevation Dataset; DLG = Digital Line Graph; kPa-s/m^2 = kilopascal-seconds per square meter; °F = degrees Fahrenheit; in Hg = inches Mercury

Source: Stantec GS 2024

The word "metric" describes a standard of measurement. Researchers developed many different types of noise metrics in the attempt to represent the effects of environmental noise. Each metric used in environmental noise analysis has a different physical meaning or interpretation.

The metrics supporting the assessment of noise from aircraft operations within this Environmental Assessment (EA) are the DNL, Onset Rate Adjusted Day-Night Average Sound Level (L_{dnmr}), L_{max}, and SEL. Each metric is briefly discussed below.

2.2.1 DNL and L_{dnmr}

The DNL is an A-weighted cumulative noise metric that measures noise based on annual average daily aircraft operations. When DNL is averaged over a busy month of operations (vice an average month) and is adjusted for the onset rate of the noise to account for the "surprise factor," the metric is L_{dnmr}. The aircraft operations within the proposed SUA would occur on a constant basis, therefore L_{dnmr} is the same as DNL in this analysis. Since DNL is the U.S. Government standard for modeling the cumulative noise exposure and assessing community noise impacts, the subsonic noise exposure in this EA is reported in DNL. DNL has two time periods of interest: daytime and nighttime. Daytime hours are from 7:00 a.m. to 10:00 p.m. local time. Nighttime hours are from 10:00 p.m. to 7:00 a.m. local time. DNL weights operations occurring during its nighttime period by adding 10 decibels (dB) to their single event sound level. Note that "daytime" and "nighttime" in calculation of DNL are sometimes referred to as "acoustical day" and "acoustical night" and always correspond to the times given above. This is often different than the "day" and "night" used commonly in military aviation, which are directly related to the times of sunrise and sunset and vary throughout the year with the seasonal changes. This study analyzes DNL on an annual average daily basis which means the airspace operations have been divided by 365 days per year to reflect an 'average day.'

2.2.2 L_{max} and SEL

Individual time-varying noise events have two main characteristics—a sound level, which changes throughout the event and a period of time during which the event is heard. L_{max} is the maximum sound level experienced by a receptor during a noise event. Although the L_{max} provides some measure of the intrusiveness of the event, it alone does not completely describe the total event. The period of time during which the sound is heard is also relevant. The SEL combines both of these characteristics into a single metric. The SEL takes all of the sound energy from a single event and compresses it into 1 second. This is useful for comparing single noise events. It is worth noting that SEL is always greater in value than L_{max} because it compresses all sound energy into a 1-second timeframe. So, for example, as a jet approaches the observer, the sound gets louder and louder, until the jet passes the observer. At that point, the observer would experience the L_{max} (the maximum sound level), then the sound would diminish as the jet moves past the observer and off into the distance. SEL compresses all of the sound energy into a 1-second timeframe. Within this noise analysis, the number of noise events that exceed 65 dB SEL are presented.

2.2.3 Noise Induced Hearing Loss

Noise induced hearing loss risk has been studied extensively. As per DoD policy memorandum, populations exposed to noise greater than 80 DNL are at the greatest risk of potential hearing loss (DoD 2009). The DoD policy directs that hearing loss risk should be assessed using the methodology described in U.S. Environmental Protection Agency (EPA) Report No. 550/9-82-105, Guidelines for Noise Impact Analysis (EPA 1982). EPA's Guidelines for Noise Impact Analysis quantify hearing loss risk in terms of Noise Induced Permanent Threshold Shift (NIPTS), a quantity that defines the permanent change in the threshold level below which a sound cannot be heard. NIPTS is stated in terms of the average threshold shift at several frequencies that can be expected from daily exposure to noise over a normal working lifetime of 40 years, with exposure lasting 8 hours per day for 5 days per week.

The actual value of NIPTS for any given person depends on that individual's physical sensitivity to noise. Over a 40-year working lifetime, some people will experience more loss of hearing than others. The actual noise exposure for any person living in an area subject to 80 DNL or greater is determined by the length of time that a person is outdoors and directly exposed to the noise. For example, noise exposure within an 80 DNL noise contour near an airfield would be affected by whether a person was at home during the daytime hours when most flying occurs. Many people would be inside their homes and would, therefore, be exposed to lower noise levels due to noise attenuation provided by the house structure.

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3.0 EXISTING CONDITIONS

3.1 EXISTING OPERATIONS

The analysis of the acoustic environment involves consideration of many factors including the types, locations, and frequency of aerial operations, the classification of existing airspace, and the amount of air traffic using or transiting through a given area. This analysis quantifies the existing and anticipated subsonic noise from military aircraft activity within the proposed airspace.

As described in **Section 1.2** and illustrated on **Figures 1-3 and 1-4**, the airspace areas proposed for R-5305 and R-5307 are located within the confines of the existing Cherry Point OPAREA and are currently used for some training activity. The proposed R-5305 overlaps with the existing Hatteras F MOA and the proposed R-5307 would be in the airspace currently charted as A-530. The existing conditions for these airspaces are detailed in the following sections.

3.1.1 Existing Hatteras F MOA

The Marine Corps routinely uses the Hatteras F MOA that exists in the airspace proposed as R-5305 A/B/C (see **Figure 1-3**). A summary of annual airspace operations is presented in **Table 3-1**. All operations are assumed to be daytime operations, or prior to 10:00 p.m., local time.

Table 3-1 Annual Sorties in Existing Hatteras MOA

Aircraft	Existing Sorties
F-35B/C	410
F-15E	30
F-16C	10
Total	***450***

Legend*:* MOA = Military Operations Area

3.1.2 Existing Unscheduled Airspace (Proposed R-5305A)

The Marine Corps routinely uses the existing non-scheduled airspace beneath the Hatteras F MOA in training associated with R-5303, R-5304, and R-5306. A summary of annual airspace operations is presented in **Table 3-2**. Operations occur both during daytime (7:00 a.m.–10:00 p.m.) and nighttime (10:00 p.m.–7:00 a.m.).

Table 3-2 Annual Sorties in Existing Airspace (Proposed R-5305A)

Aircraft	Existing Total Sorties	Day (7:00 a.m.–10:00 p.m.)	Night (10:00 p.m. –7:00 a.m.)
MV-22	969	872	97
Total	***969***	***872***	***97***

3.1.3 Existing A-530 And Burner Low/High ATCAA (Proposed R-5307A/B/C)

The Marine Corps, Navy, and Air Force routinely utilize the existing A-530 (2,500 feet MSL to 9,999 feet MSL) and Burner Low and High Air Traffic Control Assigned Airspace (ATCAA) (10,000 feet MSL to 17,999 feet MSL and 18,000 feet MSL to 29,000 feet MSL, respectively) airspace for offshore training. A

summary of annual airspace operations is presented in **Table 3-3**. Operations occur both during day-time (7:00 a.m.–10:00 p.m.) and night-time (10:00 p.m.–7:00 a.m.).

Table 3-3 Annual Sorties in A-530 and Burner Low/High ATCAA

Aircraft	Existing Total Sorties	Day (7:00 a.m.–10:00 p.m.)	Night (10:00 p.m.–7:00 a.m.)
AV-8B	1,410	1,269	141
C-17	68	61	7
C-130J	456	410	46
C560	169	152	17
F-15E	1,698	1,528	170
F-18E/F	132	119	13
KC-135R	271	244	27
MV-22	116	104	12
Total	***4,320***	***3,887***	***433***

Legend*:* ATCAA = Air Traffic Control Assigned Airspace

Appendix A depicts annual sorties, aircraft, power configuration, and altitude blocks. Percentage of relative time is also included. Total sortie time within existing airspace is 6 minutes.

3.2 EXISTING SUBSONIC NOISE EXPOSURE

MRNMap takes into account aircraft power settings, aircraft speed, and altitude when calculating average annual noise for the airspace. The software also spreads the noise out throughout the entire airspace evenly. The DNL levels and number of events above 65 dB SEL associated with existing aircraft operations within the airspace proposed as R-5305 and R-5307 are presented in **Table 3-4**. To note, noise levels are presented for specific airspace boundaries and altitudes and when combined with overlying airspace. For example, the unscheduled airspace beneath Hatteras F MOA (proposed R-5305A) has a noise level of 39 DNL. The noise level of Hatteras F MOA is 50 DNL. When these two noise levels are added, the noise level would be 50 DNL within the unscheduled airspace beneath Hatteras F MOA.

Table 3-4 Existing Subsonic Noise Exposure

Airspace	DNL (dBA)	Events above 65 dB SEL
Hatteras F MOA (R-5305 A/B/C)	50 (50)	0
Unscheduled Airspace beneath Hatteras F (R-5305A)	39 (50)	0
A-530 (R-5307A)	38 (40)	0
Burner Low/High ATCAA (R-5307 B/C)	35 (40)	0

Notes: (X) = noise level when combined with all airspace vertical segments

Legend: ATCAA = Air Traffic Control Assigned Airspace; dB = decibel; dBA = A-weighted decibel; DNL = Day-Night Average Sound Level; MOA = Military Operations Area; SEL = Sound Exposure Level

4.0 PROPOSED ACTION SCENARIO

The following section details the modeling data and the resultant noise exposure for the proposed action, which includes the development of two restricted areas, R-5305 A/B/C and R-5307 A/B/C.

The EPA has identified 55 DNL as a level that protects public health and welfare with an adequate margin of safety (EPA 1982). This means that 55 DNL is a threshold below which adverse noise effects are not expected to occur. According to the FICON, noise exposure greater than 65 DNL is considered generally incompatible with residential, public use (i.e., schools), or recreational and entertainment areas (FICON 1980).

The FAA defines a threshold for significant noise impacts as "[t]he action would increase noise by DNL 1.5 dB or more for a noise sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a 1.5 dB or greater increase, when compared to the No Action Alternative for the same timeframe" FAA Order 1050.1F.

4.1 SUBSONIC MODELING DATA

Proposed annual aircraft operations in proposed R-5305 A/B/C and R-5307 A/B/C by aircraft and branch of service are summarized in **Table 4-1 and Table 4-2**, respectively**.** Operations occur both during daytime (7:00 a.m.–10:00 p.m.) and nighttime (10:00 p.m.–7:00 a.m.). Detailed tables of specific altitudes and power configurations can be found in Appendix A.

Table 4-1 Proposed Annual Sorties in R-5305 A/B/C

Service	Aircraft	Annual Total Sorties	Day (7:00 a.m.–10:00 p.m.)	Night (10:00 p.m.–7:00 a.m.)
USMC	AV-8B /F-35B/C	80	72	8
USMC	MV-22	--		
USN	F-18E/F /F-35B/C	60	54	6
USAF	F-15E	--		
USAF	F-16C	--		
USMC	Rotary/Tilt*	500	450	50
USMC	sUAS	475	428	47
USAF/USMC	MQ-9:MQ-1	25	23	2
Total		***1,140***	***1,027***	***113***

Notes: The F-35 B/C will ultimately replace the AV-8 and FA-18 aircraft; therefore, both aircraft are listed in this table.
*= AH-1, AH-64, CH-53, CH-47, MV-22, UH-1, UH-60 all in R5305A

Legend: s=small; UAS = Unmanned Aircraft System; USAF = U.S. Air Force; USMC = U.S. Marine Corps; USN = U.S. Navy

Table 4-2 Proposed Annual Sorties in R-5307 A/B/C

Service	Aircraft	Annual Total Sorties	Day (7:00 a.m.–10:00 p.m.)	Night (10:00 p.m.–7:00 a.m.)
USMC	AV-8B F-35B/C	300	270	30
USMC	C-17	--		
USMC	C-130J	10	9	1
USN	C560	--		
USMC	MQ-9	100	90	10
USAF	F-22	10	9	1
USAF	F-15E	100	90	10
USMC	F-18E/F F-35B/C	150	135	15
USAF	KC-10	15	14	1
USAF	KC-135R	15	14	1
USMC	MV-22	--		
	Total	***700***	***631***	***69***

Legend: USAF = U.S. Air Force; USMC = U.S. Marine Corps; USN = U.S. Navy

4.2 SUBSONIC NOISE EXPOSURE

Estimated noise generated from aircraft utilizing the proposed SUAs are shown in **Table 4-3**. As shown, DNL values are generally low. This is expected given the relatively low number of sorties, as well as the somewhat large areas of airspace that are proposed. The floors of the proposed restricted areas are also different, with R-5305 A/B/C being the lowest (Surface) resulting in a value of 54 DNL. These values are all well below the 65 DNL threshold for land use planning guidelines used for airfield/airports by the FAA and DoD.

Table 4-3 DNL Values for Proposed Annual Aircraft Operations in Special Use Airspace

Special Use Airspace Name	Existing DNL (dBA)	Proposed DNL (dBA)	Events above 65 dB SEL
R-5305 A/B/C	50	54	2
R-5307 A/B/C	40	43	0

Legend: dB = decibel; dBA = A-weighted decibel; DNL = Day-Night Average Sound Level; SEL = Sound Exposure Level

5.0 ADDITIONAL METRICS

5.1 SINGLE EVENT METRICS

Table 5-1 shows the results for single event metrics for the various aircraft that would use the proposed restricted areas. For these calculations, each aircraft was modeled for SEL and L_{max} at two different power settings (afterburner [with the exception of the AV-8] and 85 percent thrust) at three different altitudes. For this analysis, the floors of the proposed restricted areas were used for the single event noise estimations since this would generate the loudest possible scenario. The DNL reported above gives the average noise levels throughout the year but does not account for the "loudness" of an individual overflight event. **Table 5-1** shows an estimation of what an observer on the ground would experience if an aircraft flew directly overhead at the different power and altitudes shown below with the understanding that aircraft operations would be limited by the altitude floor of the SUA and the specific aircraft's syllabus.

Table 5-1 SEL and L_{max} Values for Aircraft Overflights at Various Altitudes

Aircraft	Power Configuration	SEL and L_{max} (dBA) at Various Altitudes (AGL)					
		500 frrt		2,500 frrt		10,000 frrt	
		SEL (dBA)	L_{max} (dBA)	SEL (dBA)	L_{max} (dBA)	SEL (dBA)	L_{max} (dBA)
AV-8B	MIL Power	122	109	106	90	88	68
	85% RPM	114	108	98	89	81	68
F-18E/F	Afterburner	128	124	115	106	99	87
	85% NC	121	114	106	95	86	72
F-35B	Afterburner	129	124	115	106	99	87
	85% ETR	123	116	108	97	92	77
F-15E	Afterburner	128	122	113	103	98	84
	85% NC	111	104	98	86	83	68
F-16C	Afterburner	123	118	109	100	94	81
	85% NC	108	101	95	83	79	64
MV-22	90%Q-BPA	99	96	87	80	74	63
	56%Q-BPA	94	91	82	75	68	58

Notes: Speed for all aircraft for all scenarios was 400 knots. AV-8B does not have afterburner capability.
* = CH-53E at 120 knots used as surrogate.

Legend: % = percent; AGL = above ground level; dBA = A-weighted decibel; ETR = engine temperature ratio; L_{max} = maximum sound level; MIL = military; MSL = above mean sea level; RPM = rotations per minute; SEL = sound exposure level

As is expected, higher power configurations that are lower in altitude produce greater noise levels. At 500 feet in afterburner, SELs range from a high of 129 dBA for F-35B and F-18C, to a low of 123 for the F-16C. L_{max} values are similarly high. As the altitudes increase and power setting decrease, noise levels decrease, as would be expected. L_{max} values are less than compared to SEL values, as L_{max} is the loudest sound experienced by an observer, while SEL takes all the sound energy of the entire overflight event and compresses it into 1 second of time. At 500 feet AGL, a direct overflight by any of the aircraft that would be using the airspace would likely be noticeable; however, proposed operations at the lowest level (500 feet AGL) and highest power setting (Afterburner) would be less than 1 percent of operations.

5.2 POTENTIAL FOR HEARING LOSS

Potential for Hearing Loss (PHL) applies to people living in high noise environments. The threshold for assessing PHL is exposure to noise greater than 80 dB DNL. As shown in Section 4.0, the proposed action would not produce noise levels over 55 DNL, well below the 80 DNL threshold for analysis of PHL. Therefore, PHL is not analyzed further in this document.

6.0 CONCLUSION

The establishment of new restricted areas in the Cherry Point OPAREA would present little change in the noise environment. The number of aircraft operations and the altitudes that they would utilize would not produce significant noise impacts for observers under the proposed airspace. The proposed R-5305 would be wholly contained within the lateral installation boundary of MCB Camp Lejeune.

Individual overflights at lower altitudes would likely be noticeable but would be over quickly and would be unlikely to disrupt daily activities. The highest annual average noise exposure in the proposed R-5305 A/B/C and R-5307 A/B/C would be 54 DNL and 43 DNL, respectively, well below the 65 DNL threshold for land use planning recommendations for noise sensitive uses.

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7.0 REFERENCES

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APPENDIX A
DETAILED FLIGHT OPERATIONS NORTH CAROLINA SPECIAL USE AIRSPACE

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Table A-1 Aircraft Operation Assumptions for Existing Hatteras F MOA

Sorties	Aircraft		*Percentage of Relative Time in Altitude Bands*			
			Altitude Band (MSL)			
			3,000 to 5,000	5,000 to 10,000	10,000 to 14,000	14,000 to 18,000
410	F-35B/C	*Time in Altitude Band (%)*	10%	20%	40%	30%
		Power Configuration				
		Afterburner	15%	10%	5%	5%
		90% ETR	85%	90%	95%	95%

Sorties	Aircraft		*Percentage of Relative Time in Altitude Bands*			
			Altitude Band (MSL)			
			3,000 to 5,000	5,000 to 10,000	10,000 to 14,000	14,000 to 18,000
30	F-15E	*Time in Altitude Band (%)*	10%	20%	40%	30%
		Power Configuration				
		Afterburner	15%	10%	5%	5%
		90% NC	85%	90%	95%	95%

Sorties	Aircraft		*Percentage of Relative Time in Altitude Bands*			
			Altitude Band (MSL)			
			3,000 to 5,000	5,000 to 10,000	10,000 to 14,000	14,000 to 18,000
10	F-16C	*Time in Altitude Band (%)*	10%	20%	40%	30%
		Power Configuration				
		Afterburner	10%	5%	5%	5%
		85% NC	90%	95%	95%	95%

Source: Stantec GS 2023

Table A-2 Aircraft Operation Assumptions for Existing Airspace

Sorties	Aircraft		*Percentage of Relative Time in Altitude Bands*			
			Altitude Band (MSL)			
			500 to 1,000	1,000 to 3,000	3,000 to 5,000	5,000 to 7,000
969	MV-22*	*Time in Altitude Band (%)*	40%	40%	15%	5%
		Power Configuration				
		90 %Q-BPA	15%	10%	5%	5%
		56 %Q-BPA	85%	90%	95%	95%

Note: *=CH-53E used as MV-22 surrogate for noise modeling
Source: Stantec GS 2023

Table A-3 Aircraft Operation Assumptions for Existing A-530 and Burner Low/High ATCAA

Sorties	Aircraft		*Percentage of Relative Time in Altitude Bands*			
			Altitude Band (MSL)			
			2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
1,410	AV-8B: F-35B/C	*Time in Altitude Band (%)*	5%	30%	65%	0%
		Power Configuration				
		MIL (100% RPM)	15%	10%	5%	5%
		85% RPM	85%	90%	95%	95%

Sorties	Aircraft		*Percentage of Relative Time in Altitude Bands*			
			Altitude Band (MSL)			
			2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
456	C-130J	*Time in Altitude Band (%)*	5%	10%	40%	45%
		Power Configuration				
		2200 HP	100%	100%	100%	100%

Sorties	Aircraft		*Percentage of Relative Time in Altitude Bands*			
			Altitude Band (MSL)			
			2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
68	C-17	*Time in Altitude Band (%)*	5%	10%	40%	45%
		Power Configuration				
		75% NC	100%	100%	100%	100%

Sorties	Aircraft		*Percentage of Relative Time in Altitude Bands*			
			Altitude Band (MSL)			
			2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
169	C560	*Time in Altitude Band (%)*	10%	45%	45%	0%
		Power Configuration				
		1650 LBS	100%	100%	100%	100%

Sorties	Aircraft		*Percentage of Relative Time in Altitude Bands*			
			Altitude Band (MSL)			
			2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
1698	F-15E	*Time in Altitude Band (%)*	0%	0%	10%	90%
		Power Configuration				
		Afterburner	15%	10%	5%	5%
		85% NC	85%	90%	95%	95%

			Percentage of Relative Time in Altitude Bands			
			Altitude Band (MSL)			
Sorties	**Aircraft**		2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
132	F-18E/F F-35B/C	*Time in Altitude Band (%)*	0%	0%	10%	90%
		Power Configuration				
		MIL (100% RPM)	15%	10%	5%	5%
		90% NC	85%	90%	95%	95%
			Percentage of Relative Time in Altitude Bands			
			Altitude Band (MSL)			
Sorties	**Aircraft**		2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
271	KC-135R	*Time in Altitude Band (%)*	0%	0%	10%	90%
		Power Configuration				
		65% NF	85%	90%	95%	95%
			Percentage of Relative Time in Altitude Bands			
			Altitude Band (MSL)			
Sorties	**Aircraft**		2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
116	MV-22*	*Time in Altitude Band (%)*	50%	40%	10%	0%
		Power Configuration				
		90 %Q-BPA	15%	10%	5%	5%
		56 %Q-BPA	85%	90%	95%	95%

Source: Stantec GS 2023

Table A-4 Aircraft Operation Assumptions for Proposed R-5305 A/B/C

Sorties	Aircraft		***Percentage of Relative Time in Altitude Bands***			
			Altitude Band (MSL)			
			500 AGL to 3,000	3,000 to 5,000	5,000 to 10,000	10,000 to 18,000
80	AV-8B F-35B/C	*Time in Altitude Band (%)*	1%	9%	20%	70%
		Power Configuration				
		MIL (100% RPM)	15%	10%	5%	5%
		85% RPM	85%	90%	95%	95%
Sorties	**Aircraft**		***Percentage of Relative Time in Altitude Bands***			
			Altitude Band (MSL)			
			500 AGL to 3,000	3,000 to 5,000	5,000 to 10,000	10,000 to 18,000
60	F-18E/F F-35B/C	*Time in Altitude Band (%)*	1%	4%	15%	80%
		Power Configuration				
		MIL (100% RPM)	15%	10%	5%	5%
		90% NC	85%	90%	95%	95%
Sorties	**Aircraft**		***Percentage of Relative Time in Altitude Bands***			
			Altitude Band (MSL)			
			500 AGL to 3,000	4,000 to 7,000	7,000 to 10,000	10,000 to 18,000
500	Rotary/Tilt Rotor	*Time in Altitude Band (%)*	85%	15%	0%	0%
		Power Configuration				
		90 %Q-BPA	15%	10%	5%	5%
		56 %Q-BPA	85%	90%	95%	95%
Sorties	**Aircraft**		***Percentage of Relative Time in Altitude Bands***			
			Altitude Band (MSL)			
			500 AGL to 3,000	4,000 to 7,000	7,000 to 10,000	10,000 to 18,000
475	sUAS	*Time in Altitude Band (%)*	100%	0%	0%	0%
		Power Configuration				
		67% RPM	100%	100%	100%	100%
Sorties	Aircraft		***Percentage of Relative Time in Altitude Bands***			
			Altitude Band (MSL)			
			500 AGL to 3,000	4,000 to 7,000	7,000 to 10,000	10,000 to 18,000
25	MQ-9/MQ-1	*Time in Altitude Band (%)*	0%	0%	10%	90%
		Power Configuration				
		67% RPM	100%	100%	100%	100%

Source: Stantec GS 2023

Table A-5 Aircraft Operation Assumptions for Proposed R-5307 A/B/C

Sorties	Aircraft		*Percentage of Relative Time in Altitude Bands*			
			Altitude Band (MSL)			
			2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
300	AV-8B: F-35B/C	*Time in Altitude Band (%)*	1%	2%	7%	90%
		Power Configuration				
		MIL (100% RPM)	15%	10%	5%	5%
		85% RPM	85%	90%	95%	95%
Sorties	**Aircraft**		***Percentage of Relative Time in Altitude Bands***			
			Altitude Band (MSL)			
			2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
150	F-18E/F F-35B/C	*Time in Altitude Band (%)*	1%	2%	2%	95%
		Power Configuration				
		MIL (100% RPM)	15%	10%	5%	5%
		90% NC	85%	90%	95%	95%
Sorties	**Aircraft**		***Percentage of Relative Time in Altitude Bands***			
			Altitude Band (MSL)			
			2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
100	F-15E	*Time in Altitude Band (%)*	1%	1%	3%	95%
		Power Configuration				
		Afterburner	15%	10%	5%	5%
		85% NC	85%	90%	95%	95%
Sorties	**Aircraft**		***Percentage of Relative Time in Altitude Bands***			
			Altitude Band (MSL)			
			2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
10	F-22	*Time in Altitude Band (%)*	1%	1%	3%	95%
		Power Configuration				
		Afterburner	15%	10%	5%	5%
		90% ETR	85%	90%	95%	95%
Sorties	**Aircraft**		***Percentage of Relative Time in Altitude Bands***			
			Altitude Band (MSL)			
			2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
10	C130-J	*Time in Altitude Band (%)*	0%	5%	10%	85%
		Power Configuration				
		2200 HP	100%	100%	100%	100%

Sorties	Aircraft		*Percentage of Relative Time in Altitude Bands*			
			Altitude Band (MSL)			
			2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
15	KC-10	*Time in Altitude Band (%)*	0%	0%	5%	95%
		Power Configuration				
		60% N1	100%	100%	100%	100%
Sorties	**Aircraft**		***Percentage of Relative Time in Altitude Bands***			
			Altitude Band (MSL)			
			2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
15	KC-135R	*Time in Altitude Band (%)*	0%	0%	5%	95%
		Power Configuration				
		70% NF	100%	100%	100%	100%
Sorties	**Aircraft**		***Percentage of Relative Time in Altitude Bands***			
			Altitude Band (MSL)			
			2,500 AGL to 5,000	5,000 to 10,000	10,000 to 18,000	18,000 to 29,000
100	MQ-9	*Time in Altitude Band (%)*	1%	1%	3%	95%
		Power Configuration				
		67% RPM	100%	100%	100%	100%

Source: Stantec GS 2023

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Appendix D Air Quality Calculations

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Net Change in Criteria Pollutant Emissions Calculations - Proposed Action

SO2 emission factor for JP-5 from AESO Memorandum Report No. 2012-01 Revision J
SO2 emission factor for JP-8 from USAF Mobile Source Guide

Proposed Action - Low Altitude Flight

MV-22 data from AESO Memorandum Report No. 9946 Revision G

MV-22 Flight Operation	Total Number of Operations	Time Hrs	Fuel used lb/hr	Emissions (lb) /1,000 lb fuel						Flight Emissions (Total Pounds)					
				HC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
Cruise (nacelles horizontal)	500	425	3,820	0.01	0.52	14.09	0.90	1.57	1.57	19	844	22,875	1,461	2,549	2,549

Time based on sortie duration of 60 minutes and 85% of time below 3,000 ft AGL in R-5305

Post AV-8B and F-18 E/F Transition, the F-35 B/C will assume those sorties:

F-35 B/C Flight Operation	Total Number of Operations	Time Hrs	Flight Emissions (Tons)					
			VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
Low Altitude Flight	590	6	0.00	56.88	1,753.82	101.44	125.14	112.81

F-35 data from USAF ACAM version 5.0.23a

Time based on sortie duration of 60 minutes and 1% of time below 3,000 ft AGL in R-5305 and R-5307

F-15E data from USAF Mobile Source Guide, 2023

F-15 E Flight Operation	Total Number of Operations	Time Hrs	Fuel used lb/hr	Emissions (lb) /1,000 lb fuel						Flight Emissions (Total Pounds)					
				VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
Intermediate	100	1	11,540	2.89	0.86	22.2	1.07	0.70	0.63	33	10	256	12	8	7

Time based on sortie duration of 60 minutes and 1% of time below 3,000 ft AGL in R-5307

F-22 data from USAF Mobile Source Guide, 2023

F-22 Flight Operation	Total Number of Operations	Time Hrs	Fuel used lb/hr	Emissions (lb) /1,000 lb fuel						Flight Emissions (Total Pounds)					
				VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
Intermediate	10	0.1	20,220	0.03	2.14	12.4	1.07	1.40	1.09	0	4	25	2	3	2

Time based on sortie duration of 60 minutes and 1% of time below 3,000 ft AGL in R-5307

MQ-9 data from USAF Mobile Source Guide, 2023 TPE-331-10 engine data not available; TPE331-3 used as surrogate

MQ-9 Flight Operation	Total Number of Operations	Time Hrs	Fuel used lb/hr	Emissions (lb) /1,000 lb fuel						Flight Emissions (Total Pounds)					
				HC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
Climbout	100	1	409	0.17	0.98	12.36	1.07	1.47	1.32	0	0	5	0	1	1

Time based on sortie duration of 60 minutes and 1% of time below 3,000 ft AGL in R-5307

Annual Criteria Pollutant Emissions Increase - Low Altitude Flight

Annual Flight Emissions (Total Tons)					
VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
0.0	0.5	12.5	0.8	1.3	1.3

Annual Flight Emissions (Total Pounds)					
VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
52	916	24,915	1,578	2,686	2,672

Net Change in GHG Emissions Calculations - Proposed Action

Sortie operation = 1 hour

C-130J Flight Operation	Total Number of Operations	Time Hrs	Fuel used lb/hr	lb/ 1000 lb fuel CO2	Total Pounds CO_2
Circle (Cruise)	10	10	4,632	3,152	146,001

Fuel and emission factor data from AESO Memorandum Report No. 2000-10 Revision D

F-35 data used for CO2 analysis instead of AV-8B and F-18 E/F, which is being replaced

F-35 B/C Flight Operation	Total Number of Operations	Time Hrs	Total Pounds CO_2
Cruise	590	590	30,368,994

F-35 data from USAF ACAM version 5.0.23a

MV-22 Flight Operation	Total Number of Operations	Time Hrs	Fuel used lb/hr	lb/ 1000 lb fuel CO2	Total Pounds CO_2
Cruise (nacelles horizontal)	500	500	3,820	3,209	6,129,496

Fuel and emission factor data from AESO Memorandum Report No. 9946 Revision G

F-15 E Flight Operation	Total Number of Operations	Time Hrs	Fuel used lb/hr	lb/ 1000 lb fuel CO2	Total Pounds CO_2
Intermediate	100	100	11,540	3,215	3,710,110

Fuel and emission factor data from USAF Mobile Source Guide, 2023

F-22 Flight Operation	Total Number of Operations	Time Hrs	Fuel used lb/hr	lb/ 1000 lb fuel CO2	Total Pounds CO_2
Intermediate	10	10	20,220	3,215	650,073

Fuel and emission factor data from USAF Mobile Source Guide, 2023

TPE-331-10 engine data not available; TPE331-3 used as surrogate

MQ-9 Flight Operation	Total Number of Operations	Time Hrs	Fuel used lb/hr	lb/ 1000 lb fuel CO2	Total Pounds CO_2
Climbout	125	100	409	3,215	131,494

Fuel and emission factor data from USAF Mobile Source Guide, 2023

KC-135R Flight Operation	Total Number of Operations	Time Hrs	Fuel used lb/hr	lb/ 1000 lb fuel CO2	Total Pounds CO_2
Intermediate	15	15	22600	3,215	1,089,885

KC-10 Flight Operation	Total Number of Operations	Time Hrs	Fuel used lb/hr	lb/ 1000 lb fuel CO2	Total Pounds CO_2
Climbout	15	15	47025	3,215	2,267,781

Annual GHG Pollutant Emissions Increase - All Altitude Flight

Total Metric Tons CO_2
20,182

				average passenger vehicle		
				369	grams of CO2 per mile	
				0.81	lb of CO2 per mile	
	CO2 emissions	20,182	metric ton/yr	4,058	cars driving	13,476 miles per year

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location

State: North Carolina
County(s): Carteret
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: F-35A Low Altitude Band Sortie activity

Report generated with ACAM version: 5.0.23a

- Activity List:

Activity Type		Activity Title
2.	Aircraft	F-35A Destination Flight

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Aircraft

2.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Carteret
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: F-35 B

- Activity Description:
F-35B operational emissions

- Activity Emissions of Criteria Pollutants:

Pollutant	Emissions Per Year (TONs)
VOC	0.000000
SO_x	0.050719
NO_x	0.876911
CO	0.028440

Pollutant	Emissions Per Year (TONs)
PM 10	0.062569
PM 2.5	0.056407
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Emissions Per Year (TONs)
CH_4	0.006385
N_2O	0.001246

Pollutant	Emissions Per Year (TONs)
CO_2	151.844978
CO_2e	152.375865

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Emissions Per Year (TONs)
VOC	0.000000
SO_x	0.050719
NO_x	0.876911

Pollutant	Emissions Per Year (TONs)
PM 10	0.062569
PM 2.5	0.056407
Pb	0.000000

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CO	0.028440	NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Emissions Per Year (TONs)	Pollutant	Emissions Per Year (TONs)
CH_4	0.006385	CO_2	151.844978
N_2O	0.001246	CO_2e	152.375865

2.2 Aircraft & Engines

2.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine

Aircraft Designation: F-35A
Engine Model: F135-PW-100
Primary Function: Combat
Aircraft has After burn: Yes
Number of Engines: 1

- Aircraft & Engine Surrogate

Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

2.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Criteria Pollutant Emission Factors (lb/1000lb fuel)

Proprietary Information. Contact Air Quality Subject Matter Expert for More Information regarding this engine's Emission Factors.

2.3 Flight Operations

2.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft: 10
Flight Operation Cycle Type: LFP (Low Flight Pattern)
Number of Annual Flight Operation Cycles for all Aircraft: 590
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi [Idle] (mins): 0
Approach [Approach] (mins): 0
Climb Out [Intermediate] (mins): 0.6
Takeoff [Military] (mins): 0
Takeoff [After Burn] (mins): 0

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location

State: North Carolina
County(s): Carteret
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: F-35B Sorties

- Project Number/s (if applicable):

Report generated with ACAM version: 5.0.23a

- Activity List:

Activity Type		Activity Title
2.	Aircraft	F-35A sorties

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Aircraft

2.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Carteret
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: F-35A sorties

- Activity Description:
Annual F-35A sortie emissions

- Activity Emissions of Criteria Pollutants:

Pollutant	Emissions Per Year (TONs)
VOC	0.000000
SO_x	0.000000
NO_x	0.000000
CO	0.000000

Pollutant	Emissions Per Year (TONs)
PM 10	0.000000
PM 2.5	0.000000
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Emissions Per Year (TONs)
CH_4	0.638486
N_2O	0.124569

Pollutant	Emissions Per Year (TONs)
CO_2	15184.497806
CO_2e	15237.586478

- Activity Emissions of Criteria Pollutants [DC Flight Operations part]:

Pollutant	Emissions Per Year (TONs)
VOC	0.000000

Pollutant	Emissions Per Year (TONs)
PM 10	0.000000

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

SO_x	0.000000
NO_x	0.000000
CO	0.000000

PM 2.5	0.000000
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [DC Flight Operations part]:

Pollutant	Emissions Per Year (TONs)
CH_4	0.638486
N_2O	0.124569

Pollutant	Emissions Per Year (TONs)
CO_2	15184.497806
CO_2e	15237.586478

2.2 Aircraft & Engines

2.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: F-35A
Engine Model: F135-PW-100
Primary Function: Combat
Aircraft has After burn: Yes
Number of Engines: 1

- Aircraft & Engine Surrogate
Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

2.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Criteria Pollutant Emission Factors (lb/1000lb fuel)
Proprietary Information. Contact Air Quality Subject Matter Expert for More Information regarding this engine's Emission Factors.

2.3 Flight Operations

2.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 1
Flight Operation Cycle Type: DC (Destination Cycle)
Number of Annual Flight Operation Cycles for all Aircraft: 590
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi [Idle] (mins): 0
Approach [Approach] (mins): 0
Climb Out [Intermediate] (mins): 60
Takeoff [Military] (mins): 0
Takeoff [After Burn] (mins): 0