Draft
Environmental Assessment
F-22A Aircraft Plus-up
Joint Base Pearl Harbor-Hickam, Hawai'i

July 2025

154th Wing, Hawai'i Air National Guard

Joint Base Pearl Harbor-Hickam, Hawai'i

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Privacy Advisory

This Draft Environmental Assessment (EA) has been provided for public comment in accordance with the National Environmental Policy Act (NEPA) and the United States Department of the Air Force (DAF) Environmental Impact Analysis Process (EIAP), which provides an opportunity for public input on DAF decision-making, allows the public to offer input on alternative ways for DAF to accomplish what it is proposing, and solicits comments on DAF's analysis of environmental effects.

Public input allows DAF to make better-informed decisions. Letters or other written or verbal comments provided may be published in this EA. Providing personal information is voluntary. Private addresses will be compiled to develop a stakeholders inventory. However, only the names of the individuals making comments and specific comments will be disclosed. Personal information, home addresses, telephone numbers, and email addresses will not be published in this EA.

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LIST OF ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
15 WG	15th Wing
154 MXG	154th Maintenance Group
154 WG	154th Wing
199 FS	199th Fighter Squadron
ac	acre(s)
ACAM	Air Conformity Applicability Model
ACM	asbestos-containing material
AFB	Air Force Base
AFH	Air Force Handbook
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFOSH	Air Force Occupational Safety and Health
ANG	Air National Guard
APE	Area of Potential Effects
AQCR	Air Quality Control Region
ATC	Air Traffic Control
ATCAA	Air Traffic Controlled Assigned Airspace
BAI	Backup Aircraft Inventory
BASH	bird/wildlife-aircraft strike hazard
BMP	Best Management Practice
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CNIC	Commander, Navy Region Hawai’i
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CSEL	C-weighted sound exposure level
CSF	Conforming Storage Facility
CWA	Clean Water Act
CZMP	Coastal Zone Management Program
DAF	United States Department of the Air Force
DAFI	Department of the Air Force Instruction
DAFMAN	Department of the Air Force Manual
dBA	A-weighted decibel(s)
DESR	Defense Explosives Safety Regulation
DLA	Defense Logistics Agency
DNL	day-night average sound level
DOD	Department of Defense
DOH	Department of Health
DOT	Department of Transportation
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
Fed Fire	Federal Fire Department
FL	flight level
FONPA	Finding of No Practicable Alternative
FONSI	Finding of No Significant Impact
ft	foot(feet)
GAO	Government Accountability Office
GHG	greenhouse gas
gpm	gallon(s) per minute
GWP	global warming potential
HAR	Hawai’i Administrative Rules
HAZMAT	hazardous materials
HIANG	Hawai’i Air National Guard
HNL	Daniel K. Inouye International Airport
IAP	initial accumulation point
ICRMP	Integrated Cultural Resources Management Plan
IFR	Instrument Flight Rules
in.	inch(es)
IRP	Installation Restoration Program
IWTC	Industrial Waste Treatment Facility
JBLE-Langley	Joint Base Langley-Eustis
JBER-Elmendorf	Joint Base Elmendorf-Richardson
JBPHH	Joint Base Pearl Harbor-Hickam
LBP	lead-based paint
L_{dnmr}	onset-rate adjusted monthly day-night average sound level
LOCRF	Low Observable Composite Repair Facility
LOTTR	Level of Travel Time Reliability
mi	mile(s)
mm	millimeter
MSL	mean sea level
MW	megawatt(s)
NAAQS	National Ambient Air Quality Standards
NAVFAC	Naval Facilities Engineering Systems Command
Navy	United States Navy
NEPA	National Environmental Policy Act
NGB	National Guard Bureau
NHPA	National Historic Preservation Act
NM	nautical mile(s)
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxides
NRHP	National Register of Historic Places
NSP	Noncovered Source Permit
O_3	ozone
OSHA	Occupational Safety and Health Administration
PAA	Primary Aerospace Vehicle Authorized
PCB	polychlorinated biphenyl
pCi/L	picocurie(s) per liter

PES	potential explosion site
PFAS	per- and polyfluoroalkyl substances
$PM_{2.5}$	particulates equal to or less than 2.5 microns in diameter
PM_{10}	particulates equal to or less than 10 microns in diameter
POI	points of interest
PSD	Prevention of Significant Deterioration
psf	pound(s) per square foot
QD	Quantity-Distance
ROI	region of influence
RPZ	Runway Protection Zone
SMA	Special Management Area
SO_2	sulfur dioxide
SUA	Special Use Airspace
SWMP	Stormwater Management Plan
TCP	traditional cultural property
TP	target practice
tpy	ton(s) per year
US	United States
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	underground storage tank
VFR	Visual Flight Rules
VOC	volatile organic compounds

CHAPTER 1 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

The Hawai'i Air National Guard (HIANG) supports the state mission of providing organized and trained units to protect the state's citizens and property, preserve the peace, and ensure public safety during times of natural or human-caused disasters, while also supporting its federal mission to be operationally ready to support the United States Department of the Air Force (DAF) mission in time of war, national emergency, or operational emergency. To maintain this readiness, the Chief of Staff of the Air Force approved assigning F-22A Raptors to the HIANG 154th Wing (154 WG), 199th Fighter Squadron (199 FS) located at Joint Base Pearl Harbor-Hickam (JBPHH), beginning in 2011.

The Air National Guard (ANG) is a Directorate within the National Guard Bureau (NGB). Per amendments to 10 United States (U.S.) Code (USC) 10501, as described in the Department of Defense (DoD) Directive 5104.77, the NGB is a joint activity of the DoD and serves as a channel of communication and funding between the DAF and ANG organizations throughout the U.S., its territories, and the District of Columbia. The ANG's federal mission is to maintain well-trained, well-equipped units available for prompt mobilization during wartime and to provide assistance during national emergencies (such as natural disasters or civil disturbances). During peacetime, the combat-ready units and their support units are assigned to most DAF major commands to carry out missions compatible with training, mobilization readiness, humanitarian, and contingency operations. When ANG units are not mobilized or under federal control, they report to the governor of their respective state, territory, or the commanding general of the District of Columbia National Guard. The ANG maintains the majority of U.S. alert sites for air defense, provides tactical airlift, air refueling tankers, general purpose fighters, rescue and recovery capabilities, tactical air support, weather flights, strategic airlift, special operations capabilities, and aeromedical evacuation units.

The NGB is the lead agency for the Proposed Action and is responsible for the scope and content of the Draft Environmental Assessment (EA). This Draft EA considers the potential consequences to the human and natural environment that may result from implementation of this action and is prepared in accordance with the National Environmental Policy Act (NEPA) (42 USC Sections 4321–4374) and DoD and DAF implementing guidance. The NGB is the lead agency for the Proposed Action and is responsible for the scope and content of the EA.

1.2 PURPOSE OF THE PROPOSED ACTION

In October 2018, Hurricane Michael hit the Florida panhandle, causing catastrophic damage to Tyndall Air Force Base (AFB), Florida, with some of the greatest damage to base hangars and flight operations buildings. As a result, Tyndall AFB was not able to support its two F-22A squadrons. The DAF has decided it would be most efficient to consolidate the F-22As from the operational squadron at Tyndall AFB into other operational F-22 squadrons including the 199 FS. The DAF expects this consolidation to increase the F-22A's readiness rate and address key recommendations from the recent Government Accountability Office (GAO) report GAO-18-190, *F-22 Organization and Utilization Changes Could Improve Aircraft Availability and Pilot Training* (GAO, 2018), that identified small unit size as one of the challenges with F-22A readiness. This consolidation may or may not be permanent depending on the outcome of other ongoing fighter force structure studies. The F-22 Formal Training Unit, which consists of the F-22 aircraft and T-38 Talon aircraft from Tyndall AFB, were also temporarily relocated to Eglin AFB, Florida, while the DAF considered their permanent assignment.

The purpose of the Proposed Action is to integrate a total of seven DAF F-22A Raptors from Tyndall AFB into the current fleet of the HIANG 199 FS until the permanent disposition of the aircraft is determined. This would include six Primary Aerospace Vehicle Authorized (PAA) and one Backup Aircraft Inventory (BAI). PAA are aircraft authorized to a unit for performance of its operational mission. The primary authorization forms the basis for the allocation of operating resources to include manpower, support equipment, and flying-hour funds. The Proposed Action would result in an increase in the total F-22A aircraft assigned to the 199 FS from 18 PAA plus 2 BAI to 24 PAA plus 3 BAI.

1.3 NEED FOR THE PROPOSED ACTION

The devastation caused by Hurricane Michael rendered Tyndall AFB incapable of hosting F-22 aircraft for the foreseeable future and the Proposed Action rectifies the need for these aircraft to be located on an existing F-22 unit to maintain operational readiness. Rather than reconstructing the F-22A facilities that were damaged by Hurricane Michael, the DAF decided that a more efficient way forward would be to consolidate the F-22A aircraft assigned to Tyndall AFB to the other F-22A operational squadrons. The DAF expects this consolidation to increase the F-22A's readiness rate and address key recommendations from a recent GAO report that identified small unit size as one of the challenges with F-22A readiness. GAO-18-190, *F-22 Organization and Utilization Changes Could Improve, Aircraft Availability and Pilot Trainin*g, recommended:

"The Secretary of the Air Force should conduct a comprehensive assessment of the F-22 organizational structure that identifies and assesses alternative approaches to organizing F-22 squadrons. The assessment could at a minimum assess the following two alternatives: consolidating the fleet into larger squadrons and/or wings in order to improve aircraft availability and revising the design of the deployable units in squadrons to better support current deployment practices and future operational concepts."

The DAF concurred with the recommendation and, as a result, proposes permanently or temporarily relocating seven of the F-22As previously assigned to Tyndall AFB to the HIANG 199 FS in an effort to increase the primary aircraft assigned to the 199 FS from 18 PAA and 2 BAI to 24 PAA plus 3 BAI, as described above. The most effective fighter squadron configuration in the DAF has historically been 24 PAA. The seven new aircraft were located at the HIANG under a loan status as outlined in the aircraft loan process in Air Force Instruction (AFI) 16-402, *Aerospace Vehicle Programming, Assignment, Distribution, Accounting, and Termination.* The F-22A aircraft have been temporarily located at and operating from JBPHH since 2018.

1.4 LOCATION

As a result of the 2005 Base Realignment and Closure, Naval Station Pearl Harbor and Hickam AFB were merged into a single joint installation to support United States Navy (Navy), DAF, and ANG missions (**Figure 1-1**). JBPHH is located on the island of O'ahu on the southern coast near Honolulu and shares runways with Daniel K. Inouye International Airport (HNL) (**Figure 1-2**).

JBPHH is the home of Commander, United States (US) Pacific Fleet, Headquarters Pacific Air Force, and the HIANG. The HIANG includes the 154 WG, 199 FS, 201st Combat Communications Group, 199th Weather Flight, and numerous tenant and associated units. JBPHH supports the training and operations of advanced F-22A aircraft and hosts annual exercises with US allies to support pilot readiness. All buildings and land at JBPHH are Navy real property and the DAF manages the airfield. While the Navy has administrative control of the real property at JBPHH, it subsequently licenses 135.43 acres (ac) to the ANG for exclusive use and 14.69 ac for joint use.

1.5 INTERGOVERNMENTAL COORDINATION, PUBLIC AND AGENCY PARTICIPATION

The environmental analysis process, in compliance with NEPA guidance, includes public and agency review of information pertinent to the proposed and alternative actions. Further, compliance with Section 7 of the ESA and Section 106 of the NHPA requires consultation with the US Fish and Wildlife Service (USFWS)/National Marine Fisheries Service (NMFS) and the State Historic Preservation Division, respectively. Tribal consultation is also required under the NHPA. Consultation for the Coastal Zone Management Program (CZMP) would occur with the State of Hawai'i, Department of Business, Economic Development and Tourism. The Intergovernmental Coordination Act and Executive Order (EO) 12372 require federal agencies to cooperate with and consider state and local views in implementing a federal proposal. Through the coordination process, in November and December 2020 the NGB sent letters to potentially interested and affected government agencies, government representatives, elected officials, and interested parties potentially affected by the Proposed Action. The Interagency and Intergovernmental Coordination for Environmental Planning memoranda and responses, recipient mailing list, agency and intergovernmental coordination letters and responses, agency consultation letters and responses, and tribal consultation letters and responses are included in **Appendix A.**

A Notice of Availability of the Draft EA and proposed Finding of No Significant Impact (FONSI) and Finding of No Practicable Alternative (FONPA) was published in The Honolulu Star-Advertiser, Honolulu, Hawai'i,. Copies of the Draft EA, Proposed FONSI and FONPA were also made available for review on the 154 WG website at https://www.154wg.ang.af.mil/Portals/49/documents/Hickam%20F-22%20Environmental%20Assessment.pdf?ver=x2LIt9OopiaIidOROGDR2w%3d%3d inviting the public to review and comment on the Draft EA during the 30-day review period.

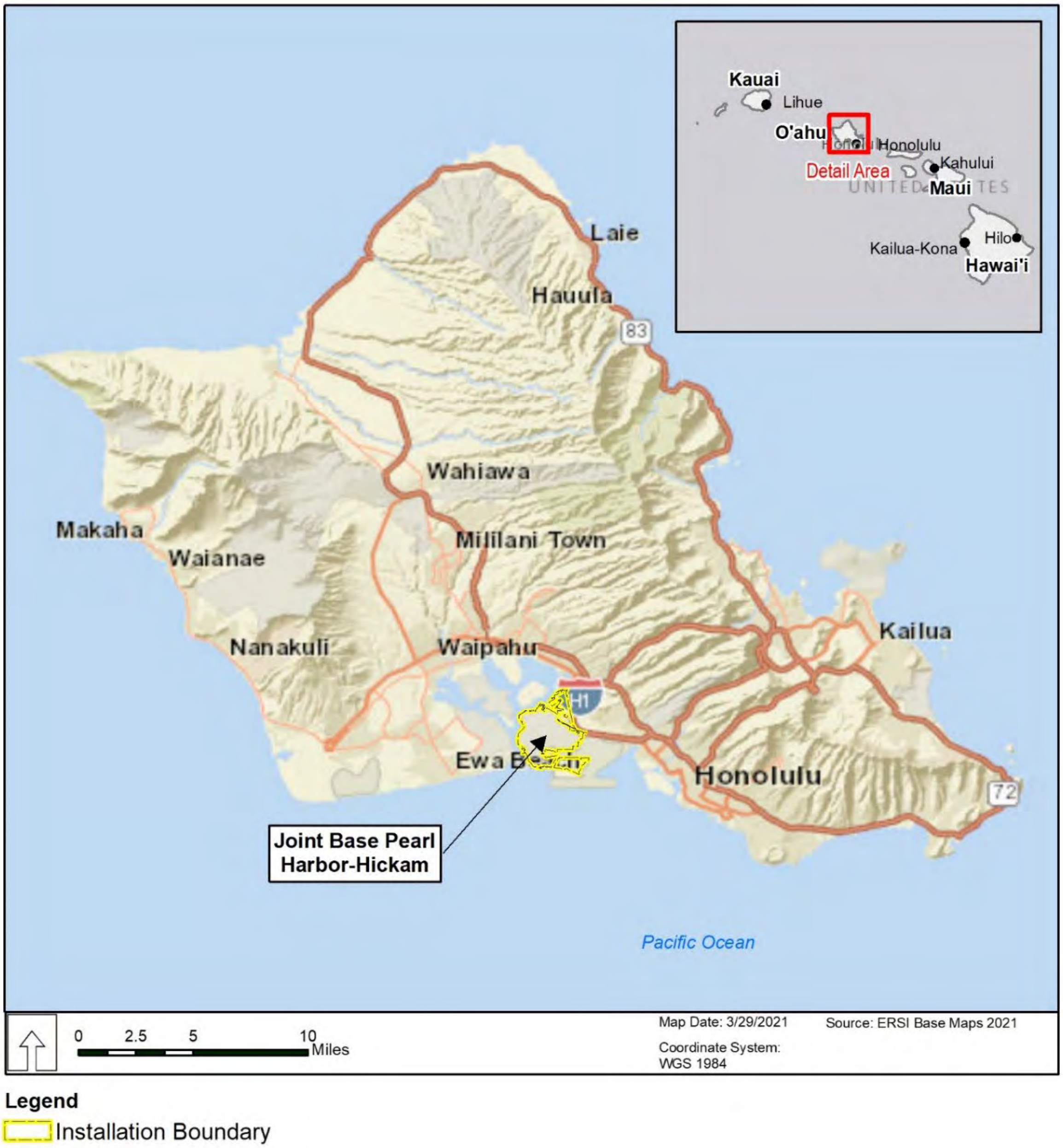

Figure 1-1. Location of Joint Base Pearl Harbor-Hickam (regional view).

Figure 1-2. Location of Joint Base Pearl Harbor-Hickam (local view).

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CHAPTER 2 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

NEPA mandates the consideration of reasonable alternatives to the Proposed Action. "Reasonable alternatives" are those that also could be utilized to meet the purpose of and need for the Proposed Action. The NEPA process is intended to support flexible, informed decision-making; the analysis provided by this EA and feedback from the public and other agencies will inform decisions made about whether, when, and how to execute the Proposed Action. The No Action Alternative provides a benchmark used to compare potential impacts of the Proposed Action.

2.1 PROPOSED ACTION

2.1.1 Introduction

The DAF is proposing to permanently or temporarily integrate seven total F-22A aircraft into the current fleet of the 199 FS, which would result in F-22A aircraft operating from JBPHH increasing from 18 PAA plus 2 BAI to 24 PAA plus 3 BAI. Depending on the outcome of other fighter force structure studies, the integration at JBPHH may or may not be permanent. The Proposed Action includes elements affecting the base and military training airspace. The elements affecting JBPHH include additional aircraft, support facilities and infrastructure, maintenance equipment, hazardous materials and hazardous waste, personnel, and sorties. The elements affecting the airspace include increased use of airspace and defensive countermeasures during training operations. The aircraft associated with the Proposed Action would be additive at JBPHH with additional programmed flying hours and would fly additional sorties.

F-22A Aircraft

The F-22A Raptor is a single-seat, all-weather, multipurpose fighter capable of both air-to-air and air-to-ground missions. This aircraft is powered by two 35,000-pound thrust-class engines and can operate at altitudes above 30,000 feet (ft) mean sea level (MSL) and at supersonic speeds. Its thrust-to-weight ratio permits the F-22A to quickly achieve and sustain speeds needed for air-to-air combat. The F-22A is approximately 62 ft long, with a wingspan of 44 ft, and a height of more than 16 ft. Special low observability composite materials are used on the F-22A that make it much harder to detect by radar than conventional aircraft of similar size. Low observability aircraft coatings require special treatment and facilities.

Facilities

The permanent or temporary assignment of the additional F-22A aircraft would require construction of new facilities and the repair of existing facilities that would be located around the existing airfield and runway. Projects would include the construction of additional ramp space and repair of deteriorated ramp pavement for the installation of additional sunshades; the construction of maintenance space for munitions, egress, and aircraft support equipment; construction of additional munitions storage; construction of a new Intel vault, the repair and renovation of Squadron Operations; and the conversion of the F-15 corrosion control facility to an F-22 paint facility. These projects are planned for Fiscal Year 2025 and beyond. A list of the repair and construction projects connected to the Proposed Action is provided in **Table 2-1**, and the locations are shown on **Figure 2-1**. Project ID 9, the construction of an F-22 maintenance deployment storage facility, is illustrated on Figure 2-1, but no longer under consideration. A more complete description of the proposed facility repair and construction projects is provided in **Appendix B**.

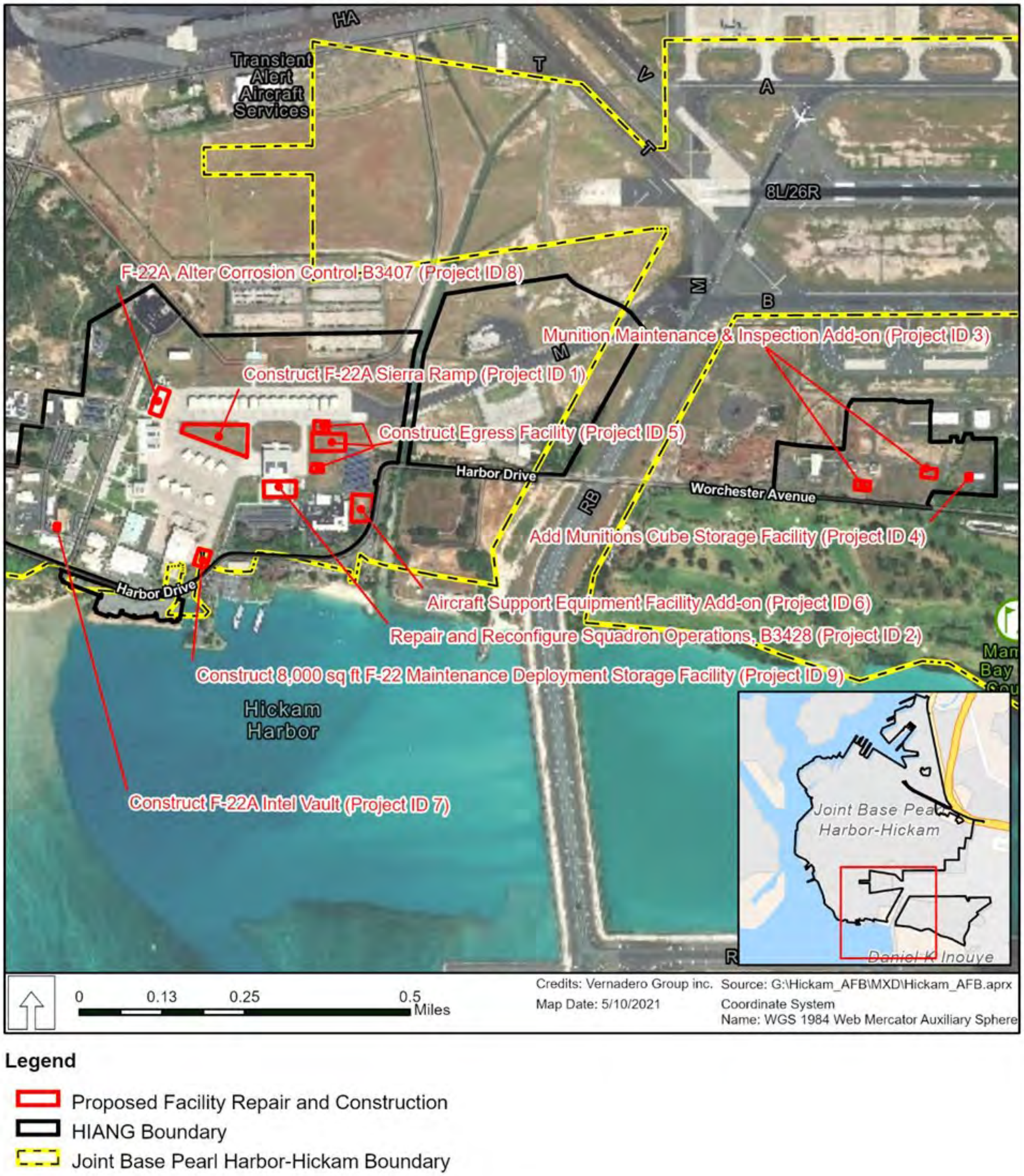

Figure 2-1. Locations of proposed facility repair and construction projects to support the F-22A plus-up.

Table 2-1
Proposed Facility Repair and Construction Projects to Support the F-22A Plus-up
(Planned to Start in Fiscal Year 2025)

Facility Title	Project ID	Proposed Action
F-22A Sierra Ramp	1	Construction and Repair
Squadron Operations, Building 3428	2	Repair and Reconfigure
Munition Maintenance and Inspection Add-on	3	Construction
Add Munitions Cube Storage Facility	4	Construction
Egress Facility	5	Construction
Aircraft Support Equipment Facility Add-on	6	Construction
F-22A Intel Vault	7	Construction
F-22A Alter Corrosion Control, Building 3407	8	Repair

Airfield Use

The Proposed Action would add an estimated 405 annual operations at JBPHH, which includes those expected for training activities and aircraft leaving for or returning from deployment or depot-level maintenance. This would result in an increase of less than 1 percent in the number of total operations at JBPHH (refer to **Table 3.7**).

DAF convention is to describe percent daily flying schedules in terms of total sorties and a "flight turn pattern." A flight turn pattern allows available aircraft to fly multiple times per day to maximize flying opportunities for assigned pilots. Flight turn patterns are designed to allow aircraft to fly, land, complete appropriate post flight inspections, get refueled, and fly again. The additional F-22As would be integrated into the current daily operations schedule and would not increase the flight turn pattern.

The additional F-22A aircraft would fly approximately one of the estimated 405 annual operations during environmental night hours (10:00 p.m. to 7:00 a.m. local time; refer to Air Force Handbook (AFH) 32-7084, *AICUZ Program Manager's Guide*), when the effects of aircraft noise are accentuated. The 199 FS does not depart the airport after 10:00 p.m., but less than one percent of the sorties return after 10:00 p.m.

Airspace Use

The additional F-22A aircraft would use the same special use airspace (SUA) currently utilized by the aircraft assigned to the 199 FS. The SUA primarily include offshore Warning Areas and Air Traffic Control Assigned Airspace (ATCAA). Warning Areas are airspace of defined dimensions that extends from 3 nautical miles (NM) outward from the coast of the United States and may be over US waters, international waters, or both. The purpose of warning areas is to warn nonparticipating pilots of potentially hazardous activity. Warning Areas may be used for other purposes if the area is released to the Federal Aviation Administration (FAA) during periods it is not required for its intended purpose and is within an area in which the FAA has Air Traffic Control (ATC) authority. ATCAA are airspace assigned to ATC to segregate air traffic between specified activities being conducted within the assigned airspace and other Instrument Flight Rules (IFR) traffic. ATCAA are above 18,000 ft MSL. These airspaces are not depicted on any charts, and they remain under control of the FAA when not in use to support general aviation activities.

The SUA proposed for use are depicted on **Figure 2-2**. Current and estimated additional training activities in the SUA are estimated to be 3,150 sorties and are summarized in **Table 2-2**. Training sorties would generally consist of the following five steps: depart from JBPHH airfield, transit to SUA, perform training, transit back to the airfield, and land. Aircraft would spend 5 to 20 minutes in transit each way between the airfield and SUA. Time spent within each SUA would depend upon the specific training mission performed but would typically last approximately 90 minutes. No SUA modifications are included as part of the Proposed Action.

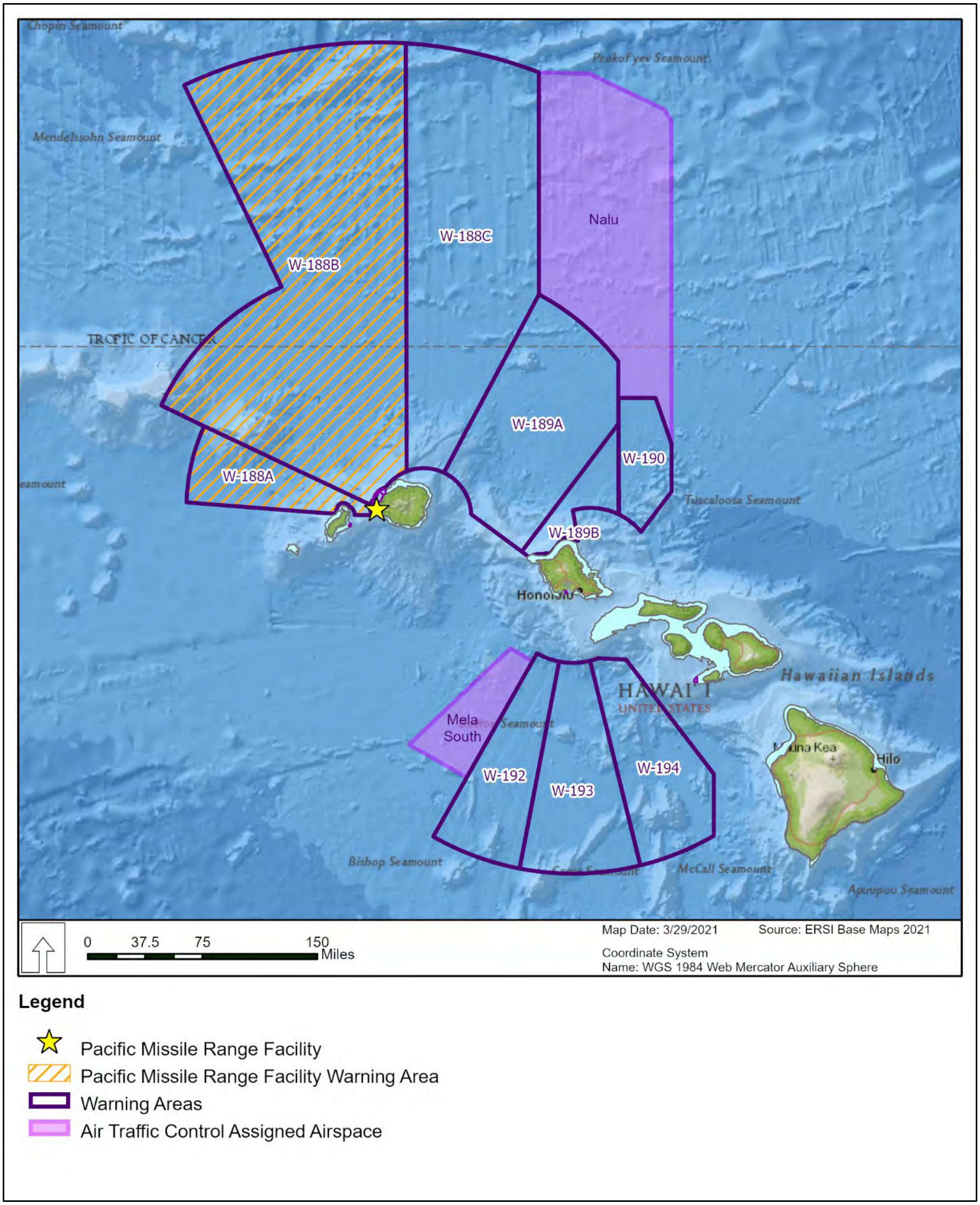

Figure 2-2. Special Use Airspace proposed to support the F-22A plus-up.

Table 2-2
Current and Projected Training Activities by the Hawai'i Air National Guard

Airspace	Current Altitude[1]	Baseline Training Sorties[2]	Estimated Additional Sorties	Estimated Total Sorties
Primary				
Warning Areas W-188C, W-189A, W-189B, and W-190 Nalu ATCAA	Surface to Unlimited FL055 to FL290	1,829	270	2,099
Warning Areas W-192, W-193, and W-194 Mela South ATCAA	Surface to Unlimited 1,200 ft MSL to FL600	916	135	1,051
Total Proposed Airspace Sorties		**2,745**	**405**	**3,150**

Notes:
[1] No change to current minimum flight altitude is proposed.
[2] Based on Fiscal Year 2018 sorties for the 199th Fighter Squadron.

ATCAA = Air Traffic Control Assigned Airspace; FL = flight level (vertical altitude expressed in hundreds of feet); ft = feet; MSL = mean sea level

Ordnance Use

The ordnance used during training sorties would primarily be defensive countermeasures (e.g., chaff and flares), as well as 20-millimeter (mm) target practice (TP). The 154th Maintenance Group (154 MXG) munitions personnel would store, account for, inspect, maintain, assemble, and deliver aircraft ordnance; 154th Aircraft Maintenance Squadron weapons load crews would be responsible for loading and unloading of aircraft ordnance.

Aircraft would employ chaff and flares (RR-188 chaff and M206 flares or similar) during 100 percent of training sorties flown in the SUA as identified in **Table 2-3**. Chaff and flares are the principal defensive countermeasure dispensed by military aircraft to avoid detection or attack by enemy air defense systems. Chaff is an electronic countermeasure designed to reflect radar waves and obscure aircraft, ships, and other equipment from radar tracking sources. Chaff bundles consist of millions of non-hazardous aluminum-coated glass fibers. When ejected from the aircraft, these fibers disperse widely in the air, forming an electromagnetic screen that temporarily hides the aircraft from radar and forms a radar decoy, allowing the aircraft to defensively maneuver or leave the area. Flares are magnesium pellets ejected from military aircraft and provide high-temperature heat sources that act as decoys for heat-seeking weapons targeting the aircraft. These defensive countermeasures are utilized to keep aircraft from being successfully targeted by or escape from weapons such as surface-to-air missiles, air-to-air missiles, anti-aircraft artillery, and, in the case of the Proposed Action, other aircraft. Frequent training in use of chaff and flares by aircrews to master the timing of deployment and the capabilities of the devices is a critical component of combat training. While 100 percent of the requirement may not be allocated or expended, this amount is carried forward to determine potential impact associated with defensive countermeasures. Chaff and flares can be dispensed in the SUA without altitude restrictions.

Table 2-3
Existing and Proposed Defensive Countermeasure Use by the Hawai'i Air National Guard

Special Use Airspace	Ordnance Type	Current Baseline Annual Use[1]	Total Estimated Future Annual Use[2]
Warning Areas W-188C, W-189A, W-189B, W-190, W-192, W-193, and W-194 Nalu and Mela South ATCAAs	Chaff Bundles	5,232	6,000
	Flares	7,848	7,000
W-193	20-mm TP ammunition	8,150	No change[3]

Notes:
1. Baseline countermeasure use is based on the Fiscal Year 2018 use by the 199th Fighter Squadron.
2 This reflects estimated additional countermeasure use for the F-22A plus-up when added to the baseline use.
3 No substantial increase in the use of 20-millimeter ammunition is expected.

ATCAA = Air Traffic Control Assigned Airspace; mm = millimeter(s); TP = target practice

The F-22A utilizes missiles or its 20-mm cannon in air-to-air engagements. Training for the use of these weapons is predominantly simulated, using its radar and targeting systems. 20-mmTP ammunition is a training cannon round comprised of a brass cartridge case, propellant powder with an electric primer, and a projectile composed of steel with an aluminum nose and a hollow body. The use of 20-mm TP ammunition is authorized for live-fire training activities and predominantly occurs in the southern portion of the Warning Area W-193 (**Figure 2-2**). The existing and estimated additional 20-mm TP ammunition use is presented in **Table 2-3**. Launches of live missiles may occur once per year within the Pacific Missile Range Facility, but this would not increase under the Proposed Action. Live missile training is primarily conducted at training ranges within the continental United States such as the Nellis Test and Training Range, Nevada, and the ranges at Eglin AFB.

F-22A pilots are projected to spend 70 percent of their training in air-to-air missions and 30 percent of their training in air-to-ground missions. The existing SUA discussed in **Section 2.1.1** are adequate for most F-22A training activities. If live-fire air-to-ground ordnance delivery training is required, it would occur when the 199 FS is deployed to other locations during special training cycles. Locations where the use of live air-to-ground ordnance is authorized could include the Utah Test and Training Range, Utah, and the ranges used for live missile training.

Personnel

More than 31,000 active duty, ANG and Reserve military, and DOD civilian personnel are currently assigned to JBPHH. To support the F-22A plus-up, approximately 150 additional ANG and civilian personnel would be assigned to JBPHH while the additional F-22As operate from JBPHH and would include pilots, maintenance, and support personnel. Additionally, an estimated 188 dependents would be added to JBPHH and the surrounding area.

2.2 ALTERNATIVE SELECTION PROCESS

Selection standards were developed to establish a means for determining the reasonableness of an alternative and whether an alternative should be carried forward for further analysis in the EA. The following selection standards meet the purpose of and need for the Proposed Action and were used to identify reasonable alternatives for analysis in the EA.

1. Mission: Locate the F-22As with an existing F-22A squadron and where they would be positioned to respond to existing and projected national threats.
2. Squadron Size: Increase squadron size to an efficient and effective PAA level that improves aircraft availability and achieves maintenance and supply efficiencies to support NGB and DAF mission requirements.
3. Airspace Capacity: Locate the F-22As where there is sufficient SUA capacity to support force-on-force training engagements and can safely support the additional sorties in the SUA. SUA must be large enough

to effectively support realistic combat training. Viable alternatives should not require establishing new SUA but should occur within existing proximate SUA.

4. Facilities: Leverage existing facilities and provide the capacity for additional facilities, if needed, to support a plus-up of F-22A aircraft.

2.2.1 Proposed Action (Alternative A)

The Proposed Action would integrate seven F-22A aircraft into the 199 FS located at JBPHH, that were previously assigned to Tyndall AFB, to increase operational readiness. This integration would last until permanent disposition of the aircraft is determined. An estimated 150 additional pilots, maintenance, and support personnel would be needed to support the Proposed Action. New construction and repair of some existing facilities would also be needed to support the additional aircraft and personnel. The Proposed Action would include the increased use of countermeasure chaff and flare and hazardous materials, as well as the generation of hazardous wastes and industrial wastewater. No substantial increase in the use of 20-mm ammunition is expected. Alternative A would meet all section standards described in **Section 2.2**.

2.2.2 No Action

No action for this EA means the F-22A aircraft from Tyndall AFB would not be integrated into the 199 FS. Under the No Action Alternative, the DAF would be required to identify an alternative unit for the F-22A aircraft. The 199 FS would stay at less than 24 PAA, resulting in continued inefficiencies driven by a smaller squadron size. In addition, under the No Action Alternative, the construction and repair of facilities to support the additional aircraft would not occur. Moreover, there would be no increase in the use of countermeasure chaff and flare or hazardous materials, nor in the generation of hazardous wastes and industrial wastewater.

Analysis of the No Action Alternative provides a benchmark, enabling decision-makers to compare the magnitude of the potential environmental effects of the Proposed Action. NEPA requires an EA to analyze the No Action Alternative. No action means that the Proposed Action would not take place during this time period.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION

2.3.1 Alternative B – Assign Aircraft from Tyndall AFB to Multiple Other Operational Squadrons

Alternative B does not meet Selection Standard 2. Under this alternative, operational F-22A aircraft from Tyndall AFB would be permanently relocated between the operational squadrons at Joint Base Langley-Eustis (JBLE-Langley), Virginia, and Joint Base Elmendorf-Richardson (JBER-Elmendorf), Alaska, each of which currently have two operational squadrons sized at 24 PAA. The most effective fighter squadron configuration in the DAF has historically been 24 PAA. Distributing six more PAA aircraft between these locations would result in one or more squadrons sized above 24 PAA, which is not effective in achieving maintenance and supply efficiencies.

2.3.2 Alternative C – Assign Aircraft from Tyndall AFB to a Single Other Operational Squadron

Alternative C does not meet Selection Standard 2. Under this alternative, operational F-22A aircraft from Tyndall AFB would be permanently relocated to an operational squadron at either JBLE-Langley or JBER-Elmendorf. This would result in one operational squadron sized at 30 PAA. The most effective fighter squadron configuration in the DAF has historically been 24 PAA and two different sized squadrons at a Wing would result in reduced efficiency.

2.3.3 Alternative D – Change Coding of Tyndall AFB Operational Aircraft from Primary Aerospace Vehicle Authorized to Backup Aircraft Inventory

Alternative D does not meet Selection Standards 1 or 2. Under this alternative, the aircraft from Tyndall AFB would change from PAA to BAI. If coding were changed to BAI, these aircraft would not be optimally positioned to increase mission readiness. In addition, BAI aircraft do not have programmed resources; therefore, the amount of support resources does not increase when assigning additional BAI aircraft above the minimum number needed for normal fleet operations and would require resources to be spread out among more aircraft, thus reducing effectiveness and efficiency.

2.4 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES

The potential impacts associated with Alternative A – Proposed Action and the No Action Alternative are summarized in **Table 2-4**. The summary is based on information discussed in detail in **Chapter 3** of the EA and includes a concise explanation of the issues addressed, and the potential environmental impacts associated with each alternative action.

Table 2-4
Comparison of Potential Environmental Consequences by Alternative

Resource	Alternative A	No Action Alternative
Airspace Management	**JBPHH** Negligible impacts **Special Use Airspace** Negligible impacts	No change to airspace management and use at JBPHH or in the special use airspace
Noise	**JBPHH** Overall, noise levels would increase; however, the increase would be negligible. **Special Use Airspace** Negligible changes in the subsonic noise environment. Impacts associated with sonic booms would be negligible	No change to noise setting at JBPHH or in the special use airspace
Air Quality	**JBPHH** Not a significant increase in criteria pollutant emissions No impacts on the region's ability to comply with the NAAQS for regulated pollutants Would not hamper efforts to achieve compliance with ozone NAAQS. **Special Use Airspace** No impacts from criteria pollutant emissions No impacts on the region's ability to meet NAAQS for all regulated pollutants	No change to air quality at JBPHH or in the special use airspace
Health and Safety	**JBPHH** No impacts on ground, explosive, or flight safety **Special Use Airspace** No impacts on ground, explosive, or flight safety	No change to ground, flight, or explosive safety at JBPHH or in the special use airspace
Land Use	**JBPHH** No changes to existing land use No impacts on the coastal zone **Special Use Airspace** N/A	No change to land use at JBPHH

Table 2-4
Comparison of Potential Environmental Consequences by Alternative

Resource	Alternative A	No Action Alternative
Earth Resources	**JBPHH** Topography and regional geology would not be affected No adverse impacts on earth resources **Special Use Airspace** N/A	No change to earth resources at JBPHH
Water Resources	**JBPHH** No impacts on surface waters, wetlands, or groundwater Projects located within flood zones and tsunami inundation zones would incorporate flood protection measures into their design and no significant impacts from the construction of new facilities or the repair of existing facilities within flood hazard areas is expected. **Special Use Airspace** Negligible impacts on water quality	No change to earth resources at JBPHH or in the airspace
Biological Resources	**JBPHH** No impacts on vegetation communities or habitat. Negligible, short- and long-term impacts on wildlife, including birds Minor impacts on birds from potential aircraft/bird collisions No impacts on federally listed species **Special Use Airspace** No impacts on marine wildlife No impacts on Essential Fish Habitat May affect but not likely to adversely affect federally listed Newell's Townsend's shearwater, short-tailed albatross, federally listed sea turtles, marine mammals, giant manta ray, oceanic whitetip shark, and scalloped hammerhead shark. No impacts from noise, including sonic booms	No change to biological resources at JBPHH or in the special use airspace
Cultural Resources	**JBPHH** No impacts on archaeological resources, traditional cultural properties or sacred sites, or historic properties No impacts on NRHP-eligible Building 2030 **Special Use Airspace** N/A	No change to cultural resources at JBPHH or in the special use airspace

Table 2-4
Comparison of Potential Environmental Consequences by Alternative

Resource	Alternative A	No Action Alternative
Infrastructure, Transportation, and Utilities	(Moderate impact) **JBPHH** Minor, short term adverse impacts on transportation and landfill capacity during construction activities Long-term, minor, direct adverse impacts on solid waste generation and landfill capacity from the additional personnel Direct, long-term, moderate impacts on transportation due to the additional personnel Long-term, minor, direct, adverse impacts on utilities from the increased use of electricity and potable water, and increased production of wastewater from the additional personnel and new facilities **Special Use Airspace** N/A	(No, minor, or negligible impact) No change to infrastructure, transportation, and utilities at JBPHH
Hazardous Materials and Wastes, Environmental Restoration Program, and Toxic Substances	(No, minor, or negligible impact) **JBPHH** No impacts on hazardous waste management No impacts on asbestos-containing materials and lead-based paint management Long-term, minor, beneficial impacts on managing and disposal of polychlorinated biphenyls No impacts from radon No environmental contamination **Special Use Airspace** N/A	(No, minor, or negligible impact) No change to hazardous materials and wastes, contaminated sites, and toxic substances at JBPHH
Socioeconomics and Protection of Children	(No, minor, or negligible impact) **JBPHH** No impacts on income or employment Minor, long-term, beneficial impacts from expenditures in the region from contract ADAIR. No disproportionate impacts on minority or low-income populations No disproportionate impacts on children **Special Use Airspace** N/A	(No, minor, or negligible impact) No change to income and employment at JBPHH No disproportionate impacts on minority, low-income, or children in the community at JBPHH

Notes:
(Green) No, minor, or negligible impact (Yellow) Moderate impact but not significant (Red) Major, significant impact

JBPHH = Joint Base Pearl Harbor-Hickam; N/A = not applicable; NAAQS = National Ambient Air Quality Standards; NRHP = National Register of Historic Places

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CHAPTER 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This EA analyses potential impacts on existing environmental conditions associated with the permanent or temporary addition of seven F-22A aircraft to the 199 FS, as well as the construction of new and repair of existing facilities listed in **Appendix B**. The analysis considers the current (baseline) conditions of the affected environment and compares those to conditions that might occur should the NGB implement either the Proposed Action or No Action Alternative.

In this section, each resource is defined, and the geographic scope is identified. The expected geographic scope of potential consequences is referred to as the region of influence (ROI). The ROI boundaries will vary depending on the nature of each resource. For example, the ROI for some resources, such as air quality, extends over a larger jurisdiction unique to the resource. The specific criteria for evaluating impacts and assumptions for the analyses are presented under each resource area. Evaluation criteria for most potential impacts were obtained from standard criteria; federal, state, or local agency guidelines and requirements; and/or legislative criteria. The analysis of significance considers both context and intensity as well as both direct and indirect effects. Quantitative thresholds are applied, where appropriate, to determine the level of significance. Other effects are assessed qualitatively based on context and intensity.

Impacts and their significance, as well as the means (e.g., Best Management Practices [BMPs]) for reducing potential adverse environmental impacts are also discussed for each resource.

3.1.1 Close Causal Effects and Reasonably Foreseeable Future Actions

Reasonably foreseeable environmental effects may occur when there is a relationship between a Proposed Action or alternatives expected to occur in a similar location or during a similar timeframe. Actions overlapping with or in close proximity to the proposed action or alternatives can reasonably be expected to have more potential for effects on “shared resources” than actions that may be geographically separated. Similarly, actions that coincide in the same timeframe tend to offer a higher potential for environmental effects.

This EA addresses reasonably foreseeable environmental effects by assessing the incremental contribution of the No Action Alternative to effects on affected resources from all factors, including future planned actions. The NGB and DAF have made an effort to identify actions on or near the affected areas that are under consideration and in the planning stage at this time (**Appendix C**). These actions are included in this analysis, drawn from the level of detail that exist now. Although the level of detail available for those future actions varies, this approach provides the decision-maker with the most current information to evaluate the consequences of the Proposed Action alternatives.

In this section, an effort was made to identify past and present actions in the region and those reasonably foreseeable actions that are in the planning phase at this time. Actions that have a potential to interact with the Proposed Action alternatives are included in this analysis. This approach enables decision-makers to have the most current information available so that they can evaluate the environmental consequences of the Proposed Action.

JBPHH is an active military base that has been in operation since 1917 and undergoes changes in mission and in training requirements in response to defense policies, current threats, and tactical and technological advances. The base, like any other major institution (e.g., university, industrial complex), requires new construction, facility improvements, infrastructure upgrades, and maintenance and repairs. In addition, tenant organizations may occupy portions of the base, conduct aircraft operations, and maintain facilities. All of these actions (i.e., mission changes, facility improvements, and tenant use) will continue regardless of which alternative is selected. The analysis for each resource topic considers how the effects of these other actions might affect or be affected by those resulting from the Proposed Action and whether such a relationship would result in potentially additive effects. Where feasible, these effects were assessed using quantifiable data; however, for many of the resources, quantifiable data are not available, and a qualitative analysis was undertaken. In addition, where an analysis of potential environmental effects for future actions has not been completed, assumptions were made based on an understanding of the nature of the project regarding effects related to this EA.

3.2 AIRSPACE MANAGEMENT AND USE

3.2.1 Definition of the Resource

Airspace management involves the direction, control, and handling of flight operations in the airspace that overlies the borders of the United States and its territories. The FAA has the responsibility to plan, manage, and control the structure and use of all airspace over the United States. FAA rules govern the national airspace system, and FAA regulations establish how and where aircraft may fly. Collectively, the FAA uses these rules and regulations to make airspace use as safe, effective, and compatible as possible for all types of aircraft, from private propeller-driven planes to large, high-speed commercial and military jets.

Aircraft use different kinds of airspace according to the specific rules and procedures defined by the FAA for each type of airspace. For the Proposed Action, the SUA used would be seven Warning Areas (W-188C, W-189A, W-189B, W-190, W-192, W-193, and W-194 and the Nalu and Mela South ATCAAs). A Warning Area is airspace that extends from 3 NM outward from the coast of the United States and may be over US waters, international waters, or both. The purpose of Warning Areas is to warn nonparticipating pilots of potentially hazardous activity. Each military organization responsible for a Warning Area develops a daily use schedule. Although the FAA designates Warning Areas for military use, other pilots may transit the SUA under Visual Flight Rules (VFR). Warning Areas exist to notify civil pilots under VFR where heavy volumes of military training exist which increases the chance of conflict and are generally avoided by VFR traffic. ATCAA are airspace of defined vertical/lateral limits assigned by FAA ATC for the purpose of providing air traffic segregation between the specified activities being conducted within the assigned airspace and other IFR air traffic.

The ROI for airspace management and use includes the JBPHH airfield and environs as well as the SUA depicted on **Figure 2-2**.

3.2.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

The JBPHH airfield is operated by the 15th Wing (15 WG) supporting military operations conducted by units stationed at the base. Military training has occurred at JBPHH since the construction of the first runway began in 1917. With a large complement of F-22s, JBPHH airfield is shared with the HNL civilian aviation activities. Most operations on the shared airfield are performed by HNL.

ATC for JBPHH is provided by Honolulu Approach (FAA). Controlled Class D airspace, which are airspace that extend upward from the surface to and including 3,200 ft MSL within a 4.5-NM radius of JBPHH, have been established around the airfield to support managing air traffic controlled by JBPHH Tower.

A variety of factors can influence the annual level of operational activity at an airfield, including economics, national emergencies, and maintenance requirements. Operations consist of arrivals and departures (itinerant) by primarily civilian aircraft, with a smaller amount of military aircraft traffic. Military aircraft use makes up 6.2 percent of the airfield use, with the remaining 93.8 percent used by civilian flights (**Table 3-1**).

Table 3-1
Annual Operations at Joint Base Pearl Harbor-Hickam

Use	Annual Operations[a]	Percentage of Use
Military		
154th Wing	5,516	1.7
Other Military	9,800	3.1
Transient	8,814	2.8
Civilian		
General Aviation	292,530	92.4
Total	**316,660**	**100.0**

Note:
[a] Military and civilian operations are from the 2019 Joint Base Pearl Harbor-Hickam Contract Adversary Air Environmental Assessment

3.2.3 Existing Conditions – Special Use Airspace

The affected environment for airspace management includes SUA where aircraft based at JBPHH perform training operations. F-22A aircraft assigned to JBPHH primarily train in Warning Areas W-188C, W-189A, W-189B, W-190, W-192, W-193, and W-194 and the Nalu and Mela South ATCAA (see **Figure 2-2** and **Table 2-3**). The Warning Areas are controlled by the Navy.

3.2.4 Environmental Consequences Evaluation Criteria

Adverse impacts on SUA might include modifications to Warning Areas or ATCAA or significantly increasing flight operations within SUA as a result of the Proposed Action and alternatives. For the purposes of this EA, an impact is considered significant if it modifies SUA location, dimensions, or aircraft operational capacity.

3.2.5 Environmental Consequences – Alternative A

The proposed seven F-22A aircraft would use the same flight profiles and SUA as existing F-22A aircraft based at JBPHH under Alternative A. The addition of an estimated 405 operations is negligible, increasing the annual number of F-22 sorties by 14.7 percent and increasing overall airport operations by less than one percent. This change is not expected to impact the operational capacity or necessitate changes to SUA locations or dimensions around JBPHH. No significant effects on the SUA around the airfield are expected as a result of this alternative.

There would also be a 14.7 percent increase in DAF F-22 operations in the SUA proposed for use. Additionally, DAF flights at night would increase by approximately one sortie per year. The local squadron does not depart the airport after 10:00 p.m., but a small number of sorties do return after 10:00 p.m. There is no identifiable negative impact on current operations in the SUA when considering Alternative A in conjunction with existing military activity. All operations would be conducted and deconflicted in accordance with existing Using Agency operating procedures and scheduling instruction procedures and priorities (Air Warfare Division [OPNAV N98], Naval Airspace and Air Traffic Control Standards and Evaluation Agency).

The SUA proposed for use have the capacity and are in locations with the dimensions necessary to support the F-22 sorties proposed; therefore, no significant effects on SUA are expected from the implementation of Alternative A.

3.2.5.1 Close Causal Effects and Reasonably Foreseeable Future Actions

Close causal effects on airspace management, combined with the potential effects expected from Alternative A, would not be significant. The addition of the Proposed Action would increase F-22 sorties by 14.7 percent at the installation and in the SUA, which represents an overall increase of less than one percent of overall airport operations. When added to reasonably foreseeable future actions, the addition of the Proposed Action would result in no significant effects.

3.2.6 Environmental Consequences – No Action Alternative

Under the No Action Alternative, the additional F-22A aircraft and associated operations would not occur at JBPHH. Under the No Action Alternative, there would be no change on airspace management and use.

3.3 NOISE

3.3.1 Definition of the Resource

Military aircraft generate two types of sound, subsonic noise and supersonic noise. Aircraft subsonic noise consists of two major types of sound events: flight events (including takeoffs, landings, and flyovers) and stationary events, such as engine maintenance run-ups. Aircraft in supersonic flight (i.e., exceeding the speed of sound, Mach 1) cause sonic booms. A sonic boom is characterized by a rapid increase in pressure, followed by a decrease before a second rapid return to normal atmospheric levels. This change occurs very quickly, typically within a few tenths of a second, and is usually perceived as a "bang-bang" sound.

Noise metrics quantify subsonic and supersonic noise in a standard way. There are several metrics that can be used to describe a range of situations, from a particular individual event to the cumulative effect of all noise events over a long time. For the purposes of this analysis, noise is expressed using several metrics including: A-weighted decibels (dBA), day-night average sound level (DNL or L_{dn}), onset-rate adjusted monthly day-night average sound level (L_{dnmr}), C-weighted sound exposure level (CSEL), and overpressure (pound[s] per square foot [psf]). These noise metrics are calculated using the following software programs: NOISEMAP, MR_NMAP, PCBoom, and BooMap. Noise metrics, noise models, and other acoustic principles are described in much greater detail in **Appendix D-2**.

The ROI for noise includes the JBPHH airfield and environs as well as the SUA depicted on **Figure 2-2**. Noise analysis at JBPHH was conducted to update the airfield noise contours and the SUA noise levels in order to reflect the most recent and accurate aircraft operations and flying conditions.

3.3.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

As is normal for military installations with a flying mission, the primary driver of noise at JBPHH is aircraft operations. Standard aircraft operations include take-offs, landings, and static run-ups. Closed pattern operations are not flown by aircraft at JBPHH.

In addition to aviation noise, some additional noise results from the day-to-day activities associated with operations, maintenance, and the industrial functions associated with the operations of the airfield. These noise sources include the operations of ground-support equipment, and other transportation noise from vehicular traffic. Noise resulting from aircraft operations remains the dominant noise source.

Aircraft operations at HNL and JBPHH airfield consist of based military aircraft, civilian aircraft, and a variety of transient aircraft. Existing annual aircraft operations at JBPHH total 316,660 operations, as summarized in **Table 3-2**. An operation is defined as a single takeoff or landing. JBPHH's Runway 08 is used for the majority of military aircraft operations while civilian aircraft operations are primarily distributed between Runways 04 and 08. Most aircraft operations at JBPHH are performed by civilian aircraft. A more detailed existing annual aircraft operations table can be found in **Appendix D-2.**

Table 3-2
Existing Annual Aircraft Operations Summary at Joint Base Pearl Harbor-Hickam

Aircraft	Departures		Arrivals		Total Operations		
	Day	Night	Day	Night	Day	Night	Total
F-22	2,758	-	2,750	8	5,508	8	5,516
Other Military	4,352	548	4,202	698	8,554	1,246	9,800
Civilian	131,454	14,811	135,280	10,985	266,734	25,796	292,530
Transients	4,407	-	4,377	30	8,784	30	8,814
Grand Total	**142,971**	**15,359**	**146,609**	**11,721**	**289,580**	**27,080**	**316,660**

The resultant 65- to 85-dBA DNL contours in 5-dBA increments for the existing daily flight events at JBPHH are shown on **Figure 3-1**. In accordance with AFH 32-7084, the 65-dBA DNL is the noise level below which generally all land uses are compatible with noise from aircraft operations. It should be emphasized that these noise levels, which are often shown graphically as contours on maps, are not discrete lines that sharply divide louder areas from land largely unaffected by noise. Instead, they are part of a planning tool that depicts the general noise environment around the installation based on typical aviation activities. Areas beyond 65-dBA DNL can also experience levels of appreciable noise depending upon training intensity or weather conditions. In addition, DNL noise contours may vary from year to year due to fluctuations in operational tempo due to unit deployments, funding levels, and other factors. Static run-up operations, such as maintenance and pre/postflight run-ups, were also modeled. A more detailed discussion of static operations at JBPHH can be found in **Appendix D-2**.

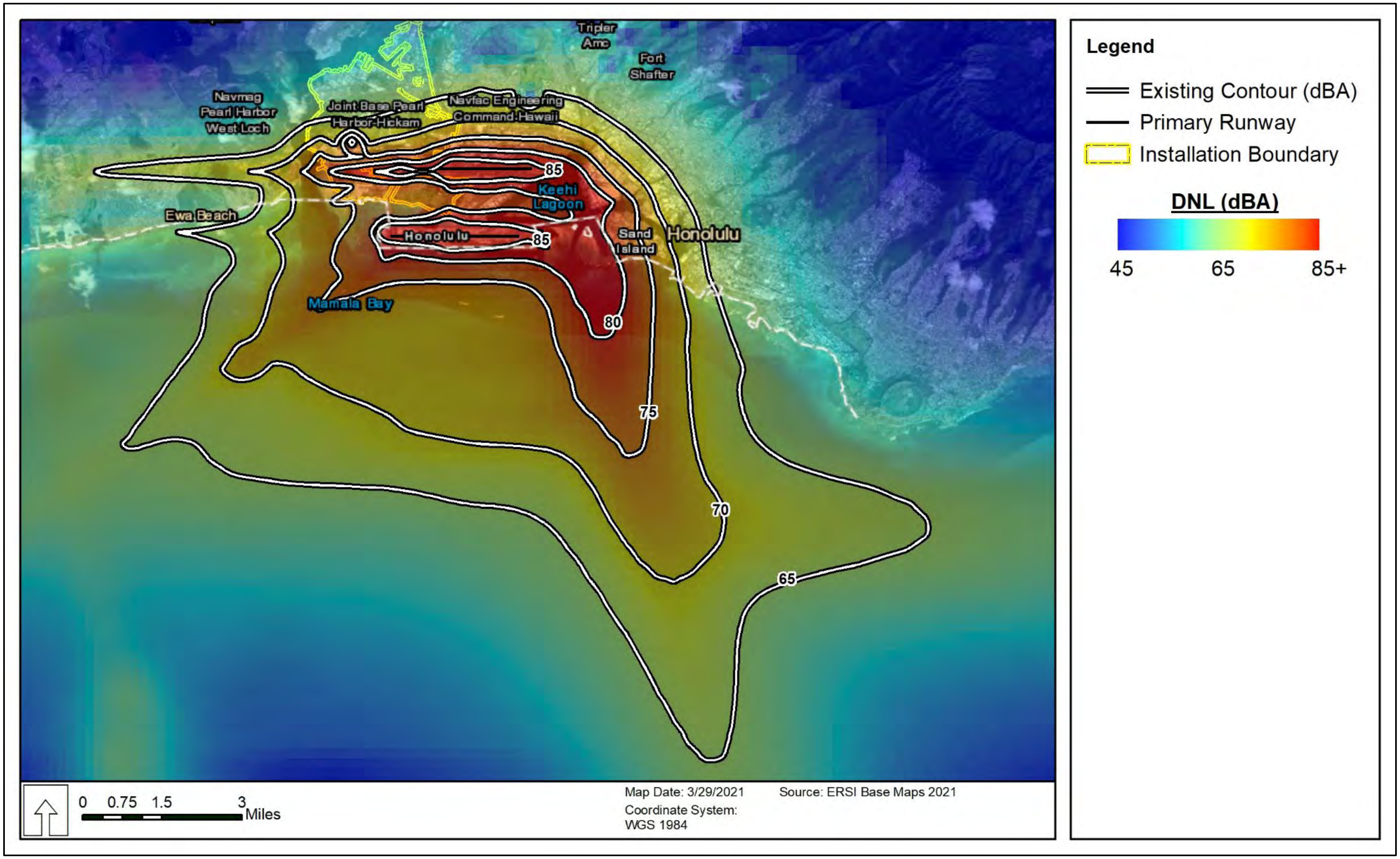

Figure 3-1. Existing Day-Night Average Sound Level Contours at Joint Base Pearl Harbor-Hickam.

The majority of the DNL contours are over water (see **Figure 3-1**). The 65-dBA contour extends over land beyond the base boundary, approximately 4.5 miles (mi) to the west and approximately 2.5 mi to the east from the end of Runway 08/26. The 70-dBA DNL contour extends approximately 2.2 mi to the west and 1.9 mi to the east from the end of the runway. The 75-dBA DNL contour extends approximately 1.3 mi to the west and 1.3 mi to the east from the end of the runway. The area within each DNL noise contour, including area over water, for the existing conditions as shown on **Figure 3-1** are summarized in **Table 3-3**.

Table 3-3
Existing Day-Night Average Sound Level Area Affected at
Joint Base Pearl Harbor-Hickam

Noise Level (dBA DNL)	Area Within Noise Contour (acres)[1]
>65	51,470
>70	28,004
>75	11,627
>80	4,821
>85	1,264

Notes:
[1] The on- and off-base area within noise contours was calculated from NOISEMAP modeling results. The amounts shown are cumulative, i.e., the acreage within the >85 dBA contour is also within all the lower noise level contours.

dBA = A-weighted decibel; DNL = Day-Night Average Sound Level

A series of representative points of interest (POI) have been identified in the vicinity of JBPHH. These POIs are made up of noise-sensitive receptors such as homes, schools, hospitals, and places of worship. **Table 3-4** shows the DNL as a result of aircraft operations at JBPHH at the 14 POIs for the existing conditions. Of the 14 POIs, six are currently exposed to a DNL between 60 and 65 dBA and seven of the POIs are exposed to a DNL higher than 65 dBA.

Table 3-4
Existing Day-Night Average Sound Level at Points of Interest in the Vicinity of Joint Base Pearl Harbor-Hickam

Points of Interest		DNL (dBA)
ID	Description	
C01	St. John The Baptist Church / School	63
C02	Kaumakapili United Church of Christ	65
H01	Lanakila Health Center	61
H02	Pauahi Wing Queens Medical Center	62
R01	Residential (108 Street)	71
R02	Residential (Iroquois Drive)	72
S01	Pearl Harbor Elementary School	62
S02	Kalakaua Middle School	66
S03	Iroquois Point Elementary School	68
S04	McKinley High School	62
S05	Aliamanu School	67
S06	Nimitz Elementary School	67
S07	Holy Family Catholic Academy	69
S08	Campbell High School	59

Notes:
Potentially affected POIs were derived from NOISEMAP-modeled noise contours.

Table 3-4
Existing Day-Night Average Sound Level at Points of Interest in the Vicinity of Joint Base Pearl Harbor-Hickam

Points of Interest		DNL (dBA)
ID	Description	

dBA = A-weighted decibel; DNL = Day-Night Average Sound Level

3.3.3 Existing Conditions – Special Use Airspace

The primary SUA used by JBPHH-based aircraft are Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 and the Nalu and Mela South ATCAA. The northern SUA (Warning Areas W-188C, W-189, W-190, and Nalu ATCAA) receive approximately 67 percent of all SUA operations originating from JBPHH while the southern SUA (Warning Areas W-192, W-193, W-194, and Mela South ATCAA) receive 33 percent. As described in **Section 2.1**, the Warning Areas are all over the Pacific Ocean. A summary of JBPHH's annual SUA operations performed by F-22 aircraft is presented in **Table 3-5**.

Table 3-5
Existing Annual F-22 Airspace Operations Summary at Joint Base Pearl Harbor-Hickam

Aircraft	North (W-188C, W-189, W-190 and Nalu ATCAA)		South (W-192, W-193, W-194 and Mela South ATCAA)		Total Operations		
	Day	Night	Day	Night	Day	Night	Total
F-22	1,372	457	641	275	2,013	732	2,745

ATCAA = Air Traffic Controlled Assigned Airspace

Supersonic operations are allowed in all the SUA above 30,000 ft between 15 to 30 NM from land and above 10,000 ft beyond 30 NM from land. All the Warning Areas are over water and most of the SUA comprising these Warning Areas is located more than 30 NM from land. Airspace sorties require aircraft to exceed Mach 1.0 (supersonic) for approximately 2 minutes per sortie. F-22 subsonic operations result in approximately 51 dBA L_{dnmr} in the northern Warning Areas (W-188C, W-189, W-190) and <45 dBA L_{dnmr} in the southern Warning Areas (W-192, W-193, W-194).

Under the existing conditions (**Table 3-5**), the cumulative C-weighted DNL exposure in the various Warning Areas used by based JBPHH aircraft do not exceed 45 dB C-weighted DNL under any airspace.

Single event sonic boom levels estimated for supersonic flights in the SUA are shown in **Table 3-6**. Overpressure (psf) and CSEL (decibels) were estimated directly under the flight path for the based F-22 aircraft at various altitudes at a speed of Mach 1.2. Overpressure levels estimated for these SUA range from 5.4 to 1.2 psf depending on the flight conditions.

Table 3-6
Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 and Nalu and Mela South Air Traffic Controlled Assigned Airspace: Sonic Boom Levels Undertrack for Aircraft in Level Flight at Mach 1.2

Aircraft	Metric	Altitude (feet above mean sea level)			
		10,000	20,000	30,000[a]	50,000
F-22	Overpressure (pounds per square foot)	5.4	2.8	1.9	1.2
F-22	C-Weighted Sound Exposure Level (decibels)[b]	116	111	107	103

Notes:
[a] Supersonic operations are allowed in Warning Areas above 30,000 feet if between 15 to 30 nautical miles from land and above 10,000 feet if beyond 30 nautical miles from land.
[b] C-weighted Sound Exposure Level – Sound Exposure Level with frequency weighting that places more emphasis on low frequencies below 1,000 hertz

3.3.4 Environmental Consequences Evaluation Criteria

Noise analysis typically evaluates potential changes to existing noise environments that would result from implementation of the Proposed Action and alternatives. In accordance with AFH 32-7084, at the installation 65-dBA DNL is the noise level below which generally all land uses are compatible with noise from aircraft operations. Areas beyond 65-dBA DNL can also experience levels of appreciable noise depending upon training intensity or weather conditions. In addition, DNL noise contours may vary from year to year due to fluctuations in operational tempo because of unit deployments, funding levels, and other factors.

Potential changes in the noise environment can be beneficial (i.e., if they reduce the number of sensitive receptors exposed to unacceptable noise levels), negligible (i.e., if the total area exposed to unacceptable noise levels is essentially unchanged), or adverse (i.e., if they result in increased noise exposure to unacceptable noise levels). Potential noise impacts associated with the implementation of the Proposed Action and alternatives were evaluated as part of this EA.

3.3.5 Environmental Consequences – Alternative A

Under the Alternative A, seven F-22A aircraft would be relocated to the 199 FS at JBPHH. These aircraft would be expected to perform approximately 405 sorties per year. Only negligible changes to the noise environment are expected from the implementation of Alternative A. As a result, no significant impacts are expected.

3.3.5.1 Joint Base Pearl Harbor-Hickam

Implementation of Alternative A would result in a 14.7 percent increase in the number of F-22 operations at JBPHH. Runway utilization, flight tracks, flight track utilization, and day/night flight distribution for proposed F-22A aircraft would be identical to existing F-22 operations. Proposed annual departure and arrival aircraft operations at JBPHH with the addition of the proposed F-22A aircraft are summarized in **Table 3-7**. The proposed F-22 aircraft would also perform static run-up operations, such as pre- and postflight run-ups.

Table 3-7
Proposed Annual Aircraft Operations Summary at Joint Base Pearl Harbor-Hickam

Aircraft	Departures		Arrivals		Total Operations		
	Day	Night	Day	Night	Day	Night	Total
Existing F-22	2,758	-	2,750	8	5,508	8	5,516
Proposed F-22	405	-	404	1	809	1	810
Other Military	4,352	548	4,202	698	8,554	1,246	9,800
Civilian	131,454	14,811	135,280	10,985	266,734	25,796	292,530
Transients	4,407	-	4,377	30	8,784	30	8,814
Grand Total	**143,376**	**15,359**	**147,013**	**11,722**	**290,389**	**27,081**	**317,470**

Under Alternative A, there would also be new construction activities resulting in additional noise at JBPHH. Noise generated by construction operations would be short-term due to the temporary nature of construction projects. Due to noise from the nearby active airfield, noise from construction operations would be expected to contribute only negligible increases to the overall JBPHH noise environment.

The modeled 65- to 85-dBA DNL contours in 5-dBA increments for the daily flight events at JBPHH under Alternative A are summarized on **Figure 3-2**. Alternative A noise contours are nearly identical to the existing conditions noise contours.

Under Alternative A, the area within noise contours increases slightly (**Table 3-8** and **Figure 3-3**). These increases are unlikely to lead to significant impacts in these areas. Further, as a result of the implementation of Alternative A, noise levels at representative POIs identified in **Table 3-3** would not increase. No significant impacts are expected.

Table 3-8
Proposed Action Day-Night Average Sound Level Area Affected on and Surrounding Joint Base Pearl Harbor-Hickam

Noise Level (dBA DNL)	Area Within Noise Contour (acres)		
	Existing	Proposed Action	Increase
>65	51,470	51,524	54
>70	28,004	28,031	27
>75	11,627	11,661	34
>80	4,821	4,841	20
>85	1,264	1,271	7

Notes:
dBA = A-weighted decibel(s); DNL = day-night average sound level

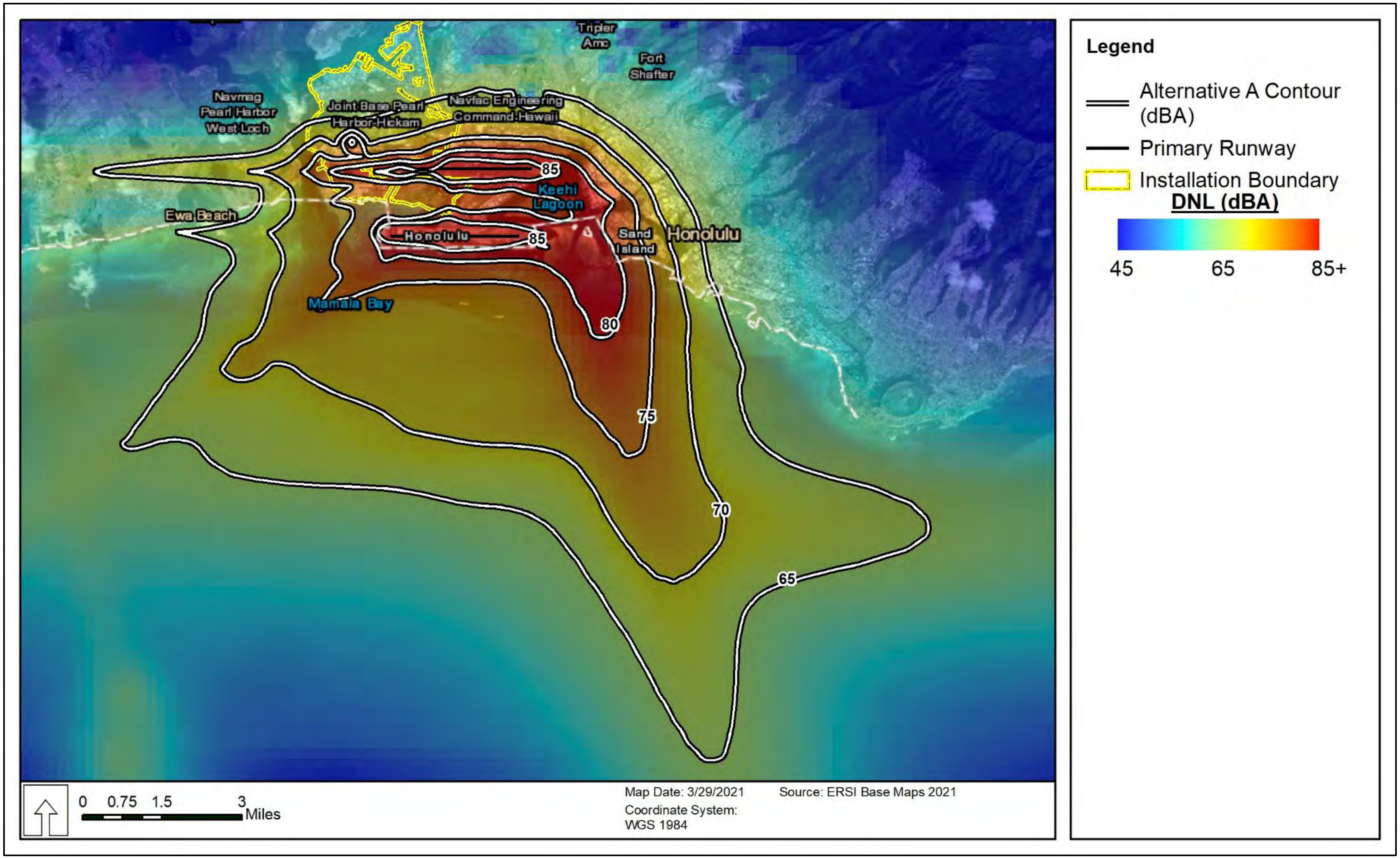

Figure 3-2. Proposed Action Day-Night Average Sound Level Contours at Joint Base Pearl Harbor-Hickam.

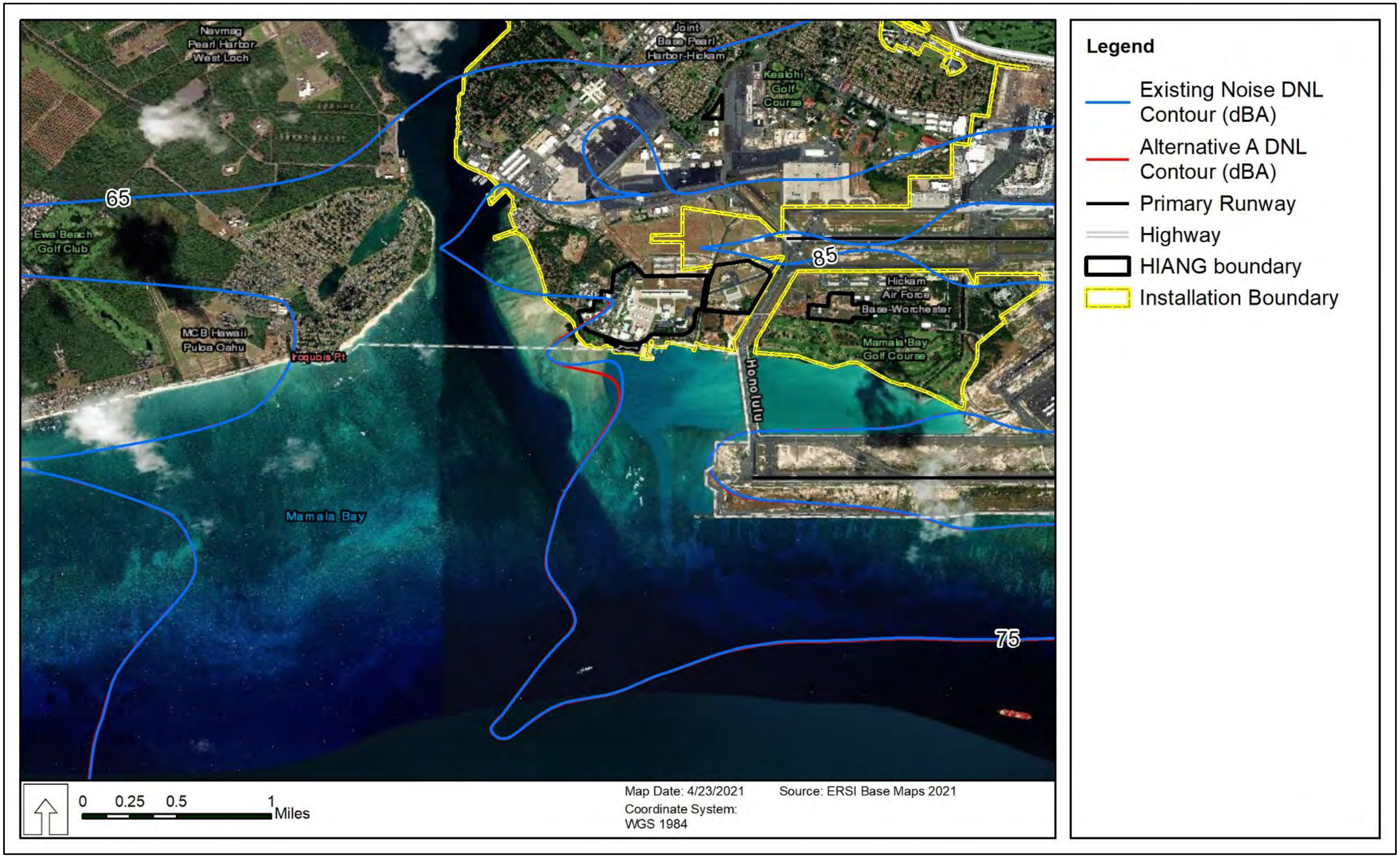

Figure 3-3. Comparison of Proposed Action and Existing Day-Night Average Sound Level Contours at Joint Base Pearl Harbor-Hickam.

3.3.5.2 Airspace

Under Alternative A, F-22A aircraft would perform an estimated 405 additional annual SUA operations in the SUA. Proposed F-22A aircraft would perform the same types of training activities as currently based F-22 aircraft. A summary of estimated annual SUA operations is presented in **Table 3-9**.

Table 3-9
Proposed Annual F-22 Airspace Operations Summary at Joint Base Pearl Harbor-Hickam

Aircraft	North (W-188C, W-189, W-190 and Nalu ATCAA)		South (W-192, W-193, W-194 and Mela South ATCAA)		Total Operations		
	Day	Night	Day	Night	Day	Night	Total
Existing F-22	1,372	457	641	275	2,013	732	2,745
Proposed F-22	203	67	94	41	297	108	405
Grand Total	**1,575**	**524**	**735**	**316**	**2,310**	**840**	**3,150**

ATCAA = Air Traffic Controlled Assigned Airspace

JBPHH-based aircraft do not dominate the noise environment of the SUA due to the large number of operations from aircraft based at other installations. Due to the low number of additional SUA operations, no significant impacts are expected to the noise environment of the SUA. In addition, the single event sonic boom levels estimated for supersonic flights shown in **Table 3-6** would not change. No significant impact would be expected to the noise environment in the SUA.

3.3.5.3 Close Causal Effects and Reasonably Foreseeable Future Actions

Alternative A would result in potential long-term, negligible increases to the noise environment. Alternative A, in addition to reasonably foreseeable future actions on and off JBPHH, may result in negligible impacts on the noise environment.

3.3.6 Environmental Consequences – No Action Alternative

Under the No Action Alternative, the additional F-22A aircraft and associated operations would not occur at JBPHH. No new construction or renovations of existing buildings to support the additional F-22A aircraft would be required. Under the No Action Alternative, there would be no change to the noise environment.

3.4 AIR QUALITY

3.4.1 Definition of the Resource

The US Environmental Protection Agency (USEPA) has divided the country into geographical regions known as Air Quality Control Regions (AQCRs) to evaluate compliance with the National Ambient Air Quality Standards (NAAQS). For purposes of this EA, there are two ROIs for air quality. One includes the State of Hawai'i AQCR within which JBPHH is located. The other ROI includes portions of the SUA.

3.4.1.1 Criteria Pollutants

Typically, the air quality in each region or area is measured by the concentration of various pollutants of concern in the atmosphere. These pollutants of concern are known as "criteria pollutants" and the quality of air, to a large extent, depends on the types and amounts of criteria pollutants found in the air within a region. For these criteria pollutants, USEPA established national numerical standards for concentration, or NAAQS, to protect public health and other resources, such as crops and vegetation.

NAAQS are currently established for six criteria air pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter (including particulates equal to or less than 10 microns in diameter (PM_{10}) and particulates equal to or less than 2.5 microns in diameter ($PM_{2.5}$), and lead. The criteria pollutant O_3 is not usually emitted directly into the air but is formed in the atmosphere by photochemical reactions involving sunlight and previously emitted pollutants, or "O_3 precursors." These O_3 precursors consist primarily of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) that are directly emitted from a wide range of emissions sources. For this reason, regulatory agencies limit atmospheric O_3 concentrations by controlling VOC pollutants (also identified as reactive organic gases) and NO_x.

When a region or area fails to meet a NAAQS for a pollutant, that region is classified as "non-attainment" for that pollutant. The Clean Air Act (CAA) required the USEPA draft general conformity regulations that are applicable in nonattainment areas, or in designated maintenance areas (i.e., attainment areas that were reclassified from a previous nonattainment status, which are required to prepare a maintenance plan for air quality). These regulations are designed to ensure that federal actions do not impede local efforts to achieve or maintain attainment with the NAAQS. The General Conformity Rule exempt certain federal actions from conformity determinations (e.g., contaminated site cleanup and natural disaster response activities). Other federal actions are assumed to conform if total indirect and direct project emissions are below specified *de minimis* levels. These threshold levels (in tons of pollutant per year) depend upon the nonattainment status that USEPA has assigned to a region. Once the net change in nonattainment pollutants is calculated, the federal agency must compare them to the *de minimis* thresholds. **Appendix D-3** provides a detailed discussion on air quality regulations and general conformity.

3.4.1.2 Greenhouse Gases

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. These emissions are generated by both natural processes and human activities. The accumulation of GHGs in the atmosphere helps regulate the earth's temperature. GHGs include water vapor, carbon dioxide (CO_2), methane, nitrous oxide, O_3, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated global warming potential (GWP), which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the earth's surface. The GWP of a particular gas provides a relative basis for calculating its carbon dioxide equivalent (CO_2e) or the amount of CO_2e to the emissions of that gas. CO_2 has a GWP of 1 and is, therefore, the standard by which all other GHGs are measured.

In Hawai'i, the USEPA regulates GHGs primarily through a permitting program known as the GHG Tailoring Rule. This rule applies to GHG emissions from stationary sources. As virtually all of the emissions increase from the implementation of Alternative A would occur from mobile sources, this rule would not apply here. As such, this rule is not discussed further.

In addition to the GHG Tailoring Rule in 2009, the USEPA promulgated a rule requiring sources to report their GHG emissions if they emit more than 25,000 metric tons or more of CO_2e per year (40 CFR § 98.2[a][2]). Again, this only applies to stationary sources of emissions.

3.4.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

3.4.2.1 Regional Climate

The regional climate of northeast Hawai'i (in the island of Oahu, Honolulu city), where JBPHH is located, is classified as a tropical savannah climate. Typically, tropical savannah climates have mean temperatures that are above 64 degrees Fahrenheit (°F) every month of the year and a pronounced dry season (Weatherbase, 2021). The warmest month is August, with average high and low temperatures of 89°F and 75°F, respectively. January and February are the coolest months with an average high temperature of 80°F and an average low temperature of 66°F (US Climate Data, 2024). The regional climate typically includes mild, constant temperatures, with only minor changes in temperature throughout the year. It typically does not have extremes of cold winters and summer heat waves. The constant temperatures can be attributed to the location of the region in the tropical latitude and the influence of the surrounding Pacific Ocean. Average annual precipitation for Honolulu is 17.1 inches (in.). The region is characterized by peak rain fall during winter months, that typically run between October and April. The wettest month by average precipitation is in December with an average of 3.2 to 43 in. of rain. The driest month is June with an average of 0.26 in. of precipitation (US Climate Data, 2024). The Hawai'ian Islands, including the island of Oahu on which JBPHH is located, is subject to persistent northeasterly trade winds. Average wind speeds are highest during the summer trade-wind period. The winds are typically from the east or northeast and remain mostly uniform throughout the year, except during periods of localized weather events, such as storms or hurricanes when wind conditions may vary (Western Regional Climate Center, 2014).

3.4.2.2 Baseline Air Emissions

The State of Hawai'i Department of Health (DOH), Clean Air Branch has adopted standards that are the same as NAAQS, except for CO and NO_2, that are more stringent than the NAAQS. The Hawai'i DOH has also established standards for hydrogen sulfide for which there are no NAAQS (Hawai'i Administrative Rules [HAR] Title 11, Chapter 59). The Clean Air Branch of the Hawai'i DOH has jurisdiction over the air emission sources that are operated by the HIANG at JBPHH and has authority to implement the federal Title V program and regulate the air emission sources in the state.

JBPHH is located on the State of Hawai'i AQCR. Each AQCR has regulatory areas that are designated as an attainment area or nonattainment area for each of the criteria pollutants depending on whether it meets or fails to meet the NAAQS for the pollutant. Currently, the entire Hawai'i AQCR is designated as an unclassifiable/attainment area for all criteria pollutants (40 CFR § 81.312). Unclassifiable areas are those areas that have not had ambient air monitoring and are assumed to be in attainment with NAAQS. The region is also in attainment of the 2015 8-hour, 70 parts per billion of ground level zone O_3 NAAQS (82 Federal Register 54232). General conformity requirements only apply in areas designated as nonattainment or maintenance of federal NAAQS. Due to this reason, the Proposed Action is not subject to General Conformity Rule requirements, and a general conformity applicability analysis and a further conformity demonstration for the Proposed Action are not required. However, the following sections will continue with the Air Quality impact Analysis for the Proposed Action.

Hawai'i ANG operates under a Noncovered Source Permit (NSP 0748-01-N) with an expiration date of 12 December 2029. The NSP for the facility enforces limits in criteria pollutant emissions so that the facility remains within the 100 tons per year (tpy) threshold for major source permitting. The NSP has limits on annual fuel use at the aircraft engine test facility, limits on the sulfur content in Jet A fuel, and for opacity. The increase in flight operations at JBPHH, as part of the Proposed Action, would result in an increase in the consumption of Jet-A and other fuels. The facility would need to evaluate if the additional fuel usage would allow the facility to stay within the annual fuel use limits for engine testing contained in the NSP, or if the fuel permit limits would need to be changed to accommodate the increase in fuel use.

JBPHH is not classified as a major source for Prevention of Significant Deterioration (PSD) nor located within 10 kilometers of any of the 156 USEPA-designated Class I areas protected by the Regional Haze Rule. Mobile sources, such as vehicle and aircraft emissions, are generally not regulated and not covered under existing stationary source permitting requirements. The most recent annual air emissions inventory assessment for HIANG was available for Calendar Year 2015. Boilers, generators, and engine test facilities would be the largest source of NO_x and CO emissions from stationary sources at HIANG. Fuel loading, painting, and miscellaneous chemical use would contribute to the facility's VOC emissions. As shown in **Table 3-10**, the criteria pollutant with the highest potential and actual emissions were VOCs, which amounted to less than 5 tpy. A mobile source inventory for HIANG covering aircraft operations, vehicles, and aerospace ground equipment was conducted for Calendar Year 2015. The inventory indicated the annual actual CO emissions from aircraft operations accounting for the most criteria pollutant emissions.

An Air Quality Impact Analysis is discussed in **Section 3.4.2**. **Appendix D-3** provides an overview of the CAA and the State of Hawai'i air quality regulations as well as assumptions used for the air quality analysis and a Record of Air Analysis.

Table 3-10
Hawai'i Air National Guard Criteria Pollutant Stationary Source Emissions Summary (Calendar Year 2015)

	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC
Actual (tpy)	1.02	0.70	0.11	0.09	0.07	2.69
Potential[a] (tpy)	2.10	3.21	0.44	0.38	0.17	4.96

Source: HIANG, 2015

Notes:
[a] Potential emissions were estimated using an estimated scaling factor

CO = carbon monoxide; NO_x = nitrogen oxides; PM_{10} = particulates equal to or less than 10 microns in diameter; $PM_{2.5}$ = particulates equal to or less than 2.5 microns in diameter; SO_2 = sulfur dioxide; tpy = tons per year; VOC = volatile organic compounds

3.4.3 Existing Conditions –Special Use Airspace

3.4.3.1 Regional Climate

The SUA are comprised of Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 and the Nalu and Mela South ATCAA. These SUA are affected by many of the same features that affect the nearby land areas. Because of oceanic influence, the diurnal temperature range in the SUA is less than that found over nearby land areas. Average high temperatures are lower and average low temperatures are higher. Many of the same weather features that affect the land areas impact the SUA, including trade winds, thunderstorms, and hurricanes.

3.4.3.2 Baseline Emissions

There are no known sources of emissions that exist in the SUA, and there are no Class I areas within 10 mi of these SUA. State jurisdiction with respect to meeting NAAQS extends to the state seaward boundary (3 mi). For the Warning Areas and ATCAA that fall outside state jurisdiction, NAAQS do not apply.

Under 40 CFR Part 55, permitting and other air quality requirements apply to facilities beyond state seaward boundaries. Within 25 NM of the state seaward boundary, facilities must comply with the air quality regulations of the nearest onshore area. Beyond 25 NM from the state seaward boundary, facilities are subject to federal requirements including the PSD preconstruction permit program and the Title V operating permit program; however, these programs apply only to stationary sources and thus would not be applicable to the proposed operations in the SUA.

3.4.4 Environmental Consequences Evaluation Criteria

The CAA Section 176(c), General Conformity, requires federal agencies to demonstrate that their proposed activities would conform to the applicable SIPs for attainment of the NAAQS. General conformity applies to nonattainment and maintenance areas. If the emissions from a federal action proposed in a nonattainment area exceed annual *de minimis* thresholds identified in the rule, a formal conformity determination is required of that action. The thresholds are more restrictive as the severity of the nonattainment status of the region increases. JBPHH is not subject to general conformity requirements since it is in attainment status for all six criteria pollutants.

This section discusses the potential effects of the Proposed Action on air quality within the ROIs. Since the overland project area (State of Hawai'i AQCR) is in an attainment or unclassified for all NAAQS the general conformity rule would not apply. In addition, operations in portions of the SUA would occur outside any AQCR. The SUA extend 3 NM from the coastline (state jurisdictional boundary), and most of the SUA extend out past the 12-NM Territorial Sea boundary and the 24-NM Contiguous Zone boundary. Thus, compliance with the NAAQS would not apply in SUA and general conformity would not apply.

Although general conformity does not apply in either ROI, to assess potential impacts, the Proposed Action emissions are compared against the 250-tpy indicator of significance of potential impact for each criteria pollutant. Proposed Action emission increases below these indicators for all criteria pollutant are considered insignificant enough as to not cause an exceedance on one or more NAAQSs.

The Air Conformity Applicability Model (ACAM) (version 5.0.17b) was used to provide emissions estimates for Proposed Action airfield operations, maintenance activities, worker commutes, and flight operations in SUA. ACAM was developed by the DAF (Air Force, 2017b); it provides estimated air emissions from proposed federal actions for each specific criterion and precursor pollutant as defined in the NAAQS. Assumptions of the model are discussed in **Appendix D-3**. ACAM uses the procedures established by the DAF as provided in *Air Emissions Guide for Air Force Mobile Sources* (Air Force, 2017a). For aircraft, operational modes, including taxi/idle (in and out), takeoff, climb out, approach, and pattern flight that includes touch and go operations, are used as the basis of the emission estimates. Furthermore, only emissions in the lower atmosphere's mixing level have a substantial impact on ground-level pollutant concentrations. The mixing layer extends from ground level up to the point at which the vertical mixing of pollutants decreases significantly. The USEPA recommends that a default mixing layer of 3,000 ft be used in aircraft emission calculations (40 CFR § 93.153[c][2]). Based on this, aircraft emissions released above 3,000 ft were not included in analysis for the ROIs.

The air quality analysis focused on emissions associated with proposed airfield operations, proposed construction, and proposed sorties in the SUA. As such emissions from ACAM were determined separately for the airfield ROI and the SUA ROI. In addition, emissions associated with the use of flares within the SUA were estimated, using draft emission factors found in Emission Factors for AP-42 Section 15.8 (USEPA, 2009).

3.4.5 Environmental Consequences – Alternative A

Under Alternative A, potential air emissions would occur from the additional flight operations at the airfield and from the SUAs. In addition, air emissions would result from facility construction and repair activities that are planned at JBPHH to accommodate the additional F-22A aircraft relocation. Only those emissions associated with the addition of F-22A aircraft operations were evaluated as no substantive changes to current operations of the HIANG 199 FS are expected to change as a result of the action. Alternative A is assumed to start in Fall 2025 for both construction activities and for aircraft operations. While construction activities would end in Fiscal Year 2029, aircraft operations at the airfield and SUA are assumed to be indefinite in duration.

3.4.5.1 Joint Base Pearl Harbor-Hickam

Airfield emissions under the implementation of Alternative A include operational emissions for the ROI in the vicinity of the airfield. These operational emissions are from increased flight operations from the proposed additional sorties and from the proposed construction activities that would occur to accommodate the additional F-22A aircraft operations. **Table 3-11** presents estimated maximum increases in annual airfield operational emissions for criteria pollutants within this ROI. These represent the worst-case emissions for each criteria pollutant and are compared against the 250-tpy indicator of significance of potential impact for each criteria pollutant. Emission increases below these indicators for all criteria pollutant are considered insignificant enough so as to not cause an exceedance on one or more NAAQSs. The methodologies, emission factors, and assumptions used for the emission estimates and related activities are outlined in **Appendix D-3**. The Detailed ACAM Report and Record of Air Analysis are also contained in **Appendix D-3**.

Table 3-11
Proposed Action Maximum Emissions (tpy) – Hawai'i Air National Guard Airfield Operations

Airfield Operations	VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$	CO_2e
Proposed Flight Operations and Associated Support Activities[a,b]	4.71	30.49	52.30	3.02	3.29	2.88	5,614.60
Proposed Construction[c]	1.18	3.26	4.17	0.01	0.46	0.13	965.50
TOTAL (tpy)[d]	**5.89**	**33.75**	**56.47**	**3.03**	**3.75**	**3.01**	**6,580.10**
Indicator of Significance of Potential Impacts (tpy)	250	250	250	250	250	250	-
Exceed Indicator (Yes/No)	No	No	No	No	No	No	-

Source: Air Conformity Applicability Model output

Notes:
[a] Represents total per year emissions for 1) flight operations (includes trim tests and auxiliary power unit use), 2) aerospace ground equipment, 3) aircraft maintenance (coatings/solvent use), additional personnel commute, and 5) Jet-A storage and loading (fuel for F-22A plus-up aircraft operation only).
[b] Based on 405 landing and takeoff cycles per year.
[c] Represents total per year emissions from 1) demolition, 2) grading, 3) trenching, 4) construction, 5) coating, and 6) paving.
[d] Due to rounding, some totals may not correspond with the sum of the separate amounts.

CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns; PM_{10} = particulate matter less than 10 microns; SO_x = sulfur oxides; tpy = ton(s) per year; VOC = volatile organic compound

Table 3-11 shows that the estimated increases in potential emissions from all criteria pollutants would increase as a result of the implementation of Alternative A; however, these increases would be below the 250-tpy significance indicator level for each pollutant of concern. The table also shows that CO emissions would be the highest (56.5 tpy) as compared with all other pollutants and would result almost entirely from airfield operations resulting from the additional flight operations and associated activities. In no instance would the CO emissions exceed the 250-tpy threshold that triggers PSD analysis. For the remaining criteria pollutants (VOC, NO_x, SO_x, $PM_{2.5}$, and PM_{10}), the maximum annual emission increases would not be considered significant under Alternative A.

The increase in flight operations at JBPHH would result in an increase in the consumption of Jet-A and JP-8 fuels for aircraft operations and maintenance. The testing of F-22A aircraft engines on test stands inside the hush houses at JBPHH are addressed under the NSP Air Permit (Special Conditions on Aircraft Engine Testing), which currently limits total JP-8 and Jet A fuel consumption to 101,926 gallons per rolling 12-month period. The average (2018 through 2024) rolling total fuel consumption for testing inside the hush house was approximately 65,000 gallons. The facility would need to evaluate if the additional testing fuel usage for the F-22A plus-up aircraft would allow the facility to stay within the annual fuel use limits contained in the NSP, or if the fuel permit limits would need to be changed to accommodate the increase in fuel use. If fuel use limits in the permit are to be increased, this would have to be implemented through a permit modification application process. Aircraft testing for the additional F-22A aircraft must also meet other applicable requirements, such as opacity, reporting, recordkeeping, and notification requirements.

The proposed additional F-22A aircraft would increase surface coating operations at Building 3428 and at the Low Observable Composite Repair Facility (LOCRF) operations. The painting materials include a topcoat, heat resistant paint, primer, and other various solvents and sealers. For the proposed additional aircraft, coatings and solvent usage were estimated to be approximately 391 gallons per year and 203 gallons per year, respectively. Surface coating of the additional F-22A aircraft would result in approximately 1.3 tons per year of VOC, which are not anticipated to exceed permit conditions or emissions limits. The requirements for LOCRF surface coating operations for currently operating F-22A aircraft operations are addressed under the NSP Air Permit (Special Conditions on LOCRF). Permit conditions for this facility include requirements for surface coating equipment, control equipment and operations. In addition, an updated list of products used inside LOCRF is required to be maintained. Surface coating at LOCRF for the additional F-22A aircraft must meet these, and all other applicable requirements, such as opacity, maintenance, reporting, recordkeeping, and notification requirements.

3.4.5.2 Airspace

The emissions associated with the additional F-22A sorties proposed for the SUA were evaluated using ACAM. Consistent with the USEPA recommendation regarding mixing height, only those emissions that would occur with the mixing layer (lowest 3,000 ft) were analyzed. Out of the of the annual additional sorties proposed, 270 are expected to include sometime between 500 to 3,000 ft above sea level in W-188C, W-189A, W-189B, and W-190. In W-192, W-193, and W-194, 135 sorties are expected to occur in the same altitude range. The flight time in the mixing layer for the SUA is estimated to be 1.8 minutes per sortie.

All sorties are expected to use chaff and flares. Chaff and flares can be dispensed in the offshore SUA without altitude restrictions (Air Force, 2001). The Air Quality impacts of chaff were studied by the DAF and reported in *Environmental Effects of Self-Protection Chaff and Flares* (Air Force, 1997). That study determined that chaff material maintains its integrity after ejection and that the use of explosive charge in impulse cartridges results in minimal PM_{10}. As a result, it was concluded that the deployment of chaff would not contribute to an exceedance of the NAAQS. Chaff deployment was therefore not included in the air quality assessment. Emission from M206 Countermeasure Flares were estimated using Emission Factors for AP-42 Section 15.8 (USEPA, 2009). Only flares deployed at or below 3,000 ft were included in the analysis. The quantity deployed (total estimated future use minus baseline use) was proportioned based on the percent of total time spent in the 500- to 3,000-ft altitude range per sortie.

Table 3-12 shows the emissions estimated for the SUA that are the result from the implementation of Alternative A beginning in Fall 2025. Overall, the use of flares made a negligible contribution to the emissions under Alternative A. Maximum emission rates associated with use of flares were for PM_{10} at 0.8 pounds per year (0.0004 tpy) and CO_2 at 1.4 pounds per year (0.0007 tpy).

Table 3-12
Proposed Action Maximum Emissions (tpy) – Hawai'i Air National Guard Airspace Operations

Airspace Operations	VOC	NO_x	CO	SOx	PM_{10}	$PM_{2.5}$	CO_2e
Warning Areas W-188C, W-189A, W-189B, W-190[a]	0.003	1.015	0.175	0.088	0.115	0.089	264.800
Warning Areas W-192, W-193, W-194[b]	0.001	0.508	0.088	0.044	0.057	0.045	132.400
TOTAL (tpy)[c]	**0.004**	**1.523**	**0.263**	**0.131**	**0.172**	**0.134**	**397.200**
Indicator of Significance of Potential Impact (tpy)	250	250	250	250	250	250	-
Exceed Indicator (Yes/No)	No	No	No	No	No	No	-

Source: Air Conformity Applicability Model output

Notes:
[a] 270 sorties
[b] 135 sorties
[c] Due to rounding, some totals may not correspond with the sum of the separate amounts.

CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns; PM_{10} = particulate matter less than 10 microns; SO_x = sulfur oxides; tpy = ton(s) per year; VOC = volatile organic compounds

As seen in **Table 3-12**, additional emissions from aircraft flight operations in the SUA are well below the indicators of significance. Each of the criteria pollutant emissions is below 2 tpy and CO_2e is below 100,000 tpy. Based on the estimates in **Table 3-12**, aircraft emissions in the SUA resulting from implementation of Alternative A would not exceed the initial indicators of significance. The increases in these pollutant emissions are not considered to be significant.

The methodologies, emission factors, and assumptions used for the emission estimates for activities under Alternative A are outlined in **Appendix D-3**. The Detailed ACAM Report and Report Record of Air Analysis are also contained in **Appendix D-3**.

3.4.5.3 Close Causal Effects and Reasonably Foreseeable Future Actions

Alternative A, in addition to reasonably foreseeable future actions on and off the JBPHH, may result in negligible impacts on air quality. With the addition of ongoing and proposed construction projects at JBPHH, and in addition to Hawai'i Department of Transportation roadway work, PM_{10} emissions would potentially increase; however, these increases would be short in duration, and the potential incremental impact on air quality would be negligible.

Proposed Action training activities would occur at times below the mixing height (3,000 ft above ground level) in the SUA; however, the duration would be brief (approximately 1.8 minutes per sortie); therefore, no impacts on air quality are expected in any of the SUA. A potential negligible, short-term incremental change associated with off-base construction to air quality is expected when adding the Proposed Action operations to reasonably foreseeable future actions. No impact on air quality when combined with reasonably foreseeable future actions is expected in the SUA.

Operational air pollutant emissions associated with the Proposed Action would result from the increased operations at the engine testing hush houses, and from surface coating operations. The stationary air operating permit for JBPHH contains fuel consumption limits, emission and operational requirements for these sources. Prior to implementation of the Proposed Action, an evaluation would be required to determine if the increase in workload due to the proposed addition of aircraft would be able to comply with the terms and conditions of the existing permit and if a permit modification would be necessary.

3.4.6 Environmental Consequences – No Action Alternative

Under the No Action Alternative, the additional F-22A aircraft and associated operations would not occur at JBPHH. No new construction or renovations of existing buildings to support the additional F-22A aircraft would be required. The No Action Alternative would not generate any new emissions and would not change emissions from current baseline levels. As a result, no impacts would occur to regional air quality under the No Action Alternative.

3.4.7 Greenhouse Gas Emissions

Annual GHG emissions under Alternative A are relatively low. Although Title V and PSD are not applicable to this action, the applicability thresholds for these permitting requirements were compared against projected CO_2e emission levels as an indicator of significance. In addition, projected CO_2e emissions were compared against the State of Hawai'i's 2015 GHG emission estimates and projections to further assess the significance of generated GHG emissions. **Table 3-13** below shows the results of this analysis. CO_2e emissions for under Alternative A fall well below the permitting thresholds and account for less than 0.03 percent of the State of Hawai'i's 2015 CO_2e emissions. This demonstrates that in isolation additional CO_2e emissions expected from the implementation of Alternative A would have a potential negligible impact. The relative quantity of GHG emissions under Alternative A is expected to be so low that no mitigation measures are required.

Table 3-13
Indicators for Carbon Dioxide Emission Impacts

Emissions ROI	Projected CO_2e Emissions (tpy)[a]	CO_2 Permit Applicability Thresholds (tpy)		Inventory Data (MMt CO_2e/year)		
		Title V	PSD New/ Modified Source	2015 Hawai'i Energy Sector[b]	Projected 2020 Hawai'i Emissions: Energy Sector[b]	Projected 2025 Hawai'i Emissions: Energy Sector[b]
Airfield	6,580	100,000	100,000 / 75,000	18.57	18.00	15.51
Airspace	397					
Total Proposed Action[a]	6,977					

Notes:
[a] Sum of emissions from airfield operations (including construction) and Warning Area sorties.
[b] Source: DOH, 2019

CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalent; MMt = million tons per year (to convert from MMt to tpy multiply by 1.1E6); PSD = Prevention of Significant Deterioration; tpy = ton(s) per year

3.5 HEALTH AND SAFETY

3.5.1 Definition of the Resource

Safety concerns associated with ground, explosive, and flight activities are considered in this section. Ground safety considers issues associated with ground operations and maintenance activities that support unit operations including arresting gear capability, jet blast/maintenance testing, and safety danger. Aircraft maintenance testing occurs in designated safety zones. Ground safety also considers the safety of personnel and facilities on the ground that may be placed at risk from flight operations in the vicinity of the airfield and in the SUA. Safety zones, which include Runway Protection Zones (RPZs) and Quantity-Distance (QD) arcs, around the airfield restrict the public's exposure to areas where there is a higher accident potential. Although ground and flight safety are addressed separately, in the immediate vicinity of the runway, risks associated with safety-of-flight issues are interrelated with ground safety concerns.

Explosives safety relates to the management and safe use of ordnance and munitions. Flight safety considers aircraft flight risks such as midair collision, bird/wildlife-aircraft strike hazard (BASH), and in-flight emergency. Flight operations at JBPHH follow DAF safety procedures and aircraft specific emergency procedures based on the aircraft design which are produced by the original equipment manufacturer of the aircraft. Basic airmanship procedures also exist for handling any deviations to ATC procedures due to an in-flight emergency; these procedures are defined in Air Force Manual (AFMAN) 11-202 (Volume 3), *General Flight Rules*, and established aircraft flight manuals. The Flight Crew Information File is a safety resource for aircrew day-to-day operations which is composed of air and ground operation rules and procedures.

Existing conditions are organized by ground, explosive, and flight safety. Additional information on safety programs is provided in **Appendix D-4**. The ROI includes JBPHH and areas immediately adjacent to the base where ground and explosive safety concerns are described, as well as the airfield and SUA where flight safety is discussed.

3.5.2 Existing Conditions – Joint Base Pearl Harbor-Hickam and Special Use Airspace

3.5.2.1 Ground Safety

Ground safety includes several categories including ground and industrial operations, operational activities, and motor vehicle use. Ground mishaps can occur from the use of equipment or materials and maintenance functions. Day-to-day operations and maintenance activities conducted by the 154 WG and 15 WG are performed in accordance with applicable DAF safety regulations, published DAF Technical Orders, and standards prescribed by Air Force Occupational Safety and Health (AFOSH) requirements identified within Department of the Air Force Instruction (DAFI) 91-202, *The Department of the Air Force Mishap Prevention Program*, and Department of the Air Force Manual (DAFMAN) 91-203, *Air Force Occupational Safety, Fire, and Health Standards*.

Emergency Response

For emergency response, Naval Facilities Engineering Systems Command (NAVFAC) Hawai'i Federal Fire Department (Fed Fire) provides emergency responders trained on the applicable mission-design series. Should NAVFAC Hawai'i Fed Fire request assistance then they would call the HNL l Fire Rescue for back-up who are also trained. For crash response, JBPHH is manned with an Aircraft Crash Damaged or Disabled Aircraft Recovery Team. For events occurring off the airfield, civilian authorities would be first on scene with follow-on assistance from NAVFAC Hawai'i.

Safety Zones

JBPHH is a joint-use airfield with HNL and therefore must comply with Unified Facilities Criteria 3-260-01 (4 February 2019), *Airfield and Heliport Planning and Design,* which specifies that FAA criteria for land areas underneath aircraft approach paths outlined in FAA Advisory Circular 150/5300-13 are applicable. The FAA RPZs preclude any obstructions and development in these areas must adhere to Unified Facilities Criteria 3-260-01 (4 February 2019, with Change 1 (5 May 2020)) (**Figure 3-4**). QD arcs are an additional safety zone, described in **Section 3.5.3.2** (**Explosive Safety**).

Arresting Gear Capability

Per AFMAN 32-1040, *Civil Engineering*, criteria for siting aircraft arresting systems vary according to the type of system and operational requirement. The best location for runways used extensively during instrument meteorological conditions is 2,200 to 2,500 ft from the threshold; however, if aircraft that are not compatible with the arresting system must operate on the same runway, the installation commander may shift the installation site as close to the threshold as possible. The critical factor in this case is assurance that the runout area for an aircraft engaging the system in an aborted takeoff scenario is large enough to safely accommodate other arresting systems or equipment such as light fixtures. JBPHH is equipped with BAK-14 and BAK-12B arresting systems on Runways 04R and 08R and a MB60 hook cable arresting system on Runway 08L.

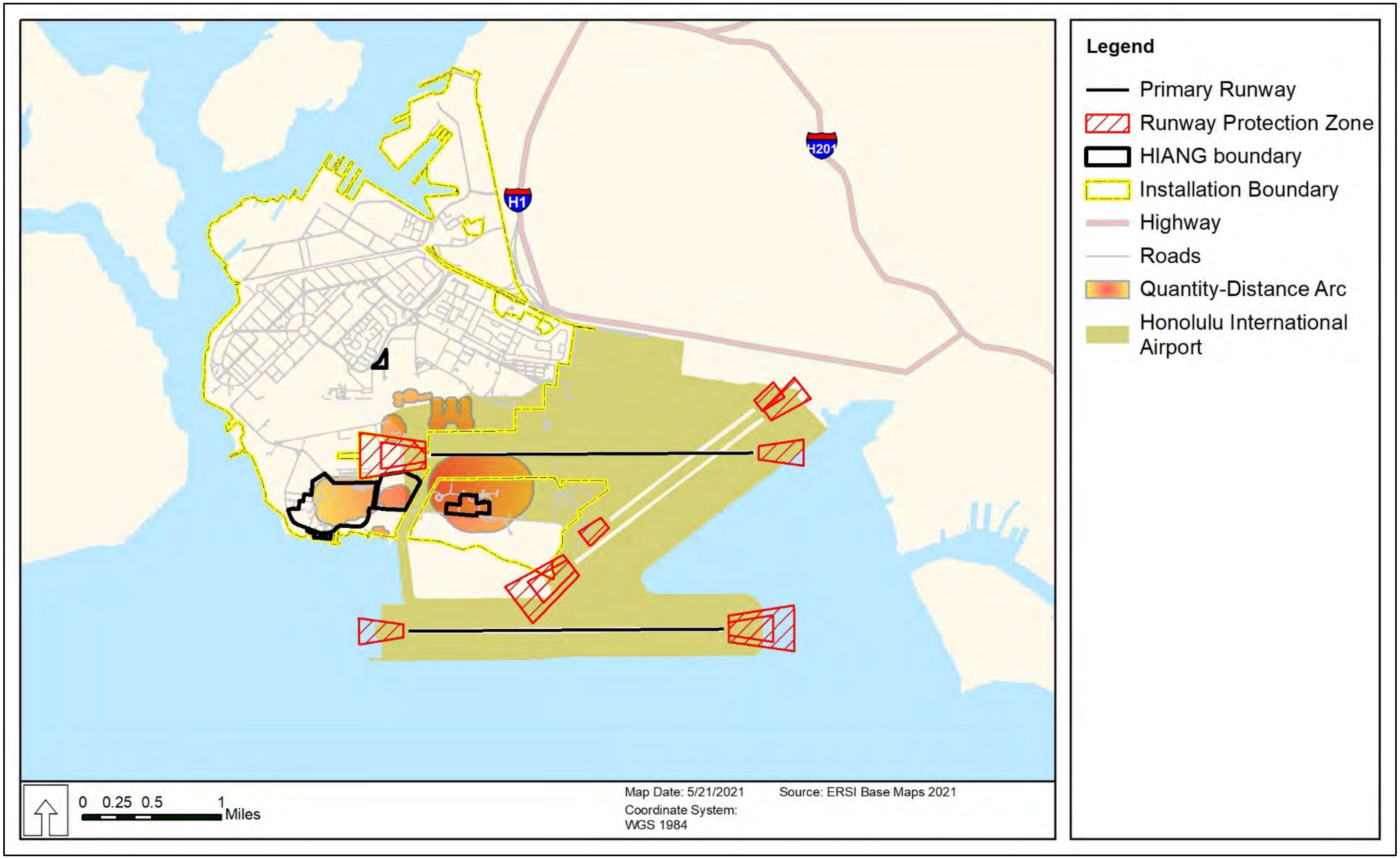

Figure 3-4. Joint Base Pearl Harbor-Hickam Runway Protection Zones and Quantity-Distance Arcs.

3.5.2.2 Explosive Safety

The 154 MXG’s Munitions Flight supports the 154 WG flying mission and includes munitions storage, inspection, maintenance, accountability, and line delivery/pick-up. Munitions handling and storage is conducted in accordance with Defense Explosives Safety Regulation (DESR) 6055.09_AFMAN 91-201, *Explosive Safety Standards*, DOD Explosive Safety Board guidelines, and approved DAF technical orders. Aircraft munitions include ammunition, propellants (solid and liquid), pyrotechnics, warheads, explosive devices, and chemical agent substances and associated components that present real or potential hazards to life, property, or the environment. During typical training operations, aircraft are not loaded with high-explosive ordnance. Training munitions usually include captive air-to-air training missiles, countermeasure chaff and flares, and 20-mm TP ammunition. All munitions are stored and maintained in the munitions storage area within facilities sited for the allowable types and amounts of explosives. All storage and handling of munitions is carried out by trained and qualified munitions systems personnel and in accordance with Air Force–approved technical orders.

Defined distances are maintained between munitions storage areas and a variety of other types of facilities (**Appendix D-4**). These distances, called QD arcs (see **Figure 3-4**), are determined by the type and quantity of explosive material to be stored. Each explosive material storage or handling facility has QD arcs extending outward from its sides and corners for a prescribed distance. Within these QD arcs, development is either restricted or prohibited altogether to ensure personnel safety and to minimize potential for damage to other facilities in the event of an accident. In accordance with DESR 6055.09_AFMAN 91-201, paragraphs 12.47.2 and 12.47.3, the ramp is authorized for chaff and flare and 20-mm TP operations.

3.5.2.3 Flight Safety

The ATC Tower is Honolulu Tower, an FAA facility, which is located near the center of the airfield between Runway 08L south of Taxiway G and the approach end of Runway 04L. In addition to supporting the 154 WG and 15 WG training missions, the tower handles a large amount of IFR and VFR traffic, ranging from airlines to small general aviation aircraft. When aircraft fly beyond its designated Class B airspace, control is transferred to the Honolulu Center Radar Approach Control, a Terminal Radar Control Facility-area control center covering the Pacific Ocean surrounding the Hawai’ian Islands.

The potential for aircraft accidents is a primary public concern with regard to flight safety. Such accidents may occur as a result of mid-air collisions, collisions with manmade structures or terrain, mechanical failure, weather-related accidents, pilot error, BASH, or strikes from defensive countermeasures used during training.

Midair Collision

Midair collision accidents involve two or more aircraft coming in contact with each other during flight. Navigation errors, miscommunications, deviations from flight plans, and lack of collision avoidance systems all increase the potential for midair collisions. Aircraft mishaps and their prevention represent a paramount concern for the DAF. DAF Policy Directive 91-2, *Safety Programs*, defines four major categories of reportable mishaps based on total cost of property damage or the degree of injury: Class A, B, C, and D mishaps. Mishap types range from loss of life or destruction of an aircraft (Class A) to a minor, reportable injury or property damage less than $50,000 (Class D). Reporting and investigation requirements for aviation mishaps are defined in DAFI 91-204, *Safety Investigations and Reports*, and AFMAN 91-223, *Safety: Aviation Safety Investigations and Reports*.

In-Flight Emergency

Each aircraft type has different emergency procedures based on the aircraft design which are produced by the original equipment manufacturer of the aircraft. Basic airmanship procedures also exist for handling any deviations to ATC procedures due to an in-flight emergency; these procedures are defined in AFMAN 11-202 (Volume 3) and established aircraft flight manuals.

Bird/Wildlife-Aircraft Strike Hazards

BASH presents a safety concern for aircraft operations because of the potential for damage to aircraft or injury to aircrews or local populations if a crash should occur. Aircraft can encounter birds at nearly all altitudes up to 30,000 ft MSL; however, most birds fly close to the ground. According to the Air Force Safety Center, BASH statistics, about 52 percent of strikes occur from birds flying below 400 ft, and 88 percent occur at less than 2,000 ft above ground level (Air Force Safety Center, 2018).

The DAF BASH program was established to minimize the risk for collisions of birds/wildlife with aircraft and the subsequent loss of life and property. In accordance with DAFI 91-202, each flying unit in the DAF is required to develop a BASH plan to reduce hazardous bird/wildlife activity relative to airport flight operations. The 15 WG and 154 WG have developed a BASH plan (JBPHH, 2021) with the intent to reduce BASH issues at the airfield by creating an integrated hazard abatement program through monitoring, avoidance, and actively controlling bird and animal population movements. HNL provides the Wildlife Services Monthly Report to 15 WG Flight Safety that details strike events at the airport. The average bird strike rate is 5.4 per 10,000 for both civilian and military operations at HNL between January and December 2020; this average strike rate is higher than normal due to a high strike rate in October 2020 of 23.1 strikes per 10,000 operations (US Department of Agriculture [USDA], 2020b). For comparison, the average bird strike rate in 2019 (January through November) was 2.6 per 10,000 operations. The period of August through April is when the majority of strikes occur due to the large populations of migratory sea birds that winter in the Hawai'ian Islands. The most common species hit during these months is the Pacific golden plover (*Pluvialis fulva*), a bird roughly the size of an American robin (*Turdus migratorius*). These birds are frequently seen in large numbers (200 to 500 in some cases) on the JBPHH ramp during darkness hours. Bird strikes are reported to 15 WG Flight Safety.

3.5.3 Environmental Consequences Evaluation Criteria

Impacts from implementation of the Proposed Action are assessed according to the potential to increase or decrease safety risks to personnel, the public, property, or the environment. Adverse impacts on safety might include implementing flight procedures that result in greater safety risk or constructing new buildings within established QD arcs. For the purposes of this EA, an impact is considered significant if the proposed safety measures are not consistent with the established federal, DOD, and DAF regulations and instructions described below and in **Appendix D-4**.

3.5.4 Environmental Consequences – Alternative A

3.5.4.1 Ground Safety

Under Alternative A, limited F-22A maintenance and testing would occur on the aircraft parking ramp or in the hangar and would be consistent with current aircraft maintenance activities on JBPHH. No unique maintenance activities would be associated with the proposed F-22A aircraft.

The activities associated with the proposed construction and repair projects have inherent risks. Potential hazards include, but are not limited to, chemical (e.g., asbestos, lead, hazardous material) and physical (e.g., noise propagation, falling, electrocution, collisions with equipment) sources. Individuals contracted to perform rehabilitation and construction activities are responsible for adhering to Occupational Safety and Health Administration (OSHA) requirements to mitigate these hazards. Industrial hygiene programs address exposure to hazardous materials, use of personal protective equipment, and the availability and use of Material Safety Data Sheets, the latter of which are also the responsibility of construction contractors to provide to workers. Federal civilian and military personnel that have a need to enter areas under rehabilitation or construction should be familiar with and adhere to OSHA and AFOSH requirements, as well as applicable industrial hygiene programs.

Emergency Response

For emergency response, NAVFAC Fed Fire provides emergency responders trained on the applicable mission-design series. Should NAVFAC Fed Fire request assistance, they would call the Airport Fire Rescue for back-up who are also trained. For crash response, JBPHH is manned with an Aircraft Crash Damaged or Disabled Aircraft Recovery Team. For events occurring off the airfield, civilian authorities would be first on scene with follow-on assistance from NAVFAC Hawai'i.

Safety Zones

Under Alternative A, RPZs around the airfield would not change, and no incompatible uses would be added.

Arresting Gear Capability

The proposed additional F-22A aircraft would be compatible with the arresting systems on the airfield or able to operate on the airfield without interference to the existing arresting system. There would be no need to change or modify the existing arresting gear. There would be no impacts on arresting gear capability for the implementation of Alternative A.

With the implementation of all applicable AFOSH and OSHA requirements, no significant impacts on ground safety are anticipated to occur under Alternative A.

3.5.4.2 Explosives Safety

Under Alternative A, the 154 MXG, Munitions Flight would support the additional F-22A training operations with the maintenance and delivery of countermeasure chaff and flares and 20-mm TP ammunition. This support would be provided by trained and certified personnel following DAF safety guidance and technical orders. The loading and unloading of countermeasure chaff and flares and 20-mm TP ammunition would occur on the aircraft parking ramp. The proposed ramp area for the additional seven F-22A aircraft is authorized for chaff and flare operations in accordance with DESR 6055.09_AFMAN 91-201, para 12.47.2 and 12.47.3.

There would be occasions in which egress cartridge actuated devices/propellant actuated devices need to be removed from the aircraft for maintenance. In accordance with DESR 6055.09_AFMAN 91-201, 11.15, when necessary, units may license a limited quantity of in-use egress explosive components of any Hazard Division explosive in the egress shop after removal from aircraft undergoing maintenance. This limit would not exceed the total number of complete sets for the number of aircraft in maintenance, and the net explosive weight is limited. Cartridge actuated devices/propellant actuated devices items are typically replaced just prior to expiration of the service life, which is typically part of aircraft scheduled maintenance or if certain lots are restricted or suspended from use.

Under Alternative A, new facilities would be constructed within existing QD arcs. DAF Policy, as outlined in DESR 6055.09_AFMAN 91-201, is to provide the maximum protection possible to personnel and property, both on and off the installation, from the destructive consequences of potential accidents involving ammunition and explosives. The primary method to meet this requirement is the establishment of QD requirements to protect an exposed site from a potential explosion site (PES) and is based on an acceptable level of damage to an exposed site in the event of an incident at a PES.

For the proposed construction on the western side of the base proposed within established QD arcs, Sierra Ramp (Project ID 1), the Squadron Operations Facility (Project ID 2), the Egress Facility (Project ID 5), and F-22 Alter Corrosion Control, Building 3407 (Project ID 8) are considered Combat Aircraft–Related Activities and can be sited at Intraline Distance from a PES. Prior to the construction of additional facilities, coordination between base civil engineering, fire, health, security, and environmental agencies would take place to update the Explosive Site Plan and licenses as needed. Similarly, the proposed additional projects on the eastern side of the base are within the Munitions Storage Area and include the Munitions Maintenance and Inspection Add-on (Project ID 3) and Munitions Cube Storage Facility (Project ID 4) would be sited to comply with Chapter 14 of DESR 6055.09_AFMAN 91-201, and the necessary coordination and update to the Explosive Site Plan would ensure the risks to personnel, equipment, and assets are minimized. The locations of the proposed facilities are provided on **Figures 3-5** and **3-6**, and a more detailed description of separation requirements is provided in **Appendix D-4**.

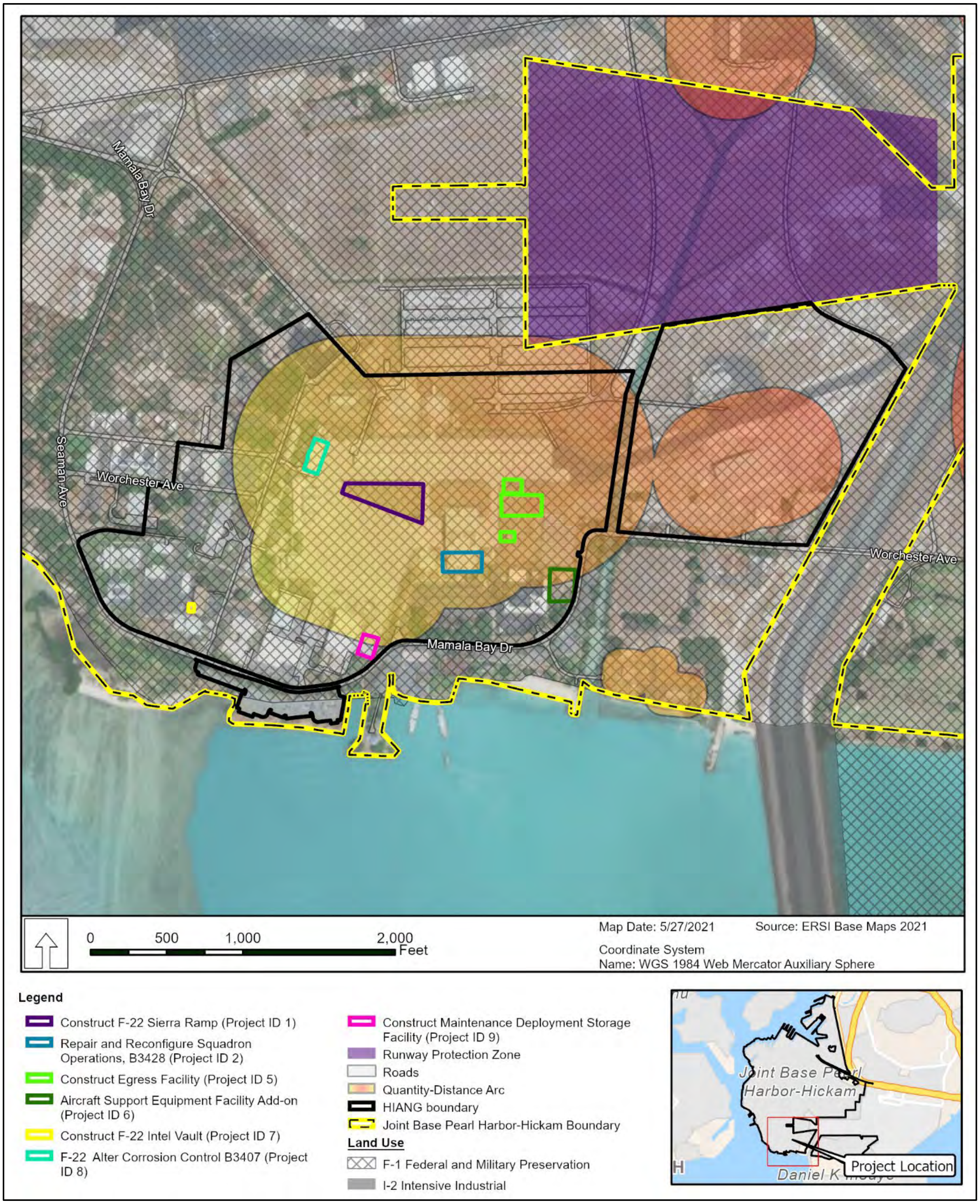

Figure 3-5. Joint Base Pearl Harbor-Hickam Runway Protection Zones, Quantity-Distance Arcs and Land Use and Proposed Construction and Repair Projects (Western Side).

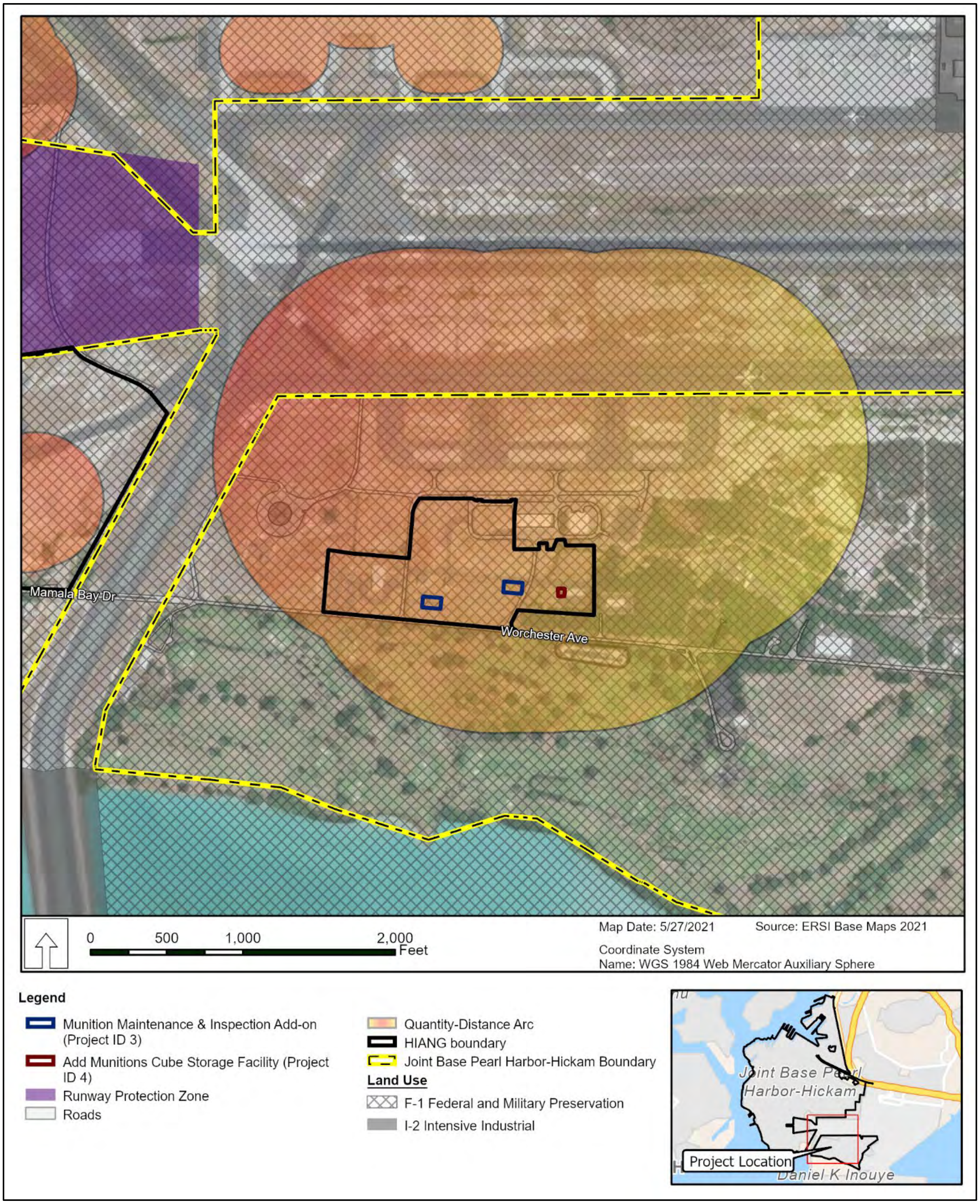

Figure 3-6. Joint Base Pearl Harbor-Hickam Runway Protection Zones, Quantity-Distance Arcs and Land Use and Proposed Construction and Repair Projects (Eastern Side).

No significant impacts on explosive safety are anticipated to occur under Alternative A provided all applicable safety guidelines are implemented.

3.5.4.3 Flight Safety

The potential for aircraft accidents is a primary public concern with regard to flight safety. Such accidents may occur as a result of mid-air collisions, collisions with manmade structures or terrain, mechanical failure, weather-related accidents, pilot error, BASH, or strikes from defensive countermeasures used during training. Under Alternative A, the seven additional F-22A aircraft would be required to strictly conform to the flight safety rules directed by the 154 WG Director of Operations.

Bird/Wildlife-Aircraft Strike Hazards

In compliance with the FAA Wildlife Hazard Mitigation Program, the additional F-22A aircraft would follow established BASH procedures.

No significant impacts on SUA /flight safety are anticipated to occur under Alternative A provided that all applicable AFOSH and OSHA requirements are implemented.

3.5.4.4 Close Causal Effects and Reasonably Foreseeable Future Actions

The Proposed Action, in addition to reasonably foreseeable future actions on and off JBPHH, would follow existing safety procedures and policies for ground and flight operations. Safety zones would not change under the Proposed Action. Training sorties would increase by less than one percent at JBPHH. This increase is not expected to pose an increased risk to flight safety; however, through compliance with the BASH plan and flight safety rules, the potential incremental impact would be minimized. As such, no impacts on health and safety are expected with implementation of the Proposed Action in addition to other reasonably foreseeable future actions.

3.5.5 Environmental Consequences – No Action Alternative

Under the No Action Alternative, the additional F-22A aircraft and associated operations would not occur at JBPHH. No new construction or renovations of existing buildings to support the additional F-22A aircraft would be required. Under the No Action Alternative, there would be no change to health and safety.

3.6 LAND USE

3.6.1 Definition of the Resource

The term "land use" refers to real property classifications that indicate either natural conditions or the types of human activity occurring on a parcel. Land use descriptions, labels, and definitions vary among jurisdictions. The JBPHH Installation Development Plan describes the land uses on JBPHH as well as serves as guidance for future development within the installation's eleven planning districts (JBPHH, 2013). The ROI for land use on the installation includes the land surrounding the facilities proposed for use and the land within the airfield noise contours (**Figure 3-7**). See **Appendix D-5** for a more detailed description of the land use resource. The SUA are over water, and therefore, potential impacts on land use are not described.

3.6.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

JBPHH is located approximately 9 mi west of downtown Honolulu, Hawai'i. The installation's airfield is bordered by HNL to the east, the Naval Base Pearl Harbor portion of the installation to the north and west, and Mamala Bay to the south. The airfield encompasses approximately 2,520 ac and includes 9,000- and 12,000-ft runways, taxiways, aprons, refueling, and aircraft support facilities. The runways operate under a joint use agreement with HNL. Land use surrounding the airfield is comprised of federal and state lands. No private lands border the airfield boundary (Hickam AFB, 2007).

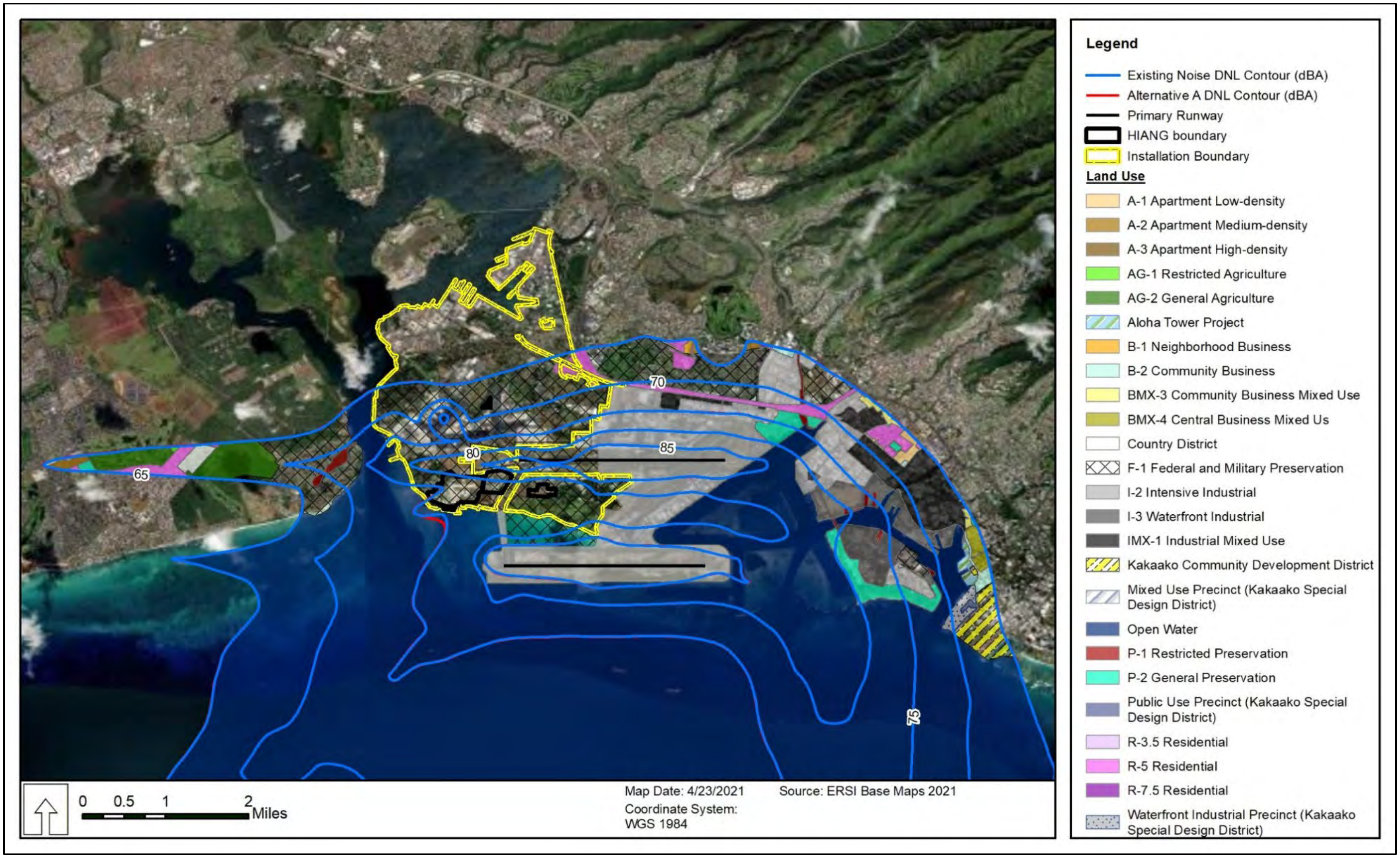

Figure 3-7. Generalized Existing Land Use Categories, Noise Contours, and Runway Protection Zones at Joint Base Pearl Harbor-Hickam.

There are 11 on-base land use categories identified at JBPHH (Hickam AFB, 2007). Categories for housing, community services, and administration are primarily located in the northern portion of the installation and include accompanied and unaccompanied housing, community-related services, and commercial services. Land use categories directly supporting the military mission, such as the airfield, industrial, and aircraft operations, are located in the southern portion of the installation. Open space and outdoor recreation are located throughout but generally along the outer edges of the base (Hickam AFB, 2007). Two special interest areas are located beneath the takeoff and approach path of the airfield. These areas are designated as preservation districts and were established by the City of Honolulu and State of Hawai'i to provide an outdoor recreation opportunity for public use. The Keehi Lagoon Beach Park is located on the northeastern point of the airfield along Keehi Lagoon and the Sand Island State Recreation Area is located on the oceanfront of Sand Island (Hickam AFB, 2007).

Off-base land within the JBPHH noise contours account for approximately 7,435 ac (**Table 3-14**). Approximately 40 percent of this land is classified as intensive industrial, with federal and military preservation comprising approximately 24 percent of the area. Waterfront industrial, industrial mixed use, Kaka'ako Community Development District, and residential make up most of the remaining land use within the noise contours. The Kaka'ako Community District is a living urban development district with housing, parks, commercial business, entertainment, and workplaces (State of Hawai'i, 2021). Most of the development area is located within the existing 65- to 70-dBA noise contours.

Approximately 277 ac of off-base land are within the RPZs of the airfield. Of the 277 ac, approximately 163 ac represent industrial land use and approximately 109 ac of military land uses. Approximately 3 ac of preservation land use are located within the RPZs. Additional information regarding RPZs and other safety zones can be found in **Section 3.5**.

Table 3-14
Off-base Land Use within Joint Base Pearl Harbor-Hickam Noise Contours

Zone Description	Area (acres) Within Noise Contours						Percent of Total
	65- to 70-dBA DNL	70- to 75-dBA DNL	75- to 80-dBA DNL	80- to 85-dBA DNL	>85-dBA DNL	Total	
Apartment Low-Med-High Density	81.7	0.0	0.0	0.0	0.0	81.7	1.1%
General Agriculture	334.1	0.0	0.0	0.0	0.0	334.1	4.4%
State: Aloha Tower Project	32.2	0.0	0.0	0.0	0.0	32.2	0.4%
Neighborhood Business	7.8	0.0	0.0	0.0	0.0	7.8	0.1%
Community Business	50.9	3.3	0.0	0.0	0.0	54.2	0.7%
Community/Central Mixed-Use Business	89.1	0.0	0.0	0.0	0.0	89.1	1.2%
Country District	48.6	0.0	0.0	0.0	0.0	48.6	0.6%
Federal and Military Preservation	952.2	253.8	177.4	255.2	125.0	1,763.6	24.6%
Intensive Industrial	205.0	450.0	620.0	609.0	1,056.7	2,940.7	39.1%
Waterfront Industrial	35.6	141.2	254.1	63.4	0.0	494.3	6.6%
Industrial Mixed Use	404.1	149.5	1.6	4.1	0.0	559.3	7.4%
Kaka'ako Community Development District	203.2	0.2	0.0	0.0	0.0	203.4	2.7%
Kaka'ako Special Design District	1.2	0.0	0.0	0.0	0.0	1.2	0.0%
Restricted Preservation	17.6	39.0	15.1	5.6	0.0	77.3	1.0%
General Preservation	22.2	92.2	159.7	0.0	0.0	274.1	3.6%
Public Use Kaka'ako Special Design District	7.4	0.0	0.0	17.0	0.0	35.7	0.5%
Residential	295.1	96.8	0.0	0.0	0.0	391.9	5.1%

Table 3-14
Off-base Land Use within Joint Base Pearl Harbor-Hickam Noise Contours

Zone Description	Area (acres) Within Noise Contours						Percent of Total
	65- to 70-dBA DNL	70- to 75-dBA DNL	75- to 80-dBA DNL	80- to 85-dBA DNL	>85-dBA DNL	Total	
Waterfront Industrial Precinct – Kaka'ako Special Design District	45.3	11.5	0.0	0.0	0.0	56.8	0.8%
Total	**2,825.4**	**1,264.7**	**1,298.5**	**956.9**	**1,178.7**	**7,524.2**	**100.0%**

Source: City and County of Honolulu, 2020

Notes:
dBA = A-weighted decibels; DNL= Day-Night Average Sound Level

Coastal Zone Management Act

The coastal zone refers to coastal waters and the adjacent shorelines, including islands, transition and intertidal areas, salt marshes, wetlands, and beaches, extending to the outer limit of state title and ownership under the Submerged Lands Act (i.e., 3 NM). The National Oceanic and Atmospheric Administration (NOAA) oversees the Coastal Zone Management Program for the federal government. Coastal areas in the United States receive special land use protections through the federal CZMP. Authorized by the Coastal Zone Management Act of 1972 (16 US Code § 1451 et seq., as amended). The Hawai'i CZMP (Hawai'i Revised Statutes, Chapter 205A, *Coastal Planning and Management*) was approved by NOAA in 1978. The lead agency for the program is the State of Hawai'i, Department of Business, Economic Development and Tourism. JBPHH and much of the area surrounding the airfield are within the Hawai'i coastal zone. See **Appendix D-5** for more information about the Coastal Zone Management Act and Hawai'i's CZMP. The Special Management Area (SMA) permitting system was established as part of the CZMP as a management tool to ensure uses, activities, or operations on land within an SMA comply with the objectives and policies of the CZMP and SMA guidelines.

3.6.3 Environmental Consequences Evaluation Criteria

Potential impacts on land use are based on the level of land use sensitivity in areas potentially affected by the Proposed Action as well as compatibility of those actions with existing conditions. In general, a land use impact would be adverse if it met one of the following criteria:

- inconsistency or noncompliance with existing land use plans or policies;
- precluded the viability of existing land use;
- precluded continued use or occupation of an area;
- incompatibility with adjacent land use to the extent that public health or safety is threatened; and
- conflict with planning criteria established to ensure the safety and protection of human life and property.

3.6.4 Environmental Consequences – Alternative A

Alternative A includes the integration of seven F-22A aircraft into the current fleet of the 199 FS. The assignment of the additional F-22A aircraft would require construction of seven new facilities and the repair/renovation of two existing facilities (see **Section 2.1** and **Appendix B**). These facilities would be located around the existing airfield and runway on land designated as Aircraft Operations or Industrial; as such, there would no long-term changes to land use on the installation.

Changes in the noise setting can affect land use compatibility from increased noise exposure to existing POIs. Noise increases of a 3-dBA DNL and greater near sensitive receptors can alter the noise setting, resulting in incompatibility with the surrounding land uses. Noise levels at representative POIs identified in **Table 3-3** would not increase; therefore, Alternative A would not result in land use incompatibility with surrounding land uses (see **Figures 3-2** and **3-3**). There would be negligible overland change in noise resulting from the implementation of Alternative A and minor changes to noise occurring offshore (see **Section 3.3.5**).

Construction associated with Alternative A would occur within the coastal zone and as such a Federal Consistency Determination was completed to assess the potential interference with the Hawai'i's CZMA program for protection of coastal communities and resources (**Appendix D-5**). The proposed construction of the Sierra Ramp addition (Project ID 1), Egress Facility (Project ID 5), addition to the Aircraft Support Equipment Facility Add-on (Project ID 6), and new F-22 Intel Vault (Project ID 7) would also be within the SMA (**Figures 3-8** and **3-9**) and subject to SMA permitting prior to construction. Prior to construction, the HIANG would consult with the Hawai'i CZMP, Department of Business, Economic Development and Tourism to determine whether any of the proposed projects have the potential to significantly affect coastal resources. It is anticipated that Alternative A would not impact coastal resources due to the proposed locations and types of proposed facilities and because no activities would occur within the shoreline setback area. NGB consulted with the State of Hawai'i on the DAF's consistency determination. On July 31, 2025, the State of Hawai'i's Office of Planning & Sustainable Development acknowledged the receipt of NGB's CSMA negative federal consistency determination for the proposed action (see **Appendix A**).

3.6.4.1 Close Causal Effects and Reasonably Foreseeable Future Actions

The Proposed Action, in addition to reasonably foreseeable future actions on and off JBPHH, would not change land use or land use compatibility or impact coastal resources. No significant effects on or off base are expected from Alternative A when combined with other reasonably foreseeable future actions.

3.6.5 Environmental Consequences – No Action Alternative

Under the No Action Alternative, the additional F-22A aircraft and associated operations would not occur at JBPHH. No new construction or renovations of existing buildings to support the additional F-22A aircraft would be required. No changes to existing land use would occur.

3.7 EARTH RESOURCES

3.7.1 Definition of the Resource

Earth resources consist of the Earth's surface and subsurface materials, typically described in terms of topography and physiography, geology, soils, and, where applicable, geologic hazards. These properties must be examined for their compatibility with particular construction activities or types of land use. See **Appendix D-6** for a more detailed description of the earth resources. The ROI for earth resources includes the land surrounding the sites for the proposed new facilities.

3.7.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

JBPHH is located on the southern shore of Oahu, which is part of an island chain formed from volcanic activity. Much of the southern coast is fringed by a wide, shallow reef. The southern shore is a predominantly low-lying coastal plain (less than 20 ft MSL) with many seawalls, revetments, and groins to protect it from strong wind and wave action (US Geological Survey, 2012). This plain represents a sequence of marine sedimentary and terrestrial alluvial layers formed during sea level changes and island subsidence which overlies volcanic bedrock (Air Force, 2003).

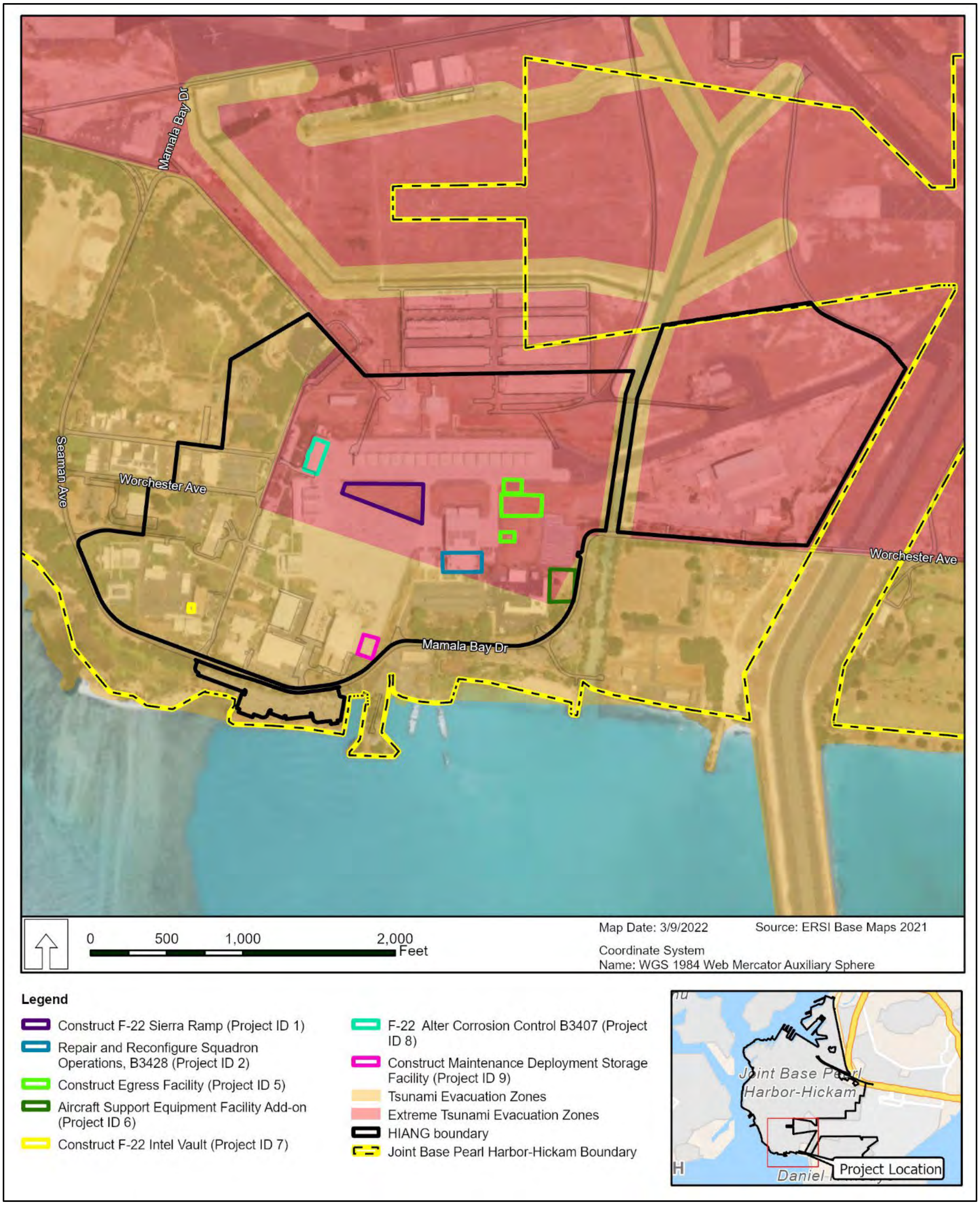

Figure 3-8. Special Management Areas and Tsunami Evacuation Zones within the Region of Influence on Joint Base Pearl Harbor-Hickam and the Proposed Construction Projects (Western Side).

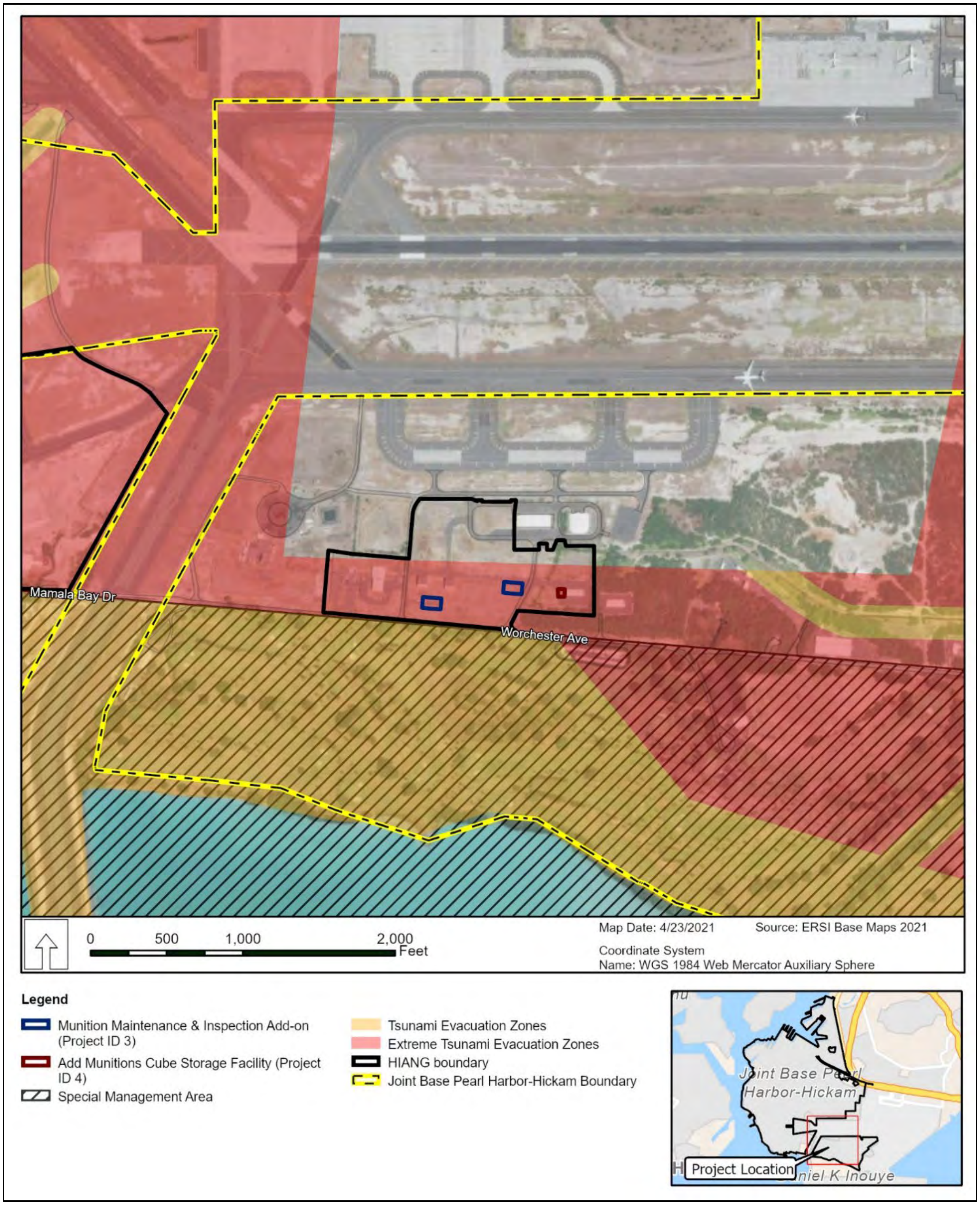

Figure 3-9. Special Management Areas and Tsunami Evacuation Zones within the Region of Influence on Joint Base Pearl Harbor-Hickam and the Proposed Construction Projects (Eastern Side).

Surficial deposits in the Proposed Action area include Holocene beach deposits and fill (US Geological Survey, 2007). Soils include Jaucas sand (0 to 15 percent slope), Mamala cobbly silty clay loam (0 to 12 percent slop), and fill (USDA, 2020a). Jaucas sand has a depth to restrictive feature of at least 80 in.; it is excessively drained with low storm runoff. Mamala cobbly silty clay loam has a depth to restrictive layer (bedrock) to about 20 in.; it is well-drained with medium storm runoff. Fill for leveling depressions and channels could include off-site material dredged from estuaries, the ocean, or other sources (Air Force, 2003). Original soils in the area are considered low value for most vegetation which limits the diversity of flora; as such, most of the maintained landscape was established on imported topsoil. This area does not have any prime farmland.

Shallow excavations are limited due to unstable excavation walls and depth to hard bedrock. This area is very limited to construction due to flooding and depth to bedrock, but erosion is slight to moderate.

3.7.3 Environmental Consequences Evaluation Criteria

Protection of unique geological features, minimization of soil erosion, and the siting of facilities in relation to potential geologic hazards are considered when evaluating potential impacts of Proposed Action on geological resources. Generally, impacts can be avoided or minimized if proper construction techniques, erosion control measures, and structural engineering design are incorporated into project development.

Effects on geology and soils would be adverse if they would alter the lithology, stratigraphy, and geological structure that control groundwater quality, distribution of aquifers and confining beds, and groundwater availability or change the soil composition, structure, or function within the environment.

Adverse impacts would result if

- regional geology was affected;
- soils classified as prime and unique farmland were affected;
- soils affected were considered unsuitable for development; and
- building construction was incompatible with the seismic risk status of the project area.

3.7.4 Environmental Consequences – Alternative A

Under Alternative A, there would be seven construction and two repair projects (see **Table 2-1**, **Figure 2-1**, and **Appendix B**). The primary concerns associated with Alternative A are soil erosion and compaction. When soils are disturbed or already bare, wind and water exposure can accelerate erosion. Such erosion, even during short-term construction, can be a major source of sedimentation in drainage systems, ground surfaces, or water bodies. While intentional soil compaction is necessary to decrease the likelihood of building and pavement settlement, lack of pore space reduces water intake and movement which can inhibit root growth and flora diversity, decrease infiltration rates, and increase erosion, runoff, and flooding (USDA, 2005). Topography and regional geology would not be affected.

The total amount of land disturbance of the proposed construction projects is approximately 1.4 ac (60,060 ft^2). Activities at the locations proposed for new/improved facilities may result in a minor, short-term increase in erosion if any soils are exposed. This can produce indirect effects by causing more surface runoff affecting downgradient areas. Construction activities would include BMPs to minimize the potential for exposed soils or other contaminants from construction activities to reach surface waters. To minimize potential impacts, BMPs would be implemented during the construction period and would include practices such as the installation of soil erosion-control mats, silt fences, straw bales, diversion ditches, riprap channels, water bars, water spreaders, sediment basins, and/or other appropriate standard construction practices. Filtration would control stormwater runoff and soil erosion from the sites. Establishing vegetation post-construction to cover exposed soil is essential to reduce erosion, but it is necessary to amend the soil with organic matter and tillage to provide optimal growth conditions. Adherence to DOD and DAF requirements and implementation of construction BMPs would minimize impacts on earth resources. No significant adverse impacts on earth resources would be expected to occur from the implementation under Alternative A.

3.7.4.1 Close Causal Effects and Reasonably Foreseeable Future Actions

Alternative A, in addition to reasonably foreseeable future actions on JBPHH, is not expected to impact earth resources.

3.7.5 Environmental Consequences – No Action Alternative

Under the No Action Alternative, the additional F-22A aircraft and associated operations would not occur at JBPHH. No new construction or renovations of existing buildings to support the additional F-22A aircraft would be required. Impacts on earth resources on base would continue as under the baseline conditions.

3.8 WATER RESOURCES

3.8.1 Definition of the Resource

Water resources are natural and man-made sources of water that are available for use by, and for the benefit of, humans and the environment. Water resources relevant to JBPHH's location in Hawai'i include groundwater, surface water, floodplains, and wetlands. Evaluation of water resources examines the quantity and quality of the resource and its demand for various purposes and ensures compliance with the Clean Water Act (CWA). The ROI for water resources includes the land surrounding the sites for the proposed new facilities and the waters beneath the SUA. Detailed description of Water Resources and the applicable regulatory guidance is provided in **Appendix D-7**. The analysis of the CZMP is in **Section 3.6.3**.

3.8.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

The primary source of drinking water for JBPHH is from three ground water pump stations: Waiawa, Halawa, and Red Hills (NAVFAC Hawai'i, 2020b). After water is pumped from the aquifer, it is disinfected and fluorinated in accordance with Navy policy and pumped into the JBPHH distribution system. Testing performed throughout 2019 did not indicate any violations of USEPA or State of Hawai'i contamination thresholds.

The Navy Wastewater Treatment Plant is owned and operated by NAVFAC Hawai'i and takes in both the industrial and domestic wastewater from JBPHH for a three-step treatment process (NAVFAC Hawai'i, 2020a). After treatment, the effluent is pumped to a deep ocean outfall located about 1.5 mi offshore. The discharges for the majority of JBPHH, which includes the Pearl Harbor-Hickam main base, are captured under a comprehensive NPDES permit issued by the Hawai'i DOH (Commander, Navy Region Hawai'i [CNIC], 2020).

JBPHH lies within the Pearl Harbor watershed that is subdivided into nine distinct subwatersheds, which contain the headwaters of nine streams that drain into Pearl Harbor. While there are no natural streams, there are several manmade canals and underground storm drains on JBPHH that drain into Mamala Bay (CNIC, 2012).

Portions of JBPHH lay within areas identified as 100-year floodplains (**Figures 3-10** and **3-11**). These floodplains are not associated with a riverine system, rather they are coastal areas subject to inundation during major storm events (CNIC, 2012). On JBPHH, areas within Tsunami Evacuation Zones are between the Reef runway Lagoon and Motor Pool Lagoon (see **Figures 3-8** and **3-9**).

On JBPHH, most wetlands are on flat or depressional areas in the southern portion of the base, along the coastline, and along channels (CNIC, 2012; **Figures 3-10** and **3-11**). Two shoreline wetlands comprised of mangrove-dominated shrubland are located along the shoreline of Mamala Bay. There are three ephemeral emergent wetlands, defined as temporarily ponded with rooted, herbaceous plants, located within the Fort Kamehameha area of the base and a fourth south of the drainage ditch near the Munitions Storage Area (MSA). Channel wetlands occur within the channels of the Kumumau'u and Manuwai Canals, these are

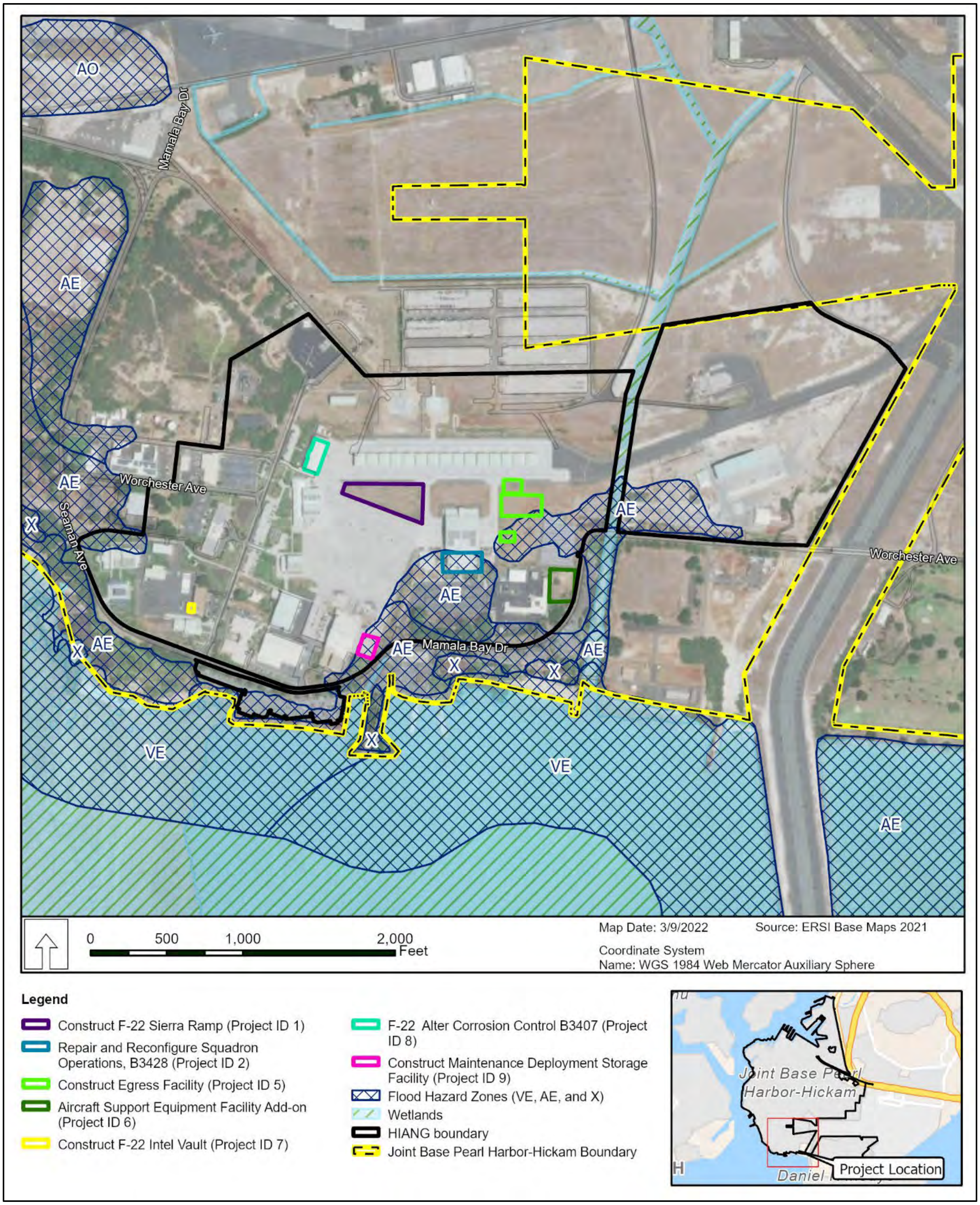

Figure 3-10. Floodplains and Wetlands within the Region of Influence on Joint Base Pearl Harbor-Hickam and the Proposed Construction Projects (Western Side).

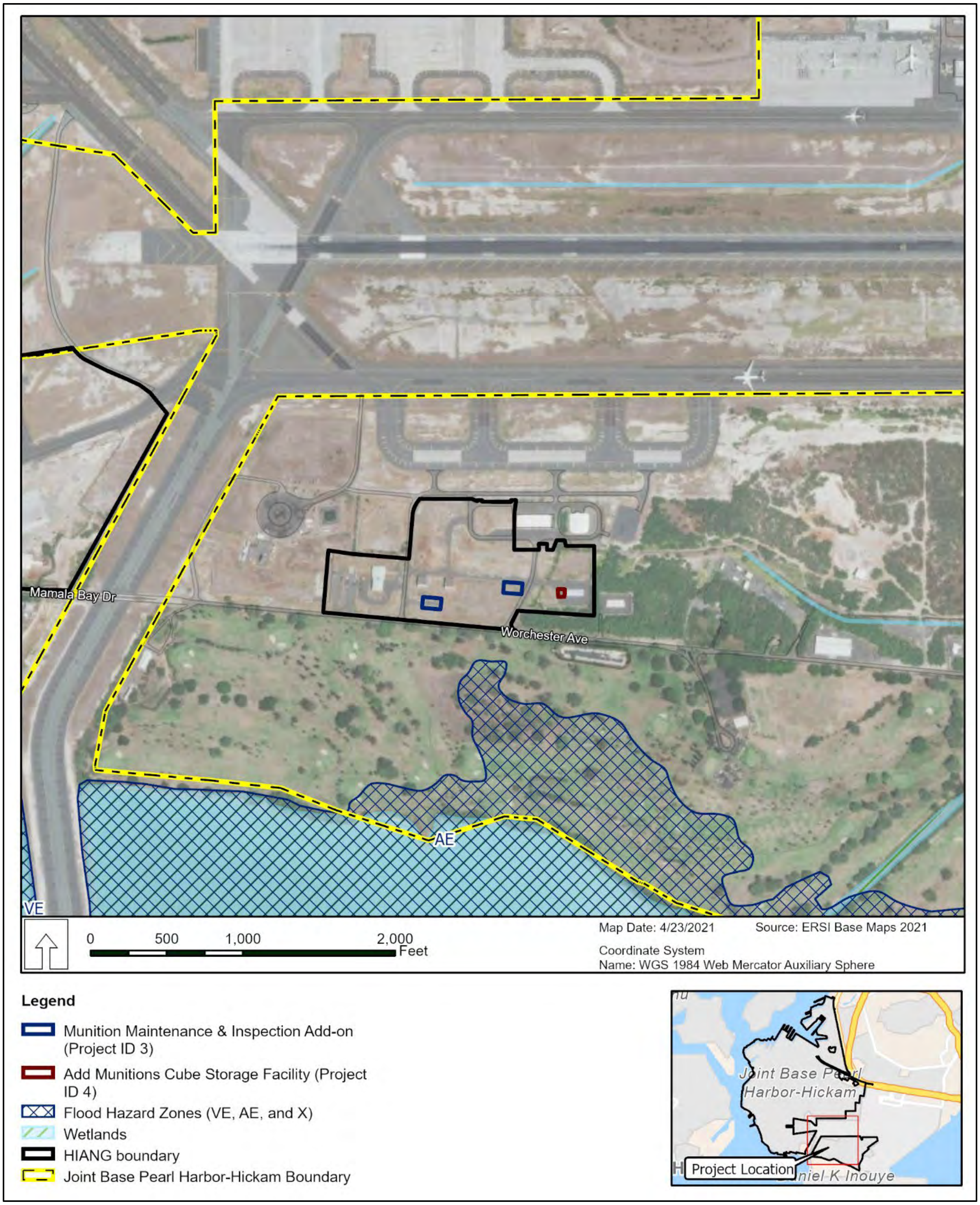

Figure 3-11. Floodplains and Wetlands within the Region of Influence on Joint Base Pearl Harbor-Hickam and the Proposed Construction Projects (Eastern Side).

estuarine, subtidal wetlands dominated by mangrove (*Rhizophora mangle*), cattail (*Typha* sp.), and California grass (*Brachiara mutica*).

3.8.3 Existing Conditions – Special Use Airspace

The offshore waters beneath the SUA are deep offshore waters all of which extends 3 NM from the coastline beyond the state jurisdictional boundary, and most of which extends out past the 12 NM Territorial Sea boundary and the 24-NM Contiguous Zone boundary. Oceanographic processes such as coastal upwelling and the North Equatorial Current create leeward eddies, vertical mixing, and horizontal transport of water from nearshore to offshore areas. The persistent easterly winds strongly influence circulation in the upper water column.

3.8.4 Environmental Consequences Evaluation Criteria

Evaluation criteria for potential impacts on water resources are based on water availability, quality, and use; existence of floodplains and wetlands; and associated regulations. Adverse impacts on water resources would occur if the Proposed Action

- reduces water availability or supply to existing users;
- overdrafts groundwater basins;
- exceeds safe annual yield of water supply sources;
- affects water quality adversely;
- endangers public health by creating or worsening health hazard conditions; or
- violates established laws or regulations adopted to protect water resources.

Potential impacts related to flood hazards can be significant if such actions are proposed in areas with high probabilities of flooding; however, any impacts can be mitigated using specific design features to minimize the effects of flooding.

3.8.5 Environmental Consequences – Alternative A

3.8.5.1 Joint Base Pearl Harbor-Hickam

Under Alternative A, there would be seven construction and two repair projects (see **Table 2-1**, **Figure 2-1**, and **Appendix B**). The primary concerns associated with Alternative A include effects on water quality during construction and the temporary and permanent conversion of existing pervious ground to impervious surfaces (e.g., parking lots). The impervious surfaces have the potential of affecting the water quality through the discharge of pollutants into surface waters. Also, the impervious surfaces have the potential of increasing the surface water runoff into the storm drainage system, which could result in insufficient capacity and potentially lead to localized flooding.

Activities at the locations proposed for new facilities may result in a minor, short-term increase in total suspended particulate matter (i.e., sedimentation) to nearby surface waters. While there are no wetlands or other surface waters within the boundaries locations proposed for the construction of the additional facilities, and the Aircraft Support Equipment Facility Add-on (Project ID 6) would be near identified wetlands. Prior to construction activities, the HIANG would conduct jurisdictional wetland determinations and acquire a CWA Section 404 permit, if necessary, prior to filling of drainages. The total amount of land disturbance of the proposed construction projects is approximately 1.4 ac (60,060 ft^2), as such NPDES permit coverage for discharges of storm water associated with construction activities would be required. Prior to construction, the contractor would be required to prepare a Stormwater Pollution Prevention Plan to manage stormwater associated with the construction activity and work with the NAVFAC Hawai'i Public Works Office to ensure compliance with the Base Stormwater Management Plan (SWMP) for pre- and postconstruction activities. The Stormwater Pollution Prevention Plan would include BMPs to minimize the potential for exposed soils or other contaminants from construction activities to reach surface waters. To minimize potential impacts, BMPs would be implemented during the construction period and include practices such as the installation of silt fences, storm drain inlet and outlet protection, and other appropriate standard construction practices. Filtration would control stormwater runoff and soil erosion from the site. The temporary and permanent conversion of existing pervious ground to impervious surfaces would be minor and within the capacity of the storm drainage system. No significant impacts from the implementation of Alternative A are expected due to construction activities or the addition of impervious surfaces. No impacts on surface waters or jurisdictional waters are expected from the implementation of Alternative A. Adherence to the requirements of the construction general permit and the Base SWMP, as well as the implementation of construction BMPs would minimize impacts on water resources and would minimize potential impacts on nearby surface waters. Implementation of guidance in Section 438 of the Energy Independence Security Act into facility designs to maintain or restore predevelopment site hydrology to the maximum extent that is technically achievable is required to further minimize impacts on surface water. No impacts on surface waters, including wetlands, would be expected to occur from the implementation of Alternative A. In addition, implementing Alternative A would not impact the groundwater table since construction activities are not expected to reach the depth to groundwater.

The proposed new Egress Facility (Project ID 5) is located within a flood hazard area (Zone AE) according to Federal Emergency Management Agency Flood Insurance Rate Map No. 15003C0333G (Federal Emergency Management Agency, 2011; see **Figures 3-10** and **3-11**). In addition, the proposed modification to Squadron Operations Building 3428 (Project ID 2) is also within a flood hazard area (Zone AE). Zone AE indicates areas subject to inundation by the one percent annual chance flood event. These areas are not considered a floodplain that are associated with rivers but rather areas with the potential for flooding due to storm events. These projects are specifically located adjacent to existing ramps and associated facilities and the relocation of these projects to other locations outside of flood hazard areas would not be possible without losing substantial functionality of the facilities. These projects would comply with EO 11988, *Floodplain Management*, and applicable floodplain design standards. Construction projects would meet base level permitting requirements and be compatible with NAVFAC Hawai'i requirements. As required, prior to construction activities, a flood zone notification would be prepared and circulated containing an explanation of why the action is proposed to be in a flood zone. In addition, a FONPA must accompany a draft FONSI when a proposed action would occur within or affect wetlands or floodplains. The FONPA must discuss why no other practicable alternatives exist to avoid impacts.

Several of the proposed projects listed below would be located within a tsunami inundation zones. The proposed facility locations in comparison with Tsunami Evacuation Zones are shown on **Figures 3-8** and **3-9**. All or a portion of the Squadron Operations Building 3428 (Project ID 2), Aircraft Support Equipment Facility Add-on (Project ID 6), and F-22 Intel Vault (Project ID 7) would be within the Tsunami Evacuation Zone. In addition, all or a portion of the F-22 Sierra Ramp (Project ID 1), Squadron Operations Building 3428 (Project ID 2), Munition Maintenance and Inspection Add-on (Project ID 3), Munitions Cube Storage Facility (Project ID 4), Egress Facility (Project ID 5), Aircraft Support Equipment Facility Add-on (Project ID 6), and F-22 Alter Corrosion Control, Building 3407 (Project ID 8) would be in the Extreme Tsunami Evacuation Zone. Projects located within flood zones and tsunami inundation zones would incorporate flood protection measures into their design. No significant impacts from the construction of new facilities or the repair of existing facilities within flood hazard areas are expected.

3.8.5.2 Airspace

The plus-up of HIANG's current squadron of F-22A aircraft would not substantially change SUA use or training operations above marine physical resources. Under Alternative A, an estimated additional 405 annual training sorties would occur within the offshore SUA (see **Section 2.1**). The additional F-22A would also train with defensive countermeasures. The use of chaff and flares has been found to be nontoxic.

Under Alternative A, chaff and flare use would increase by 6 and 73 percent, respectively (see **Table 2-3**). A detailed description of chaff and flare is provided in **Section 2.1.1** (**Ordnance Use**). Chaff is comprised primarily of silica and aluminum, and in most environments, it rapidly breaks up to become indistinguishable from native substrates (Air Force, 1997). Chaff use would be difficult to detect in the environment and would not produce a significant effect upon ocean waters under the SUA. Flare ash consists of magnesium oxide and magnesium nitride produced as combustion products of burning magnesium in air. This material poses no risk to marine water resources beneath the offshore SUA (Air Force, 1997). A description of chaff and flare plastic components and their potential impacts is provided in **Section 3.9**, **Biological Resources**.

Due to the rare and infrequent nature of fuel dumps as well as in-place safety precautions such as altitude restrictions, these emergency procedures are not likely to adversely affect water resources. Potential impacts on marine water resources would be negligible.

3.8.5.3 Close Causal Effects and Reasonably Foreseeable Future Actions

Alternative A, in addition to reasonably foreseeable future actions on and off JBPHH, is not expected to have an impact on water resources. Proposed future projects on JBPHH would comply with Section 404 of the CWA, if required, as well as the acquisition of required permits prior to activities and compliance with the JBPHH SWMP. Likewise, BMPs would be implemented to minimize impacts on surface waters. In addition, any future projects within flood hazard zones would also comply with EO 11988 and applicable floodplain design standards.

3.8.6 Environmental Consequences – No Action Alternative

Under the No Action Alternative, the additional F-22A aircraft and associated operations would not occur at JBPHH. No new construction or renovations of existing buildings to support the additional F-22A aircraft would be required. As such, the additional sorties and increased use of countermeasure chaff and flare would not occur. Similarly, there would be no ground-disturbing activities. Impacts on water resources on base and beneath the SUA would continue as under the baseline conditions.

3.9 BIOLOGICAL RESOURCES

3.9.1 Definition of the Resource

Biological resources include native, nonnative, and invasive plants and animals; sensitive and protected floral and faunal species; and the habitats in which they exist. The completed definition of biological resources is provided in **Appendix D-8**. The ROI for this resource is JBPHH and the SUA over the Pacific Ocean.

3.9.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

The information presented in this section was primarily gathered from the *Joint Base Pearl Harbor-Hickam Integrated Natural Resources Management Plan* (CNIC, 2012), the *Hawai'i-Southern California Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement* (Navy, 2018), and a 2020 flora/fauna survey of the proposed facility locations at JBPHH. Data were also gathered from the USFWS, NMFS, and Hawai'i Division of Forestry and Wildlife.

3.9.2.1 Regional Biological Setting

Vegetation and Wildlife

A flora and fauna survey of the proposed facility construction and repair project sites was conducted by a Vernadero Group Inc. biologist in December 2020 (Vernadero Group Inc., 2021). The proposed facility construction and repair project sites were located within well-maintained grassy/landscaped areas or on existing paved areas. The grassy/landscaped areas are mowed approximately once monthly. In general, plant species present were nonnative, such as Australian saltbush (*Atriplex semibaccata*), Bermuda grass (*Cynodon dactylon*), cattail (*Typha latifolia*), crimson fountain grass (*Pennisetum setaceum*), field bindweed (*Convolvulus arvensis*), kikuyu grass (*P. clandestinum*), scarlet pimpernel (*Lysimachia arvensis*), seaside heliotrope (*Heliotropium curassavicum*), smut grass (*Sporobolus* sp.), and wattle (*Acacia* sp.). Wildlife species observed included cattle egret (*Bubulcus ibis*), red-vented bulbul (*Pycnonotus cafer*), yellow-fronted canary (*Crithagra mozambica*), zebra dove (*Geopelia striata*), and killdeer (*Charadrius vociferus*). No mammal, reptile, or amphibian species were observed. Several proposed facility construction and repair project sites were proximate to existing drainages, outfalls, and/or detention basins. No plant or wildlife species that is federally or state listed as endangered or threatened was observed during the flora and fauna survey. Additional detail of the biological resources conditions for each the eight facility construction projects surveyed is provided in **Appendix D-8**.

Invasive Species

Although most of the flora observed were nonnative or ornamental, no invasive flora or fauna were observed at the proposed facility projects during surveys conducted in January 2021.

Threatened and Endangered Species and/or Species of Concern

Federally endangered and threatened species are protected under the ESA. While there is no suitable terrestrial habitat at JBPHH for any federally or state listed species, federally and state listed species do occur in estuarine and coastal habitats proximate to JBPHH. One federally listed endangered waterbird, the Hawai'ian black-necked stilt (*Himantopus mexicanus knudseni*), is common in coastal wetland areas at JBPHH, and has been observed proximate to the proposed Munition Maintenance and Inspection Add-on (Project ID 3) facility project location. Hawai'ian duck (*Anas wyvilliana*) X mallard (*Anas platyrhynchos*) hybrids, and potentially Hawai'ian ducks, are also frequently observed in ponding areas around the installation. The Hawai'ian common moorhen (*Gallinula galeata sandviciensis*) and Hawai'ian coot (*Fulica alai*) have also been observed on the installation, and Hawai'ian black-necked stilts are frequently observed in ditches at the airfield. The state-listed Hawai'ian short-eared owl (*Asio flammeus sandwichensis*) occurs on JBPHH and has been observed on the airfield on several occasions. Hawai'ian monk seals (*Monachus schauinslandi*) are occasionally observed at JBPHH beaches, green turtles (*Chelonia mydas*) occasionally use JBPHH beaches for basking (but not generally in the vicinity of the airfield), and injured green turtles occasionally wash up on shore.

A complete list of all federal and state listed species with the potential to occur on or near JBPHH and species descriptions for listed species are provided in **Appendix D-8**.

There is no designated critical habitat on or immediately adjacent to JBPHH.

3.9.3 Existing Conditions – Special Use Airspace

The information presented in this section was gathered from the *Joint Base Pearl Harbor-Hickam Integrated Natural Resources Management Plan* (CNIC, 2012), *Hawai'i-Southern California Testing and Training Final Environmental Impact Statement/Overseas Environmental Impact Statement* (Navy, 2018), and NMFS informal ESA consultation on JBPHH Combat Air Forces adversary air support[1].

3.9.3.1 Regional Biological Setting

The Insular Pacific-Hawai'ian Large Marine Ecosystem extends 1,500 mi from the main Hawai'ian Islands to the outer northwestern Hawai'ian Islands (Navy, 2018; Aquarone and Adams, 2009). This ecosystem is characterized by limited ocean nutrients, leading to high biodiversity but low sustainable yields for fisheries (Navy, 2018; Aquarone and Adams, 2009). Additional details about the marine ecosystem are provided in **Appendix D-8**.

The Proposed Action is limited to aircraft overflights and the use of defensive countermeasures by aircraft in the SUA; therefore, a discussion of biological resources is limited to those species that could be found on the ocean surface, primarily marine mammals and sea turtles. All sea turtles are federally listed under the ESA and are discussed in the Threatened and Endangered Species section.

There are 23 cetacean and 1 pinniped species that could occur within the SUA. These marine mammals are listed in **Appendix D-8**.

Invasive Species

Overflight activities from the Proposed Action training in the SUA would have no impacts on invasive species. Invasive species in the SUA are therefore not described further.

Threatened and Endangered Species and/or Species of Concern

Federally endangered and threatened marine species protected under the ESA that could occur in the offshore environment in the SUA are managed by NMFS and federally listed avian species protected under the ESA that could forage in the SUA are managed by USFWS (see **Appendix D-8**). Because there are no proposed ocean surface or

[1] Ann Garrett, Assistant Regional Administrator, NMFS, Protected Resources Division, letter correspondence with Cory Waki, Acting Environmental Program Director, Navy Region Hawai'i, 14 April 2020, *RE: Request for Informal ESA Consultation on Joint Base Pearl Harbor Hickam Combat Air Forces Adversary Air Support, Hawai'i (PIR-2020-00337; I-PI-20-1825-AG)*.

underwater activities in the SUA, and activities are limited to aircraft overflights in the SUA where noise and visual cues could cause behavioral changes in federally listed birds, mammals, and sea turtles and the use of chaff and flares which could also have effects on listed fish species, there would be no impacts on listed invertebrates or crustaceans.

3.9.4 Environmental Consequences Evaluation Criteria

The level of impact on biological resources is based on the

- importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource;
- proportion of the resource that would be affected relative to its occurrence in the region;
- sensitivity of the resource to the proposed activities; and
- duration of potential ecological ramifications.

The impacts on biological resources are adverse if species or habitats of high concern (i.e., federally and state listed threatened and endangered species, marine mammals, designated critical habitat, and Essential Fish Habitat [EFH]) are negatively affected. Impacts are also considered adverse if disturbances cause reductions in population size or distribution of a species of high concern.

As a requirement under the ESA, federal agencies must provide documentation that ensures that agency actions do not adversely affect the existence of any threatened or endangered species. The ESA requires that all federal agencies avoid unauthorized “take” of federally threatened or endangered species or adverse modification of designated critical habitat. The ESA Section 7 consultation process would result in either a concurrence on the NGB’s determination of “may affect, but not likely to adversely affect ” on listed species, or a biological opinion with either an Incidental Take Statement that authorizes a specified amount of “take” (or adverse modification of designated critical habitat) or a jeopardy determination.

3.9.5 Environmental Consequences – Alternative A

Several proposed building construction/modification project sites were proximate to existing drainages, outfalls, and/or detention basins. Specifically, if Sierra Ramp (Project ID 1) or Egress Facility (Project ID 5) were to fill the existing drainages and outfalls located within the projects’ boundaries, then an assessment of the jurisdictional status of the drainages would be required. If the drainages are determined to be nonwetland jurisdictional waters of the United States, drainages and outfalls would either be avoided, or a CWA Section 404 permit would be acquired prior to filling of drainages. Aquatic habitat impacts associated with any filling of existing drainages would be protected or replaced during the permitting process and there would be no impacts on sensitive aquatic habitats with the implementation of any permit requirements.

The proposed building construction/modification project sites mostly supported nonnative plant and wildlife species. No federally or state listed as endangered or threatened plant or wildlife species was observed during the 2020 flora/fauna survey; however, anecdotally, Hawai’ian black-necked stilt has been observed in the vicinity of Munition Maintenance and Inspection Add-on (Project ID 3). Bird species observed during the survey as well as species that could occur on JBPHH are covered under the Migratory Bird Treaty Act. Therefore, a preconstruction nest clearance survey should be conducted for each proposed project within 7 days prior to the first workday of that particular project if construction would start during the bird breeding season (1 February through 31 August). If work should occur during the breeding season, then a biological monitor should be on site during work activities to ensure active nests are not impacted due to the project. If there is an active nest within or near the project limits, a buffer can be placed around the active nest in which no work activities shall occur. The nest buffer shall be determined by the biological monitor to ensure the active nest is not impacted due to project activities. Spot checks are possible if the biological monitor can determine that no biological resources would be impacted by project work activities. With the implementation of surveys for active bird nests during the bird breeding season, the impacts on biological resources from the facility construction and modification projects would be minor and there would be no effects on any listed species.

There is limited suitable habitat for wildlife on developed areas of JBPHH and immediately adjacent to the airfield; however, undeveloped areas along the coastline of JBPHH and in the Pearl Harbor Entrance Channel support relatively common wildlife species associated with estuarine and nearshore environments. Wildlife, and especially avian species, utilizing bayshore/nearshore and beach and dune habitats for foraging and breeding would normally be sensitive to increased noise impacts from military aircraft. Although there is variability in responses across species, many birds and wildlife have the ability to habituate to noise and movement from military aircraft (Grubb et al., 2010), and military and civilian aircraft operations have been ongoing at JBPHH for decades. With the additional F-22A training operations at the airfield, the area under the 65- and 75-dBA DNL contours along the coastline where numerous shorebirds forage would not change substantially (**Figure 3-2**). Wildlife in coastal environments would not experience any changes in the noise environment with the additional F-22A operations at JBPHH. As such, the noise and movement from increased aircraft operations is anticipated to have potential negligible, short- and long-term impacts on wildlife, including birds foraging in nearby coastal habitats.

Aircraft operations always have the potential for bird and other wildlife strikes. This can occur during takeoff and landing on and near active runways, as well as during flight at altitude. With an increase in air operations associated with the additional F-22A aircraft at JBPHH, there is an increased risk of BASH; however, JBPHH maintains a BASH prevention program specifically to manage BASH risk and implement measures to greatly reduce the likelihood for BASH incidents. The outcome of the BASH program is both increased safety for pilots and military aircraft as well as less incidents of injury or death to birds and other wildlife. As such, with the continued airfield management and risk reduction implementation measures associated with the BASH program, the potential impacts on birds and other wildlife from aircraft strikes during air operations at JBPHH are minor as discussed in **Section 3.5.3.3**.

Although aircraft training can operate as low as the sea level surface in the SUA, the majority of additional F-22A training operations would occur at altitudes above where most bird species would be migrating or foraging. As such, it is highly unlikely that aircraft movement would adversely impact foraging or migrating birds or have a risk of BASH. Migrating birds could have a greater potential of encountering F-22A aircraft during training operations, especially those that migrate at altitudes above 2,000 ft; however, given the large area where training would occur, that most training operations would occur during daytime hours while most songbirds migrate at night and most migratory birds migrate at altitudes less than 2,000 ft, the likelihood for birds to encounter aircraft during training operations is low; therefore, potential adverse impacts on birds from aircraft movement is negligible. Further, given the higher altitudes that the majority of training occurs, aircraft movement in the SUA would have no impacts on marine mammals or sea turtles.

Noise modeling for the additional F-22A aircraft training operations (see **Section 3.3.2**) indicates that there would be no substantial increase in noise impacts within the SUA, and that subsonic and/or supersonic noise levels in the SUA would only experience potentially negligible increases. The negligible change to the noise environment as a result of the additional F-22A training would have no impact on marine wildlife in the SUA.

Sonic booms from supersonic flights within the SUA could cause startle effects on avian and mammal species at or near sea level; however, the sonic boom and postboom rumbling sounds that would be experienced by wildlife do not differ substantially from thunder. Further, the sonic boom events would be highly isolated and rare occurrences in the SUA and occur in areas where supersonic flights currently occur with military training activities. Numerous studies indicate that most wildlife do not react substantially to sonic booms (Air Force, 2006), and no breeding or nesting activities for terrestrial species would occur in the SUA. As such, sonic booms from supersonic flights would have no impact on wildlife, including marine mammals and sea turtles in the SUA.

Under Alternative A, the use of chaff and flares would increase by 6 and 73 percent, respectively, within the SUA from the additional F-22A training operations (see **Table 2-3**). Potential impacts on avian species from the use of chaff and flares would be limited to a startle effect from chaff and flare deployment, inhalation of chaff fibers or flare combustion products, and in some species, the potential to digest residual plastic caps if mistaken for prey items. The potential of being struck by debris, or by a dud flare, given the increase in chaff and flare use in such a large area over the Pacific Ocean, is remote. Startle effects from the release of chaff and flares would be minimal relative to the noise of the aircraft. The potential for avian species, terrestrial mammals, marine mammals, or sea turtles to be startled from flare deployment at night when flares would be most visible would be minimal due to the short burn time of the flare that only one additional night training flight is proposed. It is highly unlikely that during active military training that birds would remain in the area where training is occurring to be adversely impacted by chaff and flares deployment. Further, it is highly unlikely that the small amount of lightweight chaff and flare material ejected during their deployment would have an adverse impact on birds or that most of the chaff and flare material would remain on the Pacific Ocean surface. Small residual plastic components of chaff and flares such as end caps and pistons would be deposited on the ocean surface during training activities. While some large foraging bird species as well as marine mammals and sea turtles could ingest the remaining plastic components of chaff and flares if these components remain on the ocean surface or in the water column, they would eventually sink (Navy, 2011) and reduce the likelihood of ingestion by wildlife. Lastly, an evaluation of the potential for chaff to be inhaled by humans and large wildlife found that the fibers are too large to be inhaled into the lungs and that chaff material is made of silicon and aluminum that has been shown to have low toxicity (Air Force, 1997); therefore, the use of chaff and flares during training would have a potential negligible impact on birds.

The effect of chaff and flare components on federally listed bird species, marine mammals, fish, and sea turtles is discussed under the threatened and endangered species section below.

Fish

Increased aircraft operations in the SUA would have no impact on anadromous and marine fish. The increased use of chaff and flares does increase the potential for plastics associated with chaff and flares to end up in aquatic ecosystems and in the Pacific Ocean; however, the amount of plastic material expended in the use of chaff and flares is small, the size of the plastic material is also very small, and most of the material would fall to the ocean floor at depths below which most fish species forage; however, the use of chaff and flares may have a minor, adverse impact on fish species that are large enough to ingest plastic pieces that fall to the ocean floor or remain suspended in the water column for a period of time, even though the likelihood of any large fish species encountering plastic caps from chaff and flares is extremely low. The additional F-22A sorties in the SUA, including the use of defensive countermeasures, would have no impact on EFH.

Threatened and Endangered Species

There are no federally or state listed terrestrial mammals, reptiles, amphibians, invertebrates, or plants on JBPHH or in the SUA; therefore, the construction and modification of facilities and additional F-22A sorties from the airfield would have no effect on any of these species that could potentially occur on Oahu. Further, the HIANG would not have any in-water activities and would therefore not impact any listed species of coral that could occur in reefs proximate to Oahu or in the SUA.

Effects on listed bird and mammal species could occur from flight operations associated with additional F-22A training operations. These aircraft operations could affect biological resources from aircraft movement, noise, bird and animal aircraft strikes, and use of defensive countermeasures. For listed bird species, given the large area and high altitude where the majority of training operations would occur, and that most training would occur during daytime hours, the likelihood for birds to encounter aircraft during training operations is low. Because the additional F-22A aircraft would fly only 1 of the estimated 405 annual sorties in the SUA during environmental night hours and most of the training flights would be at higher altitudes, the one additional night flight would not adversely affect migrating birds including listed bird species. Additional takeoffs and landings at JBPHH would have no effect on the Hawai'ian duck, Hawai'ian black-necked stilt, Hawai'ian common moorhen, and Hawai'ian coot, which could occur in coastal areas near JBPHH, as there would be no increased noise in the very limited habitats where these species could occur. Although a Hawai'ian duck was struck by a commercial aircraft at HNL (which shares runways with JBPHH), it has been 15 years since that reported commercial aircraft strike, and most Hawai'ian ducks on Oahu are hybrids with mallard ducks that are not protected. The HIANG would implement BASH measures to minimize the risk of bird strikes, and the Recovery Plan for Hawai'ian Waterbirds (USFWS, 2011) does not list bird aircraft strikes as a threat to the Hawai'ian duck or any other listed waterbird. There is no suitable habitat on or near JBPHH for the Hawai'ian short-eared owl, iiwi (*Drepanis coccinea*), Oahu creeper (*Paroreomyza maculata*), Oahu elepaio (*Chasiempis ibidis*), and white tern (*Gygis alba*); as such, additional training operations would have no effect on these avian species. Further, takeoffs and landings associated with the additional F-22A training would not change the noise environment at the Hawai'ian monk seal haul-out area across the Pearl Harbor Entrance Channel from JBPHH, and these seals are habituated to aircraft movement as JBPHH and HNL have been an active airfield for decades; therefore, additional takeoffs and landings by at JBPHH would have no effect on the Hawai'ian monk seal.

It is highly unlikely that either aircraft movement or noise emissions, especially at higher altitudes, would elicit a response from marine mammals or sea turtles (refer to **Appendix D-8**). Noise from the additional F-22As would not increase substantially (including from sonic booms) in the SUA and would therefore have no effect on the listed marine mammal species and sea turtles. Sonic booms from supersonic aircraft movement could cause a startle response by the listed species when they are present on the surface of the Pacific Ocean at the moment that a sonic boom occurred; however, sonic booms would be relatively rare events during training operations in the action area, and the sonic boom and postboom rumbling would be similar to what mammal species and sea turtles experience during a thunderstorm. Sonic booms from supersonic aircraft movement would therefore have no effect on listed species.

There is the potential for components of chaff and flares that remain after use to fall to the surface of the Pacific Ocean where they could be ingested by birds, marine mammals, fish, and sea turtles. Chaff cartridges, chaff canisters, chaff components, and chaff and flare end caps and pistons would be released into the marine environment, where they would persist for long periods and could be ingested by marine wildlife while initially floating on the surface and sinking through the water column. Chaff and flare end caps and pistons would eventually sink (Navy, 2011), which would reduce the likelihood of ingestion by marine wildlife at the surface or in the water column.

Bird species could potentially encounter chaff and flare components on the Pacific Ocean surface while foraging. Some species of seabirds are known to ingest plastic when it is mistaken for prey (Auman et al., 1997; Yamashita et al., 2011; Provencher et al., 2014). The ingestion of plastic such as chaff and flare compression pads or pistons by birds could cause gastrointestinal obstructions or hormonal changes leading to reproductive issues (Provencher et al., 2014). Unless consumed plastic pieces were regurgitated, the chaff and flare compression pads or pistons could cause digestive tract blockages and eventual starvation and be lethal to birds foraging on the Pacific Ocean surface. Based on the available information, however, it is not possible to accurately estimate actual ingestion rates or responses of individual bird species (Moser and Lee, 1992); for example, it is possible that these bird species do not mistake these plastic components for prey and mistakenly consume them. Regardless, the majority of these chaff and flare plastic components would fall through the water column (Navy, 2011) and would not remain on the surface of the Pacific Ocean where a foraging bird would encounter and consume the plastic pieces. The band-rumped storm-petrel (*Oceanodroma castro*), Newell’s Townsend’s shearwater (*Puffinus auricularis newelli*), and short-tailed albatross (*Phoebastria albatrus*) forage exclusively across the ocean surface. Although it is unknown whether these species could mistake small residual plastic components for prey, there remains the possibility that they could encounter and subsequently ingest plastic end caps; therefore, the use of chaff and flares over the Pacific Ocean as a result of additional F-22A training may affect but is not likely to adversely affect the band-rumped storm-petrel, the Newell’s Townsend’s shearwater, and the short-tailed albatross.

In the very unlikely event that unconsumed chaff and flare components were encountered and ingested by a marine mammal, the small size of chaff and flare end-caps and pistons (i.e., 1.3-in. diameter and 0.13 in. thick) would pass through the digestive tract of marine mammals; therefore, the use of defensive countermeasures may affect but is not likely to adversely affect marine mammals. Sea turtles could also ingest the end caps of chaff and flares. It is likely that small residual plastic components of chaff and flares would also pass through the digestive tract of mature sea turtles. Small plastic components could, however, cause digestive problems for sea turtles if ingested, but with the large area that would be utilized for additional F-22A training in the SUA, it is highly unlikely that a sea turtle would encounter chaff and flare components; therefore, the use of chaff and flares over the Pacific Ocean as a result of additional F-22A training may affect but is not likely to adversely affect sea turtles.

The giant manta ray (*Manta birostris*), oceanic whitetip shark (*Carcharhinus longimanus*), and scalloped hammerhead shark (*Sphyrna lewini*) would not be seeking prey that would be similar to plastic end caps from chaff and flares. Also, they do not typically feed on the Pacific Ocean surface or seafloor where these plastic components would be most prevalent; however, there is still the possibility of an encounter between these fish species and the chaff and flare residual plastic components. Therefore, the use of defensive countermeasures by the additional F-22A training in the SUA may affect but is not likely to adversely affect the giant manta ray, oceanic whitetip shark, and scalloped hammerhead shark.

Takeoffs and landings at the airfield and training in the SUA by the additional F-22A aircraft would not alter terrestrial areas and adjacent shallow, sheltered aquatic areas with characteristics preferred by monk seals for pupping and nursing, would not substantially alter monk seals’ prey quality and quantity, and would not impact areas used by monk seals for hauling out, resting, or molting. Therefore, there would be no effect on monk seal critical habitat under Alternative A.

The training operations in the SUA by the additional F-22A aircraft would not alter the space for movement and use within insular false killer whale (*Pseudorca crassidens*) shelf and slope habitat, impact insular false killer whale prey species, add pollutants of a type and amount harmful to insular false killer whales, or cause increased sound levels that would impair insular false killer whales’ use or occupancy of designated critical habitat. Therefore, there would be no effect on the Main Hawai’ian Island insular false killer whale critical habitat under Alternative A.

The HIANG has made a may affect but not likely to adversely affect determination for the band-rumped storm-petrel, Newell's Townsend's shearwater, short-tailed albatross, blue whale (*Balaenoptera musculus*), false killer whale, fin whale (*Balaenoptera physalus*), sei whale (*Balaenoptera borealis*), sperm whale (*Physeter macrocephalus*), Hawai'ian monk seal, green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), leatherback turtle (*Dermochelys coriacea*), loggerhead turtle (*Caretta caretta*), olive ridley turtle (*Lepidochelys olivacea*), giant manta ray, oceanic whitetip shark, and scalloped hammerhead shark. Letters requesting concurrence with this determination were sent to the USFWS and NMFS (**Appendix A**).

3.9.5.1 Close Causal Effects and Reasonably Foreseeable Future Actions

The Proposed Action, in addition to reasonably foreseeable future actions on and off JBPHH, would potentially result in a less than significant impacts on biological resources. No sensitive or native plant communities would be impacted as a result of facility construction and renovation to support the additional F-22A aircraft; therefore, there would not be impacts on native or sensitive plant communities or habitats. Noise impacts on wildlife using the bayshore/nearshore habitats from the Proposed Action in combination with onshore road and community development construction projects may result in short- and long-term, negligible impacts under the Proposed Action. When added to reasonably foreseeable future actions, Alternative A may result in an increased risk of aircraft bird and other wildlife strikes. Compliance with the JBPHH BASH prevention program would reduce the potential risk of additional sortie operations associated with aircraft bird and other wildlife conflicts. There would be no impacts on marine mammals, sea turtles, or EFH from Alternative A in combination with ongoing and proposed Navy training activities. No additional effects on federal or state listed plant species, terrestrial reptiles, amphibians, fish, or invertebrates are anticipated because there would be no direct or indirect impacts on these species from Alternative A. Further, no significant impacts on threatened and endangered species are anticipated. The NGB has made a may affect but not likely to adversely affect determination for several federally listed species for Alternative A. No potential for significant effects on biological resources are expected from Alternative A in combination with other reasonably foreseeable future actions.

3.9.6 Environmental Consequences – No Action Alternative

Under the No Action Alternative, the additional F-22A aircraft and associated operations would not occur at JBPHH. No new construction or renovations of existing buildings to support the additional F-22A aircraft would be required. As such, there would be no change to biological resources.

3.10 CULTURAL RESOURCES

3.10.1 Definition of the Resource

Cultural resources are any prehistoric or historic district, site, building, structure, or object considered important to a culture or community for scientific, traditional, religious, or other purposes. These resources are protected and identified under several federal laws and EOs.

Cultural Resources include the following subcategories:

- Archaeological (i.e., prehistoric or historic sites where human activity has left physical evidence of that activity, but no structures remain standing)
- Architectural (i.e., buildings or other structures or groups of structures, or designed landscapes that are of historic or aesthetic significance)
- Traditional Cultural Properties (TCPs; i.e., resources of traditional, religious, or cultural significance to Native American tribes and other communities)

Historic properties are cultural resources that have been listed in or determined eligible for listing in the National Register of Historic Places (NRHP). To be eligible for the NRHP, properties must be 50 years old and have national, state, or local significance in American history, architecture, archaeology, engineering, or culture. For a more detailed definition of cultural resources, and applicable federal laws, refer to **Appendix D-9**.

Section 106 of the NHPA requires all federal agencies to seek to avoid, minimize, or mitigate adverse effects on historic properties (36 CFR § 800.1[a]). For cultural resource analysis, the Area of Potential Effects (APE) is used as the ROI. APE is defined as the "geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist," (36 CFR § 800.16[d]) and thereby diminish their historic integrity. There are two APEs including the areas of proposed facility repair, reconfiguration, and construction at JBPHH and the SUA described in **Section 2.1**.

3.10.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

3.10.2.1 Environmental Setting

JBPHH is situated on the coastal plain located on the leeward side of the Koolau Mountain Range. This is the largest flat expanse of land on Oahu, with elevations ranging from 0 to 20 ft MSL. The base is located just above MSL and relatively flat throughout. Prior to military construction, the inland area consisted primarily of marshland and ponds. Most of its present surface, including the APE, is fill land, consisting of dredged and graded coral rubble fill from either the entrance to Pearl Harbor or from inland deposits. JBPHH occupies an area which traditionally provided an excellent environment for Hawai'ian fishponds. Historic maps indicate that several Hawai'ian fishponds once existed in the vicinity of JBPHH-Hickam AFB though during the nineteenth century, the fishponds fell into disuse. By the early twentieth century, the area was leveled and filled with dredged coral fill from Ke'ehi Lagoon and the Pearl Harbor channel. There are no surface remnants of the fishponds, and the exact subsurface location of these fishponds is still in question (Hickam AFB, 2008).

3.10.2.2 Archaeological and Traditional Cultural Properties

Native Hawai'ians inhabited and extensively utilized the land upon which JBPHH was developed. The archaeological resources resulting from this use are important to the study of Native Hawai'ian culture and its development. JBPHH also contains valuable historic resources, though very little information is known about the premilitary nineteenth- and twentieth-century use of the Hickam AFB Areas with known historical settlements, such as the residence of Queen Emma and Watertown, are managed as if they are eligible for listing in the NRHP, as is Fort Kamehameha. Portions of JBPHH are also significant by association with the 7 December 1941 bombing of Hickam Field (Hickam AFB, 2008).

Documented archaeological surveys in the JBPHH area stretches back into the early twentieth century; the first inventory of archaeological resources was completed in 1905. Most recent investigations have focused on the precontact occupation of Fort Kamehameha (approximately 0.4 mi south of the proposed 7 Row aircraft parking). As a result, a wide range of archaeological sites, dating from the precontact period to the early 1900s and including fishpond complexes, seasonal occupation areas, mortuary activity areas, historic 1800s settlements, early 1900s settlements, and early military sites have been recorded. No archaeological sites have been placed on the NRHP; however, 12 sites are documented as potentially eligible and generally representative of the site types at JBPHH (Hickam AFB, 2008; **Table 3-15**).

Table 3-15
Potentially Eligible National Register of Historic Places on Joint Base Pearl Harbor-Hickam

State Historic Preservation Division Site Name	Site Number	Period of Significance
Ka`ihikapu Fishpond	50-80-13-00081	precontact (Prior to 1778)
Lelepaua Fishpond	50-80-13-00082	precontact (Prior to 1778)
Loko Waiaho	50-80-13-00094	precontact (Prior to 1778)
Loko Keoki	50-80-13-00095	precontact (Prior to 1778)
Loko Papiolua	50-80-13-00096	precontact (Prior to 1778)
Fort Kamehameha Burial Area	50-80-13-4499	precontact (Prior to 1778)
Midden site (possibly Holokahiki)	50-80-13-5325	precontact (Prior to 1778)
Hearths site	50-80-13-6406	precontact (Prior to 1778)
Hearths and post molds site	50-80-13-6692	precontact (Prior to 1778)
Queen Emma Residence	(no number)	postcontact (1800s Settlement)
Watertown	(no number)	postcontact (1800s Settlement)
Pu'uloa Camp	(no number)	postcontact (1800s Settlement)

A predictive model of archaeologically sensitive areas for the installation was developed based on the results of archaeological investigations conducted on Hickam AFB between 1975 and 2006. Areas were classified as having either a low, medium, or high probability for discovery of archaeological resources. Low probability areas include those portions of the base where extensive ground-disturbing activities have occurred and/or areas in which archaeological investigations have determined that no cultural resources exist (Hickam AFB, 2008). The APE is classified as having low potential for archaeological resources based on disturbance; this area of the base was developed prior to World War II and as a result, no archaeological surveys were conducted prior to construction. A majority of the land is built and landscaped (NAVFAC Hawai'i, 2016).

TCPs and sacred sites are a special class of cultural resources that require specialized expertise in their identification and assessment. A TCP study was completed for Hickam AFB in 2005. The Hickam AFB Integrated Cultural Resources Management Plan (ICRMP) (2008) indicates that though the study contains archival data and ethnographic interview information, it does not formally designate any TCPs. An updated, consolidated study was completed for JBPHH in 2016 in which the location of 22 potential Native Hawai'ian TCPs were presented within the boundaries of JBPHH (NAVFAC Hawai'i, 2016). The term "potential TCP" is used in the 2016 JBPHH study explicitly to refer to Hawai'ian cultural places that might be considered eligible for inclusion in the NRHP for possible cultural significance following the definitions and guidelines in the NRHP based on archival research and ethnographic data. These potential TCPs include fishponds, fish traps, fisheries, settlements, and burial locations. One of the potential TCPs identified as part of this study, designated Location 19 Portion of Pu'uloa, is located in the vicinity of the proposed F-22 Intel Vault (Project ID 7). It is of note that the spatial limits and boundaries of these potential TCPs are imperfectly defined.

Many human skeletal remains, burial pits, grave goods, and other Native American Graves Protection and Repatriation Act (NAGPRA) items have been archaeologically recovered across JBPHH, particularly, associated within the immediate vicinity of Fort Kamehameha (roughly 0.4 mi northwest of the current APE). Among the most common sites for burial grounds used by Hawai'ians were coastal sand dunes.

The coastline of Fort Kamehameha contained precontact and postcontact burials of Native Hawai'ians. Between 1975 and 1999, approximately 100 sets of human remains, in addition to animal burials such as dogs, a cat, and an ungulate (likely a horse or mule), were found at Fort Kamehameha. Standard operating procedures are outlined in various management documents (e.g., ICRMP, Programmatic Agreement) to ensure the correct and respectful treatment of remains and that ownership of the remains and funerary objects is determined following NAGPRA policy, in consultation with Native Hawai'ians and Native Hawai'ian organizations. The ICRMP specifically identifies three groups as having expertise in Native Hawai’ian affairs: the Office of Hawai’ian Affairs, the Oahu Burial Council, and *Hui Malama I Na Kupuna O Hawai`i Nei* (Hickam AFB, 2008).

3.10.2.3 Architectural Properties

In 1905, under the Taft Program, President Theodore Roosevelt initiated a major expansion of coastal defenses in areas outside of the continental United States. The naval base at Pearl Harbor was designated as the major defense installation for Hawai’i and was designed to be defended by a series of coastal defensive forts. One of these, Fort Kamehameha, was constructed at the entrance to Pearl Harbor. Land for the fort was acquired by condemnation proceedings in 1907 from the estate of Queen Emma. Since much of the land designated to become Fort Kamehameha was submerged, the Navy undertook a large-scale dredging project in Pearl Harbor channel to obtain fill material. Five batteries were constructed by the US Army Corps of Engineers to support the coastal defense system: Battery Selfridge (1913), Battery Jackson (1914), Battery Hawkins (1914), Battery Hasbrouck (1914), and eventually Battery Closson (1920) (Hickam AFB, 2008).

Fort Kamehameha encountered its only active war experience on 7 December 1941, during the Japanese surprise attack on Pearl Harbor. The antiaircraft guns successfully shot down several Japanese airplanes. Throughout World War II, the post served as coastal defense for Pearl Harbor. With the arrival of atomic weapons after the war, coastal artilleries became obsolete; the guns were scrapped and the coastal batteries were abandoned (Hickam AFB, 2008).

The batteries are considered to be excellent examples of the type of fortifications built during the early twentieth century as part of the Roosevelt/Taft-era coastal defense program and among the few examples of structures recommended by the Taft Board still under US control. Each fortified structure at Fort Kamehameha is unique and together they illustrate the military's engineering designs for coast defense at the turn of the century. Additionally, Battery Selfridge (Building 3440) was possibly reused as a control center for the HIANG in the 1960s and therefore included on the list of potentially significant resources on base associated with the Cold War as well (Hickam AFB, 2008).

The Proposed Action includes two repair and reconfiguration projects and seven new construction projects (see **Table 2-1** and **Figure 2-1** in **Section 2.1.1** and **Appendix B**). The proposed new construction actions are located around the existing airfield and runway, approximately 1 mi southwest of the Hickam Field National Historic Landmark Area and proposed Hickam Historic District and approximately 0.45 mi east of the proposed Fort Kamehameha Historic District. The repair and reconfiguration of Squadron Operations (Building 3428; Project ID 2) is located adjacent to Battery Selfridge (Building 3440), one of five batteries comprising the discontinuous Artillery District of Honolulu (Hickam AFB, 2008).

In a standard operating procedure developed for the JBPHH ICRMP, it was directed that each structure within a historic district be classified under one of five treatment categories to support clear identification of historical importance and integrity. These ranged from Category I – Property of major importance, to Category V – Property detrimental to the significance of adjacent historic properties. Battery Selfridge is classified as a Category I property of major importance for two time periods: Early Twentieth Century (1936 or earlier, including establishment of Fort Kamehameha) and After 1947 (Air Force period, including the Cold War).

3.10.3 Existing Conditions – Special Use Airspace

3.10.3.1 Environmental Setting

The SUA APE for the Proposed Action includes the SUA as described in **Section 2.1.1**. Because these SUA are over water, no discussion of NRHP-listed resources is included. Potential underwater archaeological resources are described below.

3.10.3.2 Cultural Resources in the Marine Environment

Though the location, number, and type of underwater archaeological resources have not been as formally documented through time as terrestrial resources have, underwater resources have gained scientific and public prominence in the past two decades and are currently being tracked through several industry and government-run vehicles. The Maritime

Archaeology and History of the Hawai'ian Islands Foundation was developed to identify key issues affecting submerged cultural resource management within the Pacific Ocean and is working towards developing a submerged cultural resource management plan tailored to the unique social, cultural, and political environments of Hawai'i and the Pacific Islands. Part of this process includes educating the public on submerged cultural resources, cultivating community interest in the field, and recruiting and training volunteers. Currently, data are being gathered to produce a Hawai'ian shipwreck database that can be utilized by the public (Maritime Archaeology and History of the Hawai'ian Islands Foundation, 2011). The NOAA maintains a Wrecks and Obstructions Database. Their Automated Wreck and Obstruction Information System contains information on over 10,000 submerged wrecks and obstructions in the coastal waters of the United States including latitude and longitude and a brief historic description. Approximately 50 obstructions, visible wrecks, submerged wrecks, and distributed remains of wrecks are associated with Pearl Harbor and the southern coast of Oahu. There are no documented wrecks or other obstructions on the northern coast of Kauai; however, approximately 15 distributed remains of wrecks are recorded in the open ocean waters north of the island, under W-188 (NOAA, n.d.).

Underwater resources can include shipwrecks associated with naval preparations for World War I and World War II. Private and commercial wrecks that span the seventeenth through twentieth centuries are documented as well. While shipwrecks have understandably been the primary subject of underwater archaeology, it is important to note that the potential for submerged prehistoric sites is equally great, particularly for an island nation, where the people's lives and lifeways have traditionally been so intrinsically tied to the water.

3.10.4 Environmental Consequences Evaluation Criteria

Adverse effects to cultural resources might include physically altering, damaging, or destroying all or part of a resource; altering characteristics of the surrounding environment that contribute to the resource's significance; introducing visual or audible elements that are out of character with the property or alter its setting; neglecting the resource to the extent that it deteriorates or is destroyed; or the sale, transfer, or lease of the property out of agency ownership (or control) without adequate enforceable restrictions or conditions to ensure preservation of the property's historic significance. For the purposes of this EA, an effect is considered major if it significantly alters the integrity of individually NRHP-eligible archaeological or architectural resources on JBPHH, results in the loss of contributing resources to a historic district, or potentially effects TCPs.

3.10.5 Environmental Consequences – Alternative A

3.10.5.1 Archaeological Resources

Ground disturbance as part of Alternative A would be limited to seven construction sites located in heavily developed portions of the base. The present surface of the APE is fill land consisting of dredged and graded coral rubble fill from either the entrance to Pearl Harbor or from inland deposits. Based on this and a history of development predating Word War II, this area of the base has been identified as having low potential for previously undocumented archaeological deposits. Pursuant to the 2012 Programmatic Agreement (revised) among the Commander Navy Region Hawai'i, The Advisory Council on Historic Preservation, and the Hawai'i State Historic Preservation Officer regarding Navy undertakings in Hawai'i, NAVFAC Hawai'i determined the Proposed Action does not require additional Section 106 review under NHPA (NAVFAC Hawai'i, 2022). In the unlikely case of inadvertent discovery during construction, all standard operating procedures and other guidance outlined in the installation ICRMP would be followed. Sorties within the SUA would be performed at an altitude over the Pacific Ocean that would not affect potential submerged resources. Alternative A would therefore have no effect, and consequently no impact, on archaeological resources.

3.10.5.2 Traditional Cultural Properties

Location 19, Portion of Pu'uloa is located adjacent to and west of the vicinity of the proposed F-22A Intel Vault (Project ID 7). This resource is a potential TCP as identified by a study completed in which the locations of 22 potential Native Hawai'ian TCPs were presented within the boundaries of JBPHH based on archival research and ethnographic data (NAVFAC Hawai'i, 2016). No impacts to TCPs or sacred sites are expected as a result of the implementation of Alternative A. This area of JBPHH is already heavily developed; therefore, the addition of the proposed F-22 Intel

Vault would not have significant negative impacts on location or setting. Alternative A would therefore have no effect, and consequently no impact, on TCPs or sacred sites.

3.10.5.3 Architectural Resources

Under Alternative A, one construction project and one repair and reconfiguration project are proposed adjacent to Selfridge Battery (Building 3440). This resource is one of five batteries dating to the early twentieth century comprising the Artillery District of Honolulu and is classified as a Category I property of major importance for two time periods. Typically, the identity of a district results from the interrelationship of its resources, which can convey a visual sense of the overall historic environment. The Artillery District of Honolulu, however, is discontinuous meaning visual continuity is not a factor in the significance assessment. Rather, the individual elements represent an arrangement of historically and functionally related properties that convey significance through their architectural properties and the role they played in US history during the early twentieth century and Cold War and regional history during the establishment of Fort Kamehameha. The battery's current location in a developed portion of the base, geographically separated from the other batteries, affirms this distinction – that the battery conveys its integrity in form and function, not in setting. As the battery is not included under Alternative A and will not be impacted by adjacent repair or construction activities, and as such would have no effect, and consequently no impact, on historic properties.

3.10.5.4 Close Causal Effects and Reasonably Foreseeable Future Actions

Alternative A, with the addition of reasonably foreseeable future actions on and off JBPHH, would have no effect to cultural resources at JBPHH.

3.10.6 Environmental Consequences – No Action Alternative

Under the No Action Alternative, the additional F-22A aircraft and associated operations would not occur at JBPHH. No new construction or renovations of existing buildings to support the additional F-22A aircraft would be required. As such, there would be no effects to cultural resources.

3.11 INFRASTRUCTURE, TRANSPORTATION, AND UTILITIES

3.11.1 Definition of the Resource

Infrastructure is the system of public works, including utilities and transportation, that support the function of a population in a specified area. See **Appendix D-10** for the definition of the resource. The ROI for infrastructure, transportation, and utilities is JBPHH.

3.11.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

Unless otherwise noted, the existing conditions for infrastructure at JBPHH were derived from the Installation Development Plan for JBPHH (JBPHH, 2013).

3.11.2.1 Transportation

The peak hours for traffic at JBPHH occur between 0600 and 0700 hours and between 1430 and 1530 hours. Traffic congestion occurs during these peak hours, especially at JBPHH-Pearl Harbor, with less congestion on the JBPHH-Hickam side of the base. No substantial traffic congestion occurs at JBPHH during off-peak hours (NAVFAC Hawai'i, 2013).

There are five gates providing ingress and egress access to JBPHH. Of the five gates, the Makalapa, Nimitz, and Halawa gates are over capacity during the morning peak hour of use, while the Kuntz and O'Malley gates experience occasional backups during morning peak hour use (NAVFAC Hawai'i, 2013).

The Hawai'i Department of Transportation (DOT) calculates the Level of Travel Time Reliability (LOTTR) for state highways. The LOTTR is used to show variability inherent in the travel times over a section of a road. The higher the

LOTTR the more budgeted time needed to cross a section of a roadway or go from an origin to a destination. The LOTTR for the AM peak period (6am to 10am), the Midday period (10am to 4pm), the PM peak period (4pm to 8pm), and Weekend period (6am and 8pm) show how much variability exists for the traveler and if a traveler must budget more time to reach a destination with a level of certainty if a traveler leaves earlier than normal based on the median travel time. These LOTTR metrics are compared to a threshold (provided by the Federal Highway Administration) value of 1.50 (which is 50 percent over the median travel time). If all four of the LOTTR values are below the threshold of 1.50, the highway system is deemed reliable; if not, it is deemed unreliable (Hawai'i DOT, 2020).

There are three highways providing primary access to the JBPHH from metropolitan Honolulu, State Highway 99, State Highway 92, and Interstate H1 (I-H1). State Highway 99 at I-H1 and Hawai'i State 92 is a 0.29-mile segment with an Annual Average Daily Traffic count of 23,100 in 2020. The LOTTR was 1.50 for the AM peak period, 1.56 for the Midday period, 1.50 for the PM peak period, and 1.50 for the Weekend peak period in 2020. This segment is marginally unreliable. I-H1 at the State Highway 92 exit is a 0.82-mile segment with an Annual Average Daily Traffic count of 110,500 in 2020. The LOTTR was 1.08 for the AM peak period, 1.07 for the Midday period, 1.12 for the PM peak period, and 1.09 for the Weekend period in 2020. This segment is reliable. Hawai'i DOT does not have any data specifically for State Highway 92 (Hawai'i DOT, 2020).

3.11.2.2 Electrical System

The electric capacity at JBPHH is from Puuloa (60 megawatt [MW], Kuahua (60 MW), Hickam Front (37 MW), Hickam Mamala (20 MW), and Ford Island (40 MW). The existing electrical network extends across JBPHH from these substations, and usage is at approximately 36 percent of the current capacity (JBPHH, 2013).

3.11.2.3 Liquid Fuel

Fuel is stored in 20 tanks of concrete and steel surrounded by basalt rock at the Red Hill Bulk Fuel Storage Facility. Red Hill can operate without external power. It stores jet and marine fuel used by the Air Force, US Army, Navy, US Marine Corps, the US Coast Guard, and the HIANG at JBPHH (CNIC, 2021).

3.11.2.4 Water Supply System

The average primary demand for water at JBPHH is 13 million gallons per day in the winter and 19 million gallons per day in the summer. The capacity of the water system at JBPHH is 27 million gallons per day; usage is at 48 percent of capacity in the winter and 70 percent of capacity in the summer (JBPHH, 2013).

3.11.2.5 Sanitary Sewer/Wastewater System

The primary wastewater demand at JBPHH is 6,200 gallons per minute (gpm) on the JBPHH-Pearl side, less than 2,350 gpm on the JBPHH-Hickam side, and 3,200 gpm at Ford Island. The usage of the wastewater systems at JBPHH are at 100 percent of current capacity (JBPHH, 2013).

3.11.2.6 Solid Waste Management

Regular trash pickup in residential areas is performed by contractors twice weekly. Trash pickup in industrial and commercial areas of JBPHH is performed by a contractor funded by the Facility Maintenance Division on a regular schedule (Navy Region Hawai'i, 2016)

JBPHH delivers trash to the Oahu landfills and the Honolulu Program of Waste Energy Recovery Plant. JBPHH has a recycling program that is managed by contractors. Contracted recycling includes white paper and cardboard collected in green toters as well as at blue metal containers centrally located throughout the base. All types of metals are collected at Building 159 for recycling. The JBPHH Recycling Center does not participate in the HI-5 Deposit Beverage Container Program (JBPHH, 2018).

3.11.3 Environmental Consequences Evaluation Criteria

Impacts on infrastructure from the Proposed Action are evaluated for their potential to disrupt or improve existing levels of service in the ROI as well as generate additional requirements for energy or water consumption and impacts on resources such as sanitary sewer systems. The Proposed Action would result in an adverse impact on utilities or services if the project required more than the existing infrastructure could provide or required services in conflict with adopted plans and policies for the area. The Proposed Action would result in transportation impacts if it resulted in a substantial increase in traffic generation, a substantial increase in the use of the connecting street systems or mass transit, or if on-site parking demand would not be met by projected supply.

3.11.4 Environmental Consequences – Alternative A

The facility construction and repair projects proposed under Alternative A are proximate to the airfield and existing infrastructure and are serviced by utilities such as water, wastewater, and electric and are tied into the JBPHH internal transportation network. During construction activities, there would be short-term minor impacts on transportation. Construction equipment and materials used to construct and repair the nine facilities as well as construction personnel commuting to the work sites would cause increased traffic at JBPHH gates during peak hours. These impacts on transportation from construction activities would end when facility construction and repairs were completed. Therefore, short-term, minor adverse transportation impacts would occur from construction activities under Alternative A.

The additional 150 personnel would utilize the JBPHH gates and on-base transportation network to travel to and from the facilities supporting the F-22A aircraft and training operations. Although this would only be a 0.5 percent increase in the number of personnel at JBPHH, three of the five gates at JBPHH operate at capacity during the morning peak commutes, and this small increase in vehicles at already congested gates would further increase traffic delays. Therefore, under Alternative A, there would be direct, long-term, moderate impacts on transportation from the additional 150 ANG and civilian personnel commuting to JBPHH daily.

The additional 150 personnel utilizing nearby roadways for access to JBPHH gates would have a minor long-term impact on off-base transportation. If each of the new personnel operates a separate vehicle for daily commutes to JBPHH, this would represent a 0.6 percent increase on State Highway 99 and a 0.1 percent increase on I-H1 proximate to JBPHH. Further, State Highway 99 has a LOTTR of marginally reliable and I-H1 has a LOTTR of reliable on roadway segments proximate to JBPHH. Therefore, only 150 additional vehicles during commute hours would be a minor increase and would not substantially impact the LOTTR on these roadway segments.

Solid waste would be generated during the construction and repair activities. This solid waste would be hauled off base to landfills in Oahu and disposed of according to state and local regulations. This would be an impact on the overall capacity of the local landfills to handle future construction and demolition debris; however, given the large capacity of local landfills in Oahu to handle solid waste and the small amount of construction related debris to be disposed, the direct, short-term, adverse impact on landfill capacity is minor.

Most utility systems at JBPHH have the capacity to handle additional facilities and personnel needs; however, the wastewater systems at the JBPHH-Hickam side of the base are near or at capacity. During planning and design of the new facilities to be constructed and repaired, all utility systems would be evaluated for adequate capacity. Facility construction and repair designs would take into account any infrastructure modifications necessary to meet the utility system demands of JBPHH. Therefore, there would be long-term, minor, direct, adverse impacts on utilities from the increased use of electricity and potable water, and increased production of wastewater at JBPHH.

The addition of approximately 150 ANG and civilian personnel to support the additional F-22A aircraft and training operations would generate additional solid waste that would be disposed of in local Oahu landfills. There is adequate capacity in the local landfills to handle this small amount of additional solid waste, and the volume of solid waste generated would be minimized through the JBPHH recycling program; however, the additional solid waste would still require local collection and transport to Oahu landfills and the Honolulu Program of Waste Energy Recovery Plant where the solid waste would contribute to long-term reduced landfill capacity. Therefore, there would be long-term, minor, direct adverse impacts on solid waste generation and disposal at JBPHH under Alternative A.

3.11.4.1 Close Causal Effects and Reasonably Foreseeable Future Actions

Alternative A, in addition to reasonably foreseeable future actions on and off JBPHH, is expected to have minor long-term impacts on transportation at JBPHH. Studies of gate capacity at JBPHH have been conducted and planning efforts put into place to improve gate capacity and reduce traffic congestion. Regardless, with increases in the number of personnel, there are also increases in the number of vehicles which has minor traffic impacts. Minor impacts on utilities and solid waste are expected from the implementation of Alternative A along with other reasonably foreseeable future actions.

3.11.5 Environmental Consequences – No Action Alternative

Under the No Action Alternative, the additional F-22A aircraft and associated operations would not occur at JBPHH. No new construction or renovations of existing buildings to support the additional F-22A aircraft would be required. Therefore, there would be no changes to infrastructure, transportation, or utilities under the No Action Alternative.

3.12 HAZARDOUS MATERIALS AND WASTES, ENVIRONMENTAL RESTORATION PROGRAM, AND TOXIC SUBSTANCES

3.12.1 Definition of the Resource

Activities discussed under this resource section include the use, handling and disposal of hazardous materials (HAZMAT) and wastes. HAZMAT and wastes, the Environmental Restoration Program, and toxic substances are defined and described in **Appendix D-11**. The ROI for this resource is JBPHH, except for radon which includes the city of Honolulu.

3.12.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

3.12.2.1 Hazardous Materials and Wastes

Under federal law, state regulations can be more stringent than federal policies. The Hawai'i DOH received primacy of its hazardous waste program from the USEPA in 2001; therefore, the regulations governing hazardous waste in Hawai'i are contained in the HAR Title 11. The majority of HAR regulating hazardous waste mirrors USEPA regulations; HAR § 11-260 to 272 control the identification, treatment, storage, transportation, handling, labeling, and disposal of hazardous waste. HAR § 11-273 regulates the management of universal waste and HAR § 11-279 regulates used oil storage, transportation, and disposal (NAVFAC Hawai'i, 2014).

Hazardous and toxic material procurements at JBPHH are approved and tracked by the NAVFAC Hawai'i Environmental Services hazardous waste Disposal Branch which has overall management responsibility of the installation environmental program. NAVFAC Hawai'i Environmental Services Hazardous Waste Disposal Branch supports and monitors environmental permits, HAZMAT, and hazardous waste storage, spill prevention and response (NAVFAC Hawai'i, 2014).

The NAVFAC Hawai'i Environmental Services Hazardous Waste Disposal Branch maintains the *Hazardous Waste Management Plan* (NAVFAC Hawai'i, 2014) as directed by Office of the Chief of Naval Operations Instruction 5090.1 (series) Chapter Title – Hazardous Waste Management Ashore and complies with 40 CFR Parts 260 to 272. This plan prescribes the roles and responsibilities with respect to the waste stream inventory, waste analysis plan, hazardous waste management procedures, training, emergency response, and pollution prevention. The *Hazardous Waste Management Plan* establishes the procedures to comply with applicable federal, state, and local standards for solid waste and hazardous waste management. The plan outlines procedures for transport, storage, and disposal of hazardous wastes.

Hazardous materials at JBPHH are managed by the Naval Supply Systems Command Fleet Logistics Center Pearl Harbor Hazardous Materials Information Network Center. Hazardous materials and petroleum products such as fuels, flammable solvents, paints, corrosives, pesticides, deicing fluid, refrigerants, and cleaners are used throughout JBPHH for various functions including aircraft maintenance; aircraft ground equipment maintenance; and ground vehicles, communications infrastructure, and facilities maintenance (NAVFAC Hawai'i, 2014).

Hazardous wastes generated at JBPHH include waste flammable solvents, contaminated fuels and lubricants, paint/coating, stripping chemicals, waste oils, waste paint-related materials, mixed-solid waste, and other miscellaneous wastes. The HIANG pays NAVFAC Hawai'i to dispose of generated hazardous waste. Approximately 288 pounds of hazardous waste is generated per F-22A aircraft annually[2].

Certain types of hazardous wastes are subject to special management provisions intended to ease the management burden and facilitate the recycling of such materials. These are called "Universal Wastes," and their associated regulatory requirements are specified in 40 CFR Part 273. Types of waste currently covered under the universal waste regulations include fluorescent light tubes, hazardous waste batteries, hazardous waste thermostats, and hazardous waste lamps. JBPHH recycles all lubricating fluids, batteries, and shop rags and hazardous wastes are managed in accordance with the JBPHH *Hazardous Waste Management Plan* (NAVFAC Hawai'i, 2014).

JBPHH is classified as a large-quantity hazardous waste generator as defined by the USEPA (40 CFR § 260.10), generating more than 2,200 pounds of nonacute hazardous waste per month. JBPHH operates numerous initial accumulation points (IAPs), where up to 55 gallons of "total regulated hazardous wastes" or up to 1 quart of "acutely hazardous wastes" are accumulated. IAP managers are responsible for properly segregating, storing, characterizing, labeling, marking, packaging, and transferring all hazardous wastes for disposal from the IAP to an established 90-day storage area according to federal, state, local, and Navy regulations. The Hazardous Waste Program Manager is responsible for characterizing and profiling each waste stream. JBPHH also operates several 90-day accumulation sites, where hazardous waste accumulates before transfer to the Defense Logistics Agency (DLA) Disposition Services for transportation off-installation for ultimate disposal (NAVFAC Hawai'i, 2014). Wastes generated on base are managed under regulations set forth in the JBPHH Resource Conservation and Recovery Act Part B permit. JBPHH also holds a Resource Conservation and Recovery Act permit for handling the disposal and treatment of waste munitions. DLA Disposition Services Pearl Harbor, formerly Defense Reutilization and Marketing Office, manages hazardous waste and HAZMAT disposal.

The Navy Region Hawai'i owns a permitted treatment, storage, and disposal facility, referred to as the Conforming Storage Facility (CSF), at Building 1526 under the USEPA ID No. HI 117 002 4334. The CSF is utilized as a central facility for the receipt and temporary storage of hazardous waste. The CSF is a jointly operated hazardous waste storage facility between NAVFAC Hawai'i and the DLA Disposition Services Pearl Harbor. After the hazardous waste is received, the CSF Site Manager verifies if the hazardous waste can be reused or treated. If reuse or treatment is not feasible, the hazardous waste shall be temporarily stored at the CSF pending transfer to the DLA Disposition Services Pearl Harbor or shipment to an USEPA-approved disposal site in the continental United States.

Under the same USEPA ID No., the Region owns the Industrial Waste Treatment Facility (IWTC) at Building 1424 in JBPHH. The management and hazardous waste processing requirements for both the CSF and IWTC are detailed in the CSF and IWTC Permit.

3.12.2.2 Installation Restoration Program

The JBPHH Installation Restoration Program (IRP) investigated locations of various Areas of Concern and Solid Waste Management Units for hazardous waste contamination. A total of 102 sites were identified at JBPHH. Of those sites, 85 are closed with no further action planned and 17 are in the investigation stage. Ten sites are identified as IRP sites, and seven sites are underground storage tank (UST) sites. Seven identified sites (six IRP sites and one Munitions Response Program site) that are in the vicinity of the proposed facility construction or modification project areas are all closed with no further action needed. These closed IRP and Munitions Response Program sites are

- Site H0001 - MY111-HIANG Motor Pool;
- Site H0003 - DC102-FK Cantonment Area;
- Site H0023 - ST020-EOD USTs;
- Site H0031 - ST038-FT KAM/HIANG USTs;
- Site H0044 - DA103-Basewide Polychlorinated Biphenyls (PCBs);
- Site H0045 - SD019-Sanitary Sewer System; and

[2] Cheyne Taum, 154 WG, HIANG Environmental Manager. E-mail correspondence with Alana Olson, GS-13, NGB/A4AM, 9 March 2021.

- UXO H00102 - SR001-MRA53/FK Small Arms Range.

The Navy evaluated past releases of per- and polyfluoroalkyl substances (PFAS) under the Navy's Environmental Restoration Program at JBPHH. There are no PFAS sites in close proximity to the proposed facility locations (**Figure 3-12**).

3.12.2.3 Asbestos and Lead-Based Paint

NAVFAC developed the *Asbestos Program Management Plan* (P-502) for JBPHH, which includes program administration, organizational roles and responsibilities, standard work practices, and documentation (NAVFAC Hawai'i, 2017). All buildings have been added to the JBPHH File Repository for Electronic Data. Within the File Repository for Electronic Data, architectural plans for all buildings are stored and electronic copies of all available analytical results for asbestos sampling and analysis associated with individual buildings are in the early stages of being added (NAVFAC Hawai'i, 2017). Buildings constructed prior to 2005 are assumed to contain asbestos-containing material (ACM) unless proven by sampling that materials are not ACM. Asbestos surveys for Buildings 3407 and 3428 have not been conducted[3]. Building 3407 was constructed in 1997 and Building 3428 was constructed in 2014[4]. Therefore, Building 3407 is assumed to contain ACM and materials that would be disturbed should be tested prior to repairs. It is unlikely that Building 3428 would contain ACM.

Comprehensive information or records on the presence or absence of lead-based paint (LBP) in Buildings 3407 and 3428 is not available.

3.12.2.4 Radon

The USEPA and the US Surgeon General have evaluated the radon potential around the country to organize and assist building code officials in deciding whether radon-resistant features are applicable in new construction. Radon zones can range from 1.0 (high) to 3.0 (low). The USEPA radon zone for Hawai'i is Zone 3 (Low Potential, predicted indoor average level less than 2 picocuries per liter (pCi/L). The Hawai'i Noise Radiation and Indoor Air Quality Branch (2019) indicates that radon levels in Honolulu County vary from under 2.0 pCi/L (92 percent of reported results in Zone 3) to 8 percent of results between 2.0 and 3.9 pCi/L (Zone 2). Each zone designation reflects the average short-term radon measurement that can be expected in a building without the implementation of radon control methods.

[3] Tracy Miyamoto, NAVFAC Hawai'i, E-mail correspondence with Eric Webb, Ph.D., Technical Services Director, Vernadero Group, Inc., 22 March 2021.
[4] Seto Cahti, NAVFAC Hawai'i, E-mail correspondence with Eric Webb, Ph.D., Technical Services Director, Vernadero Group, Inc., 22 March 2021.

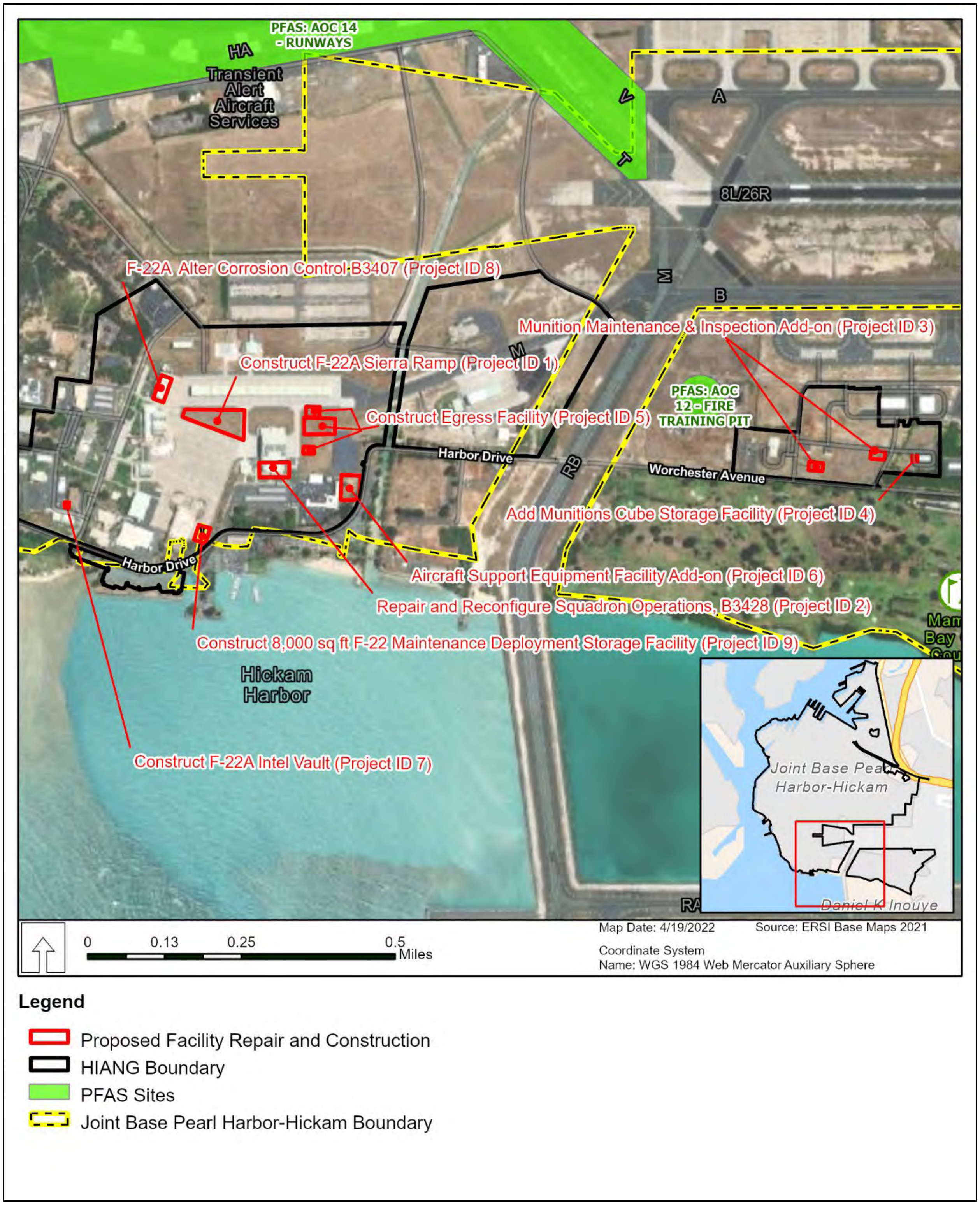

Figure 3-12. Location of Known Past Releases of Per- and Polyfluoroalkyl Substances Proximate to the Proposed Facility Repair and Construction at Joint Base Pearl Harbor-Hickam.

3.12.2.5 Polychlorinated Biphenyls

Specific PCB materials at the installation have not been identified. Note that ballasts and starters from light fixtures could contain PCB-containing material. The disposal of these materials is regulated. If the ballasts are not plainly marked as “Non-PCB”, the material must be treated as PCB-containing (or be tested and proven to be non-PCB containing). As facility repairs and demolition occur, the suspected ballasts should be removed and properly disposed. Given the dates of construction of Buildings 3407 and 3428 there should not be PCB concerns as PCBs were banned from manufacture and distribution in 1978[5].

3.12.3 Environmental Consequences Evaluation Criteria

Impacts on HAZMAT management would be considered adverse if the federal action resulted in noncompliance with applicable federal and state regulations, or increased the amounts generated or procured beyond current JBPHH waste management procedures and capacities. Impacts on the Environmental Restoration Program would be considered adverse if the federal action disturbed (or created) contaminated sites resulting in negative effects on human health or the environment.

3.12.4 Environmental Consequences – Alternative A

3.12.4.1 Hazardous Materials and Wastes

The quantity of HAZMAT such as oil, Jet-A fuel, hydraulic fluid, solvents, sealants, and antifreeze would increase with the operations and maintenance of additional F-22A aircraft at JBPHH. HAZMAT required for the F-22A aircraft would be procured, controlled, and tracked through the Environmental Services Hazardous Waste Disposal Branch, following established NAVFAC Hawai’i procedures. This would ensure that only HAZMAT needed for operations and maintenance at the smallest quantities would be used and that all of the HAZMAT used for F-22A operations at JBPHH would be properly tracked.

There would be 2,016 pounds of additional hazardous waste generated annually in the future under Alternative A as a result of the additional F-22A operations at JBPHH. The HIANG would continue to pay NAVFAC Hawai’i for the proper disposal of hazardous materials generated by the additional aircraft, and the cost of disposal is anticipated to increase by approximately $11,108 annually; however, all hazardous waste generated by F-22A aircraft operations and maintenance would be properly handled, stored, and disposed of following the NAVFAC Hawai’i *Hazardous Waste Management Plan* (NAVFAC Hawai’i, 2014). This ensures that hazardous waste is managed according to all federal, state, and local laws and regulations. As such, there would be no impact from the procurement and use of HAZMAT or the storage and disposal of hazardous waste under Alternative A.

3.12.4.2 Installation Restoration Program

There are no active IRP sites that would be impacted by the proposed facility construction and improvements at JBPHH under Alternative A. No PFAS contamination has been identified proximate to the facility and construction improvements under Alternative A. If PFAS contamination was discovered at any of the facility and construction improvement locations, a Media Management Plan would be developed and implemented to remediate any PFAS contaminated solid and aqueous media prior to the implementation of the facility and construction improvements.

3.12.4.3 Asbestos-Containing Materials and Lead-Based Paint

ACM surveys would be required in Building 3382 prior to renovation activities. If ACM is determined to be present in those buildings, the ACM would be properly removed and disposed of according to the NAVFAC Hawai’i *Asbestos Management and Operations Plan* (NAVFAC Hawai’i, 2017).

LBP surveys would be required in Building 3382 prior to renovation activities. If LBP is determined to be present, the LBP would be properly handled and disposed of in accordance with federal, state, and local laws.

[5] Jason Mori, NAVFAC Hawai’i, E-mail correspondence with Eric Webb, Ph.D., Technical Services Director, Vernadero Group, Inc., 22 March 2021.

With the implementation of the requirements described by the *Asbestos Management Plan* and proper handling of ACM and LBP if determined to be present in Building 3382, there would be no impact from potential ACM or LBP under Alternative A.

3.12.4.4 Radon

There is a low potential for radon to pose a health hazard at JBPHH and construction and renovation of facilities to support the F-22A training and operations would not be impacted by radon under Alternative A.

3.12.4.5 Polychlorinated Biphenyls

Removal of any light fixtures has the potential to disturb PCBs. Renovations of Building 3382 could require the removal of fluorescent lighting fixtures; however, it is highly unlikely that Building 3382 would contain PCBs at any other locations given the date of the building construction. Therefore, if lighting fixtures are removed, they would be disposed of according to federal, state, and local laws. The removal and proper disposal of light fixtures containing PCBs is a potential long-term, minor, beneficial impact under Alternative A.

3.12.4.6 Close Causal Effects and Reasonably Foreseeable Future Actions

Alternative A, in addition to reasonably foreseeable future actions on and off JBPHH, is not anticipated to result in potentially significant impacts on the management of hazardous materials and wastes, contaminated sites, and toxic substances. Storage and quantity of jet fuels, solvents, oil, and other hazardous materials supporting Alternative A operations in addition to foreseeable future projects would likely increase; however, this increase would potentially result in a negligible effect. The proposed project in addition to other proposed projects on base would require compliance with the NAVFAC Hawai'i Hazardous Waste Management Plan. The plan ensures that procedures for managing hazardous waste are in accordance with federal, state, and local regulations; therefore, no impacts on the storage and disposal of hazardous waste is expected. There would be no disturbance or alterations to IRP sites as result of Alternative A; therefore, there would be no impacts on hazardous waste sites at JBPHH. The addition of the proposed operations and foreseeable future projects on-base would be required to adhere to the Asbestos Management and Operating Plan for any modifications to existing structures. No significant, adverse impacts on hazardous materials and wastes, contaminated sites, and toxic substances are expected from Alternative A in combination with other reasonably foreseeable future actions.

3.12.5 Environmental Consequences – No Action Alternative

Under the No Action Alternative, the additional F-22A aircraft and associated operations would not occur at JBPHH. No new construction or renovations of existing buildings to support the additional F-22A aircraft would be required. As such, no increased quantity of HAZMAT would be used, and no increased quantity of hazardous wastes would be generated. Similarly, there would be no potential disturbance of ACM, LBP, or PCBs in JBPHH buildings. As a result, there would be no direct or indirect impact on any HAZMAT or hazardous or special wastes under the No Action Alternative.

3.13 SOCIOECONOMICS/PROTECTION OF CHILDREN AND THE ELDERLY

3.13.1 Definition of the Resource

Socioeconomics is the relationship between economics and social elements, such as population levels and economic activity. The definition of the resource is detailed in **Appendix D-12**. In addition, federal agencies are required to identify and assess environmental health and safety risks to children. See **Appendix D-13** for additional information on the definition. The ROI includes Honolulu County, Hawai'i, for JBPHH. The SUA are entirely over water and therefore not considered further.

3.13.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

The unemployment rate for Honolulu County, Hawai'i, was 2.4 percent in April 2025, which was unchanged from April 2024 (US Bureau of Labor Statistics, 2025). These unemployment rates were similar to the April 2024 and April

2025 unemployment rates for Hawai'i (2.6 and 2.5 percent, respectively) and lower than the United States (3.5 percent [April 2024] and 3.9 percent [April 2025]) (US Bureau of Labor Statistics, 2025).

The median household income in 2023 was $104,264 for Honolulu County and $98,317 for the state of Hawai'i. The rate of persons in poverty in 202023 was 9.1 percent for Honolulu County and 10.1 percent for the state of Hawai'i (US Census Bureau, 2025). The median household income and rate of persons in poverty in the United States in 2023 was $78,538 and 11.1 percent, respectively (US Census Bureau, 2025).

JBPHH is an important part of the Hawai'ian and Honolulu County economies. On 1 October 2010, JBPHH was created by combining two historic bases into a single joint installation to support both DAF and Navy missions, along with tenant commands, all Servicemembers and their families. Annually, Naval Station Pearl Harbor completed an average of 65,000 boat runs and transported 2.4 million passengers between Ford Island and other harbor locations. Navy-manned USS Arizona Memorial tour boats transport nearly 2 million visitors to the Pearl Harbor National Memorial each year. Naval Station Pearl Harbor owns and operates one of the Navy's largest recreation and special services programs, has its own police and security force and is responsible for DOD firefighters in 13 stations island wide. Located within the Hawai'ian archipelago on the southern, central, and western portions of the island of Oahu, Naval Station Pearl Harbor occupies more than 14,000 ac of land on three separate locations: Pearl Harbor Naval Complex, Naval Magazine Lualualei Branch (Lualualei Annex), and Naval Computer and Telecommunications Area Master Station Pacific in Wahiawa, also known as Wahiawa Annex (JBPHH, 2013).

The percentage of the population under the age of 18 in Honolulu County was 20.4 percent in 2023, which was similar to the percentage of children in Hawai'i (20.5 percent) and the United States as a whole (22.1 percent) (US Census Bureau, 2025).

3.13.3 Environmental Consequences Evaluation Criteria

Consequences to socioeconomic resources were assessed in terms of the potential impacts on the local economy from the proposed sorties. The level of impacts associated with the proposed expenditure is assessed in terms of direct effects on the local economy and related effects on other socioeconomic resources (e.g., property values and employment). The magnitude of potential impacts can vary greatly, depending on the location of an action. For example, implementation of an action that creates 10 employment positions might be unnoticed in an urban area but might have significant impacts in a rural region. In addition, if potential socioeconomic changes resulting from other factors were to result in substantial shifts in population trends or in adverse effects on regional spending and earning patterns, they may be considered adverse.

An analysis of affected populations applies to potential disproportionate effects on youth populations. Population issues could occur if an adverse environmental or socioeconomic consequence to the human population fell disproportionately upon youth populations..

3.13.4 Environmental Consequences – Alternative A

Under Alternative A, the HIANG would add an estimated 408 sorties annually at JBPHH with the addition of seven F-22A aircraft, an additional 150 ANG and civilian personnel, and facility construction and repair projects for this requirement.

Additional materials and labor for the facility construction and renovation would have a minor short-term beneficial impact on the socioeconomic condition on the region. There would be increased annual expenditures in the region to support the seven additional F-22A aircraft and associated training operations; however, given the size of the local economy of Honolulu County, these increased expenditures would provide a long-term, minor, beneficial impact on the region through increased payroll tax revenue and the purchase of additional equipment, materials, and fuel needed for aircraft operations and maintenance under Alternative A. The 150 additional ANG and civilian personnel and associated family members and dependents would represent a potential small increase in the total population of Honolulu County where there are over 900,000 residents; therefore, no adverse impacts on income and employment would occur under Alternative A.

The increase in the number of personnel at JBPHH supporting the additional F-22A aircraft and training operations would not result in a disproportionate impact on protection of children, because there would be adequate housing, community resources, and community services in the Honolulu region to support the small increase in personnel. The 150 additional personnel and their families supporting the additional F-22A aircraft and training would not disproportionately affect the availability of these resources to children under Alternative A. Further, there would be no substantial change in the noise environment associated with the additional sorties from the airfield. Therefore, there would be no disproportionate impacts from noise on children under Alternative A.

3.13.4.1 Close Causal Effects and Reasonably Foreseeable Future Actions

Alternative A, in addition to reasonably foreseeable actions on and off JBPHH, would not result in an adverse impact on the region's employment; however, Alternative A would potentially increase annual expenditures in the local economy. This, along with other proposed projects at JBPHH and in the area, may create an economic boost to the region and represents a potential long-term, minor, beneficial impact on the local economy. Reasonably foreseeable future actions on and off JBPHH are not expected to have a disproportionate impact on children.

3.13.5 Environmental Consequences – No Action Alternative

Under the No Action Alternative, the additional F-22A aircraft and associated operations would not occur at JBPHH. No new construction or renovations of existing buildings to support the additional F-22A aircraft would be required. There would be no additional expenditures locally or regionally to support aircraft or sorties. As a result, there would be no change in income and employment. In addition, there would be no disproportionate impacts on children from regional expenditures to support the additional aircraft or from the increased training sorties.

CHAPTER 4 REFERENCES

Air Force. 1997. *Environmental Effects of Self-protection Chaff and Flares: Final Report*. Prepared for Headquarters Air Combat Command, Langley Air Force Base, Virginia. August

Air Force. 2001. *Initial F-22 Operational Wing Beddown Final Environmental Impact Statement*. November.

Air Force. 2003. *Final Environmental Assessment for the C-17 Globemaster III Beddown, Hickam Air Force Base, Hawai'i*. August.

Air Force. 2006. *F-22A Beddown Environmental Assessment, Elmendorf Air Force Base*. Appendix E: Review of Effects of Aircraft Noise, Chaff, and Flares on Biological Resources.

Air Force. 2017a. *Air Emissions Guide for Air Force Mobile Sources, Methods for Estimating Emissions of Air Pollutants for Mobile Sources at U.S. Air Force Installations*. Prepared for Air Force Civil Engineer Center, San Antonio, Texas, by Solutio Environmental, Inc. September.

Air Force. 2017b. *Air Quality Environmental Impact Analysis Process (EIAP) Guide – Fundamentals, Volume 1 of 2*. Prepared for Air Force Civil Engineer Center, San Antonio, Texas, by Solutio Environmental, Inc. August.

Air Force. 2023. *Programmatic Environmental Assessment for Testing and Training with Defensive Countermeasures.* December.

Air Force Safety Center. 2018. *USAF Wildlife Strikes by Altitude (AGL) FY 1995–2016*.

Aquarone, M.C., and S. Adams. 2009. *Xiv-44 California Current LME*. *In* K. Sherman & G. Hempel (Eds.): *The UNEP Large Marine Ecosystem Report: A perspective on Changing Conditions in LMEs of the World's Regional Seas* (pp. 591–604). United Nations Environmental Programme, Nairobi, Kenya.

Auman, H. J., J. P. Ludwig, J. P. Giesy, and T. Colborn. 1997. *Plastic Ingestion by Laysan Albatross Chicks on Sand Island, Midway Atoll, in 1994 and 1995*. In G. Robinson and R. Gales (Eds.), Albatross Biology and Conservation, pp. 239–244. Surrey Beatty and Sons, Chipping Norton.

City and County of Honolulu. 2020. *Zoning Use Land Ordinance, Honolulu Geospatial Data*. <http://honolulu-cchnl.opendata.arcgis.com/datasets/zoning-land-use-ordinance>. Accessed March 2021.

CNIC. 2012. *Joint Base Pearl Harbor Hickam Integrated Natural Resources Management Plan*. July.

CNIC. 2020. *Storm Water Program*. <https://www.cnic.navy.mil/regions/cnrh/om/environmental/water_quality_information.html> Accessed March 2021.

CNIC. 2021. *Red Hill Bulk Fuel Storage Facility Information Website.* <https://www.cnic.navy.mil/regions/cnrh/om/red-hill-tank.html>. Accessed February 2021.

DOD. 2021. *Department of Defense Climate Adaptation Plan*. Prepared for the National Climate Task Force and Federal Chief Sustainability Officer. September.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Wetlands Research Program Technical Report Y-87-1. US Army Corps of Engineers Waterways Experiment Station. January.

Federal Emergency Management Agency. 2011. *FEMA Flood Map Service Center: Search By Address; Honolulu, City and County of Unincorporated Areas; Selected Area Number15003C0333G, Effective on 01/19/2011*. <https://msc.fema.gov/portal/home>. Accessed March 2021.

GAO. 2018. *F-22 Organization and Utilization Changes Could Improve Aircraft Availability and Pilot Training*. GAO-18-190, report to Congressional Committees. July.

Grubb, T.Y, D.K. Delaney, W.W. Bowerman, and M.R. Weirda. 2010. *Golden Eagle Indifference to Heli-skiing and Military Helicopters in Northern Utah*. Journal of Wildlife Management 74:1275–1285.

Hawai'i DOH. 2019. *Hawai'i Greenhouse Gas Emissions Report for 2015*. Clean Air Branch. January.

Hawai'i DOT. 2020. Hawai'i 2020 Travel Time Reliability. https://histategis.maps.arcgis.com/apps/dashboards/dd3798b48f914c888230330cf0517309.

Hawai'i Noise Radiation and Indoor Air Quality Branch. 2019. *Honolulu County Radon Information*. <http://county-radon.info/HI/Honolulu.html>. 6 June.

HIANG. 2015. *Air Emissions Inventory Summary Report*.

Hickam AFB. 2007. *Replacement of F-15 Aircraft with F-22A Aircraft, Hickam AFB, Hawai'i, Draft Environmental Assessment*. April.

Hickam AFB. 2008. *Final Integrated Cultural Resources Management Plan, 2008–2012 Update for Hickam AFB, Hawai'i*. Prepared by J. M. Waller Associates, Inc. January.

JBPHH. 2013. *Installation Development Plan Training Practicum Report for Joint Base Pearl Harbor-Hickam, Honolulu, Hawai'i*. 5 August.

JBPHH. 2018. *Joint Base Pearl Harbor-Hickam Recycling Brochure*.

JBPHH. 2021. *Bird/Wildlife Aircraft Strike Hazard (BASH) Plan*. Draft Operation Plan 91-2. 15/154 WG. 6 January.

Maritime Archaeology and History of the Hawai'ian Islands Foundation. 2011. *Maritime Archaeology and History of the Hawai'ian Islands Foundation Goals and Opportunities*. <http://www.mahhi.org/goals.html>. Accessed March 2021.

Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds. 2014. *Climate Change Impacts in the United States: The Third National Climate Assessment.* US Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.

NAVFAC Hawai'i. 2013. *JBPHH Main Gate Study*. JBPHH, Oahu, Hawai'i. January.

NAVFAC Hawai'i. 2014. *Navy Region Hawai'i Hazardous Waste Management Plan*. February.

NAVFAC Hawai'i. 2016. *A Native Hawai'ian Traditional Cultural Places Study for Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i.* Prepared by Nicole I. Vernon, M.A.; Maria E. Orr, M.A.; and Sara Collins, Ph.D., Pacific Consulting Services, Inc.

NAVFAC Hawai'i. 2017. *Asbestos Program Management*. NAVFAC P-502. September.

NAVFAC Hawai'i. 2020a. *Navy Wastewater Treatment Plant, Joint Base Pearl Harbor-Hickam, Oahu, Hawai'i*. July.

NAVFAC Hawai'i. 2020b. *Water Quality Report Joint Base Pearl Harbor-Hickam Water System*.

NAVFAC Hawai'i. 2022. *Programmatic Agreement Record – Archeology*. 25 Apr 2022 F-22 Plus Up, Hickam.

Navy. 2011. *Gulf of Alaska Naval Training Activities Final Environmental Impact Statement/Overseas Environmental Impact Statement*. March.

Navy. 2018. *Hawai'i-Southern California Training and Testing Final Environmental Impact Statement/ Overseas Environmental Impact Statement*. October.

Navy Region Hawai'i. 2016. *Storm Water Management Plan (SWMP) for Navy Region Hawai'i (NRH), JBPHH, Oahu, Hawai'i*. September.

NOAA. no date. *Wrecks and Obstructions Database.* <https://nauticalcharts.noaa.gov/data/wrecks-and-obstructions.html>. Accessed March 2021.

Provencher, J., A. Bond, A. Hedd, W. Montevecchi, S. Muzaffar, S. Courchesne, H. Gilchrist, S. Jamieson, F. Merkel, K. Falk, J. Durinck, and M. Mallory. 2014. *Prevalence of Marine Debris in Marine Birds from the North Atlantic*. Marine Pollution Bulletin 84:411–417.

State of Hawai'i. 2021. *About Kakaako*. Department of Business, Economic Development and Tourism. <http://dbedt.Hawai'i.gov/hcda/discover-kakaako/about-kakaako/>. Accessed 23 March 2021.

US Bureau of Labor Statistics. 2025. *Honolulu Area Economic Summary*. Updated 29 May 2025.

US Census Bureau. 2025. *US Census Quick Facts*. https://www.census.gov/quickfacts/fact/table/HI,honolulucountyHawai'i,US/PST045224 . Accessed June 2025.

US Climate Data. 2021. *Climate Honolulu - Hawai'i*. <https://www.usclimatedata.com/climate/honolulu/Hawai'i/united-states/ushi0026>. Accessed 18 March 2021.

US Geological Survey. 2007. *Geologic Map of the State of Hawai'i, Sheet 3---Island of O'ahu*. David R. Sherrod, John M. Sinton, Sarah E. Watkins, and Kelly M. Brunt.

US Geological Survey. 2012. *National Assessment of Shoreline Change: Historical Shoreline Change in the Hawai'ian Islands*. Open File Report 2011-1051. January.

USDA. 2005. *Soil Quality…Key to Absorbing and Infiltrating Rainfall*. Natural Resources Conservation Service.

USDA. 2020a. *Soil Map---Island of Oahu, Hawai'i*. Natural Resources Conservation Service Web Soil Survey. <https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>. Accessed 16 March 2021.

USDA. 2020b. *Wildlife Services (WS) Monthly Report – Daniel K. Inouye International Airport (HNL)*. December.

USEPA. 2009. *AP 42, Fifth Edition, Volume I, Chapter 15: Ordnance Detonation.*

USFWS. 2011. *Recovery Plan for Hawai'ian Waterbirds, Second Revision*. Region 1, Portland, Oregon. 28 October.

Vernadero Group Inc. 2021. Final Flora and Fauna Survey Report for the 154 Wing, F-22A Aircraft Plus-Up, Joint Base Pearl Harbor-Hickam, Hawai'i. May.

Weatherbase. 2021. *Hickam Air Force Base, Hawai'i.* <https://www.weatherbase.com/weather/weather-summary.php3?s=110032&cityname=Hickam+Air+Force+Base%2C+Hawaii%2C+United+States+of+America&units=>. Accessed 18 March 2021.

Western Regional Climate Center. 2018. *Climate of Hawai'i*. <https://wrcc.dri.edu/Climate/narrative_hi.php>. Accessed 18 March 2021.

Yamashita, R., H. Takada, M. A. Fukuwaka, and Y. Watanuki. 2011. *Physical and Chemical Effects of Ingested Plastic Debris on Short-Tailed Shearwaters, Puffinus tenuirostris, in the North Pacific Ocean*. Marine Pollution Bulletin 62(12):2845–2849.

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APPENDICES

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APPENDIX A
INTERAGENCY AND INTERGOVERNMENTAL COORDINATION AND CONSULTATIONS

INTERGOVERNMENTAL AND STAKEHOLDER COORDINATION

Scoping is an early and open process for developing the breadth of issues to be addressed in an Environmental Assessment (EA) and for identifying significant concerns related to a proposed action. Per the requirements of the *Intergovernmental Cooperation Act of 1968* (42 11 United States Code [U.S.C.] § 4231[a]) and Executive Order 12372, *Intergovernmental Review of Federal Programs*, federal, state, and local agencies with jurisdiction that could potentially be affected by the Proposed Action and alternatives were notified during the development of this EA.

The *Intergovernmental Coordination Act* and Executive Order 12372 require federal agencies to cooperate with and consider state and local views in implementing a federal proposal. Through the coordination process, the National Guard Bureau sent letters to potentially interested and affected government agencies, government representatives, elected officials, and interested parties potentially affected by the Proposed Action. The recipient mailing list and agency and intergovernmental coordination letters and responses are included in this Appendix.

Agency Consultations

Compliance with Section 7 of the Endangered Species Act (ESA) and implementing regulations (50 Code of Federal Regulations [CFR] Part 402), requires consultation with the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) in cases where a federal action could affect listed threatened or endangered species and a conference where a federal action could affect species proposed or candidates for listing. The primary focus of this consultation is to request a determination of whether any of these species occur in the proposal area. If any of these species is present, a determination is made of any potential adverse effects on the species. If it is determined that ESA listed species are not likely to be adversely affected by proposed or alternative actions, no consultation is required. Letters were sent to the appropriate USFWS and NMFS offices as well as relevant state agencies informing them of the proposal and requesting data regarding applicable protected species. In addition, the Marine Mammal Protection Act (16 U.S.C. § 1371, et seq.) makes it illegal for a person to take a marine mammal, which includes significantly disturbing the habitat, unless it is done in accordance with regulations or a permit. The Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801) requires federal agencies to consult with the NMFS when activities may have adverse impacts on designated essential fish habitat.

Coordination with appropriate Hawaii state government agencies and planning districts will occur for review and comment. Pursuant to the 2012 Programmatic Agreement (revised) among the Commander Navy Region Hawai'i, The Advisory Council on Historic Preservation, and the Hawai'i State Historic Preservation Officer regarding Navy undertakings in Hawai'i, NAVFAC Hawai'i determined the Proposed Action does not require additional Section 106 review under NHPA (NAVFAC Hawai'i, 2022). The Hawaii Office of Environmental Quality Control is the focal point for the coordination of staff review and comment, as well as the announcement of availability of environmental documents for public review and comment. In addition, the State of Hawaii, Department of Business, Economic Development and Tourism, which consists of a network of authorities and partnerships, would be coordinated with for a coastal zone consistency determination under the Coastal Zone Management Program.

Government-to-Government Consultation

The NHPA and its regulations at 36 CFR Part 800 direct federal agencies to consult with Native Hawaiian Organizations (NHOs) when a proposed or alternative action may impact properties of religious and cultural significance. Consistent with the NHPA, Department of Defense Instruction 4710.03, *Consultation with Native Hawaiian Organizations*, NHOs are organizations that serve and represent the interests of Native Hawaiians with a primary and stated purpose of providing services to Native Hawaiians and have expertise in Native Hawaiian affairs. NHOs would be invited to consult on proposed and alternative actions that have a potential to affect properties or places of traditional religious and cultural importance to an NHO. The NHO consultation process is distinct from National Environmental Policy Act consultation or the interagency coordination process, and it requires separate notification of all relevant NHOs. The timelines for NHO consultation are also distinct from those of other consultations. The Joint Base Pearl Harbor-Hickam

(JBPHH) point of contact for NHOs is the 154th Wing Commander. The point of contact for consultation with the State Historic Preservation Administrator is the National Guard Bureau Cultural Resources Program Manager. The Cultural Resources Program Manager relies on the use of Programmatic Agreements to execute projects and meet mission requirements. There is a 2003 Programmatic Agreement among the Commander, Navy Region Hawaii; the Advisory Council on Historic Preservation; and the Hawaii State Historic Preservation Administrator regarding Navy undertakings in Hawaii, which includes military actions on JBPHH. Government-to-government consultation is included within this Appendix.

The environmental analysis process, in compliance with National Environmental Policy Act guidance, includes public and agency review of information pertinent to the proposed and alternative actions. Further, compliance with Section 7 of the ESA and Section 106 of the NHPA requires consultation with the USFWS and State H, respectively. Tribal consultation is also required under the NHPA. The Interagency and Intergovernmental Coordination for Environmental Planning memoranda and responses, recipient mailing list, agency and intergovernmental coordination letters and responses, agency consultation letters and responses, and tribal consultation letters and responses are included within this Appendix.

PUBLIC AND AGENCY REVIEW OF ENVIRONMENTAL ASSESSMENT

The Notice of Availability (NOA) was included in the State of Hawaii Office of Environmental Quality Control semimonthly publication of *The Environmental Notice* for public review on August 25, 2025. The NOA invited the public to review and comment on the Draft EA. The public and agency review period ended on September 24, 2025. The public and agency comments are provided in **Appendix A**.

The NOA was published in *The Honolulu Star-Advertiser*, Honolulu, Hawaii, and *The Garden Island*, Kauai, Hawaii. Copies of the Draft EA, Proposed Finding of No Significant Impact, and Finding of No Practicable Alternative were made available for review on the 154 WG website at https://www.154wg.ang.af.mil/Portals/49/documents/Hickam%20F-22%20Environmental%20Assessment.pdf?ver=x2LIt9OopiaIidOROGDR2w%3d%3d

SAMPLE SCOPING LETTER TO UNITED STATES FISH AND WILDLIFE SERVICE AND NATIONAL MARINE FISHERIES SERVICE

NATIONAL GUARD BUREAU
3501 FETCHET AVENUE
JOINT BASE ANDREWS 20762-5157

4 November 2020

Lieutenant Colonel Christopher J. Mayor, USAF
Plans and Requirements
Air National Guard Readiness Center, NGB/A4AM
3501 Fetchet Ave
Joint Base Andrews MD 20762

Katherine Mullett, Field Supervisor
US Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Blvd, RM 3-122
Honolulu, HI 96850

Dear Ms. Mullett

The National Guard Bureau (NGB) is preparing an Environmental Assessment (EA) for the permanent beddown of additional F-22A aircraft at Joint Base Pearl Harbor-Hickam (JBPHH), Honolulu, Hawaii. This Proposed Action would increase the number of F-22A assigned aircraft to the Hawaii Air National Guard 199th Fighter Squadron (FS) from 18 Primary Aerospace Vehicles Authorized (PAA) plus 2 Backup Aircraft Inventory (BAI) to 24 PAA plus three 3 BAI. The purpose of the Proposed Action is to permanently integrate seven F-22A aircraft into JBPHH's current fleet. These F-22A aircraft were based with the 95th FS, Tyndall Air Force Base (AFB), Florida. The devastation caused by Hurricane Michael rendered Tyndall AFB incapable of hosting the F-22 Squadron for the foreseeable future. The Proposed Action is needed to ensure that these F-22A aircraft are located with an existing F-22 unit in order to maintain operational readiness. Pursuant to the National Environmental Policy Act (NEPA) of 1969 (42 United States Code 4321–4347), Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] Sections 1500–1508), and 32 CFR Part 989, et seq., the Air National Guard will prepare environmental analysis documentation (EA or Environmental Impact Statement) that considers the potential consequences to human health and/or the natural environment associated with this Action.

The 199th FS is a component of the 154th Wing, stationed at JBPHH. The 199th FS is partnered with an active associate unit, from the active-duty Air Force's 15th Wing, which provides pilots and support personnel. The additional F-22A aircraft beddown would increase training by approximately 900 sorties annually. The Proposed Action would include additional operations within Special Use Airspace proximate to JBPHH (Attachment 1). Under the Proposed Action, the use of countermeasure chaff and flares in all Special Use Airspace proposed for use would increase, and training operations could include the use of 20-millimeter target practice ammunition within the Pacific Missile Range Facility. Approximately 150 personnel would be required to support the F-22A permanent beddown at JBPHH, including pilots, maintenance, and support personnel.

Under the Proposed Action, several short-term infrastructure projects would be constructed (Attachment 2). At this time the 154th Wing has identified eight projects that would enhance current and future mission operational efficiency. Five of the proposed projects are new construction at JBPHH, including an addition to the munitions maintenance and inspection facility, an additional munitions multicube storage facility, a new egress facility, an aircraft support equipment facility add-on, and a new F-22 intel vault. Three additional proposed projects include the repair and reconfiguration of the F-22 Sierra Ramp and the Squadron Operations Building 3428, as well as alterations of the F-22 corrosion control Building 3407. The Area of Potential Effects (Attachment 3) for infrastructure projects is defined as any area where ground disturbance will occur; this includes the staging areas for equipment and materials. Some of the proposed new construction project sites have alternative locations that will be evaluated in the upcoming EA.

The NGB and 154th Wing (95th FS) are interested in any information or preliminary concerns associated with the proposed EA. Areas of concern may include potential effects on physical, ecological, social, cultural, and archaeological resources. Pursuant to Section 7 of the Endangered Species Act, we request additional information on what listed, proposed, and candidate species or designated or proposed critical habitats may be in the action area. This information and your comments on the Proposed Action will help us develop the scope of our environmental review. The NGB and 154th Wing also request any information that your agency may have regarding other proposed, ongoing, or recently completed projects that could create or exacerbate impacts to the Proposed Action.

The NGB intends to maximize the use of electronic transmittals during subsequent coordination phases of this project. Enclosed is a copy of the distribution list for those agencies and organizations being contacted (Attachment 4). If you know of any additional agencies that should review and comment on this proposal, please feel free to include them in a re-distribution of this letter and the attached materials.

Please provide any comments you may have, if possible, within 30 days of receipt of this letter to me at Lt Col Christopher Mayor, ATTN: F-22 JBPHH EA, 3501 Fetchet Avenue, Joint Base Andrews, MD 20762-5157 or by email at christopher.mayor.3@us.af.mil with the subject line title ATTN: F-22 JBPHH EA. Thank you for your assistance.

Sincerely

MAYOR.CHRISTOPHER.JESUS.1256971271 Digitally signed by MAYOR.CHRISTOPHER.JESUS.1256971271 Date: 2020.11.04 13:39:28 -05'00'

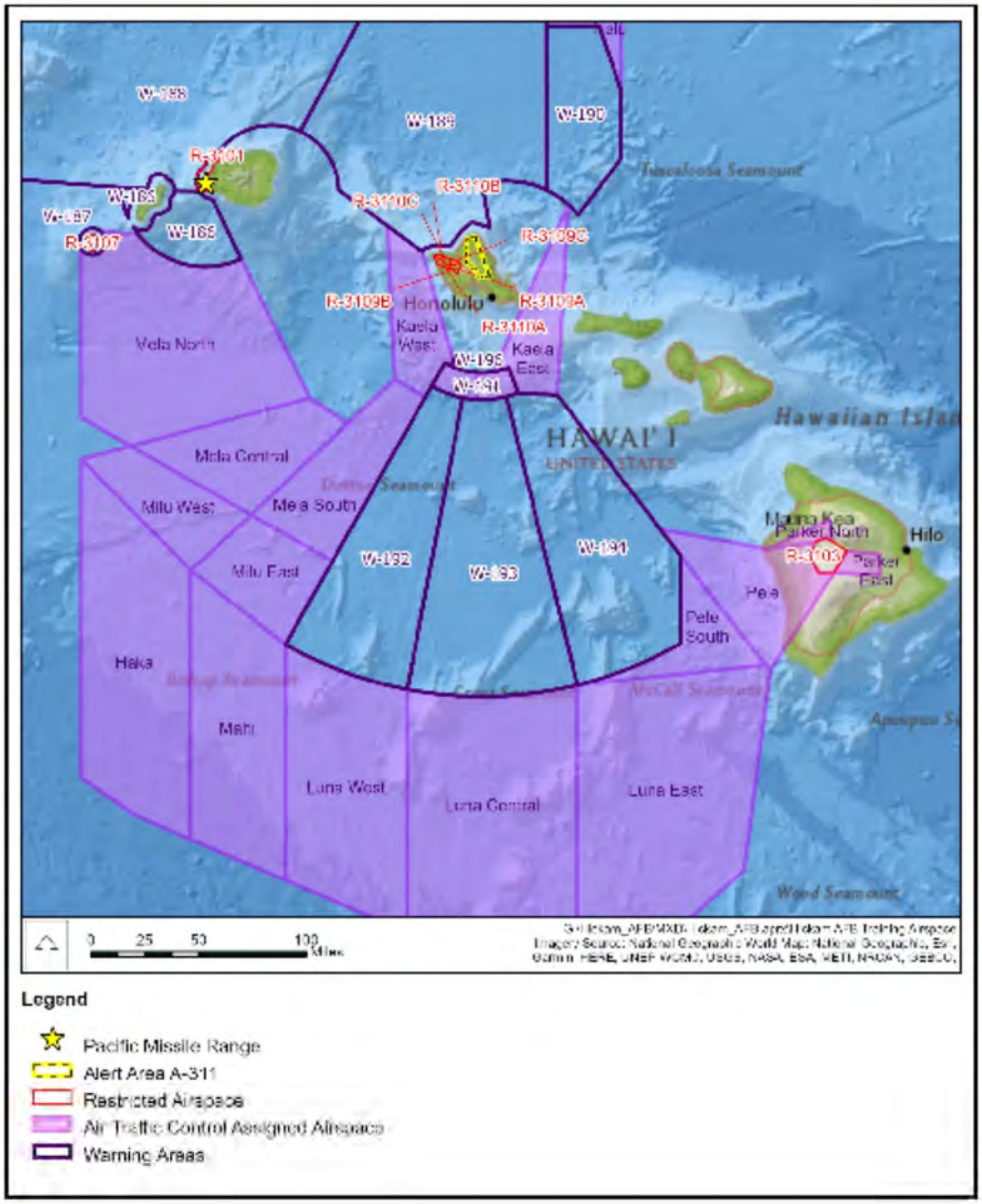
Christopher J. Mayor, Lt Col
Plans and Requirements

Four Attachments:

1. Special Use Airspace Proposed for Use
2. 154th Wing Proposed Project List for Use
3. 154th Wing Area of Potential Effects
4. Distribution List

4

Attachment 1 –Special Use Airspace Proposed for Use



Attachment 2 – 154th Wing Proposed Project List

Project ID	Project Number	Fiscal Year	Project Title	Type Action
1	KNMD202111	2022	F-22 Sierra Ramp	Repair
2	KNMD202112	2022	Squadron Operations, Building 3428	Repair and Reconfigure
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5	KNMD209087	2022	Egress Facility	Construction
6	KNMD209088	2022	Aircraft Support Equipment Facility Addon	Construction
7	KNMD209092	2022	F-22 Intel Vault	Construction
8	KNMD209093	2022	F-22 Alter Corrosion Control Building 3407	Repair

6

Attachment 3 – 154th Wing Area of Potential Effects

Legend

- Building Construction/Modification Projects
- Joint Base Pearl Harbor Hickam Boundary

MAILING LIST TO UNITED STATES FISH AND WILDLIFE SERVICE AND NATIONAL MARINE FISHERIES SERVICE

Dan Polhemus, PhD, Field Supervisor
US Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, HI 96850

Ms. Dawn Golden
Assistant Regional Administrator
NMFS, Protected Resources Division
1845 Wasp Avenue, Building 176
Honolulu, HI 96818

SAMPLE SCOPING LETTER TO STATE AND FEDERAL AGENCIES

NATIONAL GUARD BUREAU
3501 FETCHET AVENUE
JOINT BASE ANDREWS 20762-5157

4 November 2020

Lieutenant Colonel Christopher J. Mayor, USAF
Plans and Requirements
Air National Guard Readiness Center, NGB/A4AM
3501 Fetchet Ave
Joint Base Andrews MD 20762

William J. Ailā, Chairperson
Department of Hawaiian Home Lands
Office of the Chair
91-5420 Kapolei Pkwy
Kapolei, HI 96707

Dear Chairperson Ailā

The National Guard Bureau (NGB) is preparing an Environmental Assessment (EA) for the permanent beddown of additional F-22A aircraft at Joint Base Pearl Harbor-Hickam (JBPHH), Honolulu, Hawaii. This Proposed Action would increase the number of F-22A assigned aircraft to the Hawaii Air National Guard 199th Fighter Squadron (FS) from 18 Primary Aerospace Vehicles Authorized (PAA) plus 2 Backup Aircraft Inventory (BAI) to 24 PAA plus three 3 BAI. The purpose of the Proposed Action is to permanently integrate seven F-22A aircraft into JBPHH's current fleet. These F-22A aircraft were based with the 95th FS, Tyndall Air Force Base (AFB), Florida. The devastation caused by Hurricane Michael rendered Tyndall AFB incapable of hosting the F-22 Squadron for the foreseeable future. The Proposed Action is needed to ensure that these F-22A aircraft are located with an existing F-22 unit in order to maintain operational readiness. Pursuant to the National Environmental Policy Act (NEPA) of 1969 (42 United States Code 4321–4347), Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] Sections 1500–1508), and 32 CFR Part 989, et seq., the Air National Guard will prepare environmental analysis documentation (EA or Environmental Impact Statement) that considers the potential consequences to human health and/or the natural environment associated with this Action.

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Christopher J. Mayor, Lt Col
Plans and Requirements

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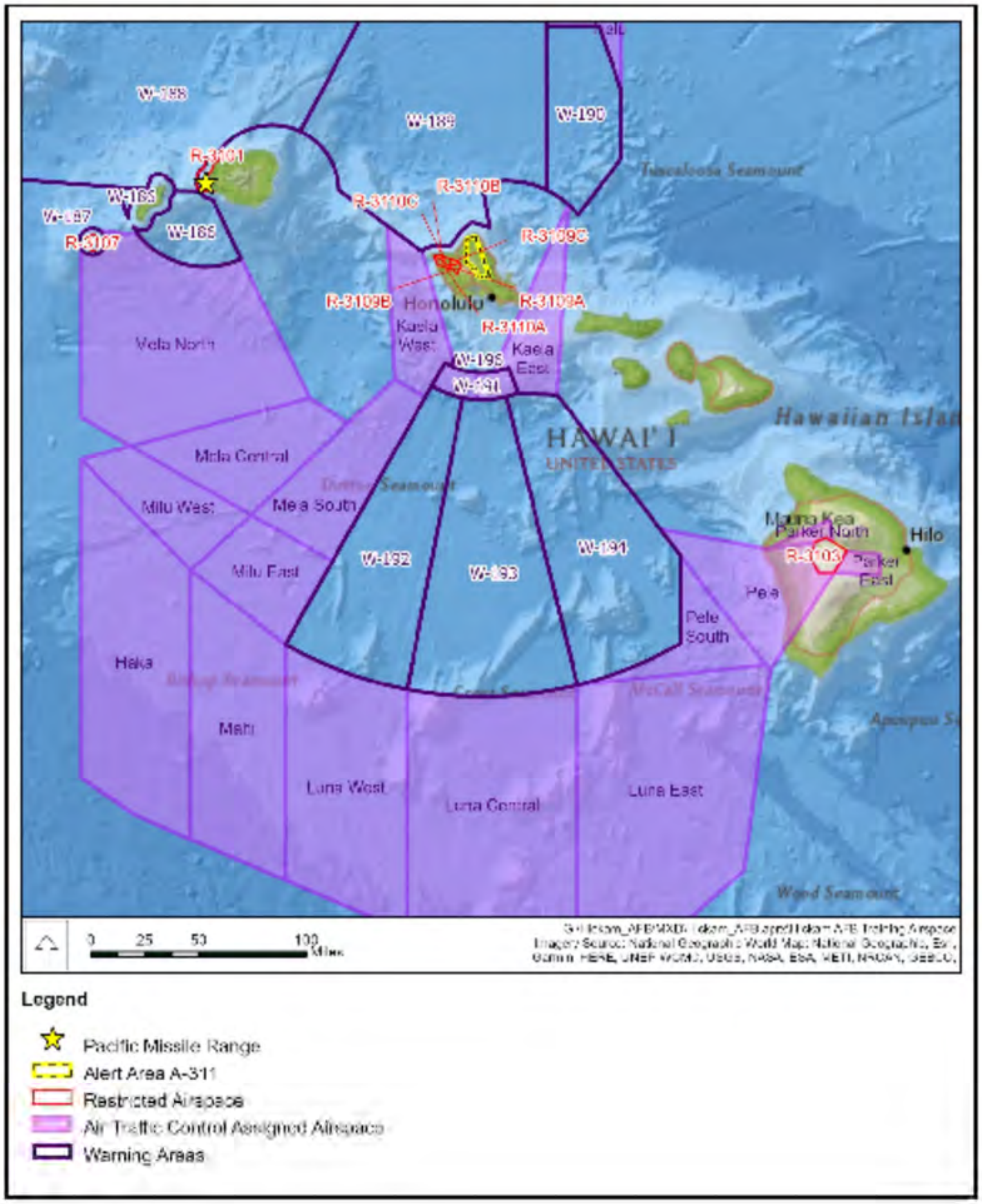
Attachment 1 –Special Use Airspace Proposed for Use



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6

Attachment 3 – 154th Wing Area of Potential Effects

Legend

Building Construction/Modification Projects

Joint Base Pearl Harbor Hickam Boundary

State and Federal Agency Mailing List

Department of Business, Economic Development and Tourism
No. 1 Capitol District Building
250 S. Hotel Street
Honolulu, HI 96813

State of Hawaii Division of Conservation and Resources Enforcement
Kalanimoku Building
1151 Punchbowl Street, Room 311
Honolulu, HI 96813

Department of Hawaiian Home Lands
Office of the Chair
91-5420 Kapolei Parkway
Kapolei, HI 96707

Department of Land and Natural Resources Main Office
Kalanimoku Building
1151 Punchbowl Street
Honolulu, HI 96813

State of Hawaii Department of Health
Director of Health
1250 Punchbowl Street
Honolulu, HI 96813

State Historic Preservation Division
Kakuihewa Building
Kamokila Boulevard, Room 555-601
Kapolei, HI 96707

Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

Governor, State of Hawaii
Executive Chambers
State Capitol
Honolulu, HI 96813
Mayor, City and County of Honolulu
Office of the Mayor
530 South King Street, Room 300
Honolulu, HI 96813

Mayor, County of Kauai
Office of the Mayor
4444 Rice Street, Suite 235
Lihue, HI 96766

Mayor, County of Hawaii
Office of the Mayor
25 Aupuni Street
Hilo, HI 96720

Mayor, County of Maui
Office of the Mayor
Kalana O Maui Building
200 S. High Street, 9th Floor
Wailuku, HI 96793

Hawaii Department of Transportation - Office of the Director
Aliiaimoku Building
869 Punchbowl Street, Room 509
Honolulu, HI 96813

Hawaii Division of State Parks
Kalanimoku Building
1151 Punchbowl Street, Room 310
Honolulu, HI 96813

Hawaii Department. of Transportation - Airports Division
400 Rodgers Boulevard, 7th Floor
Honolulu, HI 96819-1880

State of Hawaii Office of Conservation and Coastal Lands
Kalanimoku Building
1151 Punchbowl Street, Room 131
Honolulu, HI 96813

Environmental Readiness
Dept. of the Navy, US Pacific Fleet
250 Makalapa Drive
Pearl Harbor, HI 96860-3131

Hawaii Department of Land and Natural Resources
Division of Aquatic Resources
1151 Punchbowl Street, Room 330
Honolulu, HI 96813-3088

Hawai'i Land Use Commission
Leiopapa A Kamehameha Building
235 South Beretania Street, Room 406
Honolulu, HI 96813

US Environmental Protection Agency, Region IX
75 Hawthorne Street
San Francisco, CA 94105

Hawaii Department of Transportation - Harbors Division
Hale Awa Ku Moku Building
79 South Nimitz Highway
Honolulu, HI 96813-4898

State of Hawaii Division of Forestry and Wildlife
Kalanimoku Building
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

Hawaii Coastal Zone Management Program
Leiopapa A Kamehameha Building
235 South Beretania Street, 6th Floor
Honolulu, HI 96813
US Army Corps of Engineers
Honolulu District
Building 230
Fort Shafter, HI 96858-5440

Assistant Regional Administrator NMFS
Protected Resources Division
1845 Wasp Avenue, Building 176
Honolulu, HI 96818

National Park Service Regions 9, 10, and 12
333 Bush Street, Suite 500
San Francisco, CA 94104-2828

1st Congressional District
2443 Rayburn HOB
Washington, DC 20515

2nd Congressional District
1433 Longworth House Office Building
Washington, DC 20515

Senator, Hawaii
713 Hart Senate Office Building
Washington, DC 20510

Senator, Hawaii
722 Hart Senate Office Building
Washington, DC 20510

SCOPING LETTER TO STATE HISTORIC PRESERVATION DIVISION

NATIONAL GUARD BUREAU
3501 FETCHET AVENUE
JOINT BASE ANDREWS 20762-5157

24 November 2020

Dr. Alan Downer
State Historic Preservation Division
Kakuihewa Building, Room 555
601 Kamokila Blvd.
Kapolei, HI 96707

Dear Dr. Downer,

This letter is being sent in accordance with US Air Force (Air Force) requirements for Interagency and Intergovernmental Coordination for Environmental Planning. The National Guard Bureau (NGB) at Joint Base Andrews, Maryland, is preparing an Environmental Assessment (EA) for a proposed undertaking that will analyze potential effects to human health and the natural environment, including historic and traditional cultural properties.

The undertaking includes the permanent beddown of additional F-22A aircraft at Joint Base Pearl Harbor-Hickam (JBPHH), Honolulu, Hawaii. This Proposed Action would increase the number of F-22A aircraft assigned to the Hawaii Air National Guard 199th Fighter Squadron (FS) from 18 Primary Aerospace Vehicles Authorized (PAA) plus 2 Backup Aircraft Inventory (BAI) to 24 PAA plus three 3 BAI. The purpose of the Proposed Action is to permanently integrate seven F-22A aircraft into JBPHH's current fleet. These F-22A aircraft were based with the 95th FS, Tyndall Air Force Base (AFB), Florida. The devastation caused by Hurricane Michael rendered Tyndall AFB incapable of hosting the F-22 Squadron for the foreseeable future. The Proposed Action is needed to ensure that these F-22A aircraft are located with an existing F-22 unit in order to maintain operational readiness.

The Proposed Action would include additional operations within Special Use Airspace proximate to JBPHH. The additional F-22A aircraft beddown would increase training by approximately 900 sorties annually. The Area of Potential Effects (APE) for training operations includes Special Use Airspace proximate to JBPHH (Attachment 1). Most sorties would be flown within the W-189A and B and W-190 Warning Areas north of Oahu and the W-192, W-193, and W-194 Warning Areas south of Oahu. The additional airspace may be used infrequently. Under the Proposed Action, the use of countermeasure chaff and flares in all Special Use Airspace proposed for use may increase slightly, and training operations may include the use of 20-millimeter target practice ammunition within the W-193 Warning Area. Approximately 150 personnel would be required to support the F-22A permanent beddown at JBPHH, including pilots, maintenance, and support personnel.

Under the Proposed Action, several short-term infrastructure projects would be constructed (Attachment 2). At this time, the 154th Wing has identified eight projects that would enhance current and future mission operational efficiency. Five of the proposed projects are new

construction at JBPHH, including an addition to the munitions maintenance and inspection facility, an additional munitions multicube storage facility, a new egress facility, an aircraft support equipment facility add-on, and a new F-22 intel vault. Three additional proposed projects include the repair and reconfiguration of the F-22 Sierra Ramp and the Squadron Operations Building 3428, as well as alterations of the F-22 corrosion control Building 3407. The APE for the proposed infrastructure projects is on JBPPH (Attachment 3).

Pursuant to 36 CFR Part 800, implementing Section 106 of the National Historic Preservation Act, the NGB and 154th Wing (95th FS) invite your comments on the definition of the APE and request information regarding the potential presence of significant cultural resources in the affected area, including the operations facilities and the Special Use Airspace. We are also interested in any preliminary comments you may have regarding the proposed EA.

In order for the NGB to address comments on the proposed undertaking in a timely manner, please respond within 30 days of receipt of this letter. Please provide any comments to Jennifer Harty, A4V, Cultural Resources Program Manager, 3501 Fetchet Avenue, Joint Base Andrews MD 20762-5157 or by email at jennifer.harty@us.af.mil. Thank you for your assistance and we look forward to working with you on this undertaking.

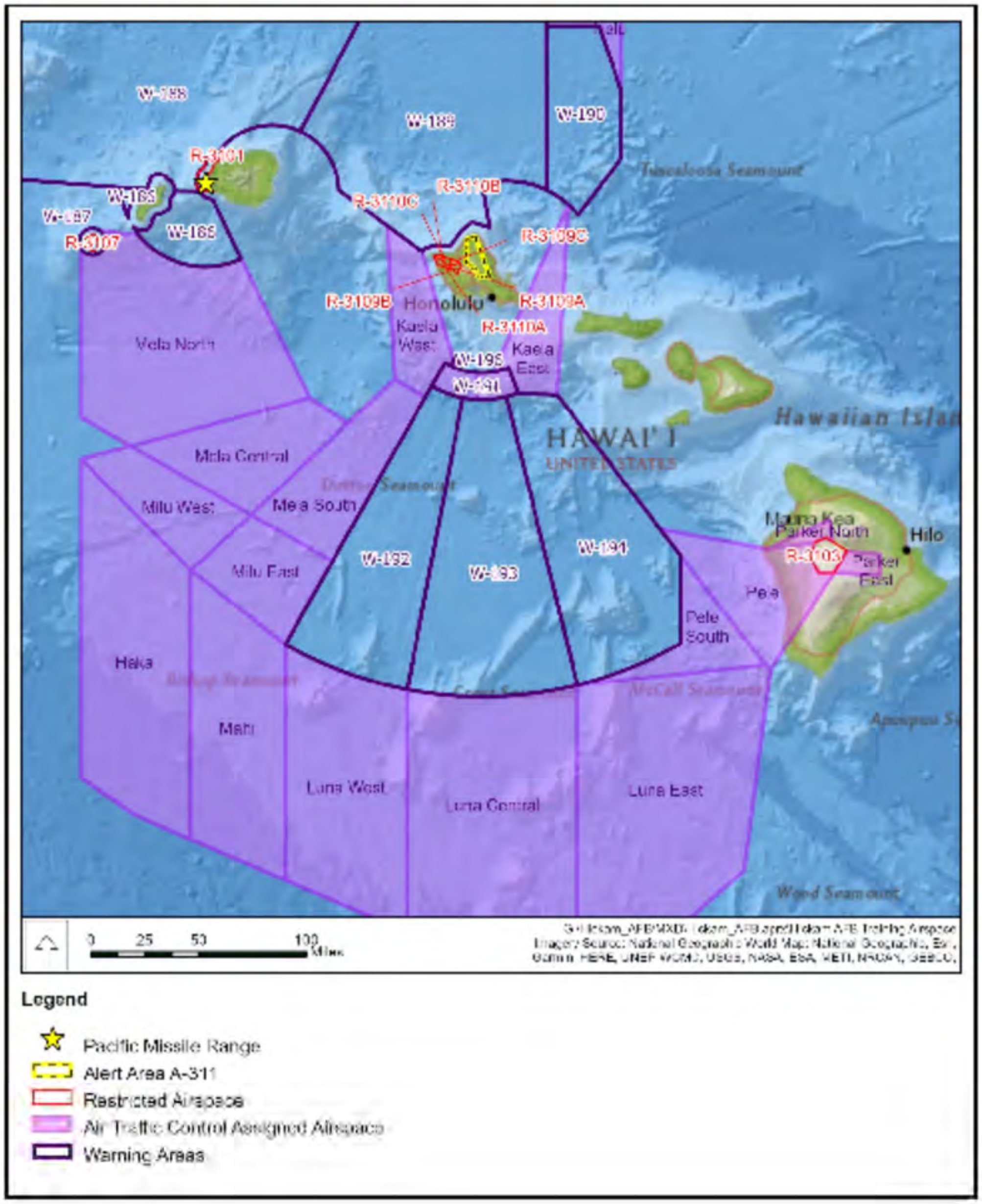
Sincerely

Jennifer L. Harty, GS-13, DAF
Cultural Resources Program Manager

Three Attachments:
1. Special Use Airspace Area of Potential Effects
2. 154th Wing Proposed Infrastructure Project List
3. 154th Wing Infrastructure Projects Area of Potential Effects

4

Attachment 1 –Special Use Airspace Proposed for Use



Attachment 2 – 154th Wing Proposed Project List

Project ID	Project Number	Fiscal Year	Project Title	Type Action
1	KNMD202111	2022	F-22 Sierra Ramp	Repair
2	KNMD202112	2022	Squadron Operations, Building 3428	Repair and Reconfigure
3	KNMD209085	2022	Munition Maintenance and Inspection Addon	Construction
4	KNMD209086	2022	Add Munitions Cube Storage Facility	Construction
5	KNMD209087	2022	Egress Facility	Construction
6	KNMD209088	2022	Aircraft Support Equipment Facility Addon	Construction
7	KNMD209092	2022	F-22 Intel Vault	Construction
8	KNMD209093	2022	F-22 Alter Corrosion Control Building 3407	Repair

6

Attachment 3 – 154th Wing Area of Potential Effects

Legend

Building Construction/Modification Projects

Joint Base Pearl Harbor Hickam Boundary

SCOPING LETTERS TO NATIVE HAWAIIAN ORGANIZATIONS

HAWAII AIR NATIONAL GUARD
HEADQUARTERS 154th WING

4 December 2020

Dann S. Carlson, Brigadier General, ANG
Commander, 154th Wing
360 Mamala Bay Dr.
Joint Base Pearl Harbor-Hickam, HI 96853

Dr. Sylvia M. Hussey, Ka Pouhana, Chief Executive Officer
Office of Hawaiian Affairs
560 N. Nimitz Hwy., Suite 200
Honolulu HI 96817

Dear Dr. Hussey:

The purpose of this letter is twofold. I would like to give you an opportunity to review and comment on a proposed action in which the Office of Hawaiian Affairs may have an interest, and, if interested, invite you to participate in government-to-government consultation with the National Guard Bureau (NGB) and Hawaii Air National Guard.

This Proposed Action would increase the number of F-22A aircraft assigned to the Hawaii Air National Guard 199th Fighter Squadron (FS) from 18 Primary Aerospace Vehicles Authorized (PAA) plus 2 Backup Aircraft Inventory (BAI) to 24 PAA plus three 3 BAI. The purpose of the Proposed Action is to permanently integrate seven F-22A aircraft into Joint Base Pearl Harbor-Hickam's (JBPHH) current fleet. These F-22A aircraft were previously based with the 95th FS, Tyndall Air Force Base (AFB), Florida. The devastation caused by Hurricane Michael rendered Tyndall AFB incapable of hosting the F-22 Squadron for the foreseeable future. The Proposed Action is needed to ensure that these F-22A aircraft are located with an existing F-22 unit in order to maintain operational readiness.

The 199th FS is a component of the 154th Wing, stationed at JBPHH. The 199th FS is partnered with an active associate unit, from the active-duty Air Force's 15th Wing, which provides pilots and support personnel. The additional F-22A aircraft beddown would increase training by approximately 900 sorties annually. The Proposed Action would include additional operations within Special Use Airspace proximate to JBPHH (Attachment 1). Most sorties would be flown within the W-189A and B and W-190 Warning Areas north of Oahu and the W-192, W-193, and W-194 Warning Areas south of Oahu. The additional airspace may be used infrequently. Under the Proposed Action, the use of countermeasure chaff and flares in all Special Use Airspace proposed for use may increase slightly, and training operations may include the use of 20-millimeter target practice ammunition in the W-193 Warning Area. Approximately 150 additional personnel would be required to support the permanent increase of F-22A at JBPHH, including pilots, maintenance, and support personnel.

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construction at JBPHH, including an addition to the munitions maintenance and inspection facility, an additional munitions multicube storage facility, a new egress facility, an aircraft support equipment facility add-on, and a new F-22 intel vault. Three additional proposed projects include the repair and reconfiguration of the F-22 Sierra Ramp and the Squadron Operations Building 3428, as well as alterations of the F-22 corrosion control Building 3407. For construction activities, the Area of Potential Effects (APE) (Attachment 3) is defined as any area where ground disturbance will occur, including the staging areas for equipment and materials. Some of the proposed new construction project sites have alternative locations that will be evaluated in the upcoming EA. An additional APE would include the area immediately beneath the airspaces to be utilized by the incoming F22A aircraft. While no new airspaces would be established for the incoming aircraft, flight traffic within existing airspaces would increase.

Pursuant to Section 106 of the **National Historic Preservation Act** (NHPA) and implementing regulations at 36 CFR Part 800, we invite you to participate in government-to-government consultation on the Proposed Action. Specifically, we ask your assistance in identifying areas of historic, religious, or cultural significance that may be affected by our proposed undertaking. Regardless of whether your organization chooses to consult on this project, the NGB will comply with the Native American Graves Protection and Repatriation Act by informing you of any inadvertent discovery of archaeological or human remains and consulting on their disposition. Being defined as a federal undertaking, NGB will be seeking input and inviting other potential consulting parties, such as the Hawaii State Historic Preservation Division, and will comply with applicable laws and regulations in the event of an inadvertent discovery of archaeological or human remains.

I understand that, to date, the Office of Hawaiian Affairs has not identified any properties of historic, religious, or cultural significance on JBPHH. We invite you to identify any such properties on the airfield or under the Special Use Airspace that might be affected by our Proposed Action. Please let us know if any of these properties are present. To ensure that we can make full use of any information you provide, please provide comments within 30 days of receipt of this letter. Please provide comments to Jennifer L. Harty, A4V, Cultural Resources Program Manager, 3501 Fetchet Avenue, Joint Base Andrews, MD 20762-5157 or by email at jennifer.harty@us.af.mil with the subject line title ATTN: F-22 JBPHH EA. Thank you in advance for your consideration.

Sincerely,

CARLSON.DANN.S.1157421952 Digitally signed by CARLSON.DANN.S.1157421952 Date: 2020.12.18 15:26:12 -10'00'

DANN S. CARLSON, Brig Gen, HIANG
Commander, 154th Wing

Three Attachments:
1. Special Use Airspace Proposed for Use
2. 154th Wing Proposed Project List for Use
3. 154th Wing Facility Construction Area of Potential Effects

HAWAII AIR NATIONAL GUARD
HEADQUARTERS 154th WING

4 December 2020

Dann S. Carlson, Brigadier General, ANG
Commander, 154th Wing
360 Mamala Bay Dr.
Joint Base Pearl Harbor-Hickam, HI 96853

Ms. Rona Rodenhurst, President
Ahahui Siwila Hawaii O Kapōlei
PO Box 700007
Kapolei HI 96709

Dear Ms. Rodenhurst:

The purpose of this letter is twofold. I would like to give you an opportunity to review and comment on a proposed action in which the Ahahui Siwila Hawaii O Kapōlei may have an interest, and, if interested, invite you to participate in government-to-government consultation with the National Guard Bureau (NGB) and Hawaii Air National Guard.

This Proposed Action would increase the number of F-22A aircraft assigned to the Hawaii Air National Guard 199th Fighter Squadron (FS) from 18 Primary Aerospace Vehicles Authorized (PAA) plus 2 Backup Aircraft Inventory (BAI) to 24 PAA plus three 3 BAI. The purpose of the Proposed Action is to permanently integrate seven F-22A aircraft into Joint Base Pearl Harbor-Hickam's (JBPHH) current fleet. These F-22A aircraft were previously based with the 95th FS, Tyndall Air Force Base (AFB), Florida. The devastation caused by Hurricane Michael rendered Tyndall AFB incapable of hosting the F-22 Squadron for the foreseeable future. The Proposed Action is needed to ensure that these F-22A aircraft are located with an existing F-22 unit in order to maintain operational readiness.

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I understand that, to date, the Ahahui Siwila Hawaii O Kapōlei has not identified any properties of historic, religious, or cultural significance on JBPHH. We invite you to identify any such properties on the airfield or under the Special Use Airspace that might be affected by our Proposed Action. Please let us know if any of these properties are present. To ensure that we can make full use of any information you provide, please provide comments within 30 days of receipt of this letter. Please provide comments to Jennifer L. Harty, A4V, Cultural Resources Program Manager, 3501 Fetchet Avenue, Joint Base Andrews, MD 20762-5157 or by email at jennifer.harty@us.af.mil with the subject line title ATTN: F-22 JBPHH EA. Thank you in advance for your consideration.

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DANN S. CARLSON, Brig Gen, HIANG
Commander, 154th Wing

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HAWAII AIR NATIONAL GUARD
HEADQUARTERS 154th WING

4 December 2020

Dann S. Carlson, Brigadier General, ANG
Commander, 154th Wing
360 Mamala Bay Dr.
Joint Base Pearl Harbor-Hickam, HI 96853

Mr. Hailama Farden, President
Association of Hawaiian Civic Clubs
PO Box 1135
Honolulu HI 96807

Dear Mr. Farden:

The purpose of this letter is twofold. I would like to give you an opportunity to review and comment on a proposed action in which the Association of Hawaiian Civic Clubs may have an interest, and, if interested, invite you to participate in government-to-government consultation with the National Guard Bureau (NGB) and Hawaii Air National Guard.

This Proposed Action would increase the number of F-22A aircraft assigned to the Hawaii Air National Guard 199th Fighter Squadron (FS) from 18 Primary Aerospace Vehicles Authorized (PAA) plus 2 Backup Aircraft Inventory (BAI) to 24 PAA plus three 3 BAI. The purpose of the Proposed Action is to permanently integrate seven F-22A aircraft into Joint Base Pearl Harbor-Hickam's (JBPHH) current fleet. These F-22A aircraft were previously based with the 95th FS, Tyndall Air Force Base (AFB), Florida. The devastation caused by Hurricane Michael rendered Tyndall AFB incapable of hosting the F-22 Squadron for the foreseeable future. The Proposed Action is needed to ensure that these F-22A aircraft are located with an existing F-22 unit in order to maintain operational readiness.

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I understand that, to date, the Association of Hawaiian Civic Clubs has not identified any properties of historic, religious, or cultural significance on JBPHH. We invite you to identify any such properties on the airfield or under the Special Use Airspace that might be affected by our Proposed Action. Please let us know if any of these properties are present. To ensure that we can make full use of any information you provide, please provide comments within 30 days of receipt of this letter. Please provide comments to Jennifer L. Harty, A4V, Cultural Resources Program Manager, 3501 Fetchet Avenue, Joint Base Andrews, MD 20762-5157 or by email at jennifer.harty@us.af.mil with the subject line title ATTN: F-22 JBPHH EA. Thank you in advance for your consideration.

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DANN S. CARLSON, Brig Gen, HIANG
Commander, 154th Wing

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HAWAII AIR NATIONAL GUARD
HEADQUARTERS 154th WING

4 December 2020

Dann S. Carlson, Brigadier General, ANG
Commander, 154th Wing
360 Mamala Bay Dr.
Joint Base Pearl Harbor-Hickam, HI 96853

Mr. Dwight Victor, President
Kalaeloa Heritage and Legacy Foundation
PO Box 75447
Kapolei HI 96707

Dear Mr. Victor:

The purpose of this letter is twofold. I would like to give you an opportunity to review and comment on a proposed action in which the Kalaeloa Heritage and Legacy Foundation may have an interest, and, if interested, invite you to participate in government-to-government consultation with the National Guard Bureau (NGB) and Hawaii Air National Guard.

This Proposed Action would increase the number of F-22A aircraft assigned to the Hawaii Air National Guard 199th Fighter Squadron (FS) from 18 Primary Aerospace Vehicles Authorized (PAA) plus 2 Backup Aircraft Inventory (BAI) to 24 PAA plus three 3 BAI. The purpose of the Proposed Action is to permanently integrate seven F-22A aircraft into Joint Base Pearl Harbor-Hickam's (JBPHH) current fleet. These F-22A aircraft were previously based with the 95th FS, Tyndall Air Force Base (AFB), Florida. The devastation caused by Hurricane Michael rendered Tyndall AFB incapable of hosting the F-22 Squadron for the foreseeable future. The Proposed Action is needed to ensure that these F-22A aircraft are located with an existing F-22 unit in order to maintain operational readiness.

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I understand that, to date, the Kalaeloa Heritage and Legacy Foundation has not identified any properties of historic, religious, or cultural significance on JBPHH. We invite you to identify any such properties on the airfield or under the Special Use Airspace that might be affected by our Proposed Action. Please let us know if any of these properties are present. To ensure that we can make full use of any information you provide, please provide comments within 30 days of receipt of this letter. Please provide comments to Jennifer L. Harty, A4V, Cultural Resources Program Manager, 3501 Fetchet Avenue, Joint Base Andrews, MD 20762-5157 or by email at jennifer.harty@us.af.mil with the subject line title ATTN: F-22 JBPHH EA. Thank you in advance for your consideration.

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Commander, 154th Wing

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HAWAII AIR NATIONAL GUARD
HEADQUARTERS 154th WING

4 December 2020

Dann S. Carlson, Brigadier General, ANG
Commander, 154th Wing
360 Mamala Bay Dr.
Joint Base Pearl Harbor-Hickam, HI 96853

Mr. Kunane Aipoalani, President
na ohana papa o mana

Dear Mr. Aipoalani:

The purpose of this letter is twofold. I would like to give you an opportunity to review and comment on a proposed action in which the na ohana papa o mana may have an interest, and, if interested, invite you to participate in government-to-government consultation with the National Guard Bureau (NGB) and Hawaii Air National Guard.

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I understand that, to date, the na ohana papa o mana has not identified any properties of historic, religious, or cultural significance on JBPHH. We invite you to identify any such properties on the airfield or under the Special Use Airspace that might be affected by our Proposed Action. Please let us know if any of these properties are present. To ensure that we can make full use of any information you provide, please provide comments within 30 days of receipt of this letter. Please provide comments to Jennifer L. Harty, A4V, Cultural Resources Program Manager, 3501 Fetchet Avenue, Joint Base Andrews, MD 20762-5157 or by email at jennifer.harty@us.af.mil with the subject line title ATTN: F-22 JBPHH EA. Thank you in advance for your consideration.

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HAWAII AIR NATIONAL GUARD
HEADQUARTERS 154th WING

4 December 2020

Dann S. Carlson, Brigadier General, ANG
Commander, 154th Wing
360 Mamala Bay Dr.
Joint Base Pearl Harbor-Hickam, HI 96853

Mr. Dennis W. Ragsdale, Advocate General
Order of Kamehameha I
1777 Ala Moana Blvd, #142-102
Honolulu HI 96815-1603

Dear Mr. Ragsdale:

The purpose of this letter is twofold. I would like to give you an opportunity to review and comment on a proposed action in which the Order of Kamehameha I may have an interest, and, if interested, invite you to participate in government-to-government consultation with the National Guard Bureau (NGB) and Hawaii Air National Guard.

This Proposed Action would increase the number of F-22A aircraft assigned to the Hawaii Air National Guard 199th Fighter Squadron (FS) from 18 Primary Aerospace Vehicles Authorized (PAA) plus 2 Backup Aircraft Inventory (BAI) to 24 PAA plus three 3 BAI. The purpose of the Proposed Action is to permanently integrate seven F-22A aircraft into Joint Base Pearl Harbor-Hickam's (JBPHH) current fleet. These F-22A aircraft were previously based with the 95th FS, Tyndall Air Force Base (AFB), Florida. The devastation caused by Hurricane Michael rendered Tyndall AFB incapable of hosting the F-22 Squadron for the foreseeable future. The Proposed Action is needed to ensure that these F-22A aircraft are located with an existing F-22 unit in order to maintain operational readiness.

The 199th FS is a component of the 154th Wing, stationed at JBPHH. The 199th FS is partnered with an active associate unit, from the active-duty Air Force's 15th Wing, which provides pilots and support personnel. The additional F-22A aircraft beddown would increase training by approximately 900 sorties annually. The Proposed Action would include additional operations within Special Use Airspace proximate to JBPHH (Attachment 1). Most sorties would be flown within the W-189A and B and W-190 Warning Areas north of Oahu and the W-192, W-193, and W-194 Warning Areas south of Oahu. The additional airspace may be used infrequently. Under the Proposed Action, the use of countermeasure chaff and flares in all Special Use Airspace proposed for use may increase slightly, and training operations may include the use of 20-millimeter target practice ammunition in the W-193 Warning Area. Approximately 150 additional personnel would be required to support the permanent increase of F-22A at JBPHH, including pilots, maintenance, and support personnel.

Under the Proposed Action, several short-term infrastructure projects would be constructed (Attachment 2). At this time, the 154th Wing has identified eight projects that would enhance current and future mission operational efficiency. Five of the proposed projects are new

construction at JBPHH, including an addition to the munitions maintenance and inspection facility, an additional munitions multicube storage facility, a new egress facility, an aircraft support equipment facility add-on, and a new F-22 intel vault. Three additional proposed projects include the repair and reconfiguration of the F-22 Sierra Ramp and the Squadron Operations Building 3428, as well as alterations of the F-22 corrosion control Building 3407. For construction activities, the Area of Potential Effects (APE) (Attachment 3) is defined as any area where ground disturbance will occur, including the staging areas for equipment and materials. Some of the proposed new construction project sites have alternative locations that will be evaluated in the upcoming EA. An additional APE would include the area immediately beneath the airspaces to be utilized by the incoming F22A aircraft. While no new airspaces would be established for the incoming aircraft, flight traffic within existing airspaces would increase.

Pursuant to Section 106 of the **National Historic Preservation Act (**NHPA**)** and implementing regulations at 36 CFR Part 800, we invite you to participate in government-to-government consultation on the Proposed Action. Specifically, we ask your assistance in identifying areas of historic, religious, or cultural significance that may be affected by our proposed undertaking. Regardless of whether your organization chooses to consult on this project, the NGB will comply with the Native American Graves Protection and Repatriation Act by informing you of any inadvertent discovery of archaeological or human remains and consulting on their disposition. Being defined as a federal undertaking, NGB will be seeking input and inviting other potential consulting parties, such as the Hawaii State Historic Preservation Division, and will comply with applicable laws and regulations in the event of an inadvertent discovery of archaeological or human remains.

I understand that, to date, the Order of Kamehameha I has not identified any properties of historic, religious, or cultural significance on JBPHH. We invite you to identify any such properties on the airfield or under the Special Use Airspace that might be affected by our Proposed Action. Please let us know if any of these properties are present. To ensure that we can make full use of any information you provide, please provide comments within 30 days of receipt of this letter. Please provide comments to Jennifer L. Harty, A4V, Cultural Resources Program Manager, 3501 Fetchet Avenue, Joint Base Andrews, MD 20762-5157 or by email at jennifer.harty@us.af.mil with the subject line title ATTN: F-22 JBPHH EA. Thank you in advance for your consideration.

Sincerely,

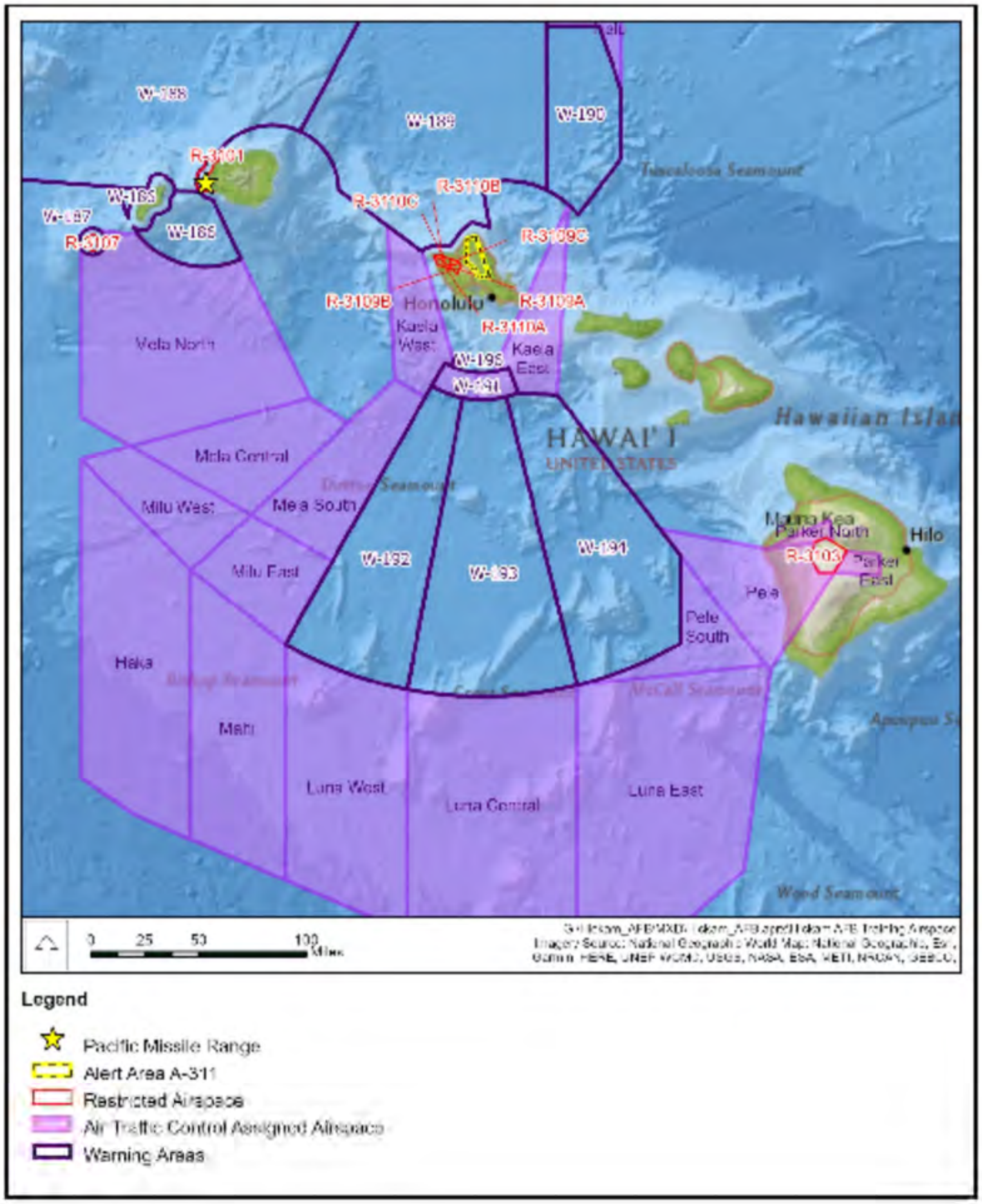
CARLSON.DAN
N.S.1157421952 Digitally signed by CARLSON.DANN.S.1157421952 Date: 2020.12.18 15:26:12 -10'00'

DANN S. CARLSON, Brig Gen, HIANG
Commander, 154th Wing

Three Attachments:
1. Special Use Airspace Proposed for Use
2. 154th Wing Proposed Project List for Use
3. 154th Wing Facility Construction Area of Potential Effects

4

Attachment 1 –Special Use Airspace Proposed for Use



Attachment 2 – 154th Wing Proposed Project List

Project ID	Project Number	Fiscal Year	Project Title	Type Action
1	KNMD202111	2022	F-22 Sierra Ramp	Repair
2	KNMD202112	2022	Squadron Operations, Building 3428	Repair and Reconfigure
3	KNMD209085	2022	Munition Maintenance and Inspection Addon	Construction
4	KNMD209086	2022	Add Munitions Cube Storage Facility	Construction
5	KNMD209087	2022	Egress Facility	Construction
6	KNMD209088	2022	Aircraft Support Equipment Facility Addon	Construction
7	KNMD209092	2022	F-22 Intel Vault	Construction
8	KNMD209093	2022	F-22 Alter Corrosion Control Building 3407	Repair

6

Attachment 3 – 154th Wing Area of Potential Effects

Legend

- Building Construction/Modification Projects
- Joint Base Pearl Harbor Hickam Boundary

NATIVE HAWAIIAN ORGANIZATION MAILING LIST

Ahahui Siwila Hawaii O Kapōlei
PO Box 700007
Kapolei, HI 96709

Association of Hawaiian Civic Clubs
PO Box 1135
Honolulu, HI 96807

Kalaeloa Heritage and Legacy Foundation
PO Box 75447
Kapolei, HI 96707
Office of Hawaiian Affairs
560 N. Nimitz Highway, Suite 200
Honolulu, HI 96817

Order of Kamehameha I
1777 Ala Moana Boulevard, #142-102
Honolulu, HI 96815-1603

na ohana papa o mana
kaipoalani@twc.com

AGENCY SCOPING RESPONSE LETTERS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

Date: 12/23/2020
DAR # 6161

MEMORANDUM

TO: Brian J. Neilson
DAR Administrator

FROM: Catherine Gewecke, Aquatic Biologist

SUBJECT:

Request Submitted by: National Guard Bureau - Air National Guard Readiness Center

Location of Project: ______

Brief Description of Project:

Comments:

☐ No Comments ☒ Comments Attached

Thank you for providing DAR the opportunity to review and comment on the proposed project. Should there be any changes to the project plan, DAR requests the opportunity to review and comment on those changes.

Comments Approved: ______ Date: Dec 30, 2020
Brian J. Neilson
DAR Administrator

DAR# 6161

Brief Description of Project

The National Guard Bureau (NGB) is preparing an Environmental Assessment (EA) for the permanent beddown (installation of infrastructure) of additional F-22A aircraft at Joint Base Pearl Harbor-Hickam (JBPHH), Honolulu, Hawaii, which would include the installation/construction of eight (8) structures to house or assist in maintenance of the aircraft. This Proposed Action would increase the number of F-22A assigned aircraft to the Hawaii Air National Guard 199th Fighter Squadron (FS) from 18 Primary Aerospace Vehicles Authorized (PAA) plus 2 Backup Aircraft Inventory (BAI) to 24 PAA plus three 3 BAI.

Under the Proposed Action, the use of countermeasure chaff and flares in all Special Use Airspace proposed for use would increase, and training operations could include the use of 20-millimeter target practice ammunition within the Pacific Missile Range Facility. In addition, under the Proposed Action, several short-term infrastructure projects would be constructed (Attachment 2). At this time the 154th Wing has identified eight projects that would enhance current and future mission operational efficiency.

The NGB and 154th Wing (95th FS) are interested in any information or preliminary concerns associated with the proposed EA. Areas of concern may include potential effects on physical, ecological, social, cultural, and archaeological resources.

DAR# 6161

Comments

DAR has identified two proposed actions in this request for comments:

1) The installation/construction of eight (8) structures at Joint Base Pearl Harbor-Hickam (JBPHH), Honolulu, Hawaii (see Attachment 3 for map) to house or assist in maintenance of an additional 6 Primary Aerospace Vehicles Authorized (PAA) plus 1 Backup Aircraft Inventory (BAI), for a total of 24 PAA plus three 3 BAI, and;

2) The increase in the use of countermeasure chaff and flares in all Special Use Airspace proposed for use (see Attachment 1 for map) and the inclusion of 20-millimeter target practice ammunition within the Pacific Missile Range Facility for training operations.

Ecological concerns:

1) From the preliminary information provided in the attachments it does not appear as though impacts to aquatic organisms may occur through the installation/construction of eight (8) structures at Joint Base Pearl Harbor-Hickam (JBPHH), to house or assist in maintenance of aircraft as the structures will be instaleld/constructed on land.

However, it is hard to confirm through the map (Attachment 3) whether or not construction activities or staging areas for equipment may overlap in areas near to the water or the shoreline, resulting in potential sediment input or leaching of construction materials/chemicals into into coastal waters with aquatic resources, or other potential impacts on aquatic resources.

DAR requests confirmation through the EA that construction activities for the eight (8) structures at Joint Base Pearl Harbor-Hickam (JBPHH) will not have impacts on aquatic organisms. If sediment input or leaching of construction materials/chemicals into into coastal waters with aquatic resources, or other potential impacts on aquatic resources is anticipated, DAR requests information on the types of mitigation or avoidance measures that will be implemented to reduce/avoid sediment input, leaching of construction materials/chemicals into coastal waters, or other potential impacts on aquatic resources.

DAR# 6161

Comments

If impacts to coral and/or live rock or anticipated through construction activities, DAR requests information on the square area of live rock to be impacted and the amount, size and species of coral colonies to be impacted. If impact to these resources cannot be avoided, after evaluation of the ecological information provided, DAR may request or recommend that offset measures be implemented for these aquatic resources (provided this is an available option based on the purpose of the activity).

2) From the preliminary information provided in the attachments it is unknown if there may be impacts to aquatic organisms due to the increase in the use of countermeasure chaff and flares in all Special Use Airspace proposed for use (see Attachment 1 for map), and the inclusion of 20-millimeter target practice ammunition within the Pacific Missile Range Facility for training operations.

DAR requests more information on potential impacts to aquatic organisms (including cetaceans, monk seals, turtles, fish and invertebrates, such as coral/crustaceans/molluscs/bivalves/sponges), due to the general use and increase in the use of countermeasure chaff and flares. DAR requests information on impacts from the potential ingestion or absorption of chaff and/or flares by aquatic organisms or the general impacts of the input of chaff and/or flares into the marine ecosystem.

DAR requests more information on potential impacts to aquatic organisms (including cetaceans, monk seals, turtles, fish and invertebrates, such as coral/crustaceans/molluscs/bivalves/sponges), due the inclusion of 20-millimeter target practice ammunition within the Pacific Missile Range Facility for training operations. DAR requests information on impacts from the potential ingestion or absorption of 20-millimeter target practice ammunition by aquatic organisms or the general impacts of the input of 20-millimeter target practice ammunition into the marine ecosystem, in addition to any acoustical impacts on organisms (e.g. cetaceans, monk seals , turtles, etc.) that may occur from use of 20-millimeter target practice ammunition at the Pacific Missile Range Facility for training operations.

DAR# 6161

Comments

Thank you for providing DAR the opportunity to review and comment on the preparation of an Environmental Assessment (EA) for the permanent beddown of additional F-22A aircraft at Joint Base Pearl Harbor-Hickam, Honolulu, Hawaii, Should there be any changes, amendments or modifications to the current plans, DAR requests the opportunity to review and comment on those.

INCOMING/ROUTING/SCANNING/OUTGOING LOG
RETURN THIS SHEET FOR FILING

FROM	Lieutenant Colonel Christopher J. Mayor Plans and Requirements Air National Guard Readiness Center	DAR	6161
		BLNR	
		GOV	
SUBJECT	Review for Comments SUBJECT:National Guard Bureau **SUSPENSE DATE: December 23, 2020**		

Draft Reply for:

☒ INCOMING: Dated: 11/24/2020 ☐ FAX ☐ EMAIL ☐ FW

	Received	Notes/To Do
Gov:		
BLNR:		
DAR:		

☒ OUTGOING: Dated: ☐ MAIL ☐ FAX ☐ EMAIL

Incoming		PAU
Director		
Commercial		
Environment		
Recreation		
Planner		
Staff Svcs		
RCUH/UH		
Statistics		
AFRC/Fed Aid		
Education		
Tech Asst	KT	
Secretary		
Office Svcs		

Outgoing		PAU
DUE DATE		
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DAR 6161

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 28, 2020

LD 1248

Lieutenant Colonel Christopher J. Mayor, USAF
ATTN: F-22 JBPHH EA
Air National Guard Readiness Center,NGB/A4AM
3501 Fetchet Avenue
Joint Base Andrews, MD 20762-5157

Via email: christopher.mayor.3@us.af.mil

Dear Sirs:

SUBJECT: **Preparation for Environmental Assessment for Permanent Beddown of Additional F-22A Aircraft at Joint Base Pearl Harbor-Hickam Draft Environmental Assessment**
Joint Base Pearl Harbor-Hickam, Honolulu, Island of O'ahu, Hawai'i

Thank you for the opportunity to review and comment on the subject project. The Land Division of the Department of Land and Natural Resources (DLNR) distributed copies of your request to DLNR's various divisions for their review and comment.

Enclosed are responses received from our (a) Division of Aquatic Resources, (b) Engineering Division, and (c) Land Division, Oahu District. Should you have any questions about the attached responses, please feel free to contact Barbara Lee via email at barbara.j.lee@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

DAVID Y. IGE

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 10, 2020

LD 1248

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources *(via email: kendall.l.tucker@hawaii.gov)*
__Div. of Boating & Ocean Recreation
X Engineering Division *(via email: DLNR.Engr@hawaii.gov)*
X Div. of Forestry & Wildlife *(via email: Rubyrosa.T.Terrago@hawaii.gov)*
X Div. of State Parks
X Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
X Office of Conservation & Coastal Lands
X Land Division – Oahu District *(via email: DLNR.Land@hawaii.gov)*

FROM: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: **Preparation for Environmental Assessment for Permanent Beddown of Additional F-22A Aircraft at Joint Base Pearl Harbor-Hickam**
LOCATION: Joint Base Pearl Harbor-Hickam, Honolulu, Island of Oahu, Hawaii
APPLICANT: **National Guard Bureau**

Transmitted for your review and comment is information on the above-referenced project. (Some of you may have already submitted comments separately.) Please review the attached information and submit any comments by **December** 23, 2020 to the Land Division at DLNR.Land@hawaii.gov, also copied to barbara.j.lee@hawaii.gov and darlene.k.nakamura@hawaii.gov.

If no response is received by the above due date, we will assume your agency has no comments at this time. If you have any questions, please contact Barbara Lee at barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✓) Comments are attached.

Signed: [signature]
Print Name: Brian J. Neilson-Administrator
Division: Aquatic Resources
Date: Dec 15, 2020

Attachments
Cc: Central Files

DAVID Y. IGE
GOVERNOR OF
HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

Date: 12/15/2020
DAR # AR0040

MEMORANDUM

TO: Brian J. Neilson
DAR Administrator

FROM: Paul Murakawa, Aquatic Biologist *Paul Y. Murakawa*

SUBJECT: R4C - Oahu: Preparation for Environmental Assessment for Permanent Beddown of Additional F-22A Aircraft at Joint Base Pearl Harbor-Hickam

Request Submitted by: Russell Tsuji, Land Administrator
Joint Base Pearl Harbor-Hickam

Location of Project: ______

Brief Description of Project:
The National Guard Bureau (NGB) is preparing an Environmental Assessment (EA) for the permanent beddown of additional F-22A aircraft at Joint Base Pearl Harbor-Hickam (JBPHH), Honolulu, Hawaii. This Proposed Action would increase the number of F-22A assigned aircraft to the Hawaii Air National Guard 199th Fighter Squadron (FS). The purpose of the Proposed Action is to permanently integrate aircraft into JBPHH's current fleet. The Proposed Action is needed to ensure that these F-22A aircraft are located with an existing F-22 unit in order to maintain operational readiness.

Comments:
☐ No Comments ☒ Comments Attached

Thank you for providing DAR the opportunity to review and comment on the proposed project. Should there be any changes to the project plan, DAR requests the opportunity to review and comment on those changes.

Comments Approved: [signature] Date: Dec 15, 2020
Brian J. Neilson
DAR Administrator

DAVID Y. IGE
GOVERNOR OF HAWAII

[illegible]

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 10, 2020

LD 1243

MEMORANDUM

FROM:

~~TO:~~ **DLNR Agencies:**

X Div. of Aquatic Resources *(via email: kendall.l.tucker@hawaii.gov)*
__ Div. of Boating & Ocean Recreation
X Engineering Division *(via email: DLNR.Engr@hawaii.gov)*
X Div. of Forestry & Wildlife *(via email: Rubyrosa.T.Terrago@hawaii.gov)*
X Div. of State Parks
X Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
X Office of Conservation & Coastal Lands
X Land Division – Oahu District *(via email: DLNR.Land@hawaii.gov)*

TO:

~~FROM:~~ Russell Y. Tsuji, Land Administrator *Russell Tsuji*

SUBJECT: **Preparation for Environmental Assessment for Permanent Beddown of Additional F-22A Aircraft at Joint Base Pearl Harbor-Hickam**

LOCATION: **Joint Base Pearl Harbor-Hickam, Honolulu, Island of Oahu, Hawaii**

APPLICANT: **National Guard Bureau**

Transmitted for your review and comment is information on the above-referenced project. (Some of you may have already submitted comments separately.) Please review the attached information and submit any comments by **December 23, 2020** to the Land Division at DLNR.Land@hawaii.gov, also copied to barbara.j.lee@hawaii.gov and darlene.k.nakamura@hawaii.gov.

If no response is received by the above due date, we will assume your agency has no comments at this time. If you have any questions, please contact Barbara Lee at barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✓) Comments are attached.

Signed: [signature]
Print Name: Carty S. Chang, Chief Engineer
Division: Engineering Division
Date: Dec 23, 2020

Attachments
Cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Preparation for Environmental Assessment for Permanent Beddown of Additional F-22A Aircraft at Joint Base Pearl Harbor-Hickam
Location: Joint Base Pearl Harbor-Hickam, Honolulu, Island of Oahu, Hawaii
Applicant: National Guard Bureau

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated **on FEMA's Flood Insurance Rate Maps (F**IRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4896.

Signed: ____________________
CARTY S. CHANG, CHIEF ENGINEER

Date: **Dec 23, 2020**

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 10, 2020

LD 1248

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources *(via email: kendall.l.tucker@hawaii.gov)*
__ Div. of Boating & Ocean Recreation
X Engineering Division *(via email: DLNR.Engr@hawaii.gov)*
X Div. of Forestry & Wildlife *(via email: Rubyrosa.T.Terrago@hawaii.gov)*
X Div. of State Parks
X Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
X Office of Conservation & Coastal Lands
X Land Division – Oahu District *(via email: DLNR.Land@hawaii.gov)*

FROM: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: **Preparation for Environmental Assessment for Permanent Beddown of Additional F-22A Aircraft at Joint Base Pearl Harbor-Hickam**
LOCATION: Joint Base Pearl Harbor-Hickam, Honolulu, Island of Oahu, Hawaii
APPLICANT: **National Guard Bureau**

Transmitted for your review and comment is information on the above-referenced project. (Some of you may have already submitted comments separately.) Please review the attached information and submit any comments by **December 23, 2020** to the Land Division at DLNR.Land@hawaii.gov, also copied to barbara.j.lee@hawaii.gov and darlene.k.nakamura@hawaii.gov.

If no response is received by the above due date, we will assume your agency has no comments at this time. If you have any questions, please contact Barbara Lee at barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
(☑) We have no comments.
( ) We have no additional comments.
( ) Comments are attached.

Signed: [signature]
Print Name: Patti Miyashiro
Division: DLNR-LAND DIV-ODLO
Date: Dec 18, 2020

Attachments
Cc: Central Files

OFFICE OF PLANNING
STATE OF HAWAII

DAVID Y. IGE
GOVERNOR

MARY ALICE EVANS
DIRECTOR
OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

DTS 202012011138HE

December 4, 2020

Lt. Col. Christopher Mayor
3501 Fetchet Avenue
Joint Base Andrews, MD 20762-5157
ATTN: F-22 JBPHH EA

Dear Lt. Col. Mayor:

Subject: National Guard Bureau Environmental Assessment for the Permanent Bed Down of Additional F-22A Aircraft at Joint Base Pearl Harbor-Hickam (JBPHH), Honolulu, Hawaii

Thank you for the opportunity to provide comments on the National Environmental Policy Act (NEPA) of 1969 (42 United States Code 4321-4347), Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] Sections 1500-1508), and 32 CFR Part 989, et seq. Our office received your request for early consultation on this proposed action via letter dated November 4, 2020.

It is our understanding that this Proposed Action calls for the increase of the number of F-22A assigned aircraft to the Hawaii Air National Guard 199th Fighter Squadron (FS) from 18 Primary Aerospace Vehicles Authorized (PAA) plus two Backup Aircraft Inventory (BAI) to 24 PAA plus three BAI. The purpose of the Proposed Action is to permanently integrate seven F-22A aircraft into JBPHH's current fleet. These F-22A aircraft were based with the 95th FS, Tyndall Air Force Base (AFB), Florida, but will be transferred to JBPHH.

The Proposed Action would include additional operations within Special Use Airspace proximate to JBPHH. The use of countermeasure chaff and flares in all Special Use Airspace proposed for use would increase, and training operations could include the use of 20-millimeter target practice ammunition within the Pacific Missile Range Facility. Furthermore, roughly 150 personnel would be required to support the F-22A permanent bed down at JBPHH, including pilots, maintenance, and support personnel.

The Office of Planning (OP) has reviewed the EA and has the following comment to offer:

Lt. Col. Christopher Mayor
December 4, 2020
Page 2

Coastal Zone Management Area (CZMA) – Federal Consistency
As this proposed action is being proposed by a federal agency, this action may be subject to a CZMA federal consistency review.

The national CZMA requires that federal actions be consistent with approved state coastal programs' enforceable policies. OP is the lead state agency with the authority to conduct CZMA federal consistency reviews. At your earliest convenience, please contact our office regarding this matter.

If you have any questions regarding this comment letter, please contact Joshua Hekekia of our office at (808) 587-2845 on NEPA EA matters, and John Nakagawa at (808) 587-2878 on CZMA federal consistency matters.

Sincerely,

Mary Alice Evans

Mary Alice Evans
Director

DAVID Y. IGE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

JADE T. BUTAY
DIRECTOR

Deputy Directors
LYNN A.S. ARAKI-REGAN
DEREK J. CHOW
ROSS M. HIGASHI
EDWIN H. SNIFFEN

IN REPLY REFER TO:
DIR 1056
STP 8.3088

December 21, 2020

Lieutenant Colonel Christopher J. Mayor
Plans and Requirements
Air National Guard Readiness Center, NGB/A4AM
3501 Fetchet Avenue
Joint Base Andrews, Maryland 20762

Attention: F-22 JBPHH EA

Dear Lieutenant Colonel Mayor:

Subject: Early Consultation for Environmental Assessment (EA)
Permanent Beddown of Additional F-22A Aircraft at Joint Base Pearl Harbor-Hickam (JBPHH)
JBPHH, Oahu, Hawaii
Tax Map Key: (1) 9-9-001: 013

Thank you for your letter dated November 4, 2020 which the State of Hawaii, Department of Transportation (HDOT) received on November 23, 2020. HDOT understand that the National Guard Bureau (NGB) is proposing the permanent beddown of seven additional F-22A aircraft at JBPHH. The Proposed Action would be the construction of several short-term infrastructure projects including the construction of five new facilities, and three repair and reconfiguration projects.

In reviewing the provided information, HDOT has the following comments:

Airports Division (HDOT-A)

1. JBPHH is adjacent to the Daniel K. Inouye International Airport. All projects within five miles from Hawaii State airports are advised to read the Technical Assistance Memorandum (TAM) for guidance with development and activities that may require further review and permits. The TAM can be viewed at this link: http://files.hawaii.gov/dbedt/op/docs/TAM-FAA-DOT-Airports_08-01-2016.pdf.

2. Federal Aviation Administration (FAA) regulation requires the submittal of FAA Form 7460-1 Notice of Proposed Construction or alteration pursuant to the Code of Federal Regulations, Title 14, Part 77.9, if the construction or alteration is within 20,000 feet of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with its longest runway more than 3,200 feet. Construction equipment and staging area heights, including heights of temporary construction cranes,

Lieutenant Colonel Christopher J. Mayor
December 21, 2020
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STP 8.3088

shall be included in the submittal. The form and criteria for submittal can be found at the following website: https://oeaaa.faa.gov/oeaaa/external/portal.jsp.

Harbors Division (HDOT-H)

1. The Draft EA should disclose any constraints imposed to the air space above Honolulu Harbor and Kalaeloa Barbers Point Harbor, if any, by the "special use airspace." Specifically, gantry cranes are important equipment that are used to load and unload cargo containers between the ship and the terminal. These cranes require heights enough to clear the highest stacks of containers on the ships to be functional.

2. In Honolulu Harbor, there are existing gantry cranes at the Sand Island Terminal and new gantry cranes that would be installed at the Kapalama Container Terminal. The Draft EA should disclose whether the proposed action would affect the "special use airspace" in such a way that would constrain any harbor operations.

3. In Kalaeloa Barbers Point Harbor, while there are no gantry cranes now, the Draft EA should disclose whether the proposed action would affect the "special use airspace" in such a way as to preclude any future installation of cranes at that harbor.

Highways Division (HDOT-HWY)

1. The proposed action does not involve direct access to State highway facilities or construction within the State right-of-way, therefore, no direct impact to State roadways are anticipated.

2. We recommend that the EA include a traffic impact discussion to include estimated trip generation and evaluation of impacts to State facilities including Interstate H-1 Freeway, Nimitz Highway (State route 92), and Kamehameha Highway (State route 99).

If there are any questions, please contact Mr. Blayne Nikaido of the HDOT Statewide Transportation Planning Office at (808) 831-7979 or via email at blayne.h.nikaido@hawaii.gov.

Sincerely,

JADE T. BUTAY
Director of Transportation

From: Aragon, Michelle <michelle.aragon@doh.hawaii.gov>
Sent: Thursday, December 3, 2020 21:13
To: MAYOR, CHRISTOPHER J Lt Col USAF ANG NGB/A7AR <christopher.mayor.3@us.af.mil>
Subject: [Non-DoD Source] ATTN: F-22 JBPHH EA

Aloha,

From Department of Health, Solid and Hazardous Waste Branch we have the following comments for this EA:

Waste generated from construction and demolition projects shall be characterized as regulated hazardous or non-regulated hazardous waste in accordance with state hazardous waste regulations. If not a regulated hazardous waste, the waste shall be delivered to Department of Health (DOH)-permitted solid waste management facilities. Soil is considered a waste if it is discarded from the project, and the contaminant concentration exceeds the most stringent DOH environmental action levels for unrestricted use.

Solid and Hazardous Waste Branch
State of Hawaii | Department of Health
2827 Waimano Home Road, #100, Pearl City, HI 96782
Phone Number: (808) 586-4226 | Fax Number: (808) 586-7509

EXECUTIVE CHAMBERS
HONOLULU

DAVID Y. IGE
GOVERNOR

December 21, 2020

VIA ELECTRONIC MAIL
Christopher J. Mayor
Lieutenant Colonel, USAF
Attn: F-22 JBPHH EA
3501 Fetchet Avenue
Joint Base Andrews, MD 20762-5157

Dear Lieutenant Colonel Mayor:

Thank you for the opportunity to write in support of the proposed beddown of additional F-22 aircraft at Joint Base Pearl Harbor–Hickam (JBPHH). The proposed increase will bring the 199th Fighter Squadron up to the Air Force standard construct for F-22 squadrons. This will allow the 199th Fighter Squadron, which is tasked with providing steady-state homeland defense of the State of Hawai'i, to provide a more robust response for USINDOPACOM should the need ever arise. Also, having additional aircraft will allow for larger daily training missions, critical to training in more complex scenarios.

The associated construction projects will also be of benefit to the people of the State of Hawai'i. The projects will help the Hawai'i Air National Guard (HIANG) become more efficient at executing its mission by modernizing or repairing facilities in use by HIANG Airmen. The 154th Civil Engineering Squadron, Hawai'i Air National Guard, indicates that it anticipates awarding the design for most of these projects in FY 21 and executing the construction in FY 22. Total construction costs are estimated at $56.9 million. This, coupled with the approximately 120 additional assigned active duty service members, will have a net-positive financial impact on the local economy.

F-22 aircraft have already been stationed at JBPHH for two years. The proposed change will cause an increase in noise caused by additional takeoff and landings at HNL. However, based on the number of daily takeoffs and landings by other jet aircraft at HNL, the overall percentage increase for all operations at HNL is very small. Little to no impact has been realized by the public from training events as they are conducted at high altitude in military airspace well out over the ocean. Finally, there has not been a noticeable change in the number or frequency of environmental complaints attributed to the F-22 squadron operations over the past two years.

Christopher J. Mayor
December 21, 2020
Page Two of Two

I appreciate the chance to write in support of the proposed project. I believe it will aid in the state's readiness and capabilities while providing a net-positive for the local economy without creating a significant increase in noise or environmental complaints.

With warmest regards,

David Y. Ige
Governor, State of Hawai'i

PROGRAMMATIC AGREEMENT RECORD - ARCHAEOLOGY

DATE:	25-Apr-22	AR22N040
PROJECT TITLE:	F-22 Plus Up	
PROJECT LOCATION:	Hickam	
PREPARED BY:	Jeff Pantaleo	
ACTIVITY/CODE:	NAVFAC Hawaii, EV2	
TELEPHONE:	(808) 471-4945	

PROJECT DESCRIPTION:

The undertaking includes the permanent beddown of additional F-22A aircraft at Joint Base Pearl Harbor-Hickam (JBPHH), Honolulu, Hawaii. This Proposed Action would increase the number of F-22A assigned aircraft to the Hawaii Air National Guard 199th Fighter Squadron (FS) from 18 Primary Aerospace Vehicles Authorized (PAA) plus 2 Backup Aircraft Inventory (BAI) to 24 PAA plus three 3 BAI. The purpose of the Proposed Action is to permanently integrate seven F-22A aircraft into JBPHH's current fleet. These F-22A aircraft were based with the 95th FS, Tyndall Air Force Base (AFB), Florida. The devastation caused by Hurricane Michael rendered Tyndall AFB incapable of hosting the F-22 Squadron for the foreseeable future. The Proposed Action is needed to ensure that these F-22A aircraft are located with an existing F-22 unit in order to maintain operational readiness.

Several short-term infrastructure projects would be constructed (Attachment 2). At this time, the 154th Wing has identified eight projects that would enhance current and future mission operational efficiency. Five of the proposed projects are new construction at JBPHH, including an addition to the munitions maintenance and inspection facility, an additional munitions multicube storage facility, a new egress facility, an aircraft support equipment facility add-on, and a new F-22 intel vault. Three additional proposed projects include the repair and reconfiguration of the F-22 Sierra Ramp and the Squadron Operations Building 3428, as well as alterations of the F-22 corrosion control Building 3407. Under the Proposed Action, the use of countermeasure chaff and flares in all Special Use Airspace proposed for use would increase, and training operations could include the use of 20-millimeter target practice ammunition within the Pacific Missile Range Facility. Approximately 150 personnel would be required to support the F-22A permanent beddown at JBPHH, including pilots, maintenance, and support personnel.

ARCHAEOLOGICAL MANAGEMENT AREAS:

AREA:	LOW	Any National Register (eligible) sites present?	NO
		Will this undertaking affect this sites?	NO

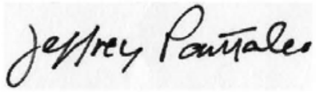
PROJECT DETERMINATION:

Considering the items below, pursuant to the 2012 PA (revised) among the Commander Navy Region Hawaii, The Advisory Council on Historic Preservation and the Hawaii State Historic Preservation Officer regarding Navy undertakings in Hawaii, the proposed undertaking does not require further Section 106 review under the National Historic Preservation Act. This memorandum is to be retained as administrative record of this finding.
[Check all that apply.]

[ ] Stipulation IX.A. 3
The undertaking does not have the potential to cause effects to listed, contributing, or eligible historic properties (specifically archaeological sites/objects/traditional cultural places) as noted above.

[X] Stipulation I (B) 3
The undertaking is listed in Appendix A.

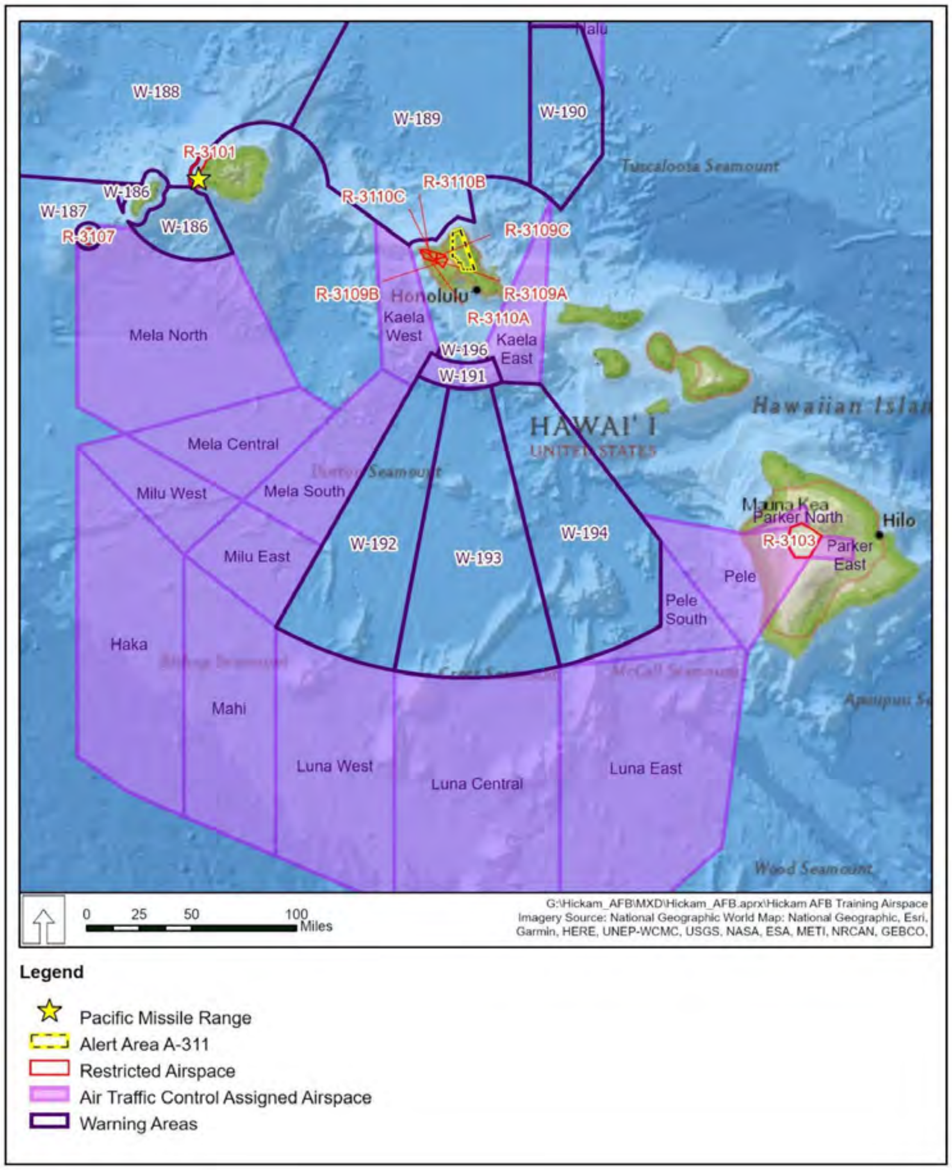
REVIEWER: COPY TO:



Jeffrey Pantaleo

1

Attachment 1 –Special Use Airspace Proposed for Use



Attachment 2 – 154th Wing Proposed Project List

Project ID	Project Number	Fiscal Year	Project Title	Type Action
1	KNMD202111	2022	F-22 Sierra Ramp	Repair
2	KNMD202112	2022	Squadron Operations, Building 3428	Repair and Reconfigure
3	KNMD209085	2022	Munition Maintenance and Inspection Addon	Construction
4	KNMD209086	2022	Add Munitions Cube Storage Facility	Construction
5	KNMD209087	2022	Egress Facility	Construction
6	KNMD209088	2022	Aircraft Support Equipment Facility Addon	Construction
7	KNMD209092	2022	F-22 Intel Vault	Construction
8	KNMD209093	2022	F-22 Alter Corrosion Control Building 3407	Repair

Attachment 3 – 154th Wing Area of Potential Effects

AGENCY CONSULTATIONS

NATIONAL GUARD BUREAU
3501 FETCHET AVENUE
JOINT BASE ANDREWS 20762-5157

17 June 2025

Kristi Kucharek
Plans and Requirements
Air National Guard Readiness Center, NGB/A4FR
3501 Fetchet Avenue
Joint Base Andrews, Maryland 20762

Ms. Sarah Malloy
Assistant Regional Administrator
NMFS, Protected Resources Division
1845 Wasp Avenue, Building 176
Honolulu, Hawaii 96818

Dear Ms. Malloy

In October 2018, Hurricane Michael hit the Florida panhandle, causing catastrophic damage to Tyndall Air Force Base (AFB), Florida, with some of the greatest damage to base hangars and flight operations buildings. As a result, Tyndall AFB was not able to support its two F-22A squadrons. The Department of the Air Force (DAF) has decided it would be most efficient to consolidate the F-22As from the operational squadron at Tyndall AFB into other operational F-22 squadrons, including the 199 FS. This consolidation may or may not be permanent depending on the outcome of other ongoing fighter force structure studies. The F-22 Formal Training Unit, which consists of the F-22 aircraft and T-38 Talon aircraft from Tyndall AFB, were also temporarily relocated to Eglin AFB, Florida, while the DAF considered their permanent assignment.

The National Guard Bureau (NGB) is proposing to permanently or temporarily integrate a total of seven Air Force F-22A Raptors from Tyndall Air Force Base, Florida, into the current fleet of the Hawaii Air National Guard 199th Fighter Squadron (199 FS), Joint Base Pearl Harbor-Hickam (JBPHH), Honolulu, Hawaii. This Proposed Action would increase the number of F-22A aircraft assigned to the 199 FS from 18 Primary Aerospace Vehicles Authorized (PAA) plus 2 Backup Aircraft Inventory (BAI) to 24 PAA plus three 3 BAI. The purpose of the Proposed Action is to permanently or temporarily integrate seven F-22A aircraft into JBPHH's current fleet. The Proposed Action is needed to ensure that these F-22A aircraft are located with an existing F-22 unit in order to maintain operational readiness. The NGB requests concurrence with a may affect but not likely to adversely affect determination for the blue whale (*Balaenoptera musculus*), Main Hawaiian Island insular false killer whale (*Pseudorca crassidens*), fin whale (*Balaenoptera physalus*), Hawaiian monk seal (*Monachus schauinslandi*), sei whale (*Balaenoptera borealis*), sperm whale (*Physeter macrocephalus*), Central North Pacific green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), leatherback turtle (*Dermochelys coriacea*), North Pacific Ocean loggerhead turtle (*Caretta caretta*), olive ridley turtle (*Lepidochelys olivacea*), giant manta ray (*Manta birostris*), oceanic whitetip shark

(*Carcharhinus longimanus*), and scalloped hammerhead shark (*Sphyrna lewini*) per Section 7 of the Endangered Species Act regarding the proposal to integrate the seven F-22A aircraft into the 199 FS at JBPHH.

The 199 FS is a component of the 154th Wing, stationed at JBPHH. The 199 FS is partnered with an active associate unit, from the active-duty Air Force's 15th Wing, which provides pilots and support personnel. The additional F-22A aircraft would add an estimated 405 annual sorties at JBPHH. This would result in an increase of less than 1 percent in the number of total operations at JBPHH. The additional F-22A aircraft would use the same airspace currently utilized by the aircraft assigned to the 199 FS. The Special Use Airspace includes offshore Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 and Air Traffic Control Assigned Airspace (ATCAA) Mela South and Nalu (Attachment 2). Under the Proposed Action, the use of countermeasure chaff and flares in all Warning Areas and ATCAA is proposed. Approximately 150 personnel would be required to support the F-22A beddown at JBPHH, including pilots, maintenance, and support personnel.

The permanent or temporary assignment of the additional F-22A aircraft would require construction of new facilities and the repair of existing facilities (nine total projects) that would be located around the existing airfield and runway (Attachment 3). Projects would include the construction of additional ramp space and repair of deteriorated ramp pavement for the installation of additional sunshades; the construction of maintenance space for munitions, egress, and aircraft support equipment; construction of additional munitions storage, a new Intel vault; the repair and renovation Squadron Operations; and the conversion of the F-15 corrosion control facility to an F-22A paint facility (Attachment 4). These projects are planned for Fiscal Year 2022.

The action area consists of all areas to be affected directly or indirectly by the proposed NGB action and not merely the immediate area involved in the footprint. Therefore, the action area is JBPHH, the airspace proximate to the JBPHH airfield, and the Warning Areas and ATCAA over the Pacific Ocean north and south of the Island of Oahu where aircraft training operations would occur.

A review of the JBPHH Integrated Natural Resources Management Plan (Commander, Navy Installations Command [CNIC], 2012), National Marine Fisheries Service (NMFS) Listed Species Lists, and NMFS Informal Endangered Species Act Consultation on Joint Base Pearl Harbor Hickam Combat Air Forces Adversary Air Support (PIR-2020-00337; I-PI-20-1825-AG) (NMFS, 2020) identified the federally listed species with the potential to occur on or proximate to JBPHH and in the Warning Areas and ATCAA:

Protected Fish

- Giant manta ray (*Mobula birostris*) – Threatened
- Oceanic whitetip shark (*Carcharhinus longimanus*) – Threatened
- Indo West Pacific scalloped hammerhead shark (*Sphyrna lewini*) – Threatened

Sea Turtles

- Central North Pacific green turtle (*Chelonia mydas*) – Threatened
- Hawksbill turtle (*Eretmochelys imbricata*) – Endangered
- Leatherback turtle (*Dermochelys coriacea*) – Endangered
- North Pacific Ocean loggerhead turtle (*Caretta caretta*) – Endangered
- Olive Ridley turtle (*Lepidochelys olivacea*) – Threatened

Marine Mammals

- Blue whale (*Balaenoptera musculus*) – Endangered
- Main Hawaiian Islands insular false killer whale (*Pseudorca crassidens*) – Endangered
- Fin whale (*Balaenoptera physalus*)– Endangered
- Hawaiian monk seal (Neomonachus schauinslandi) – Endangered
- Sei whale (*Balaenoptera borealis*) – Endangered
- Sperm whale (*Physeter macrocephalus*) – Endangered

Blue Whale. The blue whale is a baleen whale primarily feeding on krill that occurs globally and the largest animal to have ever lived on Earth. Females are slightly larger than males. Blue whales are listed as a federally endangered species. Blue whales inhabit all oceans and typically occur near the coast over the continental shelf; they have also been recorded in oceanic waters (US Navy, 2018). The blue whale could occur in the Warning Areas and ATCAA with peak abundance in the winter.

False Killer Whale. The Main Hawaiian Islands Insular Stock Distinct Population Segment (DPS) of the false killer whale is listed as federally endangered. False killer whales feed primarily on deep sea cephalopods and fish and have been known to attack other cetaceans, including dolphins and large whales. This species is found regularly within Hawaiian waters and has been reported in groups of up to 100 and would occur in the Warning Areas and ATCAA (US Navy, 2018).

Fin Whale. The federally endangered fin whale has a v-shaped head and a tall, hooked dorsal fin that rises at a shallow angle from its back. It is the second largest whale species. The fin whale feeds by gulping a wide variety of organisms including small schooling fish, squid, and crustaceans (including krill). Fin whales are found in all of the world's oceans and could occur rarely in deep offshore waters in the Warning Areas and ATCAA (US Navy, 2018).

Hawaiian Monk Seal. The federally listed endangered Hawaiian monk seal is a pinniped, of the family Phocidae. Adult monk seals measure about 7 to 8 feet in length and weigh about 400 to 600 pounds with females often being larger than males. Mature Hawaiian monk seals are a silver or slate gray on their dorsal side and have a cream coloring on their stomach, chest, and throat. They feed on fish, cephalopods, and crustaceans. Current population estimates of Hawaiian monk seals indicate approximately 1,200 seals remaining. Haul-out areas for pupping, nursing, and resting are primarily sandy beaches, but virtually all substrates, including emergent reef and shipwrecks, are used at various islands. Hawaiian monk seals frequently haul out primarily on a sandy beach at Iroquois Point-Puʻuloa Beach (versus emergent reef across the Pearl Harbor Entrance Chanel from JBPHH); however, one seal has been observed hauled out in the vicinity of Marine Railway No. 2 at the Shipyard (CNIC, 2012) and could occur in the Warning Areas and ATCAA.

Sei Whale. The sei whale is mostly dark-gray in color with a lighter belly, often with mottling on the back. The major prey species for the sei whale are copepods and krill. Sei whales occur in very low population numbers. They typically occur in deep, oceanic waters of the cool temperate zone and prefer regions of steep bathymetric relief, such as the continental shelf break, canyons, or basins between banks and ledges. They occur in the warmer waters of the Warning Areas and ATCAA in the winter and have only been detected in the Hawaiian Islands on a few occasions (US Navy, 2018).

Sperm Whale. The sperm whale is the largest of the toothed whales and is distinguished by an extremely large head and a single blowhole located on the left side of its head (asymmetrical) near the tip. The sperm whale is mostly dark-gray, with some sperm whales having white patches on the belly. The sperm whale preys on large mesopelagic squids and other cephalopods, demersal fish, and benthic invertebrates. Sperm whales are globally distributed and occur in deep offshore waters. Sperm whales are listed as federally endangered. They occur in offshore waters of Hawaii during most of the year but do migrate to equatorial waters in the winter (US Navy, 2018).

Green Turtle. The Central North Pacific and East Pacific Ocean DPS green turtle occur in the Warning Areas and ATCAA. The green turtle has a smooth black, gray-green, brown, and yellow top shell and a yellowish-white bottom shell. Its diet consists mostly of seagrasses and algae. The green turtle was listed under the federal Endangered Species Act in July 1978. Similar to the loggerhead turtle, the green turtle is globally distributed, is the most common sea turtle in the waters of the main Hawaiian Islands and occurs in waters near JBPHH including the Pearl Harbor Entrance Channel and in the Warning Areas year round (US Navy, 2018; NMFS, 2025).

Hawksbill Turtle. The hawksbill turtle is a small- to medium-sized sea turtle, has the longest measured dive times of any sea turtle, and is omnivorous during its later juvenile stage, feeding on encrusting organisms such as sponges, tunicates, bryozoans, algae, mollusks, and a variety of other items such as crustaceans and jellyfish; however, older juveniles and adults are more specialized, feeding primarily on sponges, which comprise as much as 95 percent of their diet in some locations. Hawksbill sea turtles are migratory, and hatchlings may prefer the open ocean with juveniles returning to coastal habitats and nearshore foraging grounds (US Navy, 2018). The hawksbill turtle would occur in the Warning Areas and ATCAA.

Leatherback Turtle. The leatherback turtle is the largest and deepest-diving sea turtle. Leatherback turtles feed throughout the epipelagic and into the mesopelagic zones of the water column on gelatinous zooplankton such as cnidarians (jellyfish and siphonophores) and tunicates (salps and pyrosomas). Leatherback turtles' nest along the Pacific coast of the Americas and along the along the Indo-Pacific coastlines. Leatherback turtles could occur throughout the Warning Areas as they migrate across the Pacific past Hawaii. They are sighted in offshore waters typically beyond the 3,800-foot depth contour and especially off the southeastern end of the Hawaiian Islands (US Navy, 2018). Leatherback turtles could occur in the Warning Areas and ATCAA.

Loggerhead Turtle. Loggerhead turtles are the most abundant species of sea turtle found in US coastal waters. Loggerhead turtles have a top shell that is slightly heart-shaped and reddish-brown with a pale, yellowish bottom shell. Their diet primarily consists of whelks and conch. Loggerhead turtles are circumglobal, occurring throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Pelagic juveniles and feeding adults can occur in the Warning Areas and ATCAA as they use the entire North Pacific during development and as they make transoceanic crossing to and from nesting grounds in Japan (US Navy, 2018; NMFS, 2025).

Olive Ridley Turtle. The olive ridley turtle has a heart-shaped, grayish-green top shell and has a broad diet consisting of shrimp, fish, lobster, crabs, tunicates, mollusks, and algae. They are globally distributed. The olive ridley turtle was listed as threatened under the ESA in July 1978. This species is globally distributed and requires international protection. Cooperation between countries, as well as individual country initiative has led to various international treaties and agreements as well as federal laws for olive ridley sea turtle conservation (NOAA Fisheries, 2025c). The olive ridley turtle is known to occur in waters in the Warning Areas and ATCAA and has been documented to nest on the Hawaiian Islands three times (US Navy, 2018).

Giant Manta Ray. The giant manta ray, the largest ray in the world, is listed as threatened. It is a filter feeder and eats large quantities of zooplankton. Giant manta rays are migratory with small, highly fragmented populations that are sparsely distributed across the world. The main threat to the giant manta ray is commercial fishing, with the species both targeted and caught as bycatch in a number of global fisheries throughout its range (NOAA Fisheries, 2025a). The giant manta ray is found throughout the waters off of the Hawaiian Islands and large aggregations are known to occur along the Kona coast off the Big Island (US Navy, 2018). The giant manta ray does occur in the Warning Areas and ATCAA.

Oceanic Whitetip Shark. The oceanic whitetip shark is listed as threatened, found in tropical and subtropical oceans throughout the world, and long-lived and late maturing. They feed on a wide variety of bony fishes including mackerel and tuna as well as sea birds, sea turtles, stingrays, and squid. Their fins are highly valued in the international trade for shark products. This along with being caught as bycatch in commercial fisheries are the likely causes of their population declines (NOAA Fisheries, 2025b). The oceanic whitetip shark could be present in the Warning Areas and ATCAA.

Scalloped Hammerhead Shark. The Eastern Pacific DPS of the scalloped hammerhead shark is federally listed as endangered. It occurs in coastal and semioceanic temperate and tropical waters from the surface to approximately 900 feet in depth. Scalloped hammerhead sharks feed primarily at night on a wide variety of fishes and invertebrates. They occur in the waters off the Hawaiian Islands and would occur in the Warning Areas and ATCAA (US Navy, 2018).

There is no designated critical habitat on or immediately adjacent to JBPHH. Designated critical habitat for the Hawaiian monk seal includes the marine environment with a seaward boundary that extends from the 200-meter depth contour line (relative to mean lower low water), including the seafloor and all subsurface waters and marine habitat within 10 meters of the seafloor, through the water's edge 5 meters into the terrestrial environment. Designated critical habitat occurs in the Warning Areas W-188B and W-189B. The essential features for the conservation of the Hawaiian monk seal are the following:

- Terrestrial areas and adjacent shallow, sheltered aquatic areas with characteristics preferred by monk seals for pupping and nursing;
- Marine areas from 0 to 200 meters in depth that support adequate prey quality and quantity for juvenile and adult monk seal foraging; and
- Significant areas used by monk seals for hauling out, resting, or molting.

Critical habitat for the Main Hawaiian Island insular false killer whale includes the geographic area of the 45-meter depth contour to the 3,200-meter depth contour in waters that surround the Main Hawaiian Islands from Niihau east to the Island of Hawaii. Designated critical habitat occurs in the Warning Areas W-189A and W-189B. Critical habitat for the main Hawaiian Islands insular false killer whale consists of one essential feature comprised of four characteristics:

- Space for movement and use within shelf and slope habitat
- Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth;
- Waters free of pollutants of a type and amount harmful to Main Hawaiian Island insular false killer whales; and
- Sound levels that would not significantly impair Main Hawaiian Island false killer whales' use or occupancy.

The aircraft operations associated with the Proposed Action have the potential to effect federally listed species from aircraft movement, noise, and the use of defensive countermeasures.

The additional F-22A operations at JBPHH would not substantially alter the noise environment around the airfield. Therefore, takeoffs and landings associated with the additional F-22A training would not change the noise environment at the Hawaiian monk seal haul-out area across the Pearl Harbor Entrance Channel from JBPHH. Further, these seals are habituated to aircraft movement as JBPHH. JBPHH and Daniel K. Inouye International Airport have been an active airfield for decades; therefore, additional takeoffs and landings by F-22A aircraft at JBPHH would have no effect on the Hawaiian monk seal. Aircraft movement from takeoffs and landings and training in the Warning Areas and ATCAA by the additional F-22A aircraft would not alter terrestrial areas and adjacent shallow, sheltered aquatic areas with characteristics preferred by monk seals for pupping and nursing, would not substantially alter monk seals' prey quality and quantity, and would not impact areas used by monk seals for hauling out, resting, or molting. Therefore, the Proposed Action would have no effect on monk seal critical habitat.

It is highly unlikely that either aircraft movement or noise emissions, especially at higher altitudes, would elicit a response from marine mammals or sea turtles. Noise modeling of training operations for the additional F-22As determined that there would be no substantial change to the noise environment in the Warning Areas and ATCAA (including from sonic booms). Noise in water and even at the ocean surface from individual F-22A aircraft overflights would be brief as an aircraft passes overhead, and with aircraft training typically at altitudes above 3,000 feet, noise would not have the amplitude or duration to cause any physical damage to or mask biologically relevant sounds for marine mammals, sea turtles, and fish. Therefore, noise from the additional F-22A training would have no effect on the listed marine mammal species, sea turtles, and fish. Sonic booms from supersonic aircraft movement could cause a startle response by the listed species when they are present on the surface of the Pacific Ocean at the moment that a sonic boom occurred; however, sonic booms would be relatively rare events during training operations in the action area, sonic booms happen infrequently at any given location, and the sonic boom and postboom rumbling would be similar to what mammal species and sea turtles experience during a thunderstorm. Sonic booms from supersonic aircraft movement would therefore have no effect on listed species.

There is the potential for components of chaff and flares that remain after use to fall to the surface of the Pacific Ocean where they could be ingested by marine mammals, fish, and sea turtles. Chaff cartridges, chaff canisters, chaff components, and chaff and flare end caps and pistons would be released into the marine environment, where they would persist for long periods and could be ingested by marine wildlife while initially floating on the surface and sinking through the water column. In the very unlikely event that unconsumed chaff and flare components were encountered and ingested by a marine mammal, the small size of chaff and flare end-caps and pistons (i.e., 1.3-inch-diameter and 0.13-inch thick) would pass through the digestive tract of marine mammals; therefore, the use of defensive countermeasures may affect but is not likely to adversely affect marine mammals. Sea turtles could also ingest the end caps of chaff and flares. It is likely that small residual plastic components of chaff and flares would also pass through the digestive tract of mature sea turtles. Small plastic components could, however, cause digestive problems for sea turtles if ingested, but with the large area that would be utilized for additional F-22A training in the Warning Areas and ATCAA, it is highly unlikely that a sea turtle would encounter chaff and flare components; therefore, the use of chaff and flares over the Pacific Ocean as a result of additional F-22A training may affect but is not likely to adversely affect sea turtles.

The giant manta ray, oceanic whitetip shark, and scalloped hammerhead shark would not be seeking prey that would be similar to plastic end caps from chaff and flares. Also, they do not typically feed on the Pacific Ocean surface or seafloor where these plastic components would be most prevalent; however, there is still the possibility of an encounter between these fish species and the chaff and flare residual plastic components. Therefore, the use of defensive countermeasures by the additional F-22A training in the Warning Areas and ATCAA may affect but is not likely to adversely affect the giant manta ray, oceanic whitetip shark, and scalloped hammerhead shark. The training operations in the Warning Areas and ATCAA by the additional F-22A aircraft would not alter the space for movement and use within insular false killer whale shelf and slope habitat, impact insular false killer whale prey species, add pollutants of a type and amount harmful to insular false killer whales, or cause increased sound levels that would impair insular false killer whales' use or occupancy of designated critical habitat. Therefore, there would be no effect on the Main Hawaiian Island insular false killer whale critical habitat from the Proposed Action.

We respectfully request your written concurrence with the NGB's determination of may affect but not likely to adversely affect for the blue whale, Main Hawaiian Island insular false killer whale, fin whale, Hawaiian monk seal, sei whale, sperm whale, Central North Pacific green turtle, hawksbill turtle, leatherback turtle, North Pacific Ocean loggerhead turtle, olive ridley turtle, giant manta ray, oceanic whitetip shark, and scalloped hammerhead shark; and no effect on the designated critical habitat for the Hawaiian monk seal and designated critical habitat for the insular false killer whale. Please send your concurrence to me at Kristi Kucharek, ATTN: F-22 JBPHH EA, 3501 Fetchet Avenue, Joint Base Andrews, MD 20762-5157 or by email at kristi.kucharek@us.af.mil with the subject line title ATTN: F-22 JBPHH EA.

Sincerely

Kristi L Kucharek

Kristi Kucharek, GS-14
Plans and Requirements

Four Attachments:

1. References
2. Special Use Airspace Proposed for Use
3. 154th Wing Proposed Project List for Use
4. Proposed Facility Construction and Repair Projects

Attachment 1 – References

CNIC. 2012. Joint Base Pearl Harbor-Hickam Integrated Natural Resources Management Plan. July.

NMFS. 2025. Find a Species. <https://www.fisheries.noaa.gov/find-species>. Accessed June 2025.

NMFS. 2020. Informal ESA Consultation on Joint Base Pearl Harbor Hickam Combat Air Forces Adversary Air Support (PIR-2020-00337; I-PI-20-1825-AG).

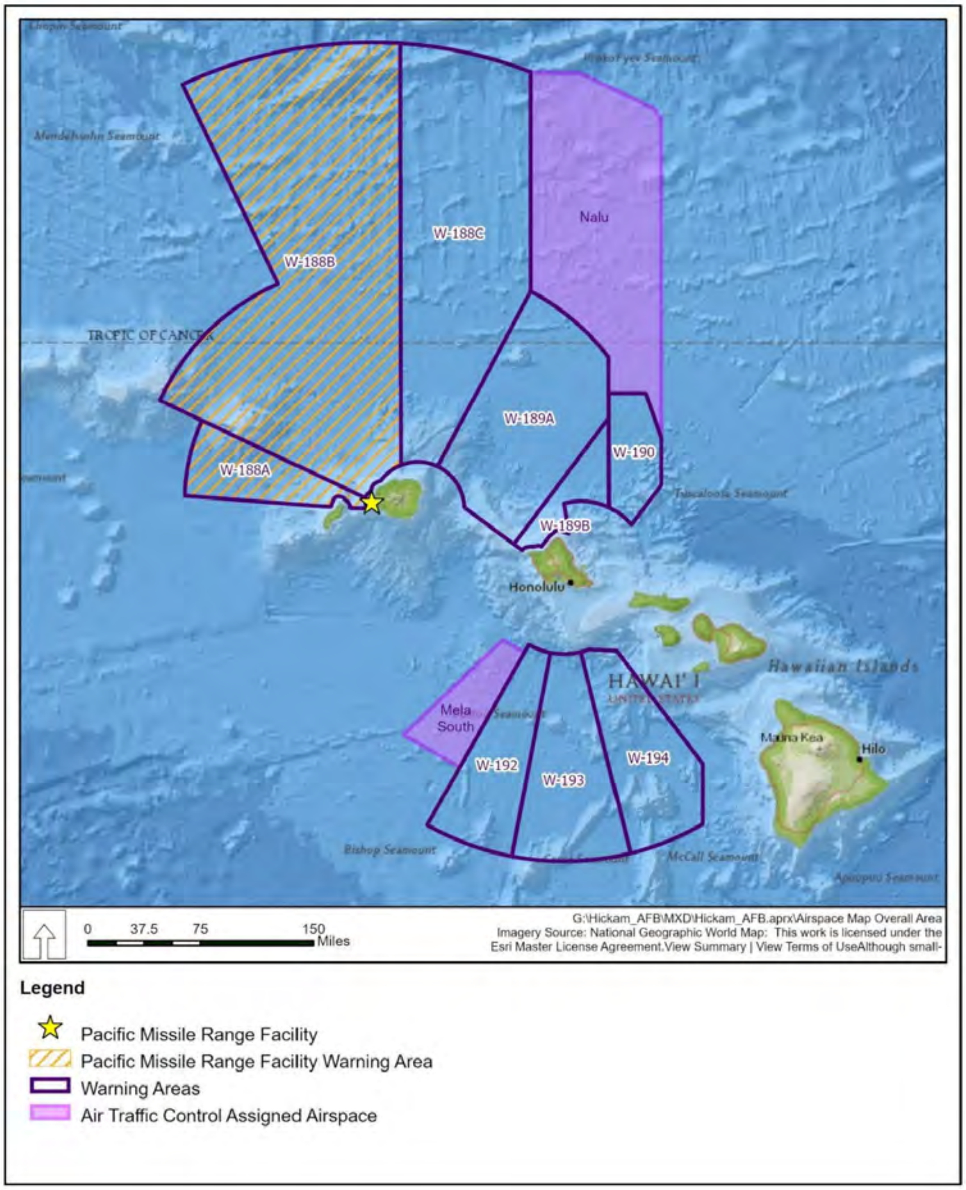
NOAA Fisheries. 2025a. Species Directory: Giant Manta Ray. <https://www.fisheries.noaa.gov/species/giant-manta-ray>. Accessed June 2025.

NOAA Fisheries. 2025b. Species Directory: Oceanic Whitetip Shark. <https://www.fisheries.noaa.gov/species/oceanic-whitetip-shark>. Accessed June 2025.

NOAA Fisheries. 2025c. Species Directory: Olive Ridley Turtle. <https://www.fisheries.noaa.gov/species/olive-ridley-turtle>. Accessed June 2025.

US Navy. 2018. Hawaii-Southern California Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement. October.

Attachment 2 –Special Use Airspace Proposed for Use

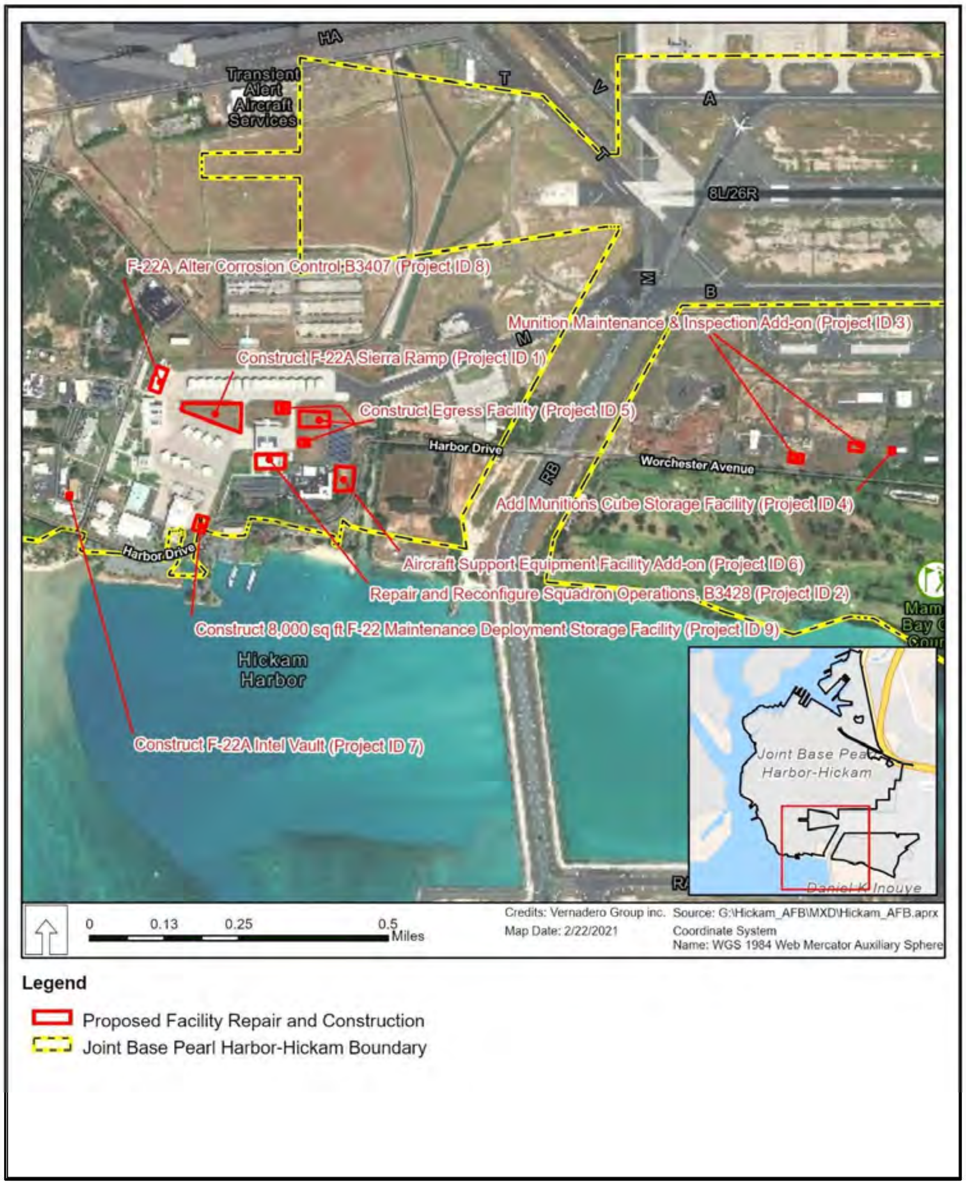


Attachment 3 – 154th Wing Proposed Project List

Project ID	Fiscal Year	Facility Title	Proposed Action
1	2022	F-22 Sierra Ramp	Construction and Repair
2	2022	Squadron Operations, Building 3428	Repair and Reconfigure
3	2022	Munition Maintenance and Inspection Add-on	Construction
4	2022	Add Munitions Cube Storage Facility	Construction
5	2022	Egress Facility	Construction
6	2022	Aircraft Support Equipment Facility Add-on	Construction
7	2022	F-22 Intel Vault	Construction
8	2022	F-22 Alter Corrosion Control Building 3407	Repair

*Note: Project ID 9, while illustrated on the attached map, is no longer under consideration.

Attachment 4 – Proposed Facility Construction and Repair Projects



NATIONAL GUARD BUREAU
3501 FETCHET AVENUE
JOINT BASE ANDREWS 20762-5157

23 July 2025

Kristi Kucharek
Plans and Requirements
Air National Guard Readiness Center, NGB/A4FR
3501 Fetchet Avenue
Joint Base Andrews, Maryland 20762

Ms. Dawn Golden
Assistant Regional Administrator
NMFS, Protected Resources Division
1845 Wasp Avenue, Building 176
Honolulu, Hawaii 96818

Dear Ms. Dawn Golden

In October 2018, Hurricane Michael hit the Florida panhandle, causing catastrophic damage to Tyndall Air Force Base (AFB), Florida, with some of the greatest damage to base hangars and flight operations buildings. As a result, Tyndall AFB was not able to support its two F-22A squadrons. The Department of the Air Force (DAF) has decided it would be most efficient to consolidate the F-22As from the operational squadron at Tyndall AFB into other operational F-22 squadrons, including the 199 FS. This consolidation may or may not be permanent depending on the outcome of other ongoing fighter force structure studies. The F-22 Formal Training Unit, which consists of the F-22 aircraft and T-38 Talon aircraft from Tyndall AFB, were also temporarily relocated to Eglin AFB, Florida, while the DAF considered their permanent assignment.

The National Guard Bureau (NGB) is proposing to permanently or temporarily integrate a total of seven Air Force F-22A Raptors from Tyndall Air Force Base, Florida, into the current fleet of the Hawaii Air National Guard 199th Fighter Squadron (199 FS), Joint Base Pearl Harbor-Hickam (JBPHH), Honolulu, Hawaii. This Proposed Action would increase the number of F-22A aircraft assigned to the 199 FS from 18 Primary Aerospace Vehicles Authorized (PAA) plus 2 Backup Aircraft Inventory (BAI) to 24 PAA plus three 3 BAI. The purpose of the Proposed Action is to permanently or temporarily integrate seven F-22A aircraft into JBPHH's current fleet. The Proposed Action is needed to ensure that these F-22A aircraft are located with an existing F-22 unit in order to maintain operational readiness. The NGB requests concurrence with a may affect but not likely to adversely affect determination for the blue whale (*Balaenoptera musculus*), Main Hawaiian Island insular false killer whale (*Pseudorca crassidens*), fin whale (*Balaenoptera physalus*), Hawaiian monk seal (*Monachus schauinslandi*), sei whale (*Balaenoptera borealis*), sperm whale (*Physeter macrocephalus*), Central North Pacific green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), leatherback turtle (*Dermochelys coriacea*), North Pacific Ocean loggerhead turtle (*Caretta caretta*), olive ridley turtle (*Lepidochelys olivacea*), giant manta ray (*Manta birostris*), and oceanic whitetip shark (*Carcharhinus longimanus*) per the Marine Mammal Protection Act (MMPA) in connection with Section 7 of the Endangered Species Act regarding the proposal to integrate the seven F-22A aircraft into the 199 FS at JBPHH.

Joint Base Pearl Harbor-Hickam Construction

Under the proposed action, the permanent or temporary assignment of the additional F-22A aircraft would require construction of new facilities and the repair of existing facilities (eight total projects) that would be located around the existing airfield and runway (Attachment 3). Projects would include the construction of additional ramp space and repair of deteriorated ramp pavement for the installation of additional sunshades; the construction of maintenance space for munitions, egress, and aircraft support equipment; construction of additional munitions storage, a new Intel vault; the repair and renovation Squadron Operations; and the conversion of the F-15 corrosion control facility to an F-22A paint facility (Attachment 4). These projects are planned for Fiscal Year 2025.

Activities at the locations proposed for new facilities may result in a minor, short-term increase in total suspended particulate matter (i.e., sedimentation) to nearby surface waters. Prior to construction activities, the Hawai'i Air National Guard (HIANG) would conduct jurisdictional wetland determinations and acquire a Clean Water Act Section 404 permit and associated Section 401 state water quality certification, if necessary, prior to filling of drainages. The total amount of land disturbance of the proposed construction projects is approximately 1.4 ac (60,060 ft^2), as such NPDES permit coverage for discharges of storm water associated with construction activities would be required. Prior to construction, the contractor would be required to prepare a Stormwater Pollution Prevention Plan (SWPPP) to manage stormwater associated with the construction activity and work with the NAVFAC Hawai'i Public Works Office to ensure compliance with the Base Stormwater Management Plan (SWMP) for pre- and post-construction activities. The SWPPP would include BMPs to minimize the potential for exposed soils or other contaminants from construction activities to reach surface waters. To minimize potential impacts, BMPs would be implemented during the construction period and include practices such as the installation of silt fences, storm drain inlet and outlet protection, and other appropriate standard construction practices. Filtration would control stormwater runoff and soil erosion from the site. The temporary and permanent conversion of existing pervious ground to impervious surfaces would be minor and within the capacity of the storm drainage system. No significant impacts from the implementation of the proposed action are expected due to construction activities or the addition of impervious surfaces. Additionally, no impacts on surface waters or jurisdictional waters are anticipated.

Hazardous materials and petroleum products such as fuels, flammable solvents, paints, corrosives, pesticides, deicing fluid, refrigerants, and cleaners are used throughout JBPHH for various functions including aircraft maintenance; aircraft ground equipment maintenance; and ground vehicles, communications infrastructure, and facilities maintenance. NAVFAC Hawai'i Environmental Services Hazardous Waste Disposal Branch supports and monitors environmental permits, HAZMAT, and hazardous waste storage, spill prevention and response. The proposed project in addition to other proposed projects on base would require compliance with the NAVFAC Hawai'i Hazardous Waste Management Plan as well as the Asbestos Management and

Operating Plan, as well as the 154 WG maintained Spill Prevention, Control, and Countermeasure Plan (NGB 2024). No significant, adverse impacts from hazardous materials and wastes, contaminated sites, and toxic substances are expected from the proposed action in combination with other reasonably foreseeable future actions.

Airspace and Flight Operations

The 199 FS is a component of the 154th Wing, stationed at JBPHH. The 199 FS is partnered with an active associate unit, from the active-duty Air Force's 15th Wing, which provides pilots and support personnel. The additional F-22A aircraft would add an estimated 405 annual sorties at JBPHH. This would result in an increase of less than 1 percent in the number of total operations at JBPHH. The additional F-22A aircraft would use the same special use airspace (SUA) currently utilized by the aircraft assigned to the 199 FS. The SUA includes offshore Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 and Air Traffic Control Assigned Airspace (ATCAA) Mela South and Nalu (Attachment 2). Approximately 150 personnel would be required to support the F-22A beddown at JBPHH, including pilots, maintenance, and support personnel.

Under the Proposed Action, the use of defensive countermeasures (e.g., chaff and flares) and ordnance (20-millimeter (mm) target practice (TP)) would continue. Aircraft would employ chaff and flares (RR-188 chaff and M206 flares or similar) during 100 percent of training sorties flown in the SUA as identified in **Table 1-1**. Chaff and flares can currently be dispensed in the SUA without altitude restrictions.

Table 1-1
Existing and Proposed Defensive Countermeasure Use by the Hawai'i Air National Guard

Special Use Airspace	Ordnance Type	Current Baseline Annual Use[1]	Total Estimated Future Annual Use[2]
Warning Areas W-188C, W-189A, W-189B, W-190, W-192, W-193, and W-194 Nalu and Mela South ATCAAs	Chaff Bundles	5,232	6,000
	Flares	7,848	7,000
W-193	20-mm TP ammunition	8,150	No change[3]

Notes:
1. Baseline countermeasure use is based on the Fiscal Year 2018 use by the 199th Fighter Squadron.
2. This reflects estimated additional countermeasure use for the F-22A plus-up when added to the baseline use.
3. No substantial increase in the use of 20-millimeter ammunition is expected.

ATCAA = Air Traffic Control Assigned Airspace; mm = millimeter(s); TP = target practice

The F-22A utilizes missiles or its 20-mm cannon in air-to-air engagements. Training for the use of these weapons is predominantly simulated, using its radar and targeting systems. 20-mmTP ammunition is a training cannon round comprised of a brass cartridge case, propellant powder with an electric primer, and a projectile composed of steel with an aluminum nose and a hollow body. The use of 20-mm TP ammunition is currently authorized for live-fire training activities and predominantly occurs in the southern portion of the Warning Area W-193. The existing and estimated additional 20-mm TP ammunition use is presented in Table 1-1. Launches of live missiles may occur once per year within the Pacific Missile Range Facility, but this would not increase under the Proposed Action.

Analysis of Effects on Threatened and Endangered Species

The action area consists of all areas to be affected directly or indirectly by the proposed NGB action and not merely the immediate area involved in the footprint. Therefore, the action area is JBPHH, the airspace proximate to the JBPHH airfield, and the Warning Areas and ATCAA over the Pacific Ocean north and south of the Island of Oahu where aircraft training operations would occur.

A review of the National Marine Fisheries Service (NMFS) Listed Species Lists, JBPHH Integrated Natural Resources Management Plan (Commander, Navy Installations Command [CNIC], 2012), and NMFS Informal Endangered Species Act Consultation on Joint Base Pearl Harbor Hickam Combat Air Forces Adversary Air Support (PIR-2020-00337; I-PI-20-1825-AG) (NMFS, 2020) identified the federally listed species with the potential to occur on or proximate to JBPHH and in the Warning Areas and ATCAA:

Protected Fish

- Giant manta ray (*Mobula birostris*) – Threatened
- Oceanic whitetip shark (*Carcharhinus longimanus*) – Threatened

Sea Turtles

- Central North Pacific green turtle (*Chelonia mydas*) – Threatened
- Hawksbill turtle (*Eretmochelys imbricata*) – Endangered
- Leatherback turtle (*Dermochelys coriacea*) – Endangered
- North Pacific Ocean loggerhead turtle (*Caretta caretta*) – Endangered
- Olive Ridley turtle (*Lepidochelys olivacea*) – Threatened

Marine Mammals

- Blue whale (*Balaenoptera musculus*) – Endangered
- Main Hawaiian Islands insular false killer whale (*Pseudorca crassidens*) – Endangered
- Fin whale (*Balaenoptera physalus*)– Endangered
- Hawaiian monk seal (Neomonachus schauinslandi) – Endangered
- Sei whale (*Balaenoptera borealis*) – Endangered
- Sperm whale (*Physeter macrocephalus*) – Endangered

Blue Whale. The blue whale is a baleen whale primarily feeding on krill that occurs globally and the largest animal to have ever lived on Earth. Females are slightly larger than males. Blue whales are listed as a federally endangered species. Blue whales inhabit all oceans and typically occur near the coast over the continental shelf; they have also been recorded in oceanic waters

(US Navy, 2018). The blue whale could occur in the Warning Areas and ATCAA with peak abundance in the winter.

False Killer Whale. The Main Hawaiian Islands Insular Stock Distinct Population Segment (DPS) of the false killer whale is listed as federally endangered. False killer whales feed primarily on deep sea cephalopods and fish and have been known to attack other cetaceans, including dolphins and large whales. This species is found regularly within Hawaiian waters and has been reported in groups of up to 100 and would occur in the Warning Areas and ATCAA (US Navy, 2018).

Fin Whale. The federally endangered fin whale has a v-shaped head and a tall, hooked dorsal fin that rises at a shallow angle from its back. It is the second largest whale species. The fin whale feeds by gulping a wide variety of organisms including small schooling fish, squid, and crustaceans (including krill). Fin whales are found in all of the world's oceans and could occur rarely in deep offshore waters in the Warning Areas and ATCAA (US Navy, 2018).

Hawaiian Monk Seal. The federally listed endangered Hawaiian monk seal is a pinniped, of the family Phocidae. Adult monk seals measure about 7 to 8 feet in length and weigh about 400 to 600 pounds with females often being larger than males. Mature Hawaiian monk seals are a silver or slate gray on their dorsal side and have a cream coloring on their stomach, chest, and throat. They feed on fish, cephalopods, and crustaceans. Current population estimates of Hawaiian monk seals indicate approximately 1,200 seals remaining. Haul-out areas for pupping, nursing, and resting are primarily sandy beaches, but virtually all substrates, including emergent reef and shipwrecks, are used at various islands. Hawaiian monk seals frequently haul out primarily on a sandy beach at Iroquois Point-Puʻuloa Beach (versus emergent reef across the Pearl Harbor Entrance Chanel from JBPHH); however, one seal has been observed hauled out in the vicinity of Marine Railway No. 2 at the Shipyard (CNIC, 2012) and could occur in the Warning Areas and ATCAA.

Sei Whale. The sei whale is mostly dark-gray in color with a lighter belly, often with mottling on the back. The major prey species for the sei whale are copepods and krill. Sei whales occur in very low population numbers. They typically occur in deep, oceanic waters of the cool temperate zone and prefer regions of steep bathymetric relief, such as the continental shelf break, canyons, or basins between banks and ledges. They occur in the warmer waters of the Warning Areas and ATCAA in the winter and have only been detected in the Hawaiian Islands on a few occasions (US Navy, 2018).

Sperm Whale. The sperm whale is the largest of the toothed whales and is distinguished by an extremely large head and a single blowhole located on the left side of its head (asymmetrical) near the tip. The sperm whale is mostly dark-gray, with some sperm whales having white patches on the belly. The sperm whale preys on large mesopelagic squids and other cephalopods, demersal fish, and benthic invertebrates. Sperm whales are globally distributed and occur in deep offshore waters. Sperm whales are listed as federally endangered. They occur in offshore waters of Hawaii during most of the year but do migrate to equatorial waters in the winter (US Navy, 2018).

Green Turtle. The Central North Pacific and East Pacific Ocean DPS green turtle occur in the Warning Areas and ATCAA. The green turtle has a smooth black, gray-green, brown, and yellow top shell and a yellowish-white bottom shell. Its diet consists mostly of seagrasses and algae. The green turtle was listed under the federal Endangered Species Act in July 1978. Similar to the loggerhead turtle, the green turtle is globally distributed, is the most common sea turtle in the waters of the main Hawaiian Islands and occurs in waters near JBPHH including the Pearl Harbor Entrance Channel and in the Warning Areas year round (US Navy, 2018; NMFS, 2025).

Hawksbill Turtle. The hawksbill turtle is a small- to medium-sized sea turtle, has the longest measured dive times of any sea turtle, and is omnivorous during its later juvenile stage, feeding on encrusting organisms such as sponges, tunicates, bryozoans, algae, mollusks, and a variety of other items such as crustaceans and jellyfish; however, older juveniles and adults are more specialized, feeding primarily on sponges, which comprise as much as 95 percent of their diet in some locations. Hawksbill sea turtles are migratory, and hatchlings may prefer the open ocean with juveniles returning to coastal habitats and nearshore foraging grounds (US Navy, 2018). The hawksbill turtle would occur in the Warning Areas and ATCAA.

Leatherback Turtle. The leatherback turtle is the largest and deepest-diving sea turtle. Leatherback turtles feed throughout the epipelagic and into the mesopelagic zones of the water column on gelatinous zooplankton such as cnidarians (jellyfish and siphonophores) and tunicates (salps and pyrosomas). Leatherback turtles' nest along the Pacific coast of the Americas and along the along the Indo-Pacific coastlines. Leatherback turtles could occur throughout the Warning Areas as they migrate across the Pacific past Hawaii. They are sighted in offshore waters typically beyond the 3,800-foot depth contour and especially off the southeastern end of the Hawaiian Islands (US Navy, 2018). Leatherback turtles could occur in the Warning Areas and ATCAA.

Loggerhead Turtle. Loggerhead turtles are the most abundant species of sea turtle found in US coastal waters. Loggerhead turtles have a top shell that is slightly heart-shaped and reddish-brown with a pale, yellowish bottom shell. Their diet primarily consists of whelks and conch. Loggerhead turtles are circumglobal, occurring throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Pelagic juveniles and feeding adults can occur in the Warning Areas and ATCAA as they use the entire North Pacific during development and as they make transoceanic crossing to and from nesting grounds in Japan (US Navy, 2018; NMFS, 2025).

Olive Ridley Turtle. The olive ridley turtle has a heart-shaped, grayish-green top shell and has a broad diet consisting of shrimp, fish, lobster, crabs, tunicates, mollusks, and algae. They are globally distributed. The olive ridley turtle was listed as threatened under the ESA in July 1978. This species is globally distributed and requires international protection. Cooperation between countries, as well as individual country initiative has led to various international treaties and agreements as well as federal laws for olive ridley sea turtle conservation (NOAA Fisheries, 2025c). The olive ridley turtle is known to occur in waters in the Warning Areas and ATCAA and has been documented to nest on the Hawaiian Islands three times (US Navy, 2018).

Giant Manta Ray. The giant manta ray, the largest ray in the world, is listed as threatened. It is a filter feeder and eats large quantities of zooplankton. Giant manta rays are migratory with small, highly fragmented populations that are sparsely distributed across the world. The main threat to the giant manta ray is commercial fishing, with the species both targeted and caught as bycatch in a number of global fisheries throughout its range (NOAA Fisheries, 2025a). The giant manta ray is found throughout the waters off of the Hawaiian Islands and large aggregations are known to occur along the Kona coast off the Big Island (US Navy, 2018). The giant manta ray does occur in the Warning Areas and ATCAA.

Oceanic Whitetip Shark. The oceanic whitetip shark is listed as threatened, found in tropical and subtropical oceans throughout the world, and long-lived and late maturing. They feed on a wide variety of bony fishes including mackerel and tuna as well as sea birds, sea turtles, stingrays, and squid. Their fins are highly valued in the international trade for shark products. This along with being caught as bycatch in commercial fisheries are the likely causes of their population declines (NOAA Fisheries, 2025b). The oceanic whitetip shark could be present in the Warning Areas and ATCAA.

There is no designated critical habitat on or immediately adjacent to JBPHH. Designated critical habitat for the Hawaiian monk seal includes the marine environment with a seaward boundary that extends from the 200-meter depth contour line (relative to mean lower low water), including the seafloor and all subsurface waters and marine habitat within 10 meters of the seafloor, through the water's edge 5 meters into the terrestrial environment. Designated critical habitat occurs in the Warning Areas W-188B and W-189B. The essential features for the conservation of the Hawaiian monk seal are the following:

- Terrestrial areas and adjacent shallow, sheltered aquatic areas with characteristics preferred by monk seals for pupping and nursing;
- Marine areas from 0 to 200 meters in depth that support adequate prey quality and quantity for juvenile and adult monk seal foraging; and
- Significant areas used by monk seals for hauling out, resting, or molting.

Critical habitat for the Main Hawaiian Island insular false killer whale includes the geographic area of the 45-meter depth contour to the 3,200-meter depth contour in waters that surround the Main Hawaiian Islands from Niihau east to the Island of Hawaii. Designated critical habitat occurs in the Warning Areas W-189A and W-189B. Critical habitat for the main Hawaiian Islands insular false killer whale consists of one essential feature comprised of four characteristics:

- Space for movement and use within shelf and slope habitat
- Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth;
- Waters free of pollutants of a type and amount harmful to Main Hawaiian Island insular false killer whales; and
- Sound levels that would not significantly impair Main Hawaiian Island false killer whales' use or occupancy.

The aircraft operations associated with the Proposed Action have the potential to effect federally listed species from aircraft movement, noise, and the use of defensive countermeasures.

Under the proposed action, there would be new construction activities resulting in additional noise at JBPHH. Noise generated by construction operations would be short-term due to the temporary nature of construction projects. Due to noise from the nearby active airfield, noise from construction operations would be expected to contribute only negligible increases to the overall JBPHH noise environment.

The proposed seven F-22A aircraft would use the same flight profiles and SUA as existing F-22A aircraft based at JBPHH under the proposed action. The addition of an estimated 405 operations is negligible, increasing the annual number of F-22 sorties by 14.7 percent and increasing overall airport operations by less than one percent. DAF flights at night would increase by approximately one sortie per year. The local squadron does not depart the airport after 10:00 p.m., but a small number of sorties do return after 10:00 p.m. There is no identifiable negative impact on current operations in the SUA when considering the proposed action in conjunction with existing military activity. All operations would be conducted and deconflicted in accordance with existing Using Agency operating procedures and scheduling instruction procedures and priorities.

The modeled 65- to 85-dBA DNL contours in 5-dBA increments for the daily flight events at JBPHH under the proposed action are summarized in Table 1-2. Additional requested noise analysis was sent over via DoD Safe on 23 June 2025. The proposed action noise contours are nearly identical to the existing conditions noise contours. Under the proposed action, the area within noise contours increases slightly (Attachment 5). These increases are unlikely to lead to significant impacts in these areas. This change is not expected to impact the operational capacity or necessitate changes to SUA locations or dimensions around JBPHH. No significant effects on the SUA around the airfield are expected as a result of this action.

Table 1-2
Proposed Action Day-Night Average Sound Level Area Affected on and Surrounding Joint Base Pearl Harbor-Hickam

Noise Level (dBA DNL)	Area Within Noise Contour (acres)		
	Existing	Proposed Action	Increase
>65	51,470	51,524	54
>70	28,004	28,031	27
>75	11,627	11,661	34
>80	4,821	4,841	20
>85	1,264	1,271	7

Notes:
dBA = A-weighted decibel(s); DNL = day-night average sound level

The additional F-22A operations at JBPHH would not substantially alter the noise environment around the airfield. Therefore, takeoffs and landings associated with the additional F-22A training would not change the noise environment at the Hawaiian monk seal haul-out area across the Pearl Harbor Entrance Channel from JBPHH. Further, these seals are habituated to aircraft movement as JBPHH. JBPHH and Daniel K. Inouye International Airport have been an active airfield for decades; therefore, additional takeoffs and landings by F-22A aircraft at JBPHH would have no effect on the Hawaiian monk seal. Aircraft movement from takeoffs and landings and training in the Warning Areas and ATCAA by the additional F-22A aircraft would not alter terrestrial areas and adjacent shallow, sheltered aquatic areas with characteristics preferred by monk seals for pupping and nursing, would not substantially alter monk seals' prey quality and quantity, and would not impact areas used by monk seals for hauling out, resting, or molting. Existing flight paths and AGLs, as seen in Attachment 6, would not change with the proposed action. These have been previously analyzed in the June 2020 Final Environmental Assessment Combat Air Forces Adversary Air Joint Base Pearl Harbor-Hickam, Hawaii (NGB, 2020). Therefore, the Proposed Action would have no effect on monk seal critical habitat.

It is highly unlikely that either aircraft movement or noise emissions, especially at higher altitudes, would elicit a response from marine mammals or sea turtles. Noise modeling of training operations for the additional F-22As determined that there would be no substantial change to the noise environment in the Warning Areas and ATCAA (including from sonic booms). Noise in water and even at the ocean surface from individual F-22A aircraft overflights would be brief as an aircraft passes overhead, and with aircraft training typically at altitudes above 3,000 feet, noise would not have the amplitude or duration to cause any physical damage to or mask biologically relevant sounds for marine mammals, sea turtles, and fish. Therefore, noise from the additional F-22A training would have no effect on the listed marine mammal species, sea turtles, and fish. Sonic booms from supersonic aircraft movement could cause a startle response by the listed species when they are present on the surface of the Pacific Ocean at the moment that a sonic boom occurred; however, sonic booms would be relatively rare events during training operations in the action area, sonic booms happen infrequently at any given location, and the sonic boom and post boom rumbling would be similar to what mammal species and sea turtles experience during a thunderstorm. Sonic booms from supersonic aircraft movement would therefore have no effect on listed species.

There is the potential for components of chaff and flares that remain after use to fall to the surface of the Pacific Ocean where they could be ingested by marine mammals, fish, and sea turtles. Chaff cartridges, chaff canisters, chaff components, and chaff and flare end caps and pistons would be released into the marine environment, where they would persist for long periods and could be ingested by marine wildlife while initially floating on the surface and sinking through the water column. In the very unlikely event that unconsumed chaff and flare components were encountered and ingested by a marine mammal, the small size of chaff and flare end-caps and pistons (i.e., 1.3-inch-diameter and 0.13-inch thick) would pass through the digestive tract of marine mammals; therefore, the use of defensive countermeasures may affect but is not likely to adversely affect marine mammals. Sea turtles could also ingest the end caps of chaff and flares. It is likely that small residual plastic components of chaff and flares would also pass through the digestive tract of mature sea turtles. Small plastic components could, however, cause digestive problems for sea turtles if ingested, but with the large area that would be utilized for additional F-22A training in the Warning Areas and ATCAA, it is highly unlikely that a sea turtle would encounter chaff and flare components; therefore, the use of chaff and flares over the

Pacific Ocean as a result of additional F-22A training may affect but is not likely to adversely affect sea turtles.

The giant manta ray and oceanic whitetip shark would not be seeking prey that would be similar to plastic end caps from chaff and flares. Also, they do not typically feed on the Pacific Ocean surface or seafloor where these plastic components would be most prevalent; however, there is still the possibility of an encounter between these fish species and the chaff and flare residual plastic components. Therefore, the use of defensive countermeasures by the additional F-22A training in the Warning Areas and ATCAA may affect but is not likely to adversely affect the giant manta ray and oceanic whitetip shark. The training operations in the Warning Areas and ATCAA by the additional F-22A aircraft would not alter the space for movement and use within insular false killer whale shelf and slope habitat, impact insular false killer whale prey species, add pollutants of a type and amount harmful to insular false killer whales, or cause increased sound levels that would impair insular false killer whales' use or occupancy of designated critical habitat. Therefore, there would be no effect on the Main Hawaiian Island insular false killer whale critical habitat from the Proposed Action.

We respectfully request your written concurrence with the NGB's determination of may affect but not likely to adversely affect for the blue whale, Main Hawaiian Island insular false killer whale, fin whale, Hawaiian monk seal, sei whale, sperm whale, Central North Pacific green turtle, hawksbill turtle, leatherback turtle, North Pacific Ocean loggerhead turtle, olive ridley turtle, giant manta ray, and oceanic whitetip shark; and no effect on the designated critical habitat for the Hawaiian monk seal and designated critical habitat for the insular false killer whale. Please send your concurrence to me at Kristi Kucharek, ATTN: F-22 JBPHH EA, 3501 Fetchet Avenue, Joint Base Andrews, MD 20762-5157 or by email at kristi.kucharek@us.af.mil with the subject line title ATTN: F-22 JBPHH EA.

Sincerely

Kristi L Kucharek

Kristi Kucharek, GS-14
Plans and Requirements

Four Attachments:

1. References
2. Special Use Airspace Proposed for Use
3. 154th Wing Proposed Project List for Use
4. Proposed Facility Construction and Repair Projects

Attachment 1 – References

CNIC. 2012. Joint Base Pearl Harbor-Hickam Integrated Natural Resources Management Plan. July.

NGB. 2020. Final Environmental Assessment Combat Air Forces Adversary Air Joint Base Pearl Harbor-Hickam, Hawaii. June 2020.

NGB. 2024. Final Spill Prevention, Control, and Countermeasure Plan 154th Wing at Joint Base Pearl Harbor-Hickam. 21 March 2024.

NMFS. 2025. Find a Species. <https://www.fisheries.noaa.gov/find-species>. Accessed June 2025.

NMFS. 2020. Informal ESA Consultation on Joint Base Pearl Harbor Hickam Combat Air Forces Adversary Air Support (PIR-2020-00337; I-PI-20-1825-AG).

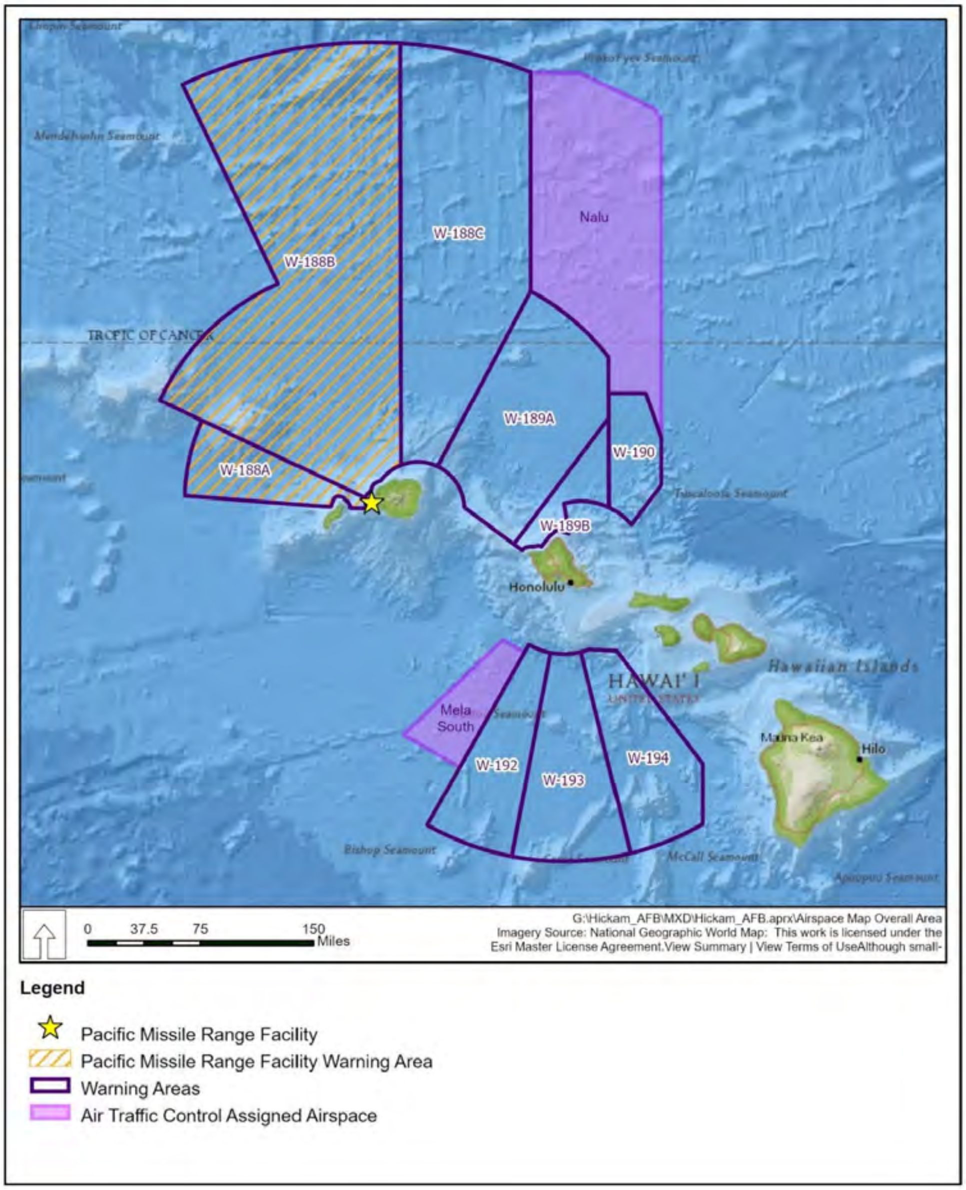
NOAA Fisheries. 2025a. Species Directory: Giant Manta Ray. <https://www.fisheries.noaa.gov/species/giant-manta-ray>. Accessed June 2025.

NOAA Fisheries. 2025b. Species Directory: Oceanic Whitetip Shark. <https://www.fisheries.noaa.gov/species/oceanic-whitetip-shark>. Accessed June 2025.

NOAA Fisheries. 2025c. Species Directory: Olive Ridley Turtle. <https://www.fisheries.noaa.gov/species/olive-ridley-turtle>. Accessed June 2025.

US Navy. 2018. Hawaii-Southern California Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement. October.

Attachment 2 –Special Use Airspace Proposed for Use

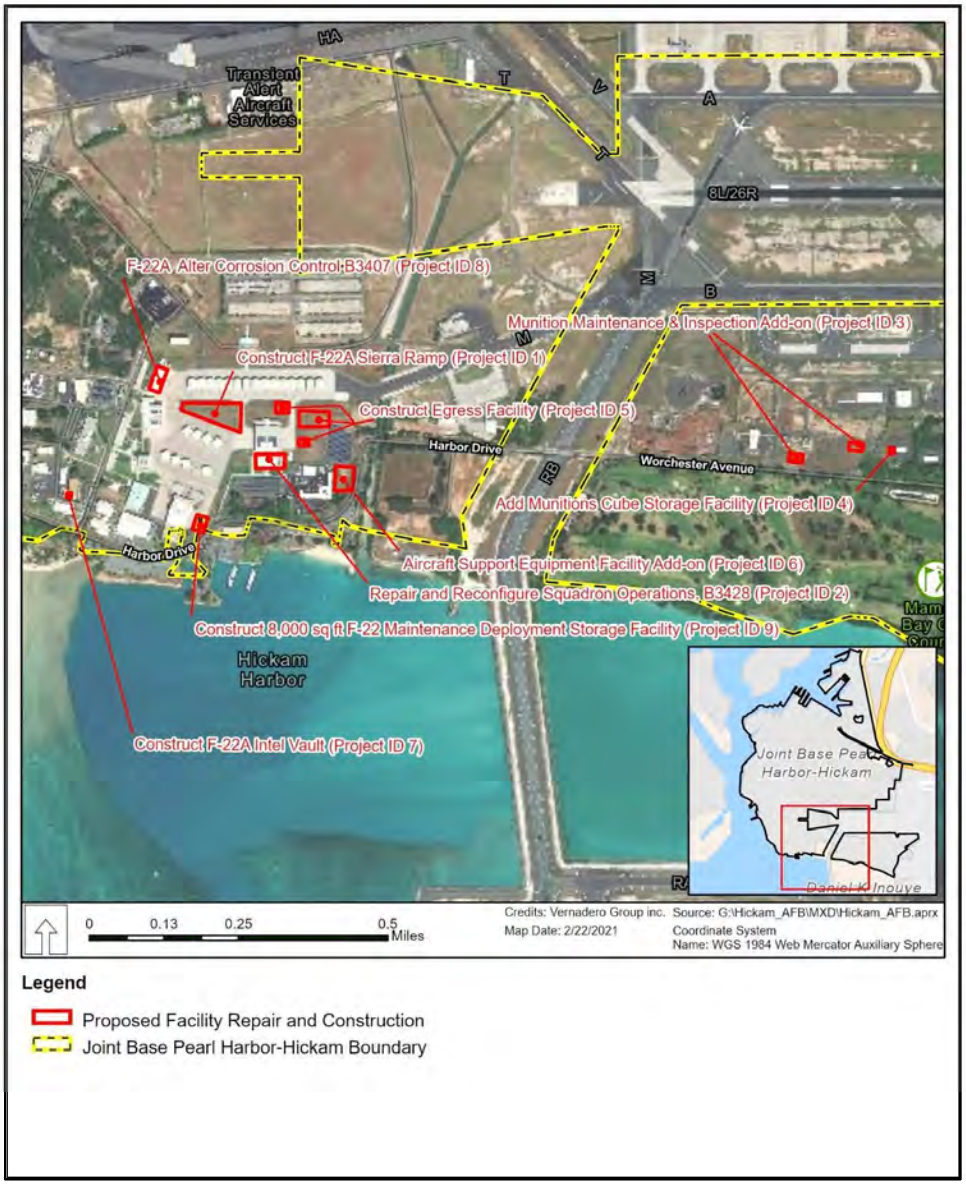


Attachment 3 – 154th Wing Proposed Project List

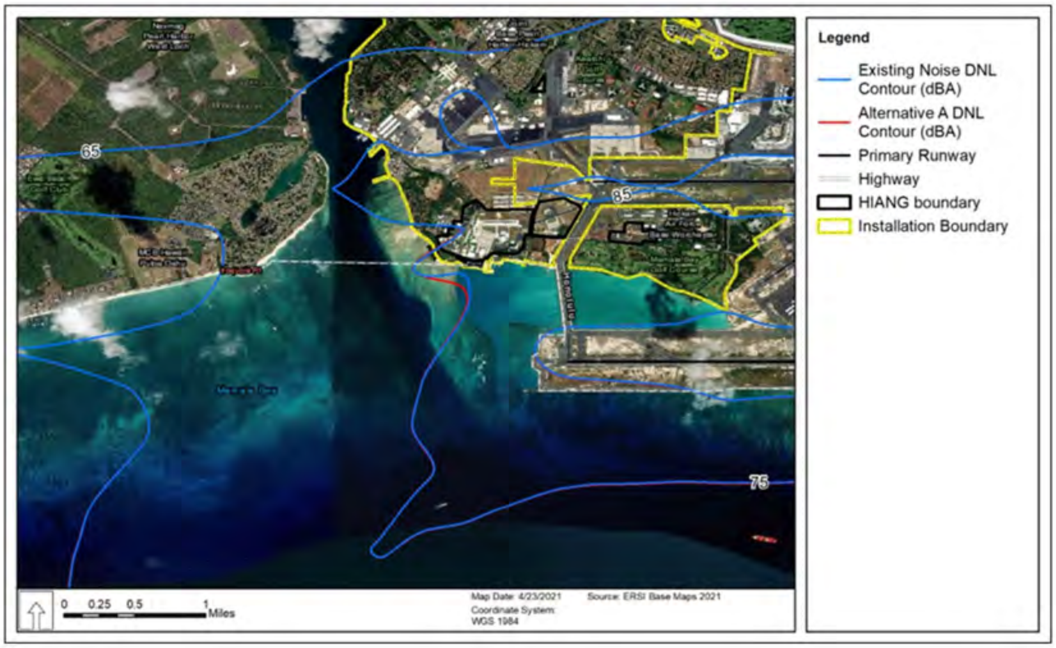
Project ID	Fiscal Year	Facility Title	Proposed Action
1	2022	F-22 Sierra Ramp	Construction and Repair
2	2022	Squadron Operations, Building 3428	Repair and Reconfigure
3	2022	Munition Maintenance and Inspection Add-on	Construction
4	2022	Add Munitions Cube Storage Facility	Construction
5	2022	Egress Facility	Construction
6	2022	Aircraft Support Equipment Facility Add-on	Construction
7	2022	F-22 Intel Vault	Construction
8	2022	F-22 Alter Corrosion Control Building 3407	Repair

*Note: Project ID 9, while illustrated on the attached map, is no longer under consideration.

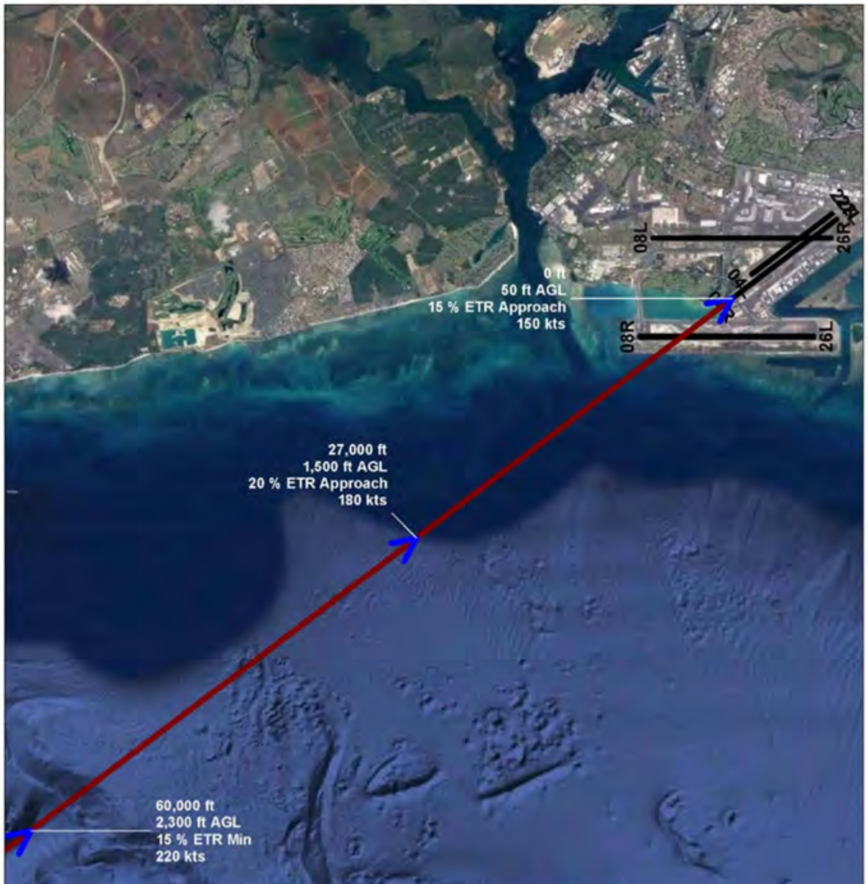
Attachment 4 – Proposed Facility Construction and Repair Projects



Attachment 5 – Comparison of Proposed Action and Existing Day-Night Average Sound Level Contours at Joint Base Pearl Harbor-Hickam



Attachment 6 – Flight Profiles for the 19th and 199th Fighter Squadron' F-22s



Flight Profile 04RA221

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	250,000	20,000 AGL	40 Min	350	-5.3 deg, -2680 fpm, 395 sec
b	60,000	2,300 AGL	15 Min	220	-1.4 deg, -490 fpm, 98 sec
c	27,000	1,500 AGL	20 Approach	180	-3.1 deg, -900 fpm, 97 sec
d	0	50 AGL	15 Approach	150	

Flight Profile 04RA221, BASED F-22 - STRAIGHT IN FROM PERLI AFTER 7PM
Based F-22
Flight Track: 4RA1 - STRAIGHT IN

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000

Scale in Feet 1:108,000 (1 inch = 9,020 feet)

N

NATIONAL GUARD BUREAU
3501 FETCHET AVENUE
JOINT BASE ANDREWS 20762-5157

17 June 2025

Kristi Kucharek
Plans and Requirements
Air National Guard Readiness Center, NGB/A4FR
3501 Fetchet Avenue
Joint Base Andrews, Maryland 20762

Dan Polhemus, Ph.D., Field Supervisor
US Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

Dear Dr. Polhemus

In October 2018, Hurricane Michael hit the Florida panhandle, causing catastrophic damage to Tyndall Air Force Base (AFB), Florida, with some of the greatest damage to base hangars and flight operations buildings. As a result, Tyndall AFB was not able to support its two F-22A squadrons. The Department of the Air Force (DAF) has decided it would be most efficient to consolidate the F-22As from the operational squadron at Tyndall AFB into other operational F-22 squadrons, including the 199 FS. This consolidation may or may not be permanent depending on the outcome of other ongoing fighter force structure studies. The F-22 Formal Training Unit, which consists of the F-22 aircraft and T-38 Talon aircraft from Tyndall AFB, were also temporarily relocated to Eglin AFB, Florida, while the DAF considered their permanent assignment.

The National Guard Bureau (NGB) is proposing to permanently or temporarily integrate a total of seven Air Force F-22A Raptors from Tyndall Air Force Base, Florida, into the current fleet of the Hawaii Air National Guard 199th Fighter Squadron (199 FS), Joint Base Pearl Harbor-Hickam (JBPHH), Honolulu, Hawaii. This Proposed Action would increase the number of F-22A aircraft assigned to the 199 FS from 18 Primary Aerospace Vehicles Authorized (PAA) plus 2 Backup Aircraft Inventory (BAI) to 24 PAA plus three 3 BAI. The purpose of the Proposed Action is to permanently or temporarily integrate seven F-22A aircraft into JBPHH's current fleet. The Proposed Action is needed to ensure that these F-22A aircraft are located with an existing F-22 unit in order to maintain operational readiness. The NGB requests concurrence with a may affect but not likely to adversely affect determination for the band-rumped storm-petrel (*Oceanodroma castro*), Newell's Townsend's shearwater (*Puffinus auricularis newelli*), and short-tailed albatross (*Phoebastria* [=*Diomedea*] *albatrus*) per Section 7 of the Endangered Species Act regarding the proposal to integrate the seven F-22A aircraft into the 199 FS at JBPHH.

The 199 FS is a component of the 154th Wing, stationed at JBPHH. The 199 FS is partnered with an active associate unit, from the active-duty Air Force's 15th Wing, which provides pilots and support personnel. The additional F-22A aircraft would add an estimated 405 annual sorties at JBPHH. This would result in an increase of less than 1 percent in the number of total operations at JBPHH. The additional F-22A aircraft would use the same airspace currently utilized by the aircraft assigned to the 199 FS. The Special Use Airspace includes offshore Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 and Air Traffic Control Assigned Airspace (ATCAA) Mela South and Nalu (Attachment 2). Under the Proposed Action, the use of countermeasure chaff and flares in all Warning Areas and ATCAA is proposed. Approximately 150 personnel would be required to support the F-22A beddown at JBPHH, including pilots, maintenance, and support personnel.

The assignment of the additional F-22A aircraft would require construction of new facilities and the repair of existing facilities that would be located around the existing airfield and runway (Attachment 3). Projects would include the construction of additional ramp space and repair of deteriorated ramp pavement for the installation of additional sunshades; the construction of maintenance space for munitions, egress, and aircraft support equipment; construction of additional munitions storage; a new Intel vault; the repair and renovation Squadron Operations; and the conversion of the F-15 corrosion control facility to an F-22A paint facility (Attachment 4). These projects are planned for Fiscal Year 2025 and beyond.

A review of the JBPHH Integrated Natural Resources Management Plan (Commander, Navy Installations Command [CNIC], 2012), Final Flora and Fauna Survey Report for the 154 Wing, F-22A Aircraft Plus-Up, Joint Base Pearl Harbor-Hickam (HIANG, 2021), and United States (US) Fish and Wildlife Service (USWFS) Information for Planning and Consultation website identified the federally listed species with the potential to occur on or proximate to JBPHH and in the Warning Areas and ATCAA:

Mammals

- Hawaiian hoary bat (*Lasiurus cinereus semotus*) – Endangered

Birds

- Band-rumped storm-petrel (*Oceanodroma castro*) – Endangered
- Hawaiian black-necked stilt (*Himantopus mexicanus knudseni*) – Endangered
- Hawaiian common gallinule (*Gallinula galeata sandviciensis*) – Endangered
- Hawaiian coot (*Fulica alai*) – Endangered
- Hawaiian duck (*Anas wyvilliana*) – Endangered
- Hawaiian petrel (*Pterodroma sandwichensis*) - Endangered
- Iiwi (*Drepanis coccinea*) – Threatened
- Newell's Townsend's shearwater (*Puffinus newelli*)– Threatened
- Oahu elapio (*Chasiempis ibidis*) - EndangeredShort-tailed albatross (*Phoebastria [Diomedea] albatrus)*– Endangered

Plants

- ʻakoko (*Euphorbia celastroides var. kaenana)*– Endangered
- ʻakoko (*Euphorbia skottsbergii var. skottsbergii)*– Endangered
- ʻenaʼena (*Pseudognaphalium sandwicensium var. molokaiense*) - Endangered
- Carter's Panicgrass (*Panicum fauriel var. carteri*) - Endangered
- Ihi (*Portulaca villosa*) - Endangered

- Ohai (*Sesbania tomentosa*) – Endangered
- Popolo (*Solanum nelsonii*) – Endangered
- Oahu creeper (*Paroreomyza maculata*) – Endangered
- Kauila (*Colubrina oppositifolia*) – Endangered

Reptiles
- Green sea turtle (*Chelonia mydas*) – Threatened
- Hawksbill sea turtle (*Eretmochelys imbricata*) – Endangered

Band-Rumped Storm-Petrel. The band-rumped storm-petrel Hawaiian Distinct Population Segment is federally and state listed endangered. The band-rumped storm-petrel breeds on Kauai, Maui, the island of Hawaii, and Lehus, at elevations of 2,000 feet or higher. This petrel forages over water and feeds on small fish, squid, and crustaceans, primarily while sitting on the water or dipping prey while flapping. It is the smallest and rarest of sea birds to breed in Hawaii (Hawaii Department of Land and Natural Resources [DLNR], 2025c). The band-rumped storm-petrel would not occur at JBPHH but could be present in the Warning Areas and ATCAA while foraging.

Hawaiian Black-Necked Stilt. Hawaiian black-necked stilts (also known as Hawaiian stilts) are federally listed endangered, endemic, slim, wading birds that can be found along the shoreline, estuarine, and freshwater habitats of Pearl Harbor including JBPHH. They primarily feed on insects and crustaceans. In Pearl Harbor, the primary stilt habitat includes the Honouliuli and Waiawa Units of the Pearl Harbor National Wildlife Refuge, as well as other shallow mudflats along the intertidal areas of Pearl City Peninsula and Naval Magazine Pearl Harbor West Loch Branch (CNIC, 2012).

Hawaiian Common Gallinule. Hawaiian common gallinules are federally listed endangered, endemic, small, black waterbirds that can be found along the shoreline, estuarine, and freshwater habitats of Pearl Harbor including JBPHH. They are opportunistic feeders, and their diet varies with habitat but may include algae, grass seeds, plant material, insects, and snails. Hawaiian common gallinules are very secretive and, thus, are hard to monitor. Population estimates indicate there are up to 300 common gallinules in existence (CNIC, 2012).

Hawaiian Coot. Hawaiian coots are federally listed endangered, endemic, plump, chicken-like birds that can be found along the shoreline, estuarine, and freshwater habitats of Pearl Harbor including JBPHH. The species is somewhat gregarious and uses freshwater and brackish wetlands, including agricultural (e.g., taro fields) wetlands and aquaculture ponds. They have a broad diet that includes snails, crustaceans, insects, small fish, tadpoles, leaves, and seeds. Nesting habitats includes freshwater and brackish ponds, irrigation ditches, and taro fields. Floating nests are constructed of aquatic vegetation and found in open water or anchored to emergent vegetation (CNIC, 2012).

Hawaiian Duck. The Hawaiian duck is a federally listed endangered, endemic waterbird that historically was found along the shoreline, estuarine, and freshwater habitats of Pearl Harbor. They were generally observed in the Honouliuli and Waiawa Units of the Pearl Harbor National Wildlife Refuge and at the mouth of streams that flow into the harbor. They primarily feed on freshwater vegetation, insects, and mollusks. Biologists believe that the Hawaiian duck has largely been replaced with a hybrid between the Hawaiian duck and mallard. State waterbird biannual survey efforts indicate that the hybridized duck numbers do dominate the Island of Oahu; however, as recently as 2005, a Hawaiian duck was documented on Oahu, through genetic testing, as result of an airstrike incident with a commercial airliner at Daniel K. Inouye International Airport (HNL; CNIC, 2012).

Hawaiian Hoary Bat. The Hawaiian hoary bat is both federally and state listed as endangered. It is the only native terrestrial mammal to Hawaii and have a wingspan of approximately 1 foot. Based on limited information about the species and its habitat requirements, roosting has typically been observed in native and nonnative vegetation. They forage just before or after sunset and feed on flying insects. Only specimen records exist for the island of Oahu and this species may be extirpated from Oahu (Hawaii DLNR, 2025b). It is highly unlikely that this species would occur at JBPHH as there are no recent observation records from Oahu.

Iiwi. The iiwi is a Hawaiian forest bird, federally listed as threatened and state listed as endangered, and found primarily in closed canopy, montane wet or montane mesic forests of tall stature, dominated by native ohia trees (*Metrosideros polymorpha*) or both ohia and koa trees (*Acacia koa*). Iiwi are nectarivorus and feed primarily on flowering ohia; ohia trees are also used for nesting (USFWS, 2016). Iiwi occur above 4,100 feet on the islands of Hawaii, Maui, and Kauai and at reduced densities below 3,300 feet. Three small, isolated populations occur on Oahu, and a relict population occurs on Molokai (Hawaii DLNR, 2025a). The iiwi would not be expected to occur at JBPHH.

Kauila. Kauila is a flowering tree in the Rhamnaceae (buckthorn) family. It is federally listed as endangered. It is 16 to 43 feet tall, has opposite, stalked, oval, thin, pinnately veined, toothless leaves. It has between 10 and 12 bisexual flowers clustered at the end of a main stalk; each flower has a stalk which elongates in fruit. The small fruit is similar to a capsule and opens explosively when mature (USFWS, 2025b). The kauila was not observed during the January 2021 biological resources surveys of the proposed facility project areas at JBPHH and is not expected to occur at JBPHH.

Newell's Townsend's Shearwater. The Newell's Townsend's shearwater is a medium-sized shearwater with a glossy black top, a white bottom, and a black bill that is sharply hooked. They live in open tropical seas and offshore waters near breeding grounds where they plunge-dive for prey such as squid and fish. During the breeding season, they nest in burrows under ferns on forested mountain slopes. They forage over the open ocean. The primarily occur in the southern portion of the Hawaiian Islands but could be present in all of the Warning Areas and ATCAA (US Navy, 2018).

Oahu Creeper. The Oahu creeper is a small bird that is both federally and state listed as endangered and is endemic to Oahu. Female birds are gray to grayish green above and yellowish white below, and usually have white wingbars. Males are olive-green above and golden yellow below and do not have wingbars. The Oahu creeper feeds exclusively on insects and probes the bark of large tree branches and tree trunks for insects. The Oahu creeper has not been sighted since 1985 and is likely extinct (Hawaii DLNR, 2025d; USFWS, 2025b). The Oahu creeper would not be expected to occur at JBPHH.

Oahu Elapaio. The Oahu elapaio is a small monarch flycatcher that is both federally and state listed as endangered. The Oahu elapaio is endemic to Oahu at the subspecies level. They are dark brown above and white below, with light brown streaks on their breast. They primarily feed on arthropods by flycatching. Oahu elepaio occur in the Koʻolau Range from 325 to 1,800 feet and in the Waiʻanae Range between 1,625 to 2,775 feet (Hawaii DLNR, 2025e; USFWS 2025b). The Oahu elapaio would not be expected to occur at JBPHH.

Short-Tailed Albatross. The short-tailed albatross is a large, white seabird with a 7-foot wingspan, black and white wings, and a large, pink bill. It forages across the entire North Pacific, but its nesting habitat is isolated to islands in Japan. Its diet consists of squid, fish, and shrimp. Currently, the short-tailed albatross population is estimated at approximately 1,200 individuals. Of these, the total number of breeding age birds is thought to be approximately 600 individuals. At-sea sightings since the 1940s indicate that the short-tailed albatross, while very few in number today, is distributed widely throughout its historical foraging range of the temperate and subarctic North Pacific Ocean and often found close to the US coast (USFWS, 2015a). The short-tailed albatross could travel and forage in the Warning Areas and ATCAA.

ʻakoko (*var. kaenana*). ʻakoko var. kaenana, is a low-growing or upright shrub up to 5 ft tall with milky sap. The leaves, which fall off during the dry season, are-mostly hairless and are arranged in two opposite rows along the stem; 0.8 to 2.6 in long and 0.3 to 0.8 in wide, being widest at the tip. Flower clusters (cyathia) are crowded on small side branches, and each produces a small erect capsule. Seeds are small, spherical, and gray or white. (USFWS, 2025b) The ʻakoko var. kaenana was not identified during surveys at JBPHH (HIANG, 2021).

ʻakoko (*var. skottsbergii*). ʻakoko var. skottsbergii is a perennial, erect to prostrate shrub 0.5 ft to 3.3 ft tall (occasionally reaching (6.6 ft, with brittle, slender, jointed branches that are minutely hairy, especially when young. The opposite, two-ranked, oval leaves are 0.5 to 0.8 in long and 0.1 to 0.5 in wide, often with toothed margins, and have a hairless upper surface. Each cyathium (flower cluster resembling a single flower) is situated singly in a leaf axil and consists of a female flower made up of one pistil surrounded by several male flowers, each with a single stamen. The green capsules are 0.06 to 0.08 in in length with a curved stalk, and open to release gray to brown seeds 0.04 to 0.05 in long. (USFWS, 2025b) The ʻakoko var. skottsbergii was not identified during surveys at JBPHH (HIANG, 2021).

ʻena'ena. ʻena'ena, a perennial herb in the Asteraceae (sunflower) family, is 4 to 26 in tall. The woolly erect to prostrate stems are 4 to 12 in long and olive green to white or gray in color. Leaves are spatulate to narrowly obovate, the lower ones usually 0.3 to 0.8 in wide, with only the tips of the whitish to pale yellow involucral bracts (below the flower) exposed, the remainder densely woolly. Yellow flower heads are 0.06 to 0.3 in in diameter, arranged in terminal, corymbose (flat-topped) or sometimes nearly spherical, leafless, or nearly leafless clusters. Fruit and seeds are not described. ʻena'ena is very densely woolly over the entire plant, and this is a distinguishing feature among the other varieties of this species. (USFWS, 2025b) The ʻena'ena was not identified during surveys at JBPHH (HIANG, 2021).

Carter's Panicgrass. Carter's Panicgrass is a low, tufted annual grass that is 0.8 to 11.8 in tall. The stem, leaf, and inflorescence morphology are uniform in the Panicum fauriei complex, which includes two additional varieties; P. fauriei var. fauriei and P. fauriei var. latius. The aerial stems are usually branched and puberulent. The leaves are attached to the stem above the ground. The blades are 0.6 to 4.8 in long and 0.04 to 0.2 inches wide, loosely involute, upper surface pilose (long hairs), lower surface puberulent (short hairs). The flowers are arranged in a tightly branched inflorescence which is 0.4 to 4.3 in long. The axis and branches of the inflorescence are puberulent to sparsely pilose (short to longer hairs). The recognition of three varieties is based on spikelet morphology, particularly glume length and pubescence. (USFWS, 2025b) Carter's Panicgrass was not identified during surveys at JBPHH (HIANG, 2021).

Ihi. Ihi is a perennial succulent herb in the Portulacaceae (purslane) family, with a fleshy to woody, tuberous taproot. Stems are prostrate to weakly ascending and can extend outward approximately 1 ft in length. Leaves are pale grayish green, narrowly oblanceolate (longer than wide, widest toward the tip) to linear and subterete (somewhat cylindrical). Leaves are approximately 0.2 to 1 in long and 0.06 to 0.1 in wide, sessile, with a dense tuft of yellowish brown hairs in the leaf axil, 0.04 to 0.5 in long. Flowers are white, pink, or pink with a white base. Flowers are clustered (3 to 6) in dense, terminal, head-like cymes subtended by dense tufts of hairs 0.2 to 0.5 in long and a series of involucrate leaves (below the flower) with bracteoles (stalked bracts) approximately 0.06 in long; petals obovate, 0.3 to 0.4 in long; sepals 0.16 to 0.2 in long with thin, dry, somewhat translucent membranous margins; stamens 18 to 50; style 5- to 7- or 8-branched. Capsules are broadly ovoid, 0.1 to 0.2 in long. Seeds are dark reddish brown, 0.02 to 0.03 in long, with a stellulate-rugose (star-shaped-wrinkled) surface. (USFWS, 2025b) The Ihi was not identified during surveys at JBPHH (HIANG, 2021).

Ohai. Ohai, a member of the in the pea family (Fabaceae), is usually an erect to prostrate shrub and sometimes a small, erect tree. When prostrate, the branches are up to 45 ft long. Trees are 8.2 to 20.0 ft tall. Each compound leaf consists of 18 to 38 oblong to elliptic leaflets, each 0.6 to 1.5 in long and 0.2 to 0.7 in wide, and is usually sparsely to densely covered with silky hairs. Flowers are salmon tinged with yellow, orange red, scarlet, or pure yellow (USFWS, 2025b). The ohai was not identified during surveys at JBPHH (HIANG, 2021).

Popolo. Popolo, a member of the nightshade family (Solanaceae), is a sprawling or trailing shrub which grows up to 3.3 ft tall, forming clumps up to 4.9 ft in diameter. Young stems and leaves are densely pubescent (hairy) and do not have spines. Leaves are grayish green, have entire margins (edges continuous, not notched), are arranged alternately along the stems, and are broadly ovate. Flowers are perfect (have both male and female organs) and have a white tubular corolla that is tinged with lavender to pale purple. Round berries are usually black when mature with numerous seeds (USFWS, 2025b) The popolo was not identified during surveys at JBPHH (HIANG, 2021).

Construction Activities

Under the Proposed Action, ground-disturbing activities would be limited to highly disturbed and previously developed areas near the JBPHH flightline. There is no suitable terrestrial habitat at JBPHH for any federally listed species nor have any federally listed species been identified as documented in the 2021 JBPHH Final and Fauna Surveys (HIANG, 2021). The entire base is developed and located in urban Honolulu. Further, no wetland or aquatic habitats suitable for any federally listed species would be indirectly disturbed by facility construction and repair projects. Therefore, none of the proposed facility construction and repair, or aircraft maintenance and operation activities at the proposed new facilities would affect federally listed species.

Airspace Activities

Under the Proposed Action, potential impacts on federally listed species would be associated with aircraft operations at JBPHH and in the Warning Areas and ATCAA. The aircraft operations associated with the Proposed Action have the potential to effect federally listed species from aircraft movement, the use of defensive countermeasures, noise, or bird/wildlife aircraft strikes. The Hawaiian hoary bat, iiwi, kauila, Oahu creeper, and Oahu elapaio do not occur on JBPHH or in the Warning Areas and ATCAA and therefore would not be affected by the Proposed Action. Of the listed species potentially occurring in the project area, seven federally listed bird species could be impacted by the Proposed Action: band-rumped storm-petrel, Hawaiian black-necked stilt, Hawaiian common gallinule, Hawaiian coot, Hawaiian duck, Newell's Townsend's shearwater, and short-tailed albatross.

Federally listed species that occur in estuarine and coastal habitats proximate to JBPHH could potentially be affected by aircraft movement. The Hawaiian black-necked stilt is common in coastal wetland areas at JBPHH and has been observed in ditches near the airfield. Hawaiian duck X mallard (*Anas platyrhynchos*) hybrids, and potentially Hawaiian ducks, are also frequently observed in ponding areas around base. The Hawaiian common gallinule and Hawaiian coot have been observed in wetlands and aquatic habitats on JBPHH; however, additional takeoffs and landings at JBPHH would have no effect on the Hawaiian duck, Hawaiian black-necked stilt, Hawaiian common moorhen, and Hawaiian coot, which could occur in coastal areas near JBPHH, as there would be no increased noise in the very limited habitats where these species could occur. Although a Hawaiian duck was struck by a commercial aircraft at HNL (which shares runways with JBPHH), it has been over 15 years since that reported commercial aircraft strike, and most Hawaiian ducks on Oahu are hybrids with mallard ducks that are not protected. The Hawaii Air National Guard would implement bird/wildlife aircraft strike hazard measures to minimize the risk of bird strikes, and the Recovery Plan for Hawaiian Waterbirds (USFWS, 2011) does not list bird aircraft strikes as a threat to the Hawaiian duck or any other listed waterbird. Further, if these bird species were under the approach and departure flight patterns for JBPHH and HNL during the additional F-22A operations, they would be habituated to aircraft movement and associated noise, and the additional F-22A operations would make up a very small fraction of overall aircraft operations at the airfield. Therefore, there would be no effect from the additional F-22A operations on the Hawaiian common gallinule, Hawaiian coot, Hawaiian duck, and Hawaiian black-necked stilt.

Aircraft movement at low altitudes in the Warning Areas could have a startle effect on the band-rumped storm-petrel, short-tailed albatross, and Newell's Townsend's shearwater if these species would be present at a distance from F-22A aircraft operations where aircraft would be visible. Although current military aircraft training operations similar to the proposed additional F-22A sorties currently occur in the Warning Areas and ATCAA, the movement of fighter aircraft at low altitudes in the Warning Areas could potentially startle migrating and feeding petrels, albatross, and shearwaters; therefore, additional F-22A aircraft movement in the Warning Areas may affect but is not likely to adversely affect these species.

The components of chaff and flares have been found to have low toxicity and do not accumulate or magnify in food webs; chaff fibers are too large to be inhaled; and human health assessments have found the products from flare combustion to not have significant adverse effects, which is likely applicable to other species (Air Force, 1997); however, the use of chaff and flares in the Warning Areas and ATCAA could produce small amounts of ingestible material, such as plastic caps and pistons, and these could fall to the ocean surface where they could be ingested by birds. Chaff cartridges, chaff canisters, chaff components, and chaff and flare end caps and pistons would be released into the marine environment, where they would persist for long periods and could be ingested by marine wildlife while initially floating on the surface and sinking through the water column. Bird species could potentially encounter chaff and flare components on the Pacific Ocean surface while foraging. Some species of seabirds are known to ingest plastic when it is mistaken for prey (Auman et al., 1997; Yamashita et al., 2011; Provencher et al., 2014). The ingestion of plastic such as chaff and flare compression pads or pistons by birds could cause gastrointestinal obstructions or hormonal changes leading to reproductive issues (Provencher et al., 2014). Unless consumed plastic pieces are regurgitated, the chaff and flare compression pads or pistons could cause digestive tract blockages and eventual starvation and be lethal to birds foraging on the Pacific Ocean surface; however, based on the available information, it is not possible to accurately estimate actual ingestion rates or responses of individual bird species (Moser and Lee, 1992). For example, it is possible that these bird species will not mistake these plastic components for prey and mistakenly consume them. Regardless, the majority of these chaff and flare plastic components would fall through the water column (Navy, 2011) and would not remain on the surface of the Pacific Ocean where a foraging bird would encounter and consume the plastic pieces. Although the Warning Areas and ATCAA are large, only a relatively small amount of chaff and flares are proposed for use annually during additional F-22A training, and residual plastic chaff and flare components would sink from the Pacific Ocean surface to the ocean floor. The band-rumped storm-petrel, Newell's Townsend's shearwater, and short-tailed albatross forage exclusively across the ocean surface and some of these materials could be consumed by seabirds if they would be present when defensive countermeasures are being used during training operations. Therefore, the use of defensive countermeasures during additional F-22A training in the Warning Areas may affect but is not likely to adversely affect the band-rumped storm-petrel, Newell's Townsend's shearwater, and short-tailed albatross.

We respectfully request your written concurrence with the NGB's determination of no effect on Hawaiian common gallinule, Hawaiian coot, Hawaiian duck, Hawaiian black-necked stilt, Hawaiian hoary bat, Iiwi, kauila, Oahu creeper, Oahu elepaio and may affect but is not likely to adversely affect the band-rumped storm-peterl, Newell's Townsend's shearwater, and short-tailed albatross. Please send your concurrence to me at Kristi Kucharek, ATTN: F-22 JBPHH EA, 3501 Fetchet Avenue, Joint Base Andrews, MD 20762-5157 or by email at kristi.kucharek@us.af.mil with the subject line title ATTN: F-22 JBPHH EA.

Sincerely

Kristi Kucharek, GS-14
Plans and Requirements

Four Attachments:
1. References
2. Special Use Airspace Proposed for Use
3. 154th Wing Proposed Project List for Use
4. 154th Wing Area of Potential Effects

Attachment 1 – References

Air Force. 1997. *Environmental Effects of Self-protection Chaff and Flares: Final Report.* Prepared for Headquarters Air Combat Command, Langley Air Force Base, Virginia.

Auman, H. J., J. P. Ludwig, J. P. Giesy, and T. Colborn. 1997. *Plastic Ingestion by Laysan Albatross Chicks on Sand Island, Midway Atoll, in 1994 and 1995. In* G. Robinson and R. Gales (Eds.), Albatross Biology and Conservation, pp. 239–244. Surrey Beatty and Sons, Chipping Norton.

CNIC. 2012. *Joint Base Pearl Harbor-Hickam Integrated Natural Resources Management Plan.* July.

HIANG. 2021. *Final Flora and Fauna Survey Report for the 154 Wing, F-22A Aircraft Plus-Up, Joint Base Pearl Harbor-Hickam, Hawaii.* May.

Hawaii DLNR. 2025a. *'I'iwi Fact Sheet.* https://dlnr.hawaii.gov/wildlife/hswap/fact-sheets/. Accessed June 2025.

Hawaii DLNR. 2025b. *'Ope'ape'a or Hawaiian Hoary Bat Fact Sheet*. https://dlnr.hawaii.gov/wildlife/hswap/fact-sheets/. Accessed June 2025.

Hawaii DLNR. 2025c. *'Ake'ake or Band-rumped Storm-petrel Fact Sheet.* https://dlnr.hawaii.gov/wildlife/hswap/fact-sheets/. Accessed June 2025.

Hawaii DLNR. 2025d. *'Alauahio or O'ahu Creeper Fact Sheet.* https://dlnr.hawaii.gov/wildlife/hswap/fact-sheets/. Accessed June 2025.

Hawaii DLNR. 2025e. *O'ahu 'Elepaio Fact Sheet*. https://dlnr.hawaii.gov/wildlife/hswap/fact-sheets/. Accessed June 2025.

Moser, M.L., and D.S. Lee. 1992. *A Fourteen-Year Survey of Plastic Ingestion by Western North Atlantic Seabirds*. Colonial Waterbirds 15(1):83–94.

Provencher, J., A. Bond, A. Hedd, W. Montevecchi, S. Muzaffar, S. Courchesne, H. Gilchrist, S. Jamieson, F. Merkel, K. Falk, J. Durinck, and M. Mallory. 2014. *Prevalence of Marine Debris in Marine Birds from the North Atlantic.* Marine Pollution Bulletin 84:411–417.

US Navy. 2011. *Gulf of Alaska Naval Training Activities Final Environmental Impact Statement/Overseas Environmental Impact Statement.* March.

USFWS. 2011. *Recovery Plan for Hawaiian Waterbirds, Second Revision.* Region 1, Portland, Oregon. 28 October.

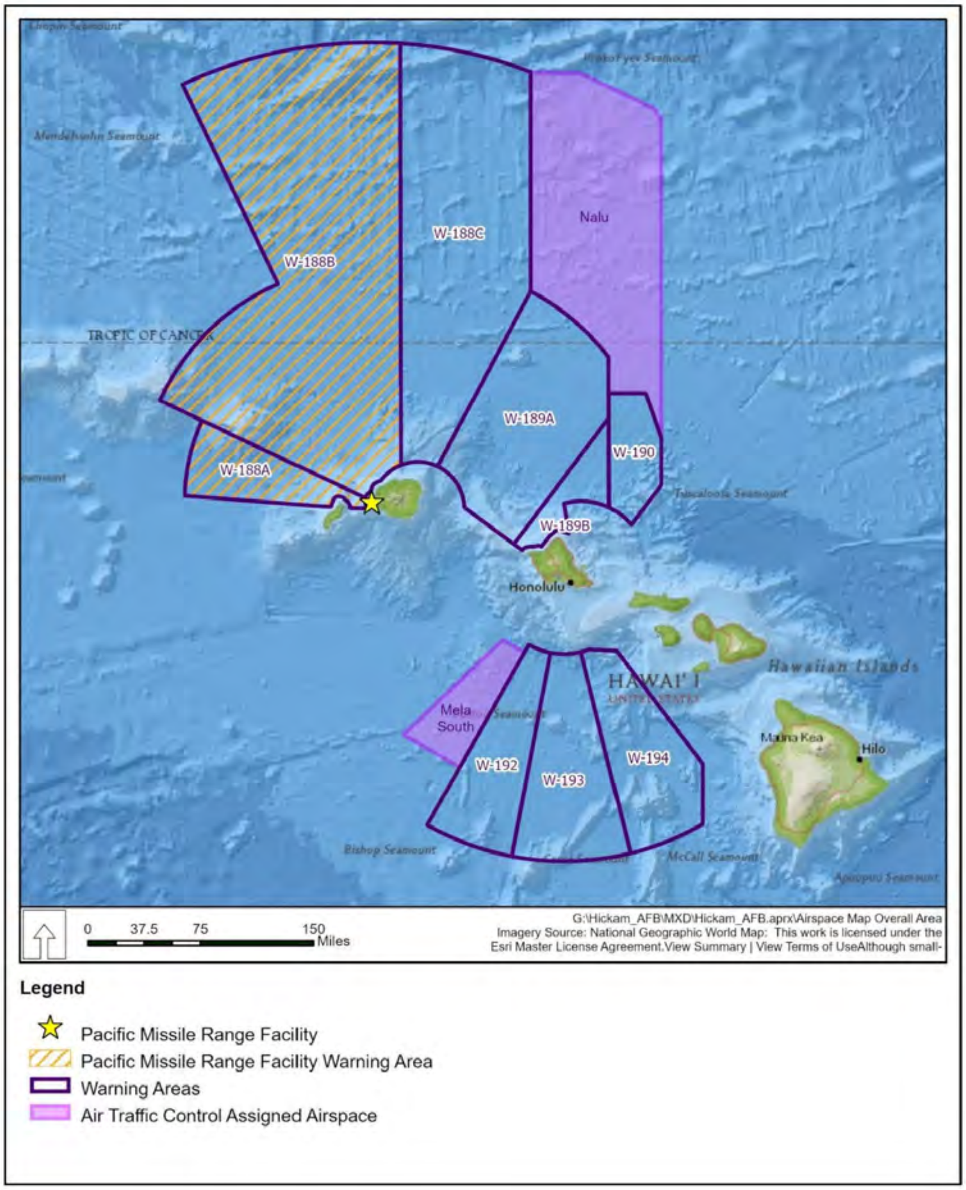
USFWS. 2016. *Iiwi (Drepanis coccinea) Special Status Species Report*. Pacific Islands Fish and Wildlife Office, US Fish and Wildlife Service Region 1. December.

USFWS. 2025a. *Species Profile for Short-Tailed Albatross (Phoebastria (=diomedea) albatrus)*. < https://www.fws.gov/species/short-tailed-albatross-phoebastria-albatrus >. June 2025.

USFWS. 2025b. *US Fish and Wildlife Service Information for Planning and Consultation*. <https://ecos.fws.gov/ipac/>. Accessed June 2025.

Yamashita, R., H. Takada, M. A. Fukuwaka, and Y. Watanuki. 2011. *Physical and Chemical Effects of Ingested Plastic Debris on Short-Tailed Shearwaters, Puffinus tenuirostris, in the North Pacific Ocean*. Marine Pollution Bulletin 62(12):2845-2849.

Attachment 2 –Special Use Airspace Proposed for Use

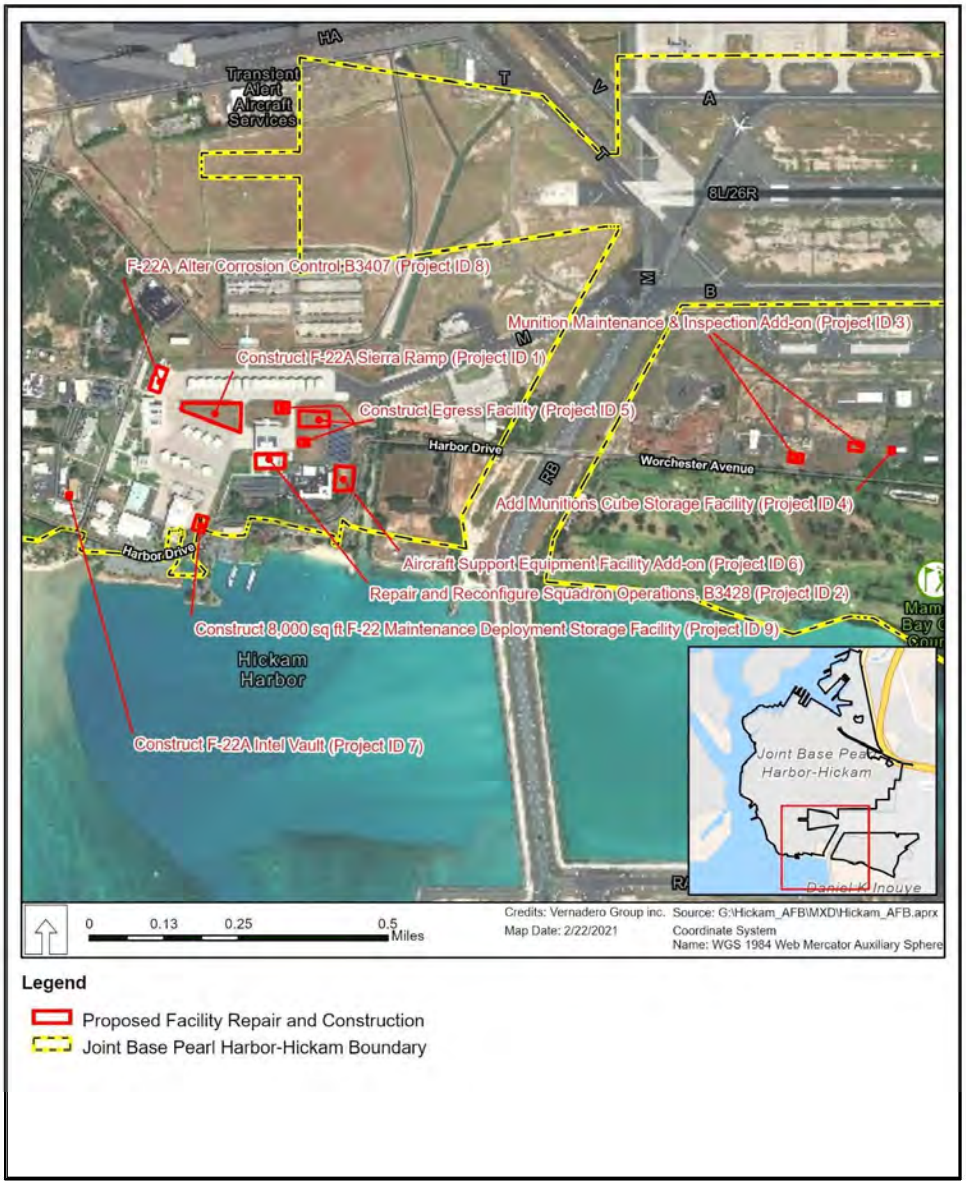


Attachment 3 – 154th Wing Proposed Project List

Project ID	Fiscal Year	Facility Title	Proposed Action
1	2022	F-22 Sierra Ramp	Construction and Repair
2	2022	Squadron Operations, Building 3428	Repair and Reconfigure
3	2022	Munition Maintenance and Inspection Add-on	Construction
4	2022	Add Munitions Cube Storage Facility	Construction
5	2022	Egress Facility	Construction
6	2022	Aircraft Support Equipment Facility Add-on	Construction
7	2022	F-22 Intel Vault	Construction
8	2022	F-22 Alter Corrosion Control Building 3407	Repair

*Note: Project ID 9, while illustrated on the attached map, is no longer under consideration.

Attachment 4 – Proposed Facility Construction and Repair Projects



NATIONAL GUARD BUREAU
3501 FETCHET AVENUE
JOINT BASE ANDREWS 20762-5157

26 June 2025

TO: Mr. John Nakagawa
Office of Planning
State of Hawai'i
P.O. Box 2359
Honolulu, HI 96804-2359

FROM: Ms. Kristi Kucharek
Plans and Requirements
Air National Guard Readiness Center, NGB/A4FR
3501 Fetchet Ave
Joint Base Andrews MD 20762

SUBJECT: Federal Agency Coastal Zone Management Act Consistency Negative Determination for the National Guard Bureau Beddown of F-22A Aircraft at Joint Base Pearl Harbor-Hickam, Honolulu, Hawaii

1. In accordance with the 1972 Coastal Zone Management Act (CZMA) §307 (16 United States Code [U.S.C.] § 1456) and the National Oceanic and Atmospheric Administration federal consistency regulations (15 Code of Federal Regulations [C.F.R.] Part 930), the Office of Planning's review and concurrence is requested for the National Guard Bureau's (NGB) negative determination for the proposed action to permanently beddown additional F-22A aircraft at Joint Base Pearl Harbor-Hickam (JBPHH), Honolulu, Hawaii, and the construction and repair of facilities to support the beddown. A detailed description and locations of the proposed action are included as part of Attachment 1.

2. The CZMA 's consistency provision requires federal actions that have reasonably foreseeable effects on any land or water use or natural resources of the coastal zone to be undertaken in a manner consistent with the enforceable policies of a coastal state's federally approved coastal management plan.

3. Under the Hawaii Coastal Zone Management (CZM) Program, the CZM area is defined as encompassing all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the United States territorial sea. However, the United States federal government retained the rights to certain lands and mineral rights to include "all submerged lands adjacent to property owned by the United States above the line of mean high tide" in 48 U.S.C. § 1705(b)(ii). The proposed actions that have the potential to affect the coastal zone all occur exclusively on federal land. In accordance with 15 CFR § 930.35(a), if a Federal agency determines there would be no coastal effects, the Federal agency will provide the State agencies with a negative determination.

4. Per 15 CFR §930.33 and §930.35(a)(3), the NGB has assessed reasonably foreseeable direct, indirect, and cumulative effects on Hawaii's defined coastal zone and reviewed relevant management programs (enforceable policies) of the Hawaii CZM Program in accordance with the CZMA. Based on the information, data. and analysis contained in the attached project description and justification, the NGB finds that the proposed permanent beddown of the additional F-22A aircraft and the construction and repair of support facilities would have no coastal effects.

If you have any questions or need additional information, please contact me at (240) 612-9471 or e-mail kristi.kucharek@us.af.mil.

Sincerely,

Kristi L Kucharek

Kristi Kucharek, GS-14
Plans and Requirements

One Attachment:
1. Federal Consistency Assessment for F-22A Aircraft Plus-up

HAWAII COASTAL ZONE MANAGEMENT PROGRAM

Attachment 1

Federal Consistency Assessment for F-22A Aircraft Plus-up
Joint Base Pearl Harbor-Hickam, Hawaii
Project Description, Locations, and Assessment

F-22A Aircraft Plus-up

Joint Base Pearl Harbor-Hickam, Hawaii

Introduction

In October 2018, Hurricane Michael hit the Florida panhandle, causing catastrophic damage to Tyndall Air Force Base (AFB), Florida, with some of the greatest damage to base hangars and flight operations buildings. As a result, Tyndall AFB was not able to support its two F-22A squadrons. The Department of the Air Force (DAF) has decided it would be most efficient to consolidate the F-22As from the operational squadron at Tyndall AFB into other operational F-22 squadrons, including the 199 FS. This consolidation may or may not be permanent depending on the outcome of other ongoing fighter force structure studies. The F-22 Formal Training Unit, which consists of the F-22 aircraft and T-38 Talon aircraft from Tyndall AFB, were also temporarily relocated to Eglin AFB, Florida, while the DAF considered their permanent assignment.

The Hawaii Air National Guard (HIANG) is proposing to permanently or temporarily integrate a total of seven Air Force F-22A Raptors from Tyndall AFB into the current fleet of the HIANG 199 FS at Joint Base Pearl Harbor-Hickam (JBPHH). The Proposed Action would result in an increase in the total F-22A aircraft assigned to the 199 FS from 18 Primary Aerospace Vehicles Authorized (PAA) plus 2 Backup Aircraft Inventory (BAI) to 24 PAA plus three 3 BAI. The assignment of the additional F-22A aircraft would require construction of new facilities and the repair of existing facilities that would be located around the existing airfield and runway.

All proposed construction and repair projects would be located on real property at JBPHH on land licensed to the HIANG (**Figure 1**). Project ID 1 -2, and 5 through 8 would be within the HIANG Cantonment and Project ID 3 and 4 would be within the Munitions Storage Area. Projects would include the construction of additional ramp space and repair of deteriorated ramp pavement for the installation of additional sunshades; the construction of maintenance space for munitions, egress, and aircraft support equipment; construction of additional munitions storage, a new Intel vault; the repair and renovation Squadron Operations; and the conversion of the F-15 corrosion control facility to an F-22A paint facility. While Project ID 9 is included in the project map, that project is no longer under consideration and would not be constructed. These projects are planned for Fiscal Year 2025 and beyond. A list and description of the repair and construction projects connected to the Proposed Action is provided in **Table 1**.

An estimated 150 additional pilots, maintenance, and support personnel would be needed to support the Proposed Action. The Proposed Action would add an estimated 405 annual sorties at JBPHH, which includes those expected for training activities and aircraft leaving for or returning from deployment or depot-level maintenance. This would result in an increase of less than 1 percent in the number of total operations at JBPHH. The additional F-22A aircraft would use the same airspace currently utilized by the aircraft assigned to the 199 FS. The Special Use Airspace (SUA) primarily includes offshore Warning Areas and Air Traffic Control Assigned Airspace (ATCAA). The SUA includes Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194, as well as the Mela South and Nalu ATCAAs (**Figure 2**). The SUA extends 3 NM from the coastline (state jurisdictional boundary), and most of the SUA extend out past the 12 NM Territorial Sea boundary and the 24-NM Contiguous Zone boundary.

Assessment of Applicable Federal Consistency Resources

A review of the potential for the Proposed Action to affect the resource areas listed in the Hawaii CZM Program Federal Consistency Assessment Form is provided along with the justification for the negative determination.

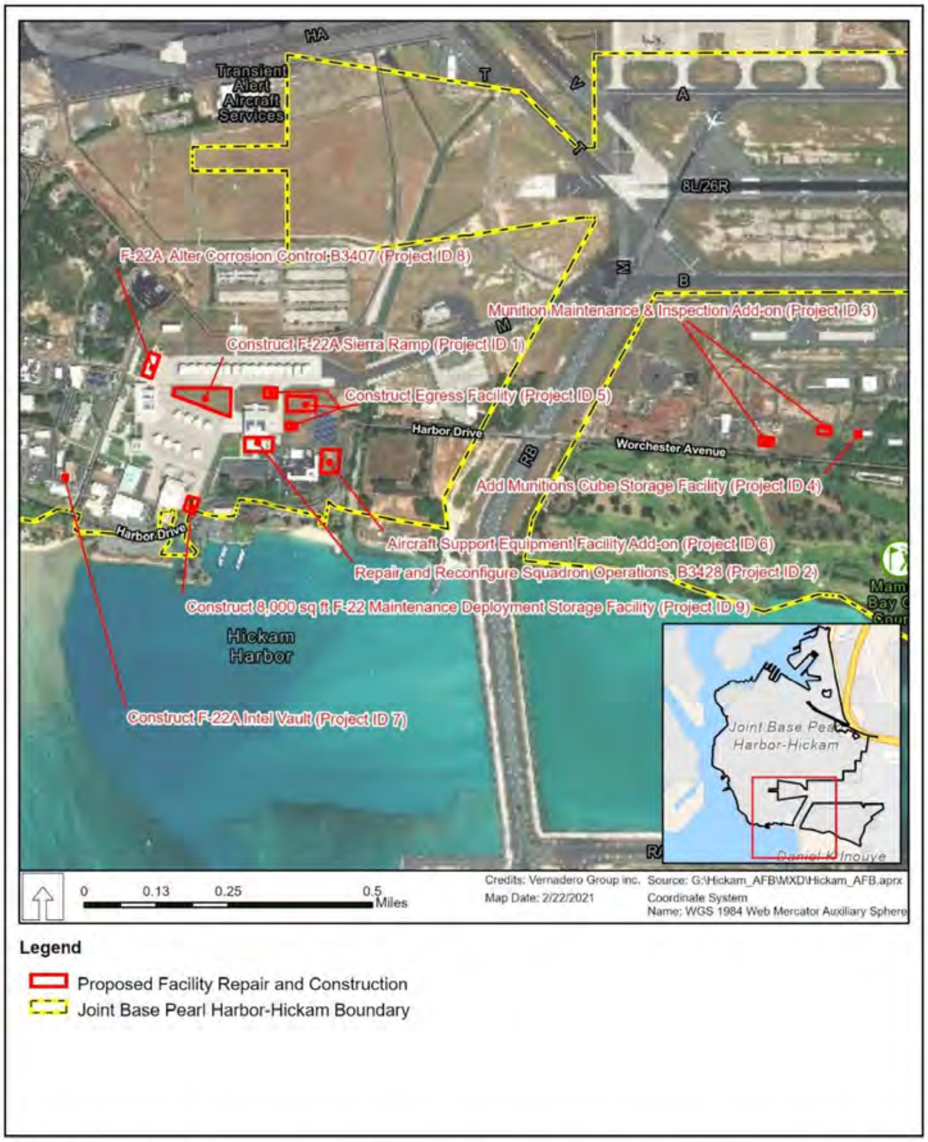


Figure 1. Locations of proposed facility repair and construction projects to support the F-22 plus-up.

Table 1 – Description of the Proposed Construction and Repair Actions at Joint Base Pearl Harbor-Hickam to Support the Plus-up of F-22A Aircraft at the 154 Wing, Hawaii Air National Guard.

Project ID	Facility Title	Type Action	Proposed Project Scope
1	F-22 Sierra Ramp	Construction	Primary location: Construct additional airfield pavement, repair the existing deteriorated Sierra Ramp, and install five new metal sunshades. This new pavement would be installed in an area that is currently landscaped. Electrical conduits connect to the existing transformer near Buildings 3406 and 3407. Some repairs to existing airfield pavement would occur during the connection to new pavement and to facilitate the installation of electrical conduits. Repairs to existing airfield pavement would occur to account for connection to new pavement and to facilitate the installation of electrical conduits. Other miscellaneous support including but not limited to sitework, ramp lighting reconfiguration, and pavement striping/markings would also be included. The repair work would be sequenced, scheduled, and coordinated as both Sierra Ramp and CAPA ramp would be in use by airfield management, F-22 maintenance, and F-22 operations. The depth of construction would be a maximum of 7.5 feet from the existing grade. This location would result in the addition of 89,127 SF of new impervious surface. Alternate location: Install five new metal sunshades in the triangular area just north of the Sierra Ramp. This alternate location would require new ramp pavement for sunshade installation.
2	Squadron Operations	Repair and Reconfigure	This is a comprehensive repair project to reconfigure the existing mass administrative office area of the 199th Fighter Squadron operations and maintenance sections, expand the maintenance secure briefing area, expand the maintenance conference room to provide additional administrative area, convert the existing open space mezzanine into office space, and provide additional locker space for squadron personnel. In addition to the administrative office area reconfiguration, the secure briefing rooms of the operation section would be reconfigured to provide two additional briefing rooms. Exterior repairs would consist of exterior wall and roof construction. Interior repairs would consist of space repairs and interior wall construction. Repairs would include upgrading the fire protection, mechanical, and life safety systems utilizing conventional design and repair methods to accommodate the mission of the facility. Project also includes repairs to the existing HVAC and electrical system to accommodate the reconfigured areas. While a majority of this action would be limited to interior renovation, some ground disturbance would be required to implement all repairs.

Project ID	Facility Title	Type Action	Proposed Project Scope
3	Munition Maintenance and Inspection Addon	Construction	Construct a 3,000 SF addition to the existing Munitions Maintenance and Inspection facility. The Fire Alarm and Suppression system and communication infrastructure would be upgraded on the entire facility to meet current standards. New asphalt pavement would provide access and egress from the new facility's maintenance bays. Communication infrastructure, maintenance facility lightning, and grounding protection requirements would be included. A concrete pad for the Material Assembly Center (MAC) would be constructed as well.
4	Munitions Cube Storage Facility	Construction	Construct a 1,320 SF Munitions Cube Storage facility adjacent to the existing Cube Storage facilities. The area selected for this facility would be backfilled as additional site improvement. Under this project, the heating, ventilation, and air conditioning (HVAC) system on the existing Cube Storage facilities would be upgraded from a R-22 to a R 410 refrigerant system to comply with current standards. A section of new asphalt pavement would be constructed adjacent to the existing asphalt pavement to provide access around this new facility section. Maintenance facility lightning and grounding protection requirements would be included in the new facility.
5	Egress Facility	Construction	Construct a 5,000 SF Egress Maintenance facility adjacent to the Squadron Operations maintenance back-shops (Building 3428). The project would also include the addition of asphalt pavement to provide access to the new facility, and new concrete pads for Aerospace Ground Equipment, concrete gaseous oxygen carts and canopy shelter pad with conduits for future power/comm connections, and electro-explosive device Fire Maintenance operations.
6	Aircraft Support Equipment Facility Add-on	Construction	Construct a 5,000 SF Aircraft Support Equipment addition onto the existing Vehicle Maintenance facility. This project would include upgrading the existing HVAC system from a R-22 to a R-410 refrigerant, adding electrical and communications outlets to support new office layout, and adding restrooms to adequate support assigned personnel. Concrete and asphalt pavement would be included to provide access and egress from maintenance bays and adequate pavement for equipment storage and staging. Maintenance facility lightning and grounding protection requirements would be included in the new facility.

Project ID	Facility Title	Type Action	Proposed Project Scope
7	F-22A Intel Vault	Construction	Construct a 6,000 SF additional Intel Vault onto Building 3382 including Special Construction Requirements for a Secure Compartmentalized Information Facility. The existing portion of the facility, built in 1970, would be demolished and replaced with the new facility. This project also includes upgrading the existing facilities' HVAC system from an R-22 to the R-410 refrigerant system.
8	F-22A Alter Corrosion Control	Repair	Convert Building 3407 from a F-15 fuels/corrosion control hangar to an F-22 light low observational paint, corrosion control, wash rack, and fuel cell repair facility. This action would include 17,114 SF of interior renovation to an existing facility.

***Note: Project ID 9, illustrated on Figure 1, is no longer under consideration and would not be constructed.**

Historic Resources

Battery Selfridge (Building 3440) is adjacent to the proposed construction location of the Squadron Operations repair/reconfigure (Project ID 2). While this battery is part of the Artillery District of Honolulu, the district is discontinuous and only encompasses the footprint of each battery, and as such the setting or visual component is not a condition of its significance. As with Item 1 above, the discontinuous Artillery District of Honolulu is on the Register (approximately since the 1980s); however, the project site is not listed and/or nominated to the Hawaii or National Register of Historic Places. While none of the proposed project sites have been surveyed, this portion of the base is effectively "made land" that has been heavily developed since before WWII. This land has been classified by Joint Base Pearl Harbor Hickam (JBPHH) as having a low potential for archaeological resources.

While the locations proposed for the Munition Maintenance and Inspection Add-on (Project ID 3) and Munitions Cube (Project ID 4) includes undeveloped land, this area has been previously disturbed. The projects would be located on land immediately adjacent existing buildings that had likely been graded during their construction.

Scenic and Open Space Resources

One project would consist of the extensive repair and reconfiguration of existing Building 3428 (Project ID 2), as described in **Table 1**. While some ground disturbance would be required to implement all of the repairs, this project would mostly be limited to repairs to the existing building. This project is located within the cantonment area with other multi-story buildings. This facility would not impact access or views of coastal resources.

No projects are proposed on beach, oceanfront, or within the shoreline setback. While some project sites would occur on undeveloped land, the land on JBPHH has been heavily disturbed in the past. The majority of open space is located throughout the installation but generally along the outer edges of the base. The largest open space, unimproved land on JBPHH is an unmanaged vegetation area behind the housing area at Fort Kamehameha, which would not be disturbed during this action.

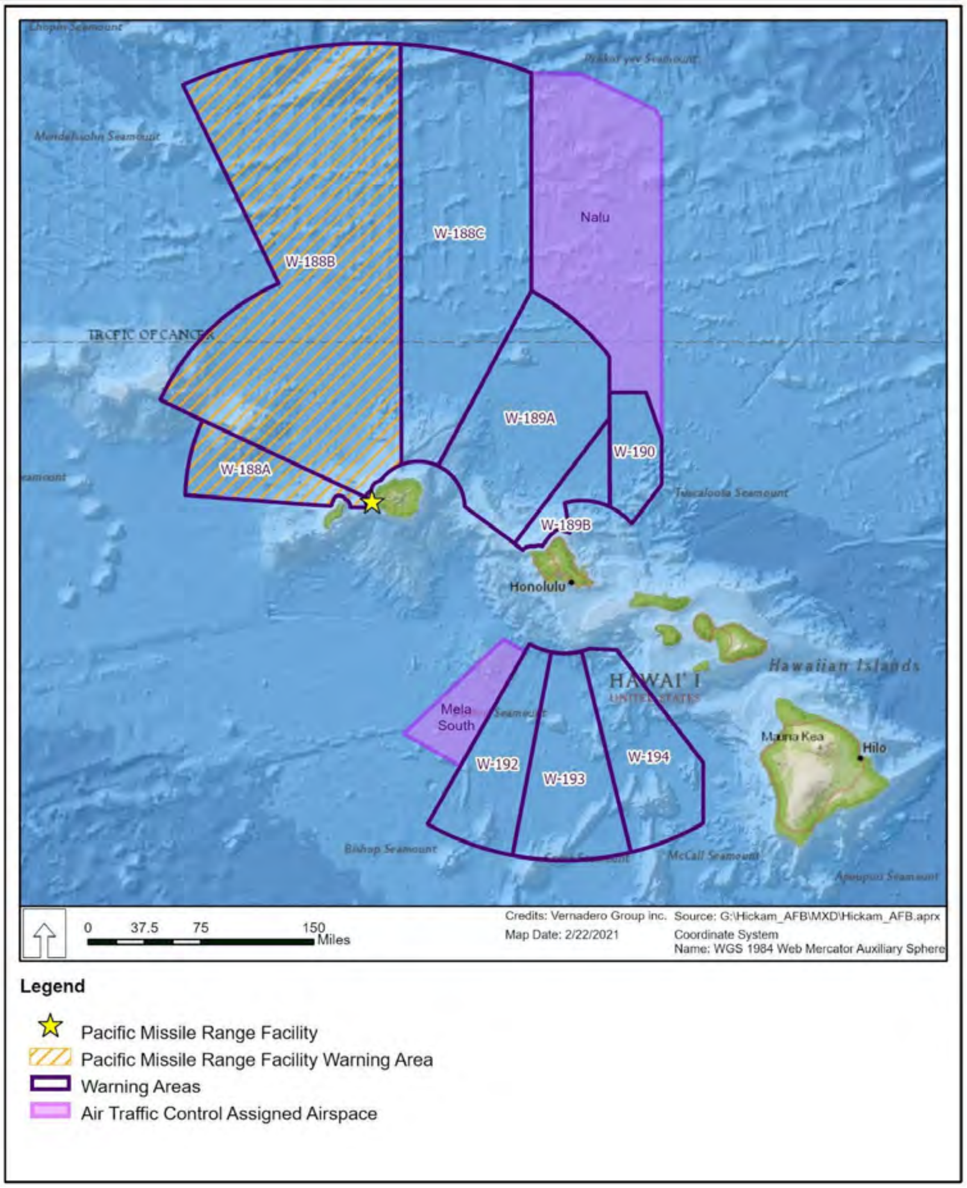


Figure 2. Special Use Airspace proposed for use to support the permanent F-22A plus-up.

Coastal Ecosystems

The proposed construction of the Sierra Ramp addition (Project ID 1), repairs and reconfiguration of Squadron Operations [B3428] (Project ID 2), Egress Facility (Project ID 5), addition to the Aircraft Support Equipment Facility (Project ID 6), new F-22A Intel Vault (Project ID 7), and proposed construction of the Maintenance Deployment Storage Facility (Project ID 8) would be within the Special Management Area (SMA), and as such, would be subject to SMA permitting prior to construction. **Figures 3 and 4** show the location of the proposed projects within the SMA. The total amount of land disturbance of the proposed construction projects is approximately 1.2 acres (52,320 sq ft). Ground disturbance would be limited to seven construction sites located in heavily developed portions of the base. The present surface of these areas is fill land consisting of dredged and graded coral rubble fill from either the entrance to Pearl Harbor or from inland deposits. Activities at the locations proposed for new/improved facilities may result in a minor, short-term increase in erosion if any soils are exposed. National Pollutant Discharge Elimination System permit coverage for discharges of storm water associated with construction activities would be required via the State of Hawai'i Department of Health (DOH) Clean Water Branch (CWB). Prior to construction, the contractor would be required to prepare a Stormwater Pollution Prevention Plan to manage stormwater associated with the construction activity and work with the NAVFAC Hawaii Public Works Office to ensure compliance with the Base Stormwater Management Plan for pre- and post-construction activities. To minimize potential impacts, Best Management Practices would be implemented during the construction period and would include practices such as the installation of soil erosion-control mats, silt fences, strawbales, diversion ditches, riprap channels, water bars, water spreaders, sediment basins, and/or other appropriate standard construction practices.

While proposed project locations are not within or immediately adjacent to wetlands, several are relatively close. **Figures 5 and 6** show the location(s) of wetlands in relation to proposed project sites. On JBPHH, most wetlands are on flat or depressional areas in the southern portion of the base, along the coastline, and along channels. Two shoreline wetlands comprised of mangrove-dominated shrubland are located along the shoreline of Mamala Bay. There are three ephemeral emergent wetlands, defined as temporarily ponded with rooted, herbaceous plants, located within the Fort Kamehameha area of the base and a fourth south of the drainage ditch near the Munitions Storage Area. Channel wetlands occur within the channels of the Kumumau'u and Manuwai Canals. Proposed projects in flood hazard areas would comply with EO 11990, *Protection of Wetlands*. For proposed facility construction activities that would occur near identified wetlands, the HIANG would acquire jurisdictional wetland determinations and a Clean Water Act Section 404 permit from the USACE as well as a Section 401 Water Quality Certification from the Hawai'i DOH CWB prior to filling of drainages as required.

Coastal Hazards

All or a portion of the Squadron Operations Building 3428 (Project ID 2), Aircraft Support Equipment Facility (Project ID 6), and F-22A Intel Vault (Project ID 7) would be within a Tsunami Evacuation Zone; while the F-22A Sierra Ramp (Project ID 1), Munition Maintenance & Inspection Add-on (Project ID 3), Munitions Cube Storage Facility (Project ID 4), Egress Facility (Project ID 5), and Corrosion Control Building 3407 (Project ID 8) would be within an Extreme Tsunami Evacuation Zone. **Figures 3 and 4** show the locations of the proposed project sites within tsunami inundation areas. Projects located within these areas would incorporate flood protection measures into their design.

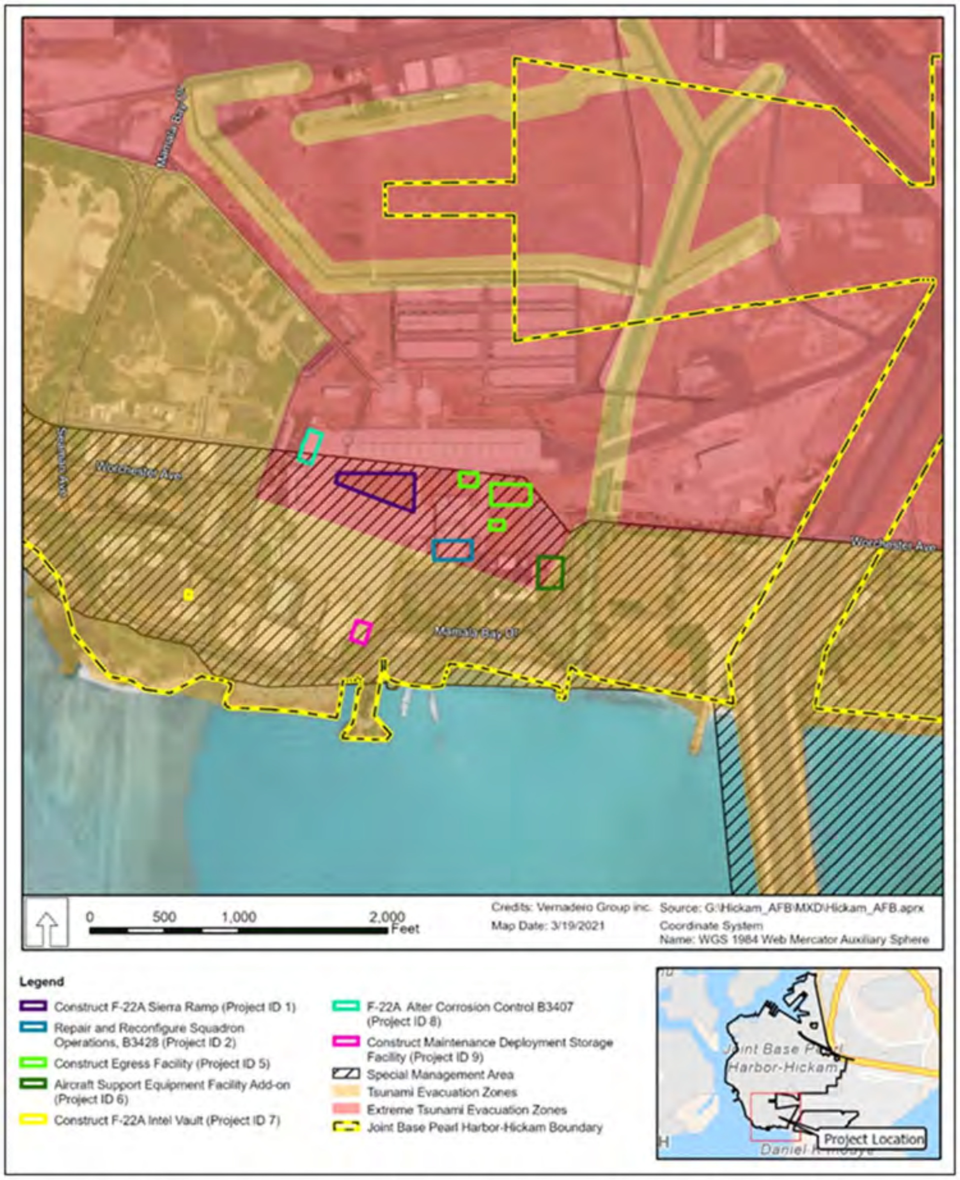


Figure 3. Special Management Areas and Tsunami Evacuation Zones within the Region of Influence on Joint Base Pearl Harbor-Hickam and the Proposed Construction Projects, Cantonment

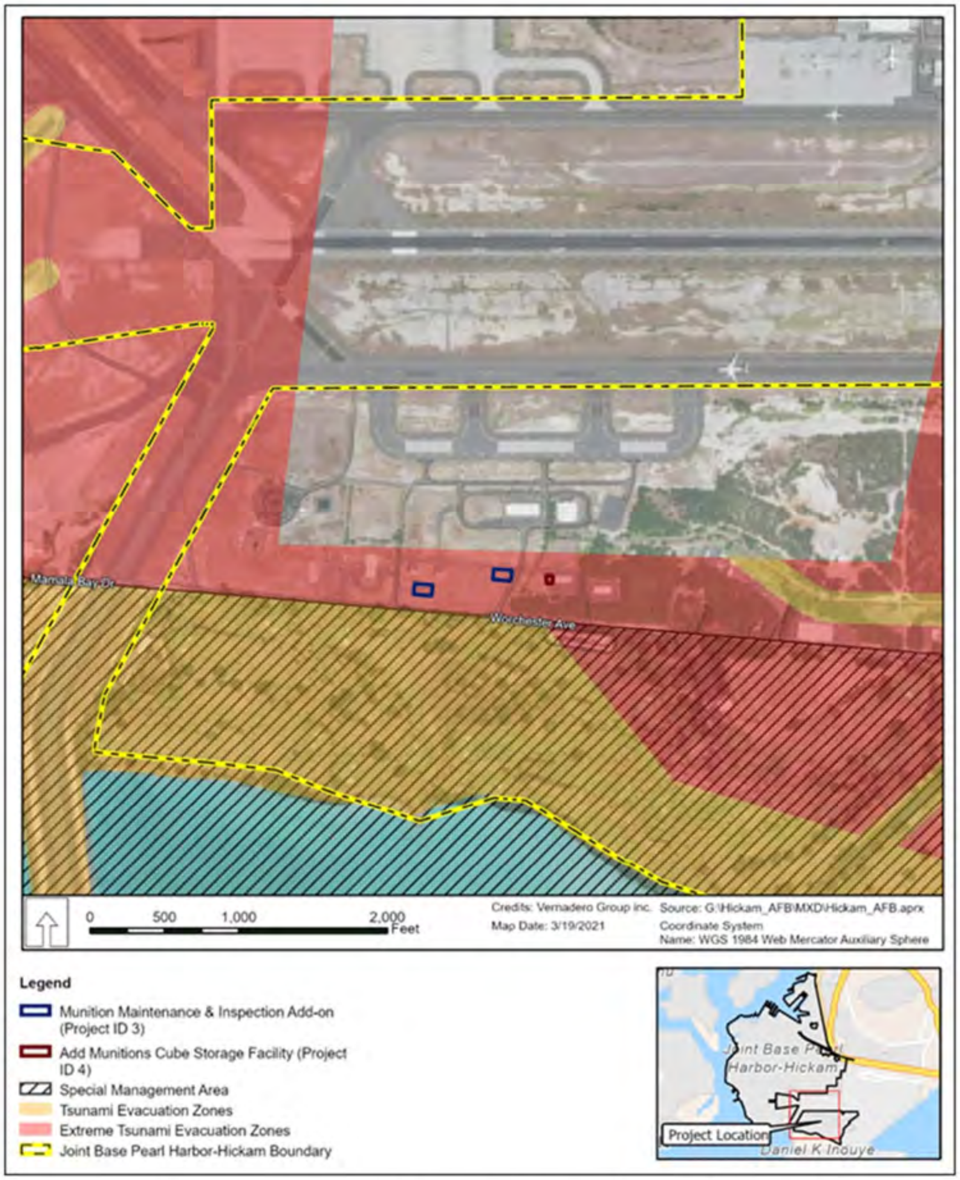


Figure 4. Special Management Areas and Tsunami Evacuation Zones within the Region of Influence on Joint Base Pearl Harbor-Hickam and the Proposed Construction Projects, Munitions Storage Area

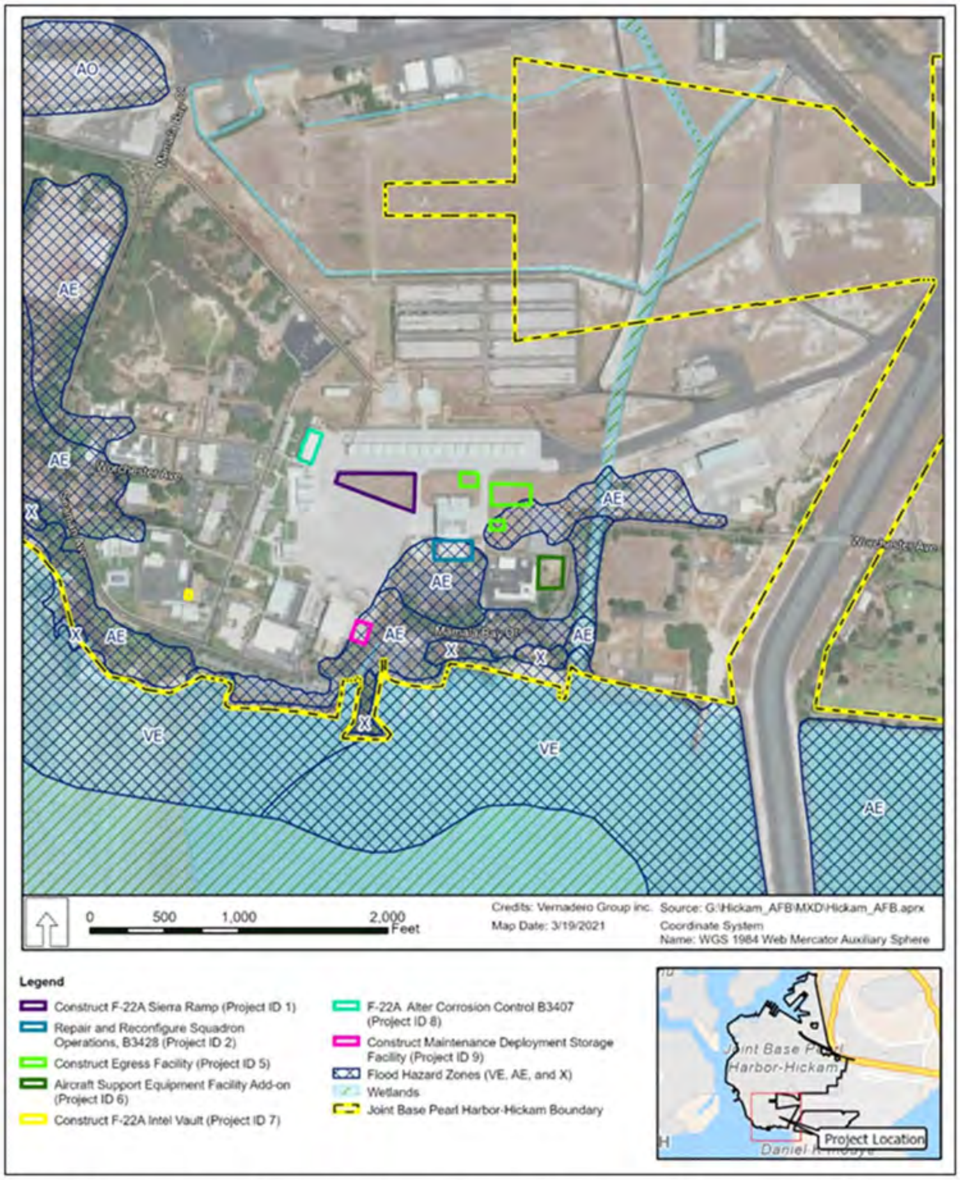


Figure 5. Floodplains and Wetlands within the Region of Influence on Joint Base Pearl Harbor-Hickam and the Proposed Construction Projects, Cantonment

Figure 6. Floodplains and Wetlands within the Region of Influence on Joint Base Pearl Harbor-Hickam and the Proposed Construction Projects, Munitions Storage Area

The proposed new Egress Facility (Project ID 5)is located within a flood hazard area (Zone AE) according to FEMA Flood Insurance Rate Map No. 15003C0333G. The proposed modification to Squadron Operations Building 3428 is also within a flood hazard area (Zone AE). **Figures 5 and 6** show the locations of the proposed project sites within flood hazard areas. Proposed projects in flood hazard areas would comply with Executive Order 11988 - *Floodplain Management* and applicable floodplain design standards. In addition, construction projects would meet base level permitting requirements and would be compatible with NAVFAC Hawaii requirements.

Managing Development

All required permits would be obtained prior to construction. All proposed facilities would be compatible with the existing JBPHH land use designations.

The following actions are in progress:

1. National Environmental Policy Act: Draft Environmental Assessment with a Proposed Finding of No Significant Impact and Finding on No Practicable Alternative
2. Coastal Zone Management Act: Negative Determination concurrence
3. National Historic Preservation Act: No effect determination coordination with the State Historic Preservation Division
4. Endangered Species Act: US Fish and Wildlife and National Marine Fisheries Service Section 7 Effects Determination

Public Participation

Initial notification of the Proposed Action was accomplished in November and December 2020, with notification letters sent to federal and state agencies and multiple Native Hawaiian Organizations (NHO).

The public, as well as federal and state agencies, and NHOs will be provided a Notification of Availability and the opportunity to comment on the Draft Environmental Assessment (DEA), Proposed Finding of No Significant Impact (FONSI), and Proposed Finding of No Practicable Alternative (FONPA) during the 30-day public comment period. The DEA identifies and describes all the proposed construction and repair activities and locations and assesses the potential environmental impacts associated with project implementation. Notices of Availability of the DEA and Proposed FONSI/FONPA will be published in in The *Honolulu Star-Advertiser*, Honolulu, Hawaii, and *The Garden Island*, Kauai, Hawaii. A website will be included that will provide an electronic version of the DEA and Proposed FONSI/FONPA and copies will also be made available for review at the following locations:

- Joint Base Pearl Harbor – Hickam Library, 990 Mills Boulevard, JBPHH, Hawaii 96853
- Hawaii State Public Library, 1325 Kalihi St., Honolulu, HI 96819
- Salt Lake-Moanalua Public Library, 3225 Salt Lake Blvd, Honolulu, HI 96818

STATE OF HAWAIʻI
OFFICE OF PLANNING
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Coastal Zone Management Program

Environmental Review Program

Land Use Commission

Land Use Division

Special Plans Branch

State Transit-Oriented Development

Statewide Geographic Information System

Statewide Sustainability Branch

DTS202507241259NA

July 31, 2025

Ms. Kristi Kucharek
Plans and Requirements
Air National Guard Readiness Center, NGB/A4FR
3501 Fetchet Avenue
Joint Base Andrews MD 20762

Dear Ms. Kucharek:

Subject: Coastal Zone Management Act Federal Consistency Negative Determination for the National Guard Bureau Beddown of F-22A Aircraft at Joint Base Pearl Harbor-Hickam, Honolulu, Hawaiʻi

The Hawaiʻi Coastal Zone Management (CZM) Program acknowledges receipt on July 24, 2025, of the National Guard Bureau's (NGB's) Coastal Zone Management Act federal consistency negative determination for the proposed action to permanently beddown additional F-22A aircraft at Joint Base Pearl Harbor-Hickam (JBPHH), Honolulu, island of Oʻahu.

This Hawaiʻi CZM Program acknowledgement of receipt does not represent endorsement of the proposed federal agency activity, nor does it convey approval with any regulations administered to any State of Hawaiʻi or county agency. If you have questions, please contact Debra Mendes of our CZM Program at Debra.L.Mendes@hawaii.gov.

Mahalo,

Mary Alice Evans

Mary Alice Evans
Director

PUBLIC AND AGENCY REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT

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APPENDIX B
DESCRIPTION OF PROPOSED FACILITY CONSTRUCTION AND REPAIR ACTIONS

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Table B-1
Descriptions of Proposed Facility Construction and Repair Actions

Project ID	Facility Title	Type Action	Project Size (sq ft)	Proposed Project Scope
1	F-22 Sierra Ramp	Construction	32,400	Primary location: Construct additional airfield pavement, repair the existing deteriorated Sierra Ramp, and install five new metal sunshades. This new pavement would be installed in an area that is currently landscaped. Electrical conduits connect to the existing transformer near Buildings 3406 and 3407. Some repairs to existing airfield pavement would occur during the connection to new pavement and to facilitate the installation of electrical conduits. Repairs to existing airfield pavement would occur to account for connection to new pavement and to facilitate the installation of electrical conduits. Other miscellaneous support including but not limited to sitework, ramp lighting reconfiguration, and pavement striping/markings would also be included. The repair work would be sequenced, scheduled, and coordinated as both Sierra Ramp and CAPA ramp would be in use by airfield management, F-22 maintenance, and F-22 operations. The depth of construction would be a maximum of 7.5 feet from the existing grade. This location would result in the addition of 89,127 SF of new impervious surface. Alternate location: Install five new metal sunshades in the triangular area just north of the Sierra Ramp. This alternate location would require new ramp pavement for sunshade installation.
2	Squadron Operations	Repair and Reconfigure	12,200	This is a comprehensive repair project to reconfigure the existing mass administrative office area of the 199th Fighter Squadron operations and maintenance sections, expand the maintenance secure briefing area, expand the maintenance conference room to provide additional administrative area, convert the existing open space mezzanine into office space, and provide additional locker space for squadron personnel. In addition to the administrative office area reconfiguration, the secure briefing rooms of the operation section would be reconfigured to provide two additional briefing rooms. Exterior repairs would consist of exterior wall and roof construction. Interior repairs would consist of space repairs and interior wall construction. Repairs would include upgrading the fire protection, mechanical, and life safety systems utilizing conventional design and repair methods to accommodate the mission of the facility. Project also includes repairs to the existing HVAC and electrical system to accommodate the reconfigured areas. Ground disturbance would be required to implement all repairs.

Table B-1
Descriptions of Proposed Facility Construction and Repair Actions

Project ID	Facility Title	Type Action	Project Size (sq ft)	Proposed Project Scope
3	Munition Maintenance and Inspection Addon	Construction	3,000	Construct an addition to the existing Munitions Maintenance and Inspection facility. The Fire Alarm and Suppression system and communication infrastructure would be upgraded on the entire facility to meet current standards. New asphalt pavement would provide access and egress from the new facility's maintenance bays. Communication infrastructure, maintenance facility lightning, and grounding protection requirements would be included. A concrete pad for the Material Assembly Center (MAC) would be constructed as well.
4	Munitions Cube Storage Facility	Construction	1,320	Construct a Munitions Cube Storage facility adjacent to the existing Cube Storage facilities. The area selected for this facility would be backfilled as additional site improvement. Under this project, the heating, ventilation, and air conditioning (HVAC) system on the existing Cube Storage facilities would be upgraded from a R-22 to a R-410 refrigerant system to comply with current standards. A section of new asphalt pavement would be constructed adjacent to the existing asphalt pavement to provide access around this new facility section. Maintenance facility lightning and grounding protection requirements would be included in the new facility.
5	Egress Facility	Construction	5,000	Construct an Egress Maintenance facility adjacent to the Squadron Operations maintenance back-shops (Building 3428). The project would also include the addition of asphalt pavement to provide access to the new facility, and new concrete pads for Aerospace Ground Equipment, concrete gaseous oxygen carts and canopy shelter pad with conduits for future power/comm connections, and electroexplosive device Fire Maintenance operations.
6	Aircraft Support Equipment Facility Addon	Construction	5,000	Construct an Aircraft Support Equipment addition onto the existing Vehicle Maintenance facility. This project would include upgrading the existing HVAC system from a R-22 to a R-410 refrigerant, adding electrical and communications outlets to support new office layout, and adding restrooms to adequate support assigned personnel. Concrete and asphalt pavement would be included to provide access and egress from maintenance bays and adequate pavement for equipment storage and staging. Maintenance facility lightning and grounding protection requirements would be included in the new facility.

Table B-1
Descriptions of Proposed Facility Construction and Repair Actions

Project ID	Facility Title	Type Action	Project Size (sq ft)	Proposed Project Scope
7	F-22 Intel Vault	Construction	6,000	Construct an additional Intel Vault onto Building 3382 including Special Construction Requirements for a Secure Compartmentalized Information Facility. The existing portion of the facility, built in 1970, would be demolished and replaced with the new facility. This project also includes upgrading the existing facilities' HVAC system from an R-22 to the R-410 refrigerant system.
8	F-22 Alter Corrosion Control	Repair	17,114	Convert Building 3407 from a F-15 fuels/corrosion control hangar to an F-22 light low observational paint, corrosion control, wash rack, and fuel cell repair facility.

*Note: While Project ID 9, F-22 Maintenance Deployment Facility, is identified on Figure B-1, that action is no longer under consideration and is therefore not assessed.

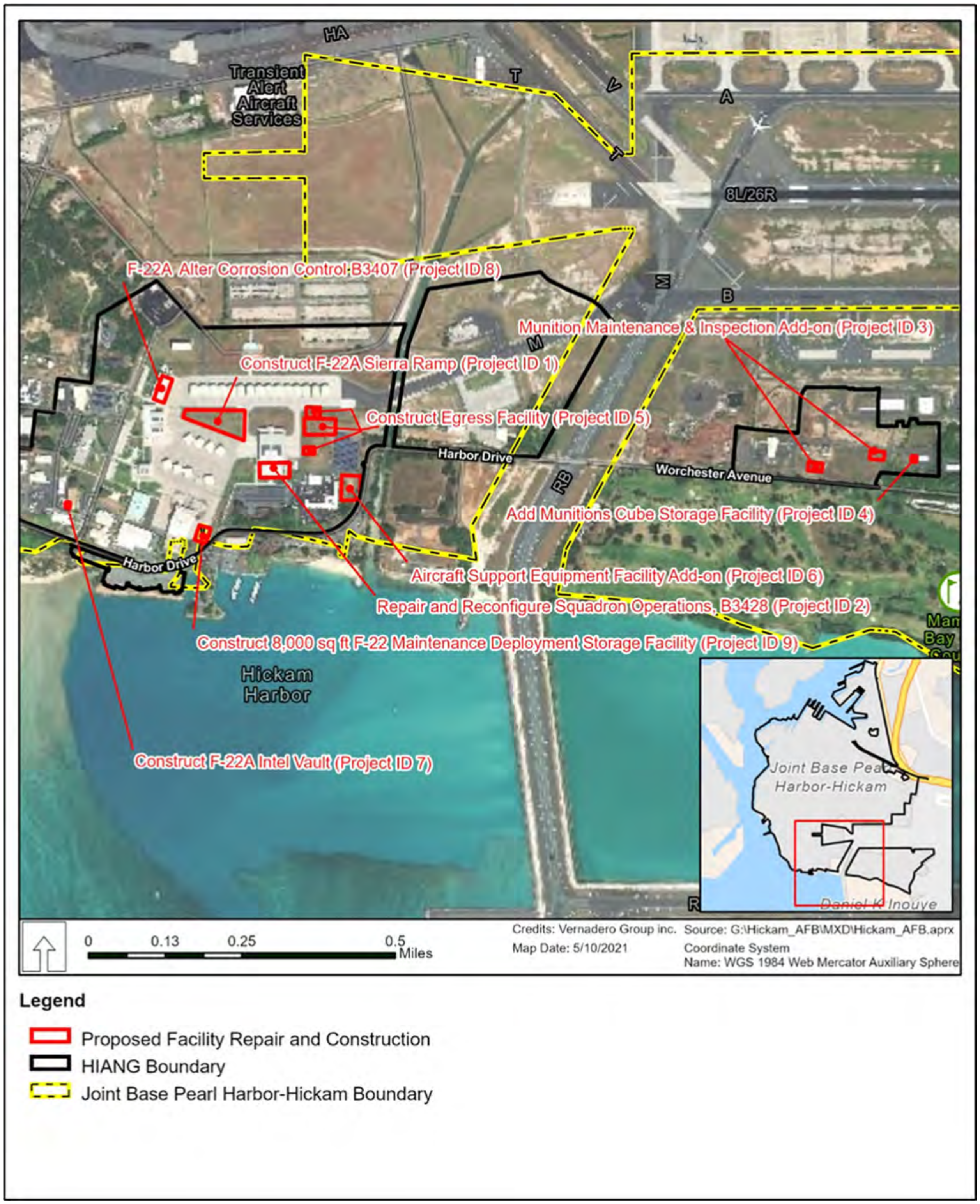

Figure B-1. Proposed Project Locations.

Figure B-2. Project ID 1, Construct F-22 Sierra Ramp.

Figure B-3. Project ID 2, Repair and Reconfigure Squadron Operations, Building 3428.

Figure B-4. Project ID 3, Munition Maintenance, and Inspection Add-on.

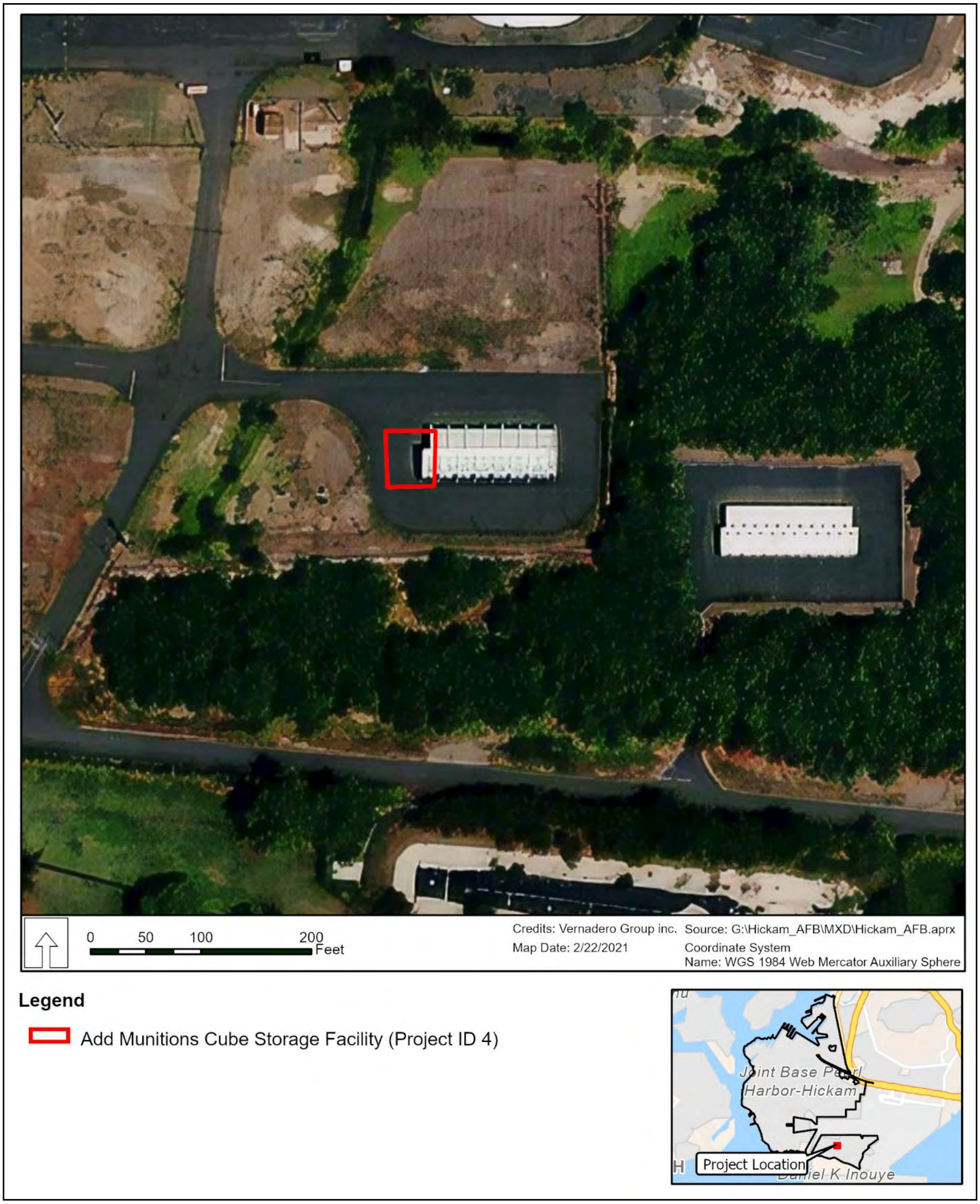

Figure B-5. Project ID 4, Construct Munitions Cube Storage Facility.

Figure B-6. Project ID 5, Construct Egress Facility.

Figure B-7. Project ID 6, Aircraft Support Equipment Facility Add-on.

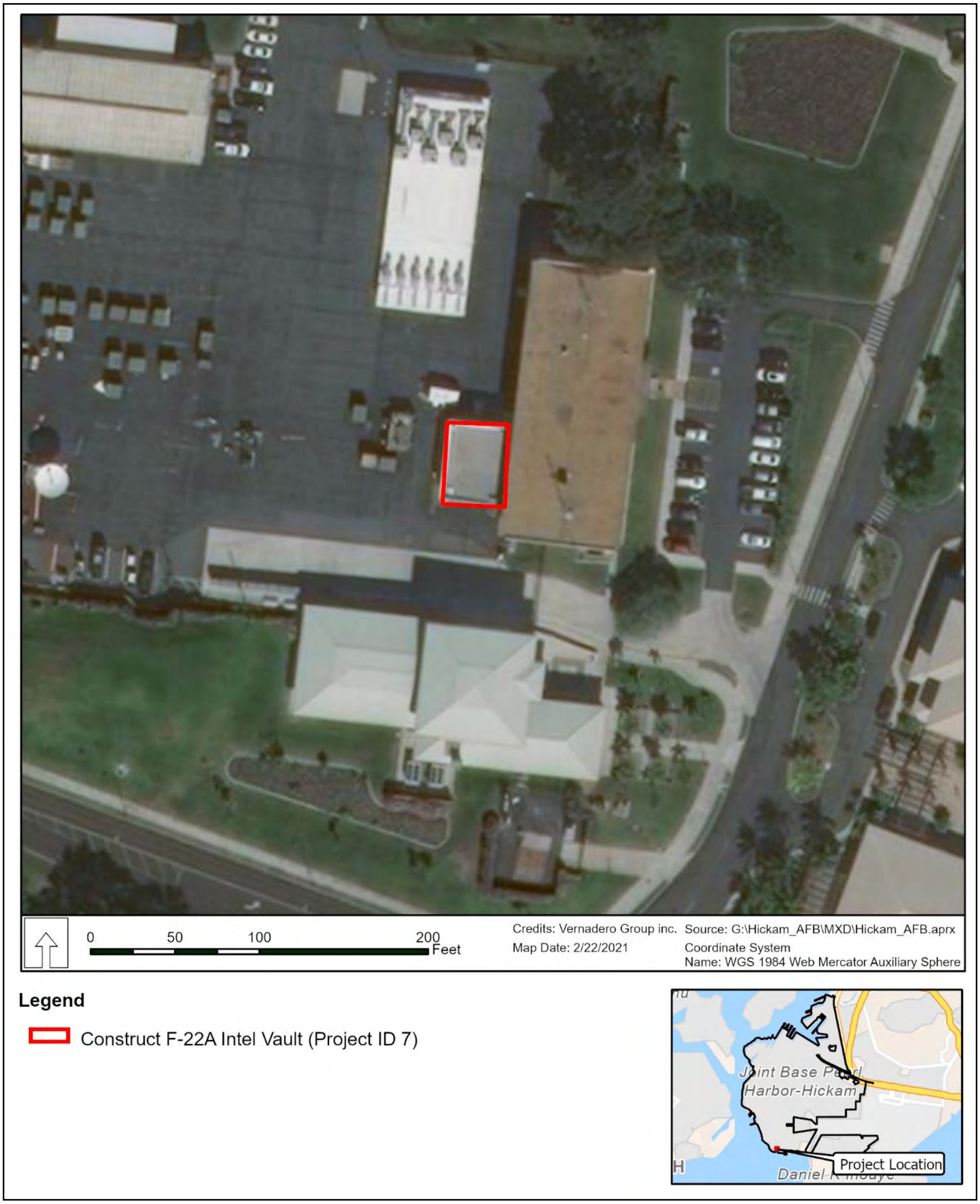

Figure B-8. Project ID 7, Construct F-22 Intel Vault.

Figure B-9. Project ID 8, Convert to F-22 Corrosion Control Building 3407.

APPENDIX C
CLOSE CASUAL RELATIONSHIPS AND REASONABLY FORESEEABLE FUTURE ACTIONS

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Table C-1
Reasonably Foreseeable Future Actions at Joint Base Pearl Harbor-Hickam and Special Use Airspace

Scheduled Project	Project Summary	Implementation Date	Relevance to Proposed Action	Resource Potentially Affected
SPCS Basing Actions	The United States Air Force would provide the facilities and locations suitable for the establishment of an Air National Guard SPCS location.at JBPHH.	2026	Construction of one additional facility and additional personnel and dependents working and living on JBPHH.	Noise, Safety, Air Quality, Biological Resources, Land Use, Socioeconomics, Hazardous Materials/Waste
NAVFAC HI Waterfront Projects	New construction and/or repair/renovation of piers/wharves, bulkheads, drydocks and caissons, waterfront facilities such as warehouses or waterfront operations buildings, and bridges.	2024 and 2025	Waterfront repair and maintenance activities	Noise, Safety; Air Quality; Biological Resources; Land Use and Coastal Zone; Earth Resources; Water Quality; Socioeconomics; Hazardous Materials/Waste; Infrastructure, Transportation, And Utilities

Notes:
JBPHH = Joint Base Pearl Harbor-Hickam; NAVFAC HI = Naval Facilities Engineering Systems Command, Hawaii; SPCS = Space Control Squadron

Nonfederal Actions

Nonfederal actions such as new development or construction projects occurring in the area surrounding JBPHH were considered for reasonably foreseeable future actions. Several proposed projects were considered in addition to the JBPHH project as shown in **Table C-2**.

Table C-2
Reasonably Foreseeable Future Actions – Nonfederal Actions

Scheduled Project	Project Summary	Implementation Date	Relevance to Proposed Action	Resource Potentially Affected
Interstate Route H-1 Airport Viaduct Improvements (Phase 2)	Improvements of H-1 in the vicinity Of Valkenburgh Street to Middle Street	2025	Construction would overlap with the Proposed Action.	Noise; Air Quality; Socioeconomics; Infrastructure, Transportation, And Utilities
H-1 Airport Viaduct Improvements	Resurfacing, repair weakened pavement areas, upgrade guardrail and end terminals, install pavement markings, striping and signing.	2025	Construction would overlap with the Proposed Action.	Noise; Air Quality; Socioeconomics; Infrastructure, Transportation, And Utilities
Eastbound H-1 Freeway Improvement Project – from the Ola Lane Overpass to the Likelike Highway Off-Ramp	Enhance safety and alleviate congestion along eastbound H-1 corridor. Includes widening the eastbound H-1 Freeway, construct new retaining walls, watermain relocations	2024-2026	Construction would overlap with the Proposed Action.	Noise; Air Quality; Socioeconomics; Infrastructure, Transportation, And Utilities

Sources: Hawaii Community Development Authority, 2025; Hawaii Department of Transportation, 2025

APPENDIX D
DEFINITION OF RESOURCES AREAS ANALYZED, METHODOLOGIES, AND MODELING

APPENDIX D-1
AIRSPACE MANAGEMENT AND USE

D.1.1 Definition of the Resource

Airspace management involves the direction, control, and handling of flight operations in the airspace that overlies the borders of the United States (US) and its territories. Under Title 49, US Code § 40103, *Sovereignty and Use of Airspace*, and Public Law No. 103-272, the US government has exclusive sovereignty over the nation's airspace. The Federal Aviation Administration (FAA) has the responsibility to plan, manage, and control the structure and use of all airspace over the United States. FAA rules govern the national airspace system, and FAA regulations establish how and where aircraft may fly. Collectively, the FAA uses these rules and regulations to make airspace use as safe, effective, and compatible as possible for all types of aircraft, from private propeller-driven planes to large, high-speed commercial and military jets.

Aircraft use different kinds of airspace according to the specific rules and procedures defined by the FAA for each type of airspace. A Warning Area is airspace of defined dimensions that extends from 3 nautical miles outward from the coast of the United States and may be over US waters, international waters, or both. The purpose of Warning Areas is to warn nonparticipating pilots of potentially hazardous activity. Warning Areas may be used for other purposes if released to the FAA during periods when not required for their intended purpose and are within areas in which the FAA has Air Traffic Control authority.

Each military organization responsible for a Warning Area develops a daily use schedule. Although the FAA designates Warning Areas for military use, other pilots may transit the airspace under Visual Flight Rules (VFR). Warning Areas exist to notify civil pilots under VFR where heavy volumes of military training exist which increases the chance of conflict and are generally avoided by VFR traffic. Warning Areas in the vicinity of busy airports may have specific avoidance procedures that also apply to small private and municipal airfields. Avoidance procedures are maintained for each Warning Area, and both civil and military aircrews build them into daily flight plans.

Air Traffic Control Assigned Airspace are assigned to Air Traffic Control to segregate air traffic between specified activities being conducted within the assigned airspace and other Instrument Flight Rules traffic. Air Traffic Control Assigned Airspace are the equivalent of a Military Operations Area at 18,000 feet mean sea level and above. This airspace is not depicted on any chart but is often an extension of other air space to higher altitudes and usually referred to by the same name. This airspace remains under control of the FAA when not in use to support general aviation activities.

APPENDIX D-2
NOISE RESOURCES

D.2.1 Sound, Noise, and Potential Effects

D.2.1.1 Introduction

This appendix discusses sound and noise and their potential effects on the human and natural environment. **Section D.2.1.2** provides an overview of the basics of sound and noise. **Section D.2.1.3** defines and describes the different metrics used to describe noise. The largest section, **Section D.2.1.4**, reviews the potential effects of noise, focusing on effects on humans but also addressing effects on property values, terrain, structures, and animals. **Section D.2.1.5** contains the list of references cited. **Section D.2.2** contains data used in the noise modeling process. A number of noise metrics are defined and described in this appendix. Some metrics are included for the sake of completeness when discussing each metric and to provide a comparison of cumulative noise metrics.

D.2.1.2 Basics of Sound

D.2.1.2.1 Sound Waves and Decibels

Sound consists of minute vibrations in the air that travel through the air and are sensed by the human ear. **Figure D-1** is a sketch of sound waves from a tuning fork. The waves move outward as a series of crests where the air is compressed and troughs where the air is expanded. The height of the crests and the depth of the troughs are the amplitude or sound pressure of the wave. The pressure determines its energy or intensity. The number of crests or troughs that pass a given point each second is called the frequency of the sound wave.

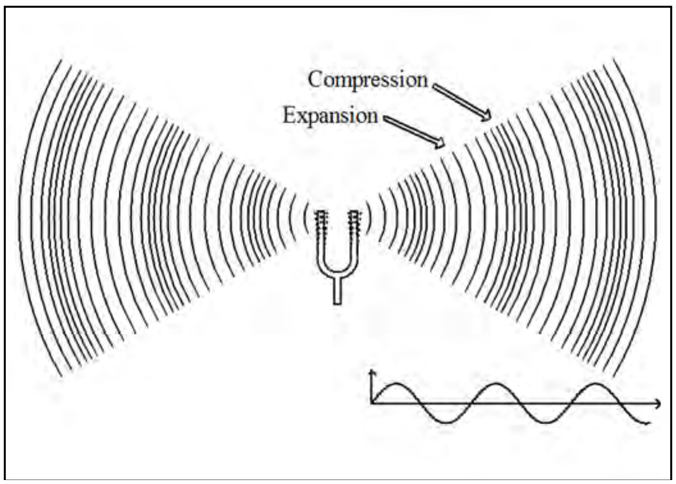


Figure D-1. Sound Waves from a Vibrating Tuning Fork.

The measurement and human perception of sound involves three basic physical characteristics: intensity, frequency, and duration.

- Intensity is a measure of the acoustic energy of the sound and related to sound pressure. The greater the sound pressure, the more energy carried by the sound and the louder the perception of that sound.
- Frequency determines how the pitch of the sound is perceived. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches.
- Duration or the length of time the sound can be detected.

The loudest sounds that can be comfortably heard by the human ear have intensities a trillion times higher than those of sounds barely heard. Because of this vast range, it is unwieldy to use a linear scale to represent the intensity of sound. As a result, a logarithmic unit known as the decibel (abbreviated dB) is used to represent the intensity of a sound. Such a representation is called a sound level. A sound level of

0 dB is approximately the threshold of human hearing and barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 and 140 dB are felt as pain (Berglund and Lindvall, 1995).

As shown on **Figure D-1**, the sound from a tuning fork spreads out uniformly as it travels from the source. The spreading causes the sound's intensity to decrease with increasing distance from the source. For a source such as an aircraft in flight, the sound level will decrease by about 6 dB for every doubling of the distance. For a busy highway, the sound level will decrease by 3 to 4.5 dB for every doubling of distance.

As sound travels from the source, it also is absorbed by the air. The amount of absorption depends on the frequency composition of the sound, temperature, and humidity conditions. Sound with high frequency content gets absorbed by the air more than sound with low frequency content. More sound is absorbed in colder and drier conditions than in hot and wet conditions. Sound is also affected by wind and temperature gradients, terrain (elevation and ground cover), and structures.

Because of the logarithmic nature of the decibel unit, sound levels cannot simply be added or subtracted and are somewhat cumbersome to handle mathematically; however, some simple rules are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example:

60 dB + 60 dB = 63 dB, and
80 dB + 80 dB = 83 dB.

Second, the total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

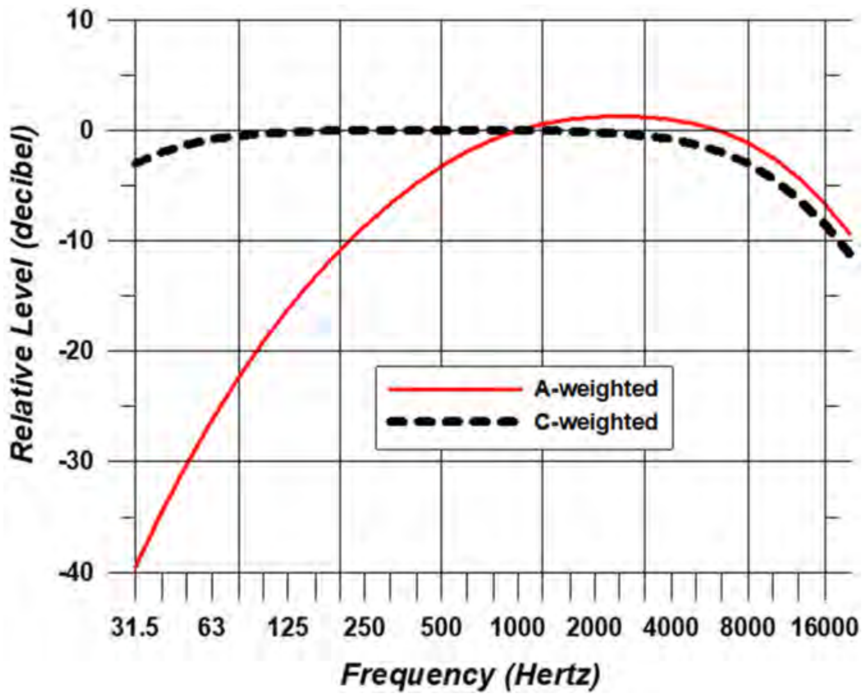
Because the addition of sound levels is different than that of ordinary numbers, this process is often referred to as "decibel addition."

The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. On average, a person perceives a change in sound level of about 10 dB as a doubling (or halving) of the sound's loudness. This relation holds true for loud and quiet sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound intensity but only a 50 percent decrease in perceived loudness because the human ear does not respond linearly.

Sound frequency is measured in terms of cycles per second or hertz (Hz). The normal ear of a young person can detect sounds that range in frequency from about 20 to 20,000 Hz. As we get older, we lose the ability to hear high frequency sounds. Not all sounds in this wide range of frequencies are heard equally. Human hearing is most sensitive to frequencies in the 1,000 to 4,000 Hz range. The notes on a piano range from just over 27 to 4,186 Hz, with middle C equal to 261.6 Hz. Most sounds (including a single note on a piano) are not simple pure tones like the tuning fork on **Figure D-1** but contain a mix, or spectrum, of many frequencies.

Sounds with different spectra are perceived differently even if the sound levels are the same. Weighting curves have been developed to correspond to the sensitivity and perception of different types of sound. A-weighting and C-weighting are the two most common weightings. These two curves, shown on **Figure D-2**, are adequate to quantify most environmental noises. A-weighting puts emphasis on the 1,000- to 4,000-Hz range where human hearing is most sensitive.

Very loud or impulsive sounds, such as explosions or sonic booms, can sometimes be felt and cause secondary effects, such as shaking of a structure or rattling of windows. These types of sounds can add to annoyance and are best measured by C-weighted sound levels, denoted dBC. C-weighting is nearly flat throughout the audible frequency range and includes low frequencies that may not be heard but cause shaking or rattling. C-weighting approximates the human ear's sensitivity to higher intensity sounds.



Source: ANSI S1.4A -1985 "Specification of Sound Level Meters"

Figure D-2. Frequency Characteristics of A- and C-Weighting.

D.2.1.2.2 Sound Levels and Types of Sounds

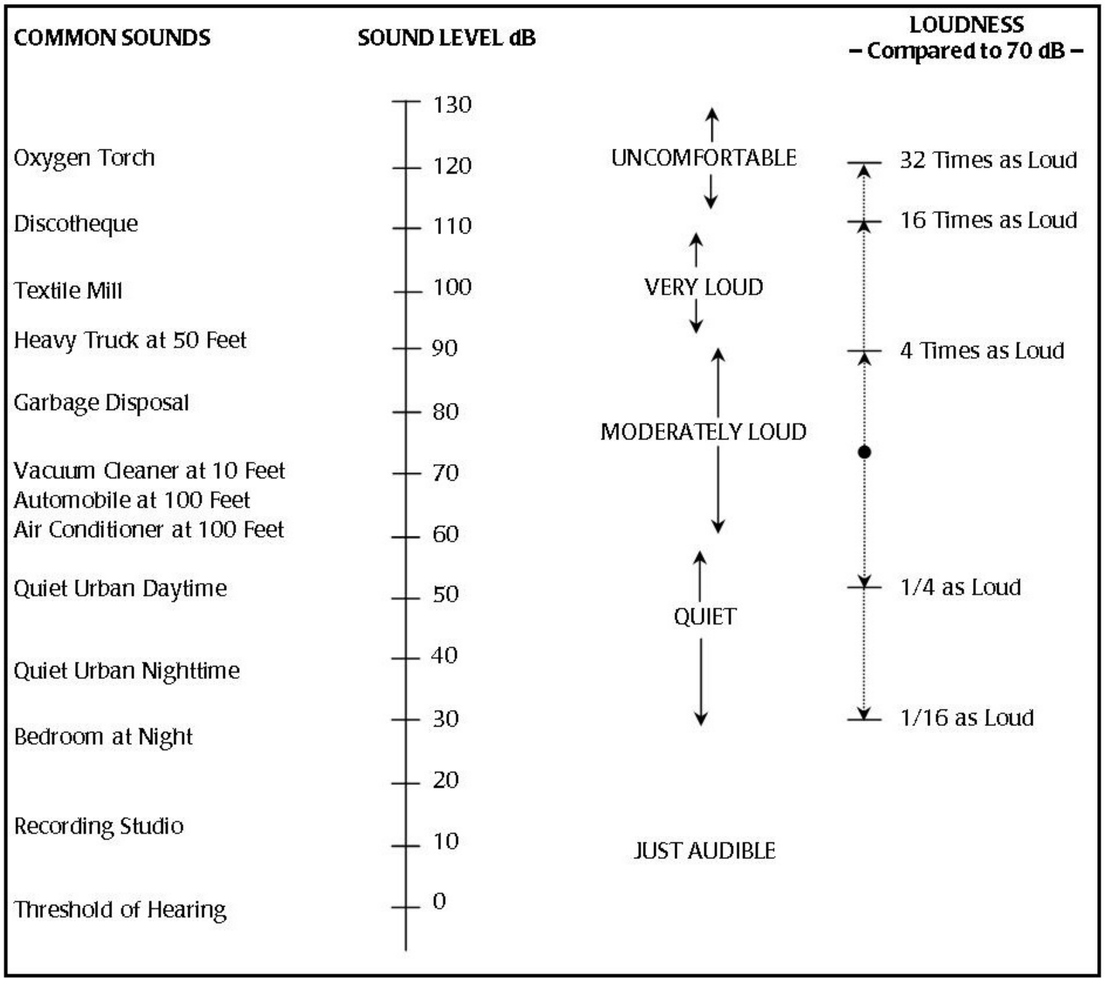
Most environmental sounds are measured using A-weighting. They are called A-weighted sound levels and sometimes use the unit dBA or dB(A) rather than dB. When the use of A-weighting is understood, the term "A-weighted" is often omitted and the unit dB is used. Unless otherwise stated, dB units refer to A-weighted sound levels.

Sound becomes noise when it is unwelcome and interferes with normal activities, such as sleep or conversation. Noise is unwanted sound. Noise can become an issue when its level exceeds the ambient or background sound level. Ambient noise in urban areas typically varies from 60 to 70 dB but can be as high as 80 dB in the center of a large city. Quiet suburban neighborhoods experience ambient noise levels around 45 to 50 dB (United States [US] Environmental Protection Agency [USEPA], 1978).

Figure D-3 shows A-weighted sound levels from common sources. Some sources, like the air conditioner and vacuum cleaner, are continuous sounds whose levels are constant for some time. Some sources, like the automobile and heavy truck, are the maximum sound during an intermittent event like a vehicle pass-by. Some sources like "urban daytime" and "urban nighttime" are averages over extended periods. A variety of noise metrics have been developed to describe noise over different time periods. These are discussed in detail in **Section D.2.1.3**.

Aircraft noise consists of two major types of sound events: flight (including takeoffs, landings, and flyovers) and stationary, such as engine maintenance run-ups. The former is intermittent and the latter primarily continuous. Noise from aircraft overflights typically occurs beneath main approach and departure paths, in local air traffic patterns around the airfield, and in areas near aircraft parking ramps and staging areas. As aircraft climb, the noise received on the ground drops to lower levels, eventually fading into the background or ambient levels.

Impulsive noises are generally short, loud events. Their single-event duration is usually less than 1 second. Examples of impulsive noises are small-arms gunfire, hammering, pile driving, metal impacts during railyard shunting operations, and riveting. Examples of high-energy impulsive sounds are quarry/mining explosions, sonic booms, demolition, and industrial processes that use high explosives, military ordnance (e.g., armor, artillery and mortar fire, and bombs), explosive ignition of rockets and missiles, and any other explosive source where the equivalent mass of dynamite exceeds 25 grams (American National Standards Institute [ANSI], 1996).



Source: Harris, 1979

Figure D-3. Typical A-weighted Sound Levels of Common Sounds.

D.2.1.3 Noise Metrics

Noise metrics quantify sounds so they can be compared with each other and with their effects, in a standard way. There are a number of metrics that can be used to describe a range of situations, from a particular individual event to the cumulative effect of all noise events over a long time. This section describes the metrics relevant to environmental noise analysis.

D.2.1.3.1 Single Events

Maximum Sound Level

The highest A-weighted sound level measured during a single event in which the sound changes with time is called the maximum A-weighted sound level or Maximum Sound Level and is abbreviated L_{max}. The L_{max} is depicted for a sample event in **Figure D-4**.

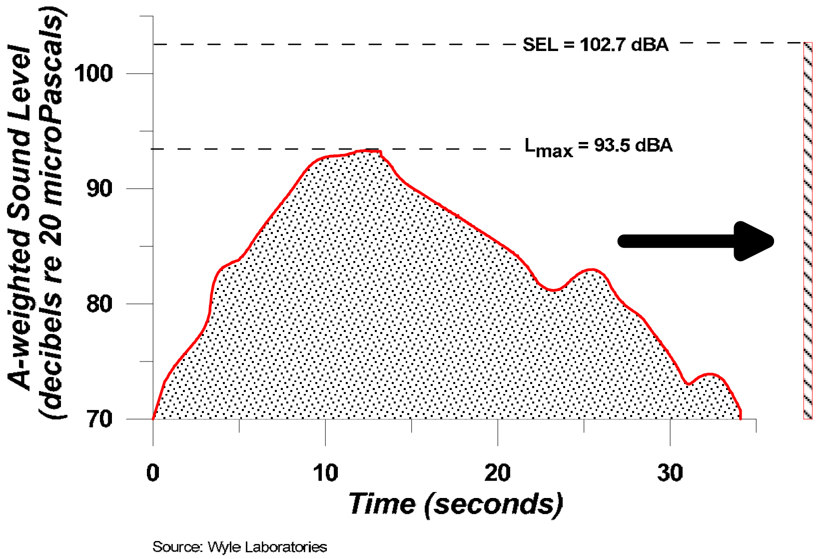


Figure D-4. Example Time History of Aircraft Noise Flyover.

L_{max} is the maximum level that occurs over a fraction of a second. For aircraft noise, the "fraction of a second" is one-eighth of a second, denoted as "fast" response on a sound level measuring meter (ANSI, 1988) (**Figure D-4**). Slowly varying or steady sounds are generally measured over 1 second, denoted as "slow" response. L_{max} is important in judging if a noise event will interfere with conversation, television or radio listening, or other common activities. Although it provides some measure of the event, it does not fully describe the noise because it does not account for how long the sound is heard.

Peak Sound Pressure Level

The Peak Sound Pressure Level (L_{pk}) is the highest instantaneous level measured by a sound level measurement meter. L_{pk} is typically measured every 20 microseconds and usually based on unweighted or linear response of the meter. It is used to describe individual impulsive events such as blast noise. Because blast noise varies from shot to shot and varies with meteorological (weather) conditions, the US Department of Defense (DOD) usually characterizes L_{pk} by the metric PK 15(met), which is the L_{pk} exceeded 15 percent of the time. The "met" notation refers to the metric accounting for varied meteorological or weather conditions.

Sound Exposure Level

Sound Exposure Level (SEL) combines both the intensity of a sound and its duration. For an aircraft flyover, SEL includes the maximum and all lower noise levels produced as part of the overflight, together with how long each part lasts. It represents the total sound energy in the event. **Figure D-4** indicates the SEL for an example event, representing it as if all the sound energy were contained within 1 second.

Aircraft noise varies with time. During an aircraft overflight, noise starts at the background level, rises to a maximum level as the aircraft flies close to the observer, then returns to the background as the aircraft recedes into the distance. This is sketched on **Figure D-4**, which also indicates two metrics (L_{max} and SEL) that are described above. Over time there can be a number of events, not all the same. Because aircraft noise events last more than a few seconds, the SEL value is larger than L_{max}. It does not directly represent the sound level heard at any given time but rather the entire event. SEL provides a much better measure of aircraft flyover noise exposure than L_{max} alone.

Overpressure

The single event metrics commonly used to assess supersonic noise are overpressure in pounds per square foot and C-Weighted Sound Exposure Level (CSEL). Overpressure is the peak pressure at any location within the sonic boom footprint.

<u>**C-Weighted Sound Exposure Level**</u>

CSEL is SEL computed with C frequency weighting, which is similar to A-Weighting (discussed in **Section D.2.2.2**) except that C weighting places more emphasis on low frequencies below 1,000 hertz.

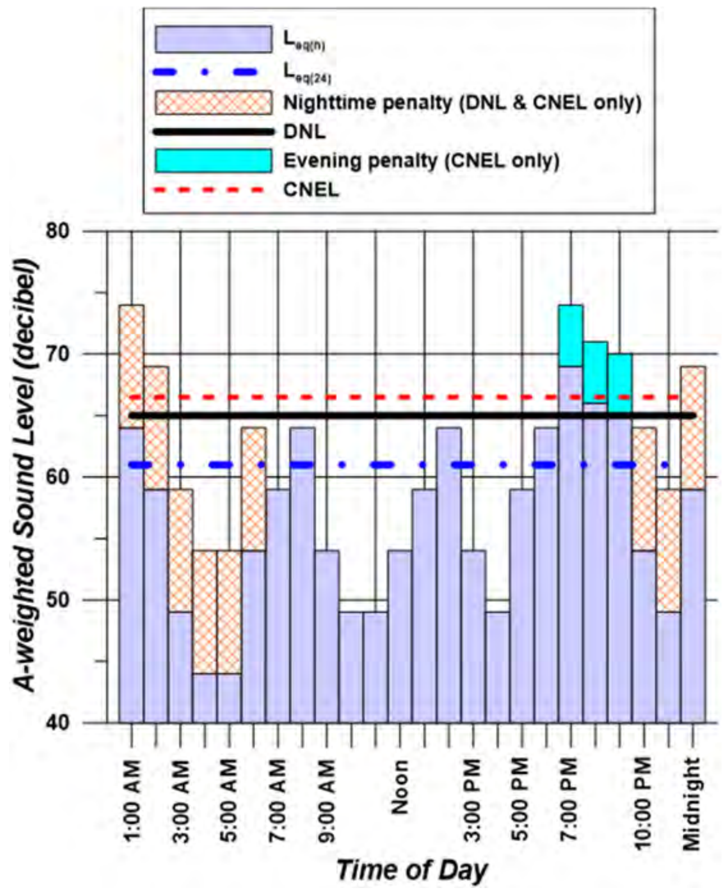
D.2.1.3.2 Cumulative Events

<u>**Equivalent Sound Level**</u>

Equivalent Sound Level (L_{eq}) is a "cumulative" metric that combines a series of noise events over a period of time. L_{eq} is the sound level that represents the decibel average SEL of all sounds in the time period. Just as SEL has proven to be a good measure of a single event, L_{eq} has proven to be a good measure of series of events during a given time period.

The time period of an L_{eq} measurement is usually related to some activity and is given along with the value. The time period is often shown in parenthesis (e.g., L_{eq}[24] for 24 hours). The L_{eq} from 7:00 a.m. to 3:00 p.m. may give exposure of noise for a school day.

Figure D-5 gives an example of L_{eq}(24) using notional hourly average noise levels (L_{eq}[h]) for each hour of the day as an example. The L_{eq}(24) for this example is 61 dB.



Source: Wyle Laboratories

Figure D-5. Example of Cumulative Noise Exposure From All Events Over a Full 24 Hours, Day-Night Average Sound Level and C-Weighted Sound Exposure Level Computed from Hourly Equivalent Sound Levels.

Day-Night Average Sound Level and Community Noise Equivalent Level

Day-Night Average Sound Level (DNL or L_{dn}) is a cumulative metric that accounts for all noise events in a 24-hour period; however, unlike $L_{eq}(24)$, DNL contains a nighttime noise penalty. To account for our increased sensitivity to noise at night, DNL applies a 10-dB penalty to events during the nighttime period, defined as 10:00 p.m. to 7:00 a.m. The notations DNL and L_{dn} are both used for Day-Night Average Sound Level and are equivalent.

Community Noise Equivalent Level (CNEL) is a variation of DNL specified by law in California (California Code of Regulations Title 21, Public Works) (Wyle Laboratories, 1970). CNEL has the 10-dB nighttime penalty for events between 10:00 p.m. and 7:00 a.m. but also includes a 4.8-dB penalty for events during the evening period of 7:00 p.m. to 10:00 p.m. The evening penalty in CNEL accounts for the added intrusiveness of sounds during that period. For airports and military airfields, DNL and CNEL represent the average sound level for annual average daily aircraft events.

Figure D-5 gives an example of DNL and CNEL using notional hourly average noise levels (L_{eq}[h]) for each hour of the day as an example. Note the L_{eq}(h) for the hours between 10:00 p.m. and 7:00 a.m. have a 10-dB penalty assigned. For CNEL, the hours between 7:00 p.m. and 10:00 p.m. have a 4.8-dB penalty assigned. The DNL for this example is 65 dB. The CNEL for this example is 66 dB.

Figure D-6 shows the ranges of DNL or CNEL that occur in various types of communities. Under a flight path at a major airport the DNL may exceed 80 dB while rural areas may experience DNL less than 45 dB. The decibel summation nature of these metrics causes the noise levels of the loudest events to control the 24-hour average. As a simple example, consider a case in which only one aircraft overflight occurs during the daytime over a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours, 59 minutes, and 30 seconds of the day, the ambient sound level is 50 dB. The DNL for this 24-hour period is 65.9 dB. Assume, as a second example that 10 such 30-second overflights occur during daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The DNL for this 24-hour period is 75.5 dB. Clearly, the averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events.

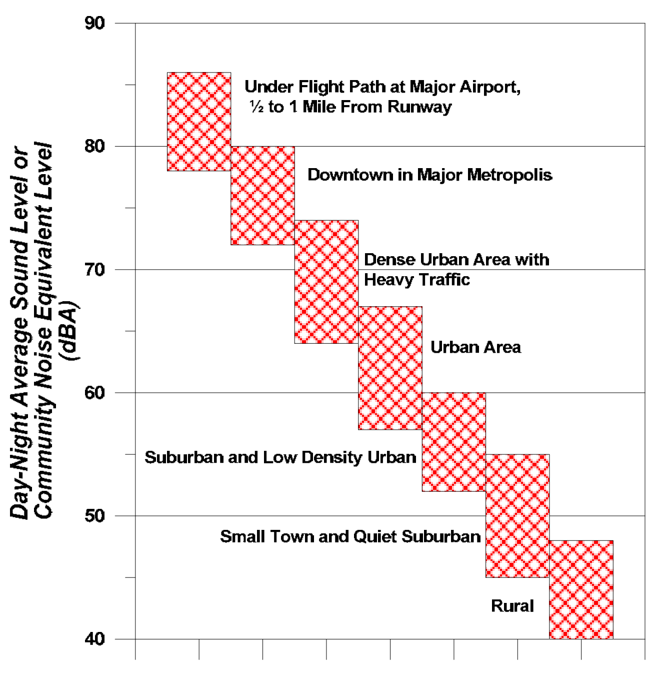


Figure D-6. Typical Day-Night Average Sound Level or Community Noise Equivalent Level Ranges in Various Types of Communities.

A feature of the DNL metric is that a given DNL value could result from a very few noisy events or a large number of quieter events. For example, one overflight at 90 dB creates the same DNL as 10 overflights at 80 dB.

DNL or CNEL does not represent a level heard at any given time but represent long-term exposure. Scientific studies have found good correlation between the percentages of groups of people highly annoyed and the level of average noise exposure measured in DNL (Schultz, 1978; USEPA, 1978).

Onset-Rate Adjusted Monthly Day-Night Average Sound Level and Onset-Rate Adjusted Monthly Community Noise Equivalent Level

Military aircraft utilizing Special Use Airspace (SUA) such as Military Training Routes, Military Operations Areas, and restricted areas generate a noise environment that is somewhat different from that around airfields. Rather than regularly occurring operations like at airfields, activity in SUA is highly sporadic. It is often seasonal, ranging from 10 per hour to less than 1 per week. Individual military overflight events also differ from typical community noise events in that noise from a low-altitude, high-airspeed flyover can have a rather sudden onset, with rates of up to 150 dB per second.

The cumulative daily noise metric devised to account for the "surprise" effect of the sudden onset of aircraft noise events on humans and the sporadic nature of SUA activity is the Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). Onset rates between 15 and 150 dB per second require an adjustment of 0 to 11 dB to the event's SEL while onset rates below 15 dB per second require no adjustment to the event's SEL (Stusnick et al., 1992). The term 'monthly' in L_{dnmr} refers to the noise assessment being conducted for the month with the most operations or sorties -- the so-called busiest month.

In California, a variant of the L_{dnmr} includes a penalty for evening operations (7:00 p.m. to 10:00 p.m.) and is denoted Onset-Rate Adjusted Monthly Community Noise Equivalent Level ($CNEL_{mr}$).

D.2.1.3.3 Supplemental Metrics

Number-of-Events Above a Threshold Level

The Number-of-Events Above (NA) metric gives the total number of events that exceed a noise level threshold (L) during a specified period of time. Combined with the selected threshold, the metric is denoted NAL. The threshold can be either SEL or L_{max}, and it is important that this selection is shown in the nomenclature. When labeling a contour line or point of interest, NAL is followed by the number of events in parentheses. For example, where 10 events exceed an SEL of 90 dB over a given period of time, the nomenclature would be NA90SEL(10). Similarly, for L_{max} it would be NA90L_{max}(10). The period of time can be an average 24-hour day, daytime, nighttime, school day, or any other time period appropriate to the nature and application of the analysis.

NA is a supplemental metric. It is not supported by the amount of science behind DNL/CNEL, but it is valuable in helping to describe noise to the community. A threshold level and metric are selected that best meet the need for each situation. An L_{max} threshold is normally selected to analyze speech interference, while an SEL threshold is normally selected for analysis of sleep disturbance.

The NA metric is the only supplemental metric that combines single-event noise levels with the number of aircraft operations. In essence, it answers the question of how many aircraft (or range of aircraft) fly over a given location or area at or above a selected threshold noise level.

Time Above a Specified Level

The Time Above (TA) metric is the total time, in minutes, that the A-weighted noise level is at or above a threshold. Combined with the threshold level (L), it is denoted TAL. TA can be calculated over a full 24-hour annual average day, the 15-hour daytime and 9-hour nighttime periods, a school day, or any other time period of interest, provided there is operational data for that time.

TA is a supplemental metric, used to help understand noise exposure. It is useful for describing the noise environment in schools, particularly when assessing classroom or other noise sensitive areas for various scenarios. TA can be shown as contours on a map similar to the way DNL contours are drawn.

TA helps describe the noise exposure of an individual event or many events occurring over a given time period. When computed for a full day, the TA can be compared alongside the DNL in order to determine the sound levels and total duration of events that contribute to the DNL. TA analysis is usually conducted along with NA analysis, so the results show not only how many events occur, but also the total duration of those events above the threshold.

D.2.1.4 Noise Effects

Noise is of concern because of potential adverse effects. The following subsections describe how noise can affect communities and the environment and how those effects are quantified. The specific topics discussed are

- annoyance;
- speech interference;
- sleep disturbance;
- noise effects on children; and
- noise effects on domestic animals and wildlife.

D.2.1.4.1 Annoyance

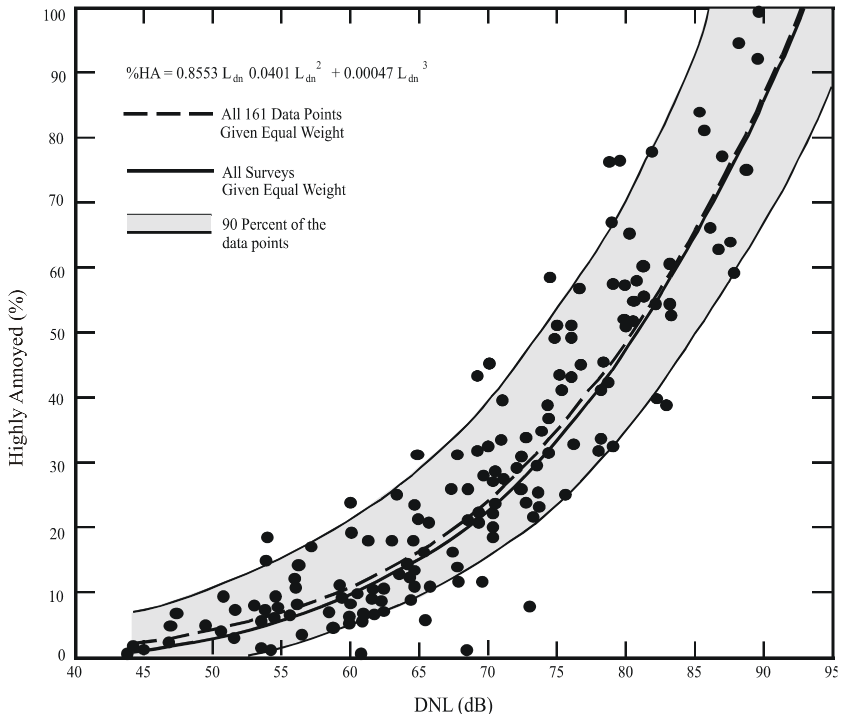
With the introduction of jet aircraft in the 1950s, it became clear that aircraft noise annoyed people and was a significant problem around airports. Early studies, such as those of Rosenblith et al. (1953) and Stevens et al. (1953) showed that effects depended on the quality of the sound, its level, and the number of flights. Over the next 20 years considerable research was performed refining this understanding and setting guidelines for noise exposure. In the early 1970s, the USEPA published its “Levels Document” (USEPA, 1974) that reviewed the factors that affected communities. DNL (still known as L_{dn} at the time) was identified as an appropriate noise metric, and threshold criteria were recommended.

Threshold criteria for annoyance were identified from social surveys, where people exposed to noise were asked how noise affects them. Surveys provide direct real-world data on how noise affects actual residents.

Surveys in the early years had a range of designs and formats and needed some interpretation to find common ground. In 1978, Schultz showed that the common ground was the number of people “highly annoyed,” defined as the upper 28 percent range of whatever response scale a survey used (Schultz, 1978). With that definition, he was able to show a remarkable consistency among the majority of the surveys for which data were available. **Figure D-7** shows the result of his study relating DNL to individual annoyance measured by percent highly annoyed (%HA).

Schultz’s original synthesis included 161 data points. **Figure D-8** shows a comparison of the predicted response of the Schultz data set with an expanded set of 400 data points collected through 1989 (Finegold et al., 1994). The new form is the preferred form in the United States, endorsed by the Federal Interagency Committee on Aviation Noise (FICAN, 1997). Other forms have been proposed, such as that of Fidell and Silvati (2004) but have not gained widespread acceptance.

When the goodness of fit of the Schultz curve is examined, the correlation between groups of people is high, in the range of 85 to 90 percent; however, the correlation between individuals is much lower, at 50 percent or less. This is not surprising, given the personal differences between individuals. The surveys underlying the Schultz curve include results that show that annoyance to noise is also affected by nonacoustical factors. Newman and Beattie (1985) divided the nonacoustic factors into the emotional and physical variables shown in **Table D-1**.



Source: Schultz, 1978

Figure D-7. Schultz Curve Relating Noise Annoyance to Day-Night Average Sound Level

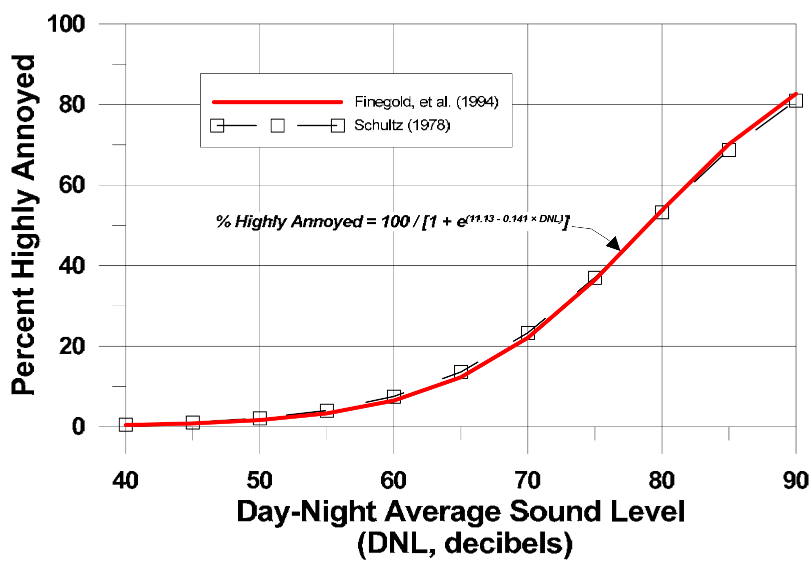


Figure D-8. Response of Communities to Noise; Comparison of Original Schultz (1978) with Finegold et al. (1994).

Table D-1
Nonacoustic Variables Influencing Aircraft Noise Annoyance

Emotional Variables
Feeling about the necessity or preventability of the noise
Judgement of the importance and value of the activity that is producing the noise
Activity at the time an individual hears the noise
Attitude about the environment
General sensitivity to noise
Belief about the effect of noise on health
Feeling of fear associated with the noise

Physical Variables
Type of neighborhood
Time of day
Season
Predictability of the noise
Control over the noise source
Length of time individual is exposed to a noise.

Schreckenberg and Schuemer (2010) examined the importance of some of these factors on short term annoyance. Attitudinal factors were identified as having an effect on annoyance. In formal regression analysis, however, sound level (L_{eq}) was found to be more important than attitude. A series of studies at three European airports showed that less than 20 percent of the variance in annoyance can be explained by noise alone (Márki, 2013).

A study by Plotkin et al. (2011) examined updating DNL to account for these factors. It was concluded that the data requirements for a general analysis were much greater than are available from most existing studies. It was noted that the most significant issue with DNL is that it is not readily understood by the public and that supplemental metrics such as TA and NA were valuable in addressing attitude when communicating noise analysis to communities (DOD, 2009a).

A factor that is partially nonacoustical is the source of the noise. Miedema and Vos (1998) presented synthesis curves for the relationship between DNL and percentage “Annoyed” and percentage “Highly Annoyed” for three transportation noise sources. Different curves were found for aircraft, road traffic, and railway noise. **Table D-2** summarizes their results. Comparing the updated Schultz curve suggests that the percentage of people highly annoyed by aircraft noise may be higher than previously thought. Miedema and Oudshoorn (2001) authors supplemented that investigation with further derivation of percent of population highly annoyed as a function of either DNL or DENL along with the corresponding 95 percent confidence intervals with similar results.

Table D-2
Percent Highly Annoyed for Different Transportation Noise Sources

Day-Night Average Sound Level (decibels)	Percent Highly Annoyed (%HA)			
	Miedema and Vos			Schultz Combined
	Air	Road	Rail	
55	12	7	4	3
60	19	12	7	6
65	28	18	11	12
70	37	29	16	22
75	48	40	22	36

Source: Miedema and Vos, 1998

As noted by the World Health Organization (WHO), however, even though aircraft noise seems to produce a stronger annoyance response than road traffic, caution should be exercised when interpreting synthesized data from different studies (WHO, 1999).

Consistent with WHO's recommendations, the Federal Interagency Committee on Noise (FICON, 1992) considered the Schultz curve to be the best source of dose information to predict community response to noise but recommended further research to investigate the differences in perception of noise from different sources.

The International Standard Organization (ISO 1996:1-2016) update introduced the concept of Community Tolerance Level (L_{ct}) as the day-night sound level at which 50 percent of the people in a particular community are predicted to be highly annoyed by noise exposure. L_{ct} accounts for differences between sources and/or communities when predicting the percentage highly annoyed by noise exposure. ISO also recommended a change to the adjustment range used when comparing aircraft noise to road noise. The previous edition suggested +3 to +6 dB for aircraft noise relative to road noise while the latest editions recommends an adjustment range of +5 to +8 dB. This adjustment range allows DNL to be correlated to consistent annoyance rates when originating from different noise sources (i.e., road traffic, aircraft, or railroad). This change to the adjustment range would increase the calculated percent highly annoyed at the 65-dBA DNL by approximately 2 to 5 percent greater than the previous ISO definition. **Figure D-9** depicts the estimated percentage of people highly annoyed for a given DNL using both the ISO 1996-1 estimation and the older FICON 1992 method. The results suggest that the percentage of people highly annoyed may be greater than previous thought and reliance solely on DNL for impact analysis may be insufficient if utilizing the FICON 1992 method.

The US Federal Aviation Administration (FAA) is currently conducting a major airport community noise survey at approximately 20 US airports in order to update the relationship between aircraft noise and annoyance. Results from this study have not yet been released.

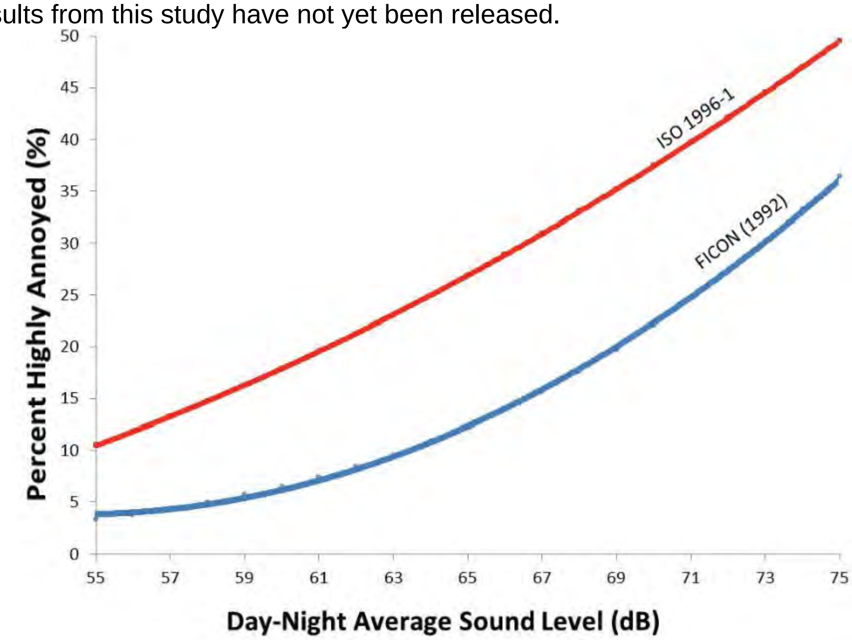


Figure D-9. Percent Highly Annoyed Comparison of International Standard Organization 1996-1 to Federal Interagency Committee on Noise (1992).

D.2.1.4.2 Speech Interference

Speech interference from noise is a primary cause of annoyance for communities. Disruption of routine activities such as radio or television listening, telephone use, or conversation leads to frustration and annoyance. The quality of speech communication is important in classrooms and offices. In the workplace, speech interference from noise can cause fatigue and vocal strain in those who attempt to talk over the noise. In schools it can impair learning.

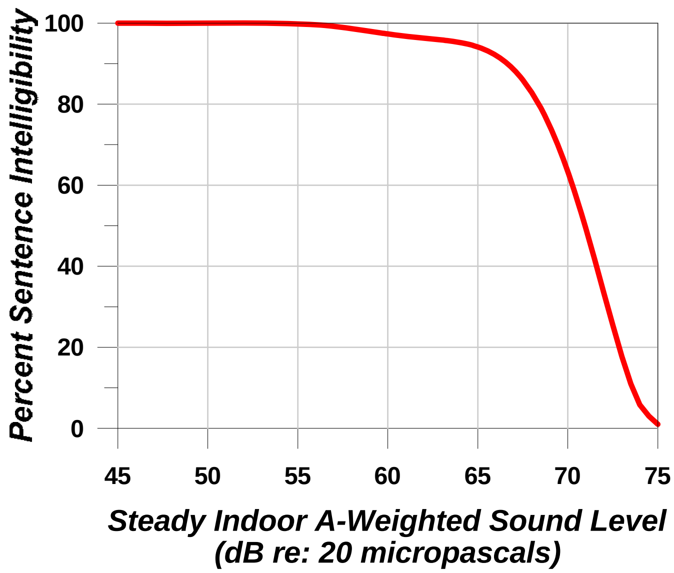
There are two measures of speech comprehension:

1. Word Intelligibility – the percent of words spoken and understood. This might be important for students in the lower grades who are learning the English language and particularly for students who have English as a Second Language.
2. Sentence Intelligibility – the percent of sentences spoken and understood. This might be important for high-school students and adults who are familiar with the language and who do not necessarily have to understand each word in order to understand sentences.

United States Federal Criteria for Interior Noise

In 1974, the USEPA identified a goal of an indoor L_{eq}(24) of 45 dB to minimize speech interference based on sentence intelligibility and the presence of steady noise (USEPA, 1974). **Figure D-10** shows the effect of steady indoor background sound levels on sentence intelligibility. For an average adult with normal hearing and fluency in the language, steady background indoor sound levels of less than the 45-dB L_{eq} are expected to allow 100 percent sentence intelligibility.

The curve on **Figure D-10** shows 99 percent intelligibility at L_{eq} below 54 dB and less than 10 percent above 73 dB. Recalling that L_{eq} is dominated by louder noise events, the USEPA L_{eq}(24) goal of 45 dB generally ensures that sentence intelligibility will be high most of the time.



Source: Digitized from United States Environmental Protection Agency, 1974

Figure D-10. Speech Intelligibility Curve.

Classroom Criteria

For teachers to be understood, their regular voice must be clear and uninterrupted. Background noise has to be below the teacher's voice level. Intermittent noise events that momentarily drown out the teacher's voice need to be kept to a minimum. It is therefore important to evaluate the steady background level, level of voice communication, and single-event level due to aircraft overflights that might interfere with speech.

Lazarus (1990) found that for listeners with normal hearing and fluency in the language, complete sentence intelligibility can be achieved when the signal-to-noise ratio (i.e., a comparison of the level of the sound to the level of background noise) is in the range of 15 to 18 dB. The initial ANSI (2002) classroom noise standard and American Speech-Language-Hearing Association (2005) guidelines concur, recommending at least a 15-dB signal-to-noise ratio in classrooms. If the teacher's voice level is at least 50 dB, the background noise level must not exceed an average of 35 dB. The National Research Council of Canada (Bradley, 1993) and WHO (1999) agree with this criterion for background noise.

For eligibility for noise insulation funding, the FAA guidelines state that the design objective for a classroom environment is the 45-dB L_{eq} during normal school hours (FAA, 1985).

Most aircraft noise is not continuous. It consists of individual events like the one sketched on **Figure D-4**. Since speech interference in the presence of aircraft noise is caused by individual aircraft flyover events, a time-averaged metric alone, such as L_{eq}, is not necessarily appropriate. In addition to the background level criteria described above, single-event criteria that account for those noisy events are also needed.

A 1984 study by Wyle for the Port Authority of New York and New Jersey recommended using Speech Interference Level (SIL) for classroom noise criteria (Sharp and Plotkin, 1984). SIL is based on the maximum sound levels in the frequency range that most affects speech communication (500 to 2,000 Hz). The study identified an SIL of 45 dB as the goal. This would provide 90 percent word intelligibility for the short time periods during aircraft overflights. While SIL is technically the best metric for speech interference, it can be approximated by an L_{max} value. An SIL of 45 dB is equivalent to an A-weighted L_{max} of 50 dB for aircraft noise (Wesler, 1986).

Lind et al. (1998) also concluded that an L_{max} criterion of 50 dB would result in 90 percent word intelligibility. Bradley (1985) recommends SEL as a better indicator. His work indicates that 95 percent word intelligibility would be achieved when indoor SEL did not exceed 60 dB. For typical flyover noise, this corresponds to an L_{max} of 50 dB. While WHO (1999) only specifies a background L_{max} criterion, they also note the SIL frequencies and that interference can begin at around 50 dB.

The United Kingdom Department for Education and Skills (UKDfES) established in its classroom acoustics guide a 30-minute time-averaged metric of L_{eq}(30min) for background levels and the metric of LA1,30min for intermittent noises, at thresholds of 30 to 35 dB and 55 dB, respectively. LA1,30min represents the A-weighted sound level that is exceeded 1 percent of the time (in this case, during a 30-minute teaching session) and is generally equivalent to the L_{max} metric (UKDfES, 2003).

Table D-3 summarizes the criteria discussed. Other than the FAA (1985) 45 dB L_{max} criterion, they are consistent with a limit on indoor background noise of 35 to 40 dB L_{eq} and a single event limit of 50 dB L_{max}. It should be noted that these limits were set based on students with normal hearing and no special needs. At-risk students may be adversely affected at lower sound levels.

Table D-3
Indoor Noise Level Criteria Based on Speech Intelligibility

Source	Metric/Level (dB)	Effects and Notes
Federal Aviation Administration (1985)	$L_{eq(during\ school\ hours)}$ = 45 dB	Federal assistance criteria for school sound insulation; supplemental single-event criteria may be used.
Lind et al. (1998), Sharp and Plotkin (1984), Wesler (1986)	L_{max} = 50 dB / Speech Interference Level 45	Single event level permissible in the classroom.
World Health Organization (1999)	L_{eq} = 35 dB L_{max} = 50 dB	Assumes average speech level of 50 dB and recommends signal to noise ratio of 15 dB.
American National Standards Institute (2010)	L_{eq} = 35 dB, based on Room Volume (e.g., cubic feet)	Acceptable background level for continuous and intermittent noise.
United Kingdom Department for Education and Skills (2003)	$L_{eq(30min)}$ = 30-35 dB L_{max} = 55 dB	Minimum acceptable in classroom and most other learning environs.

dB = decibel(s); L_{eq} = Equivalent Sound Level; L_{max} = Maximum Sound Level

D.2.1.4.3 Sleep Disturbance

Sleep disturbance is a major concern for communities exposed to aircraft noise at night. A number of studies have attempted to quantify the effects of noise on sleep. This section provides an overview of the major noise-induced sleep disturbance studies. Emphasis is on studies that have influenced US federal noise policy. The studies have been separated into two groups:

1. Initial studies performed in the 1960s and 1970s, where the research was focused on sleep observations performed under laboratory conditions.
2. Later studies performed in the 1990s up to the present, where the research was focused on field observations.

Initial Studies

The relation between noise and sleep disturbance is complex and not fully understood. The disturbance depends not only on the depth of sleep and the noise level but also on the nonacoustic factors cited for annoyance. The easiest effect on measure is the number of arousals or awakenings from noise events. Much of the literature has therefore focused on predicting the percentage of the population that will be awakened at various noise levels.

FICON's 1992 review of airport noise issues (FICON, 1992) included an overview of relevant research conducted through the 1970s. Literature reviews and analyses were conducted from 1978 through 1989 using existing data (Griefahn, 1978; Lukas, 1978; Pearsons et. al., 1989). Because of large variability in the data, FICON did not endorse the reliability of those results.

FICON did, however, recommend an interim dose-response curve, awaiting future research. That curve predicted the percent of the population expected to be awakened as a function of the exposure to SEL. This curve was based on research conducted for the US Air Force (Air Force; Finegold, 1994). The data included most of the research performed up to that point and predicted a 10 percent probability of awakening when exposed to an interior SEL of 58 dB. The data used to derive this curve were primarily from controlled laboratory studies.

Recent Sleep Disturbance Research – Field and Laboratory Studies

It was noted that early sleep laboratory studies did not account for some important factors. These included habituation to the laboratory, previous exposure to noise, and awakenings from noise other than aircraft. In the early 1990s, field studies in people's homes were conducted to validate the earlier laboratory work conducted in the 1960s and 1970s. The field studies of the 1990s (e.g., Horne, 1994) found that 80 to 90 percent of sleep disturbances were not related to outdoor noise events but rather to indoor noises and nonnoise factors. The results showed that, in real life conditions, there was less of an effect of noise on sleep than had been previously reported from laboratory studies. Laboratory sleep studies tend to show more sleep disturbance than field studies because people who sleep in their own homes are used to their environment and, therefore, do not wake up as easily (FICAN, 1997).

FICAN

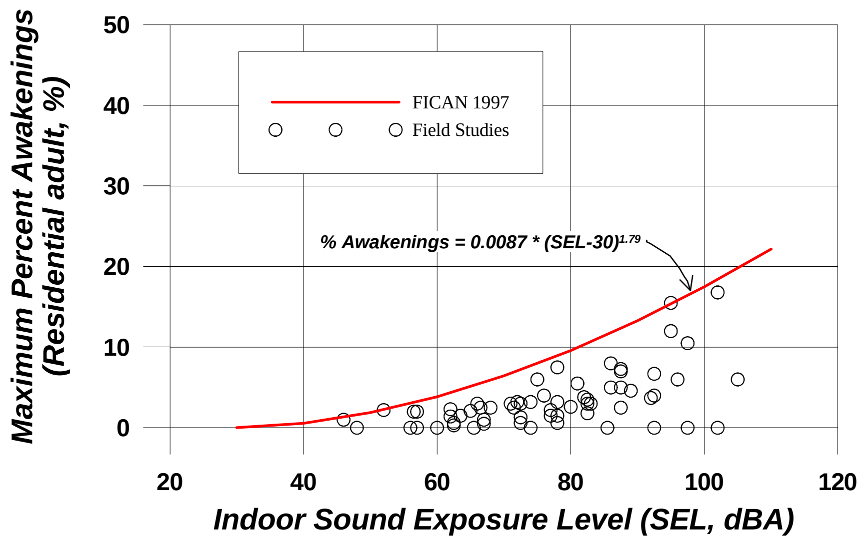
Based on this new information, in 1997 FICAN recommended a dose-response curve to use instead of the earlier 1992 FICON curve (FICAN, 1997). **Figure D-11** shows FICAN's curve, the red line, which is based on the results of three field studies shown in the figure (Ollerhead et al., 1992; Fidell et al., 1994, 1995a, 1995b), along with the data from six previous field studies.

The 1997 FICAN curve represents the upper envelope of the latest field data. It predicts the maximum percent awakened for a given residential population. According to this curve, a maximum of 3 percent of people would be awakened at an indoor SEL of 58 dB. An indoor SEL of 58 dB is equivalent to an outdoor SEL of about 83 dB, with the windows closed (73 dB with windows open).

Number of Events and Awakenings

It is reasonable to expect that sleep disturbance is affected by the number of events. The German Aerospace Center (DLR Laboratory) conducted an extensive study focused on the effects of nighttime aircraft noise on sleep and related factors (Basner, 2004). The DLR Laboratory study was one of the largest studies to examine the link between aircraft noise and sleep disturbance. It involved both laboratory and in-home field research phases. The DLR Laboratory investigators developed a dose-response curve that predicts the number of aircraft events at various values of L_{max} expected to produce one additional awakening over the course of a night. The dose-effect curve was based on the relationships found in the field studies.

Later studies by DLR Laboratory conducted in the laboratory comparing the probability of awakenings from different modes of transportation showed that aircraft noise lead to significantly lower awakening probabilities than either road or rail noise (Basner et al., 2011). Furthermore, it was noted that the probability of awakening, per noise event, decreased as the number of noise events increased. The authors concluded that by far the majority of awakenings from noise events merely replaced awakenings that would have occurred spontaneously anyway.



Source: FICAN 1997

Figure D-11. Federal Interagency Committee on Aviation Noise (1997) Recommended Sleep Disturbance Dose-Response Relationship.

A different approach was taken by an ANSI standards committee (ANSI, 2008). The committee used the average of the data shown on **Figure D-10** rather than the upper envelope, to predict average awakening from one event. Probability theory is then used to project the awakening from multiple noise events.

Currently, there are no established criteria for evaluating sleep disturbance from aircraft noise although recent studies have suggested a benchmark of an outdoor SEL of 90 dB as an appropriate tentative criterion when comparing the effects of different operational alternatives. The corresponding indoor SEL would be approximately 25 dB lower (at 65 dB) with doors and windows closed, and approximately 15 dB lower (at 75 dB) with doors or windows open. According to the ANSI (2008) standard, the probability of awakening from a single aircraft event at this level is between 1 and 2 percent for people habituated to the noise sleeping in bedrooms with windows closed, and between 2 to 3 percent with windows open. The probability of the exposed population awakening at least once from multiple aircraft events at the 90-dB SEL is shown in **Table D-4**.

Table D-4
Probability of Awakening from Aircraft Events Exceeding a Sound Exposure Level of 90 Decibels over a 9-Hour Period

Number of Aircraft Events at the 90-Decibel Sound Exposure Level for Average 9-Hour Night	Minimum Probability of Awakening at Least Once	
	Windows Closed	Windows Open
1	1%	2%
3	4%	6%
5	7%	10%
9 (1 per hour)	12%	18%
18 (2 per hour)	22%	33%
27 (3 per hour)	32%	45%

Source: DOD, 2009b

In December 2008, FICAN recommended the use of this new standard. FICAN also recognized that more research is underway by various organizations, and that work may result in changes to FICAN's position. Until that time, FICAN recommends the use of the ANSI (2008) standard (FICAN, 2008).

Summary

Sleep disturbance research still lacks the details to accurately estimate the population awakened for a given noise exposure. The procedure described in the ANSI (2008) Standard and endorsed by FICAN is based on probability calculations that have not yet been scientifically validated. While this procedure certainly provides a much better method for evaluating sleep awakenings from multiple aircraft noise events, the estimated probability of awakenings can only be considered approximate.

D.2.1.4.4 Noise Effects on Children

Recent studies on school children indicate a potential link between aircraft noise and both reading comprehension and learning motivation. The effects may be small but may be of particular concern for children who are already scholastically challenged.

Effects on Learning and Cognitive Abilities

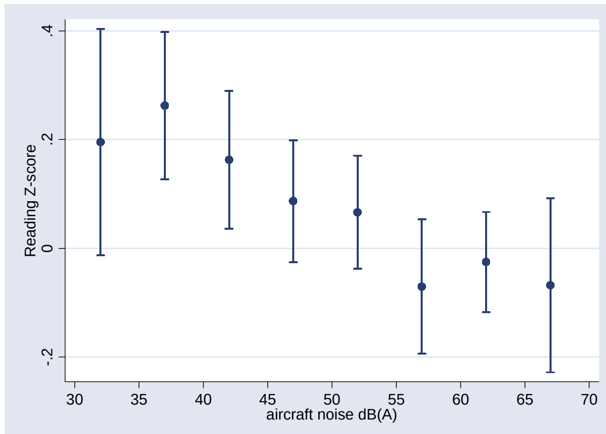
Early studies in several countries (Cohen et al., 1973, 1980, 1981; Bronzaft and McCarthy, 1975; Green et al., 1982; Evans et al., 1998; Haines et al., 2002; Lercher et al., 2003) showed lower reading scores for children living or attending school in noisy areas than for children away from those areas. In some studies noise exposed children were less likely to solve difficult puzzles or more likely to give up.

A longitudinal study reported by Evans et al. (1998), conducted prior to relocation of the old Munich airport in 1992, reported that high noise exposure was associated with deficits in long-term memory and reading comprehension in children with a mean age of 10.8 years. Two years after the closure of the airport, these deficits disappeared, indicating that noise effects on cognition may be reversible if exposure to the noise ceases. Most convincing was the finding that deficits in memory and reading comprehension developed over the 2-year follow-up for children who became newly noise exposed near the new airport; deficits were also observed in speech perception for the newly noise-exposed children.

More recently, the Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health (RANCH) study (Stansfeld et al., 2005; Clark et al., 2005) compared the effect of aircraft and road traffic noise on over 2,000 children in three countries. This was the first study to derive exposure-effect associations for a range of cognitive and health effects and was the first to compare effects across countries.

The study found a linear relation between chronic aircraft noise exposure and impaired reading comprehension and recognition memory. No associations were found between chronic road traffic noise exposure and cognition. Conceptual recall and information recall surprisingly showed better performance in high road traffic noise areas. Neither aircraft noise nor road traffic noise affected attention or working memory (Stansfeld et al., 2005; Clark et al., 2006).

Figure D-12 shows RANCH's result relating noise to reading comprehension. It shows that reading falls below average (a z-score of 0) at Leq greater than 55 dB. Because the relationship is linear, reducing exposure at any level should lead to improvements in reading comprehension.



Sources: Stansfeld et al. 2005; Clark et al. 2006

Figure D-12. Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health Study Reading Scores Varying with Equivalent Sound Level.

An observation of the RANCH study was that children may be exposed to aircraft noise for many of their childhood years and the consequences of long-term noise exposure were unknown. A follow-up study of the children in the RANCH project is being analyzed to examine the long-term effects on children's reading comprehension (Clark et al., 2009). Preliminary analysis indicated a trend for reading comprehension to be poorer at 15 to 16 years of age for children who attended noise-exposed primary schools. An additional study utilizing the same data set (Clark et al., 2012) investigated the effects of traffic-related air pollution and found little evidence that air pollution moderated the association of noise exposure on children's cognition.

There was also a trend for reading comprehension to be poorer in aircraft noise exposed secondary schools. Significant differences in reading scores were found between primary school children in the two different classrooms at the same school (Bronzaft and McCarthy, 1975). One classroom was exposed to high levels of railway noise while the other classroom was quiet. The mean reading age of the noise-exposed children was 3 to 4 months behind that of the control children. Studies suggest that the evidence of the effects of noise on children's cognition has grown stronger over recent years (Stansfeld and Clark, 2015), but further analysis adjusting for confounding factors is ongoing and needed to confirm these initial conclusions.

Studies identified a range of linguistic and cognitive factors to be responsible for children´s unique difficulties with speech perception in noise. Children have lower stored phonological knowledge to reconstruct degraded speech reducing the probability of successfully matching incomplete speech input when compared with adults. Additionally, young children are less able than older children and adults to make use of contextual cues to reconstruct noise-masked words presented in sentential context (Klatte et al., 2013).

FICAN funded a pilot study to assess the relationship between aircraft noise reduction and standardized test scores (Eagan et al., 2004; FICAN, 2007). The study evaluated whether abrupt aircraft noise reduction within classrooms, from either airport closure or sound insulation, was associated with improvements in test scores. Data were collected in 35 public schools near three airports in Illinois and Texas. The study used several noise metrics. These were, however, all computed indoor levels, which makes it hard to compare with the outdoor levels used in most other studies.

The FICAN study found a significant association between noise reduction and a decrease in failure rates for high school students but not middle or elementary school students. There were some weaker associations between noise reduction and an increase in failure rates for middle and elementary schools. Overall, the study found that the associations observed were similar for children with or without learning difficulties, and between verbal and math/science tests. As a pilot study, it was not expected to obtain final answers but provided useful indications (FICAN, 2007).

A recent study of the effect of aircraft noise on student learning (Sharp et al., 2013) examined student test scores at a total of 6,198 US elementary schools, 917 of which were exposed to aircraft noise at 46 airports with noise exposures exceeding the 55-dBA DNL. The study found small but statistically significant associations between airport noise and student mathematics and reading test scores, after taking demographic and school factors into account. Associations were also observed for ambient noise and total noise on student mathematics and reading test scores, suggesting that noise levels per se, as well as from aircraft, might play a role in student achievement.

As part of the Noise-Related Annoyance, Cognition and Health study conducted at Frankfurt airport, reading tests were conducted on 1,209 school children at 29 primary schools. It was found that there was a small decrease in reading performance that corresponded to a 1-month reading delay; however, a recent study observing children at 11 schools surrounding Los Angeles International Airport found that the majority of distractions to elementary age students were other students followed by themselves, which includes playing with various items and daydreaming. Less than 1 percent of distractions were caused by traffic noise.

While there are many factors that can contribute to learning deficits in school-aged children, there is increasing awareness that chronic exposure to high aircraft noise levels may impair learning. This awareness has led WHO and a North Atlantic Treaty Organization (NATO) working group to conclude that daycare centers and schools should not be located near major sources of noise, such as highways, airports, and industrial sites (NATO, 2000; WHO, 1999). The awareness has also led to the classroom noise standard discussed earlier (ANSI, 2002).

D.2.1.4.5 Noise Effects on Animals and Wildlife

Hearing is critical to an animal's ability to react, compete, reproduce, hunt, forage, and survive in its environment. While the existing literature does include studies on possible effects of jet aircraft noise and sonic booms on wildlife, there appears to have been little concerted effort in developing quantitative comparisons of aircraft noise effects on normal auditory characteristics. Behavioral effects have been relatively well described, but the larger ecological context issues, and the potential for drawing conclusions regarding effects on populations, have not been well developed.

The relationships between potential auditory/physiological effects and species interactions with their environments are not well understood. Manci et al. (1988) assert that the consequences that physiological effects may have on behavioral patterns are vital to understanding the long-term effects of noise on wildlife. Questions regarding the effects (if any) on predator-prey interactions, reproductive success, and intraspecific behavior patterns remain.

The following discussion provides an overview of the existing literature on noise effects (particularly jet aircraft noise) on animal species. The literature reviewed here involves those studies that have focused on the observations of the behavioral effects that jet aircraft and sonic booms have on animals.

A great deal of research was conducted in the 1960s and 1970s on the effects of aircraft noise on the public and the potential for adverse ecological impacts. These studies were largely completed in response to the increase in air travel and as a result of the introduction of supersonic jet aircraft. According to Manci et al. (1988), the foundation of information created from that focus does not necessarily correlate or provide information specific to the impacts on wildlife in areas overflown by aircraft at supersonic speed or at low altitudes.

The abilities to hear sounds and noise and to communicate assist wildlife in maintaining group cohesiveness and survivorship. Social species communicate by transmitting calls of warning, introduction, and other types that are subsequently related to an individual's or group's responsiveness.

Animal species differ greatly in their responses to noise. Noise effects on domestic animals and wildlife are classified as primary, secondary, and tertiary. Primary effects are direct, physiological changes to the auditory system and most likely include the masking of auditory signals. Masking is defined as the inability of an individual to hear important environmental signals that may arise from mates, predators, or prey. There is some potential that noise could disrupt a species' ability to communicate or could interfere with behavioral patterns (Manci et al., 1988). Although the effects are likely temporal, aircraft noise may cause masking of auditory signals within exposed faunal communities. Animals rely on hearing to avoid predators, obtain food, and communicate with, and attract, other members of their species. Aircraft noise may mask or interfere with these functions. Other primary effects, such as ear drum rupture or temporary and permanent hearing threshold shifts, are not as likely given the subsonic noise levels produced by aircraft overflights.

Secondary effects may include nonauditory effects such as stress and hypertension; behavioral modifications; interference with mating or reproduction; and impaired ability to obtain adequate food, cover, or water. Tertiary effects are the direct result of primary and secondary effects and include population decline and habitat loss. Most of the effects of noise are mild enough that they may never be detectable as variables of change in population size or population growth against the background of normal variation (Bowles, 1995). Other environmental variables (e.g., predators, weather, changing prey base, ground-based disturbance) also influence secondary and tertiary effects and 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, durations, and sources of noise (Manci et al., 1988).

Many scientific studies have investigated the effects of aircraft noise on wildlife, and some have focused on wildlife "flight" due to noise. Animal responses to aircraft are influenced by many variables, including size, speed, proximity (both height above the ground and lateral distance), engine noise, color, flight profile, and radiated noise. The type of aircraft (e.g., fixed wing versus rotor-wing [helicopter]) and type of flight mission may also produce different levels of disturbance, with varying animal responses (Smith et al., 1988). Consequently, it is difficult to generalize animal responses to noise disturbances across species.

One result of the Manci et al. (1988) literature review was the conclusion that, while behavioral observation studies were relatively limited, a general behavioral reaction in animals from exposure to aircraft noise is the startle response. The intensity and duration of the startle response appears to be dependent on which species is exposed, whether there is a group or an individual, and whether there have been some previous exposures. Responses range from flight, trampling, stampeding, jumping, or running, to movement of the head in the apparent direction of the noise source. Manci et al. (1988) reported that the literature indicated that avian species may be more sensitive to aircraft noise than mammals.

Domestic Animals

Although some studies report that the effects of aircraft noise on domestic animals is inconclusive, a majority of the literature reviewed indicates that domestic animals exhibit some behavioral responses to military overflights but generally seem to habituate to the disturbances over a period of time. Mammals in particular appear to react to noise at sound levels higher than 90 dB, with responses including the startle response, freezing (i.e., becoming temporarily stationary), and fleeing from the sound source. Many studies on domestic animals suggest that some species appear to acclimate to some forms of sound disturbance (Manci et al., 1988). Some studies have reported such primary and secondary effects as reduced milk production and rate of milk release, increased glucose concentrations, decreased levels of hemoglobin, increased heart rate, and a reduction in thyroid activity. These latter effects appear to represent a small percentage of the findings occurring in the existing literature.

Some reviewers have indicated that earlier studies, and claims by farmers linking adverse effects of aircraft noise on livestock, did not necessarily provide clear-cut evidence of cause and effect (Cottereau, 1978). In contrast, many studies conclude that there is no evidence that aircraft overflights affect feed intake, growth, or production rates in domestic animals.

Wildlife

Studies on the effects of overflights and sonic booms on wildlife have been focused mostly on avian species and ungulates such as caribou and bighorn sheep. Few studies have been conducted on marine mammals, small terrestrial mammals, reptiles, amphibians, and carnivorous mammals. Generally, species that live entirely below the surface of the water have also been ignored due to the fact they do not experience the same level of sound as terrestrial species (National Park Service, 1994). Wild ungulates appear to be much more sensitive to noise disturbance than domestic livestock. This may be due to previous exposure to disturbances. One common factor appears to be that low-altitude flyovers seem to be more disruptive in terrain where there is little cover (Manci et al., 1988).

Some physiological/behavioral responses such as increased hormonal production, increased heart rate, and reduction in milk production have been described in a small percentage of studies. A majority of the studies focusing on these types of effects have reported short-term or no effects.

The relationships between physiological effects and how species interact with their environments have not been thoroughly studied; therefore, the larger ecological context issues regarding physiological effects of jet aircraft noise (if any) and resulting behavioral pattern changes are not well understood.

Animal species exhibit a wide variety of responses to noise. It is therefore difficult to generalize animal responses to noise disturbances or to draw inferences across species, as reactions to jet aircraft noise appear to be species-specific. Consequently, some animal species may be more sensitive than other species and/or may exhibit different forms or intensities of behavioral responses. For instance, wood ducks appear to be more sensitive and more resistant to acclimation to jet aircraft noise than Canada geese in one study. Similarly, wild ungulates seem to be more easily disturbed than domestic animals.

The literature does suggest that common responses include the “startle” or “fright” response and, ultimately, habituation. It has been reported that the intensities and durations of the startle response decrease with the numbers and frequencies of exposures, suggesting no long-term adverse effects. The majority of the literature suggests that domestic animal species (e.g., cows, horses, chickens) and wildlife species exhibit adaptation, acclimation, and habituation after repeated exposure to jet aircraft noise and sonic booms.

Animal responses to aircraft noise appear to be somewhat dependent on, or influenced by, the size, shape, speed, proximity (vertical and horizontal), engine noise, color, and flight profile of planes. Helicopters also appear to induce greater intensities and durations of disturbance behavior as compared to fixed-wing aircraft. Some studies showed that animals that had been previously exposed to jet aircraft noise exhibited greater degrees of alarm and disturbance to other objects creating noise, such as boats, people, and objects blowing across the landscape. Other factors influencing response to jet aircraft noise may include wind direction, speed, and local air turbulence; landscape structures (i.e., amount and type of vegetative cover); and, in the case of bird species, whether the animals are in the incubation/nesting phase.

D.2.2 Noise Model Operational Data Documentation

D.2.2.1 Introduction

The following sections describe the data collected and noise modeling performed for the Environmental Assessment (EA) for the F-22A Plus-Up at Joint Base Pearl Harbor-Hickam (JBPHH). These datasets were developed in coordination with the Air National Guard Bureau and JBPHH personnel over a series of virtual data collection efforts in late 2020 and early 2021.

The following analysis tools were used to calculate the potential noise levels associated with the Proposed Action.

D.2.2.1.1 NOISEMAP

Analyses of aircraft noise exposure and compatible land uses around DOD airfield-like facilities are normally accomplished using a group of computer-based programs, collectively called NOISEMAP (Czech and Plotkin, 1998; Wasmer and Maunsell, 2006a, 2006b). The core computational program of the NOISEMAP suite is NMAP. In this report, NMAP Version 7.3 was used to analyze aircraft operations and to generate noise contours.

D.2.2.1.2 MR_NMAP

When the aircraft flight tracks are not well defined and are distributed over a wide area, such as in Military Training Routes with wide corridors or Warning Areas, the Air Force uses the DOD-approved MR_NMAP program (Lucas and Calamia, 1996). In this report, MR_NMAP Version 3.0 was used to model subsonic aircraft noise in SUA. For SUA environments where noise levels are calculated to be less than 45 dB, the noise levels are stated as “<45 dB.”

D.2.2.1.3 PCBoom

Environmental analysis of supersonic aircraft operations requires calculation of sonic boom amplitudes. For the purposes of this study, the Air Force and DOD-approved PCBoom program was used to assess sonic boom exposure due to military aircraft operations in supersonic SUA. In this report, PCBoom Version 4 was used to calculate sonic boom ground signatures and overpressures from supersonic vehicles performing steady, level flight operations (Plotkin, 2002).

D.2.2.1.4 BooMap

For cumulative sonic boom exposure under supersonic air combat training arenas, the Air Force and DOD-approved BooMap program was used. In this report, BooMap96 was used to calculate cumulative C-weighted DNL (CDNL) exposure based on long-term measurements in a number of SUA (Plotkin, 1993).

D.2.2.2 Flight Tracks

The following figures display flight tracks used by JBPHH-based aircraft. All flight tracks shown are included in the JBPHH noise model. Closed pattern operations are not flown at JBPHH.

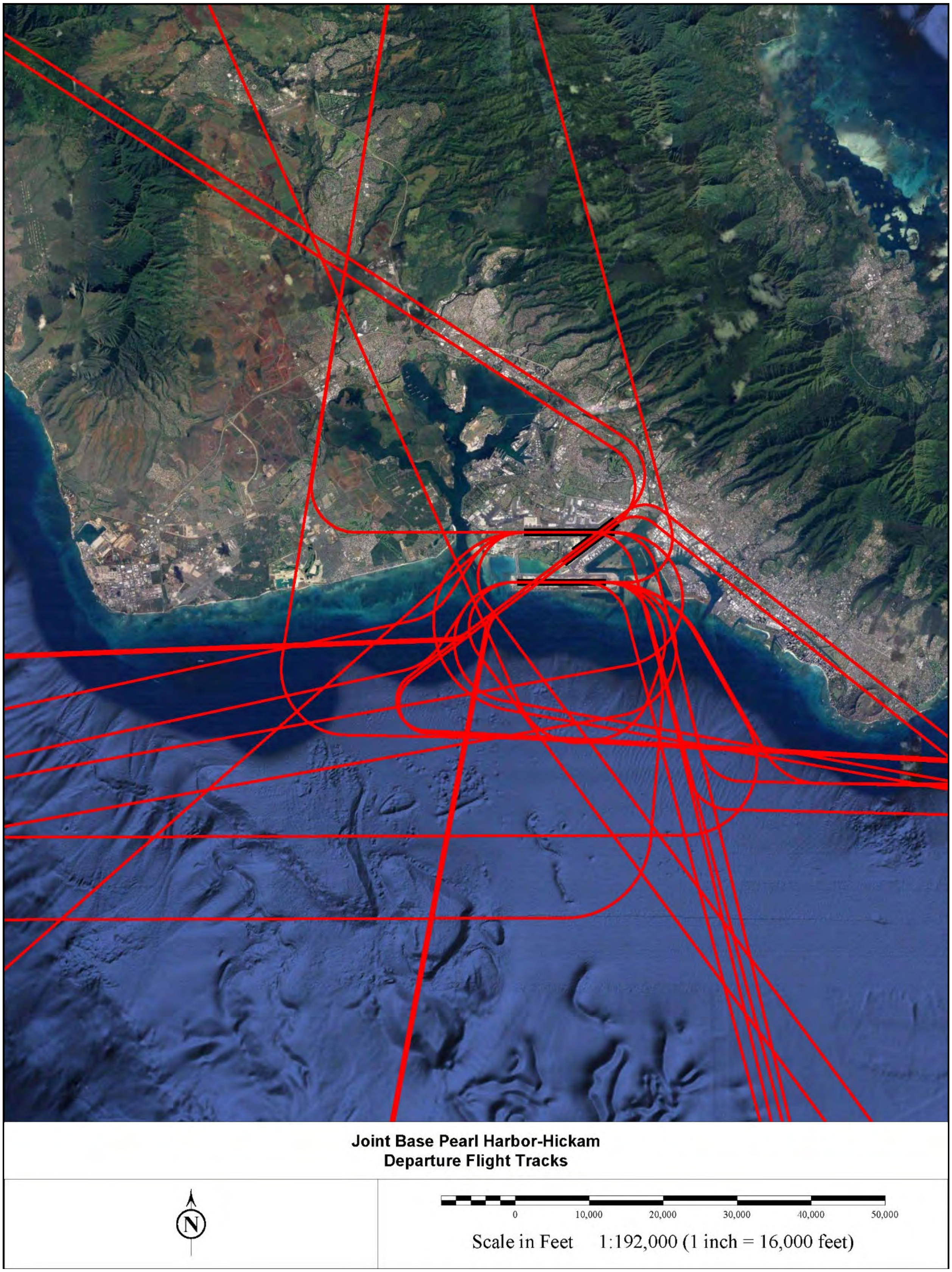


Figure D-13. Departure Flight Tracks at Joint Base Pearl Harbor-Hickam.

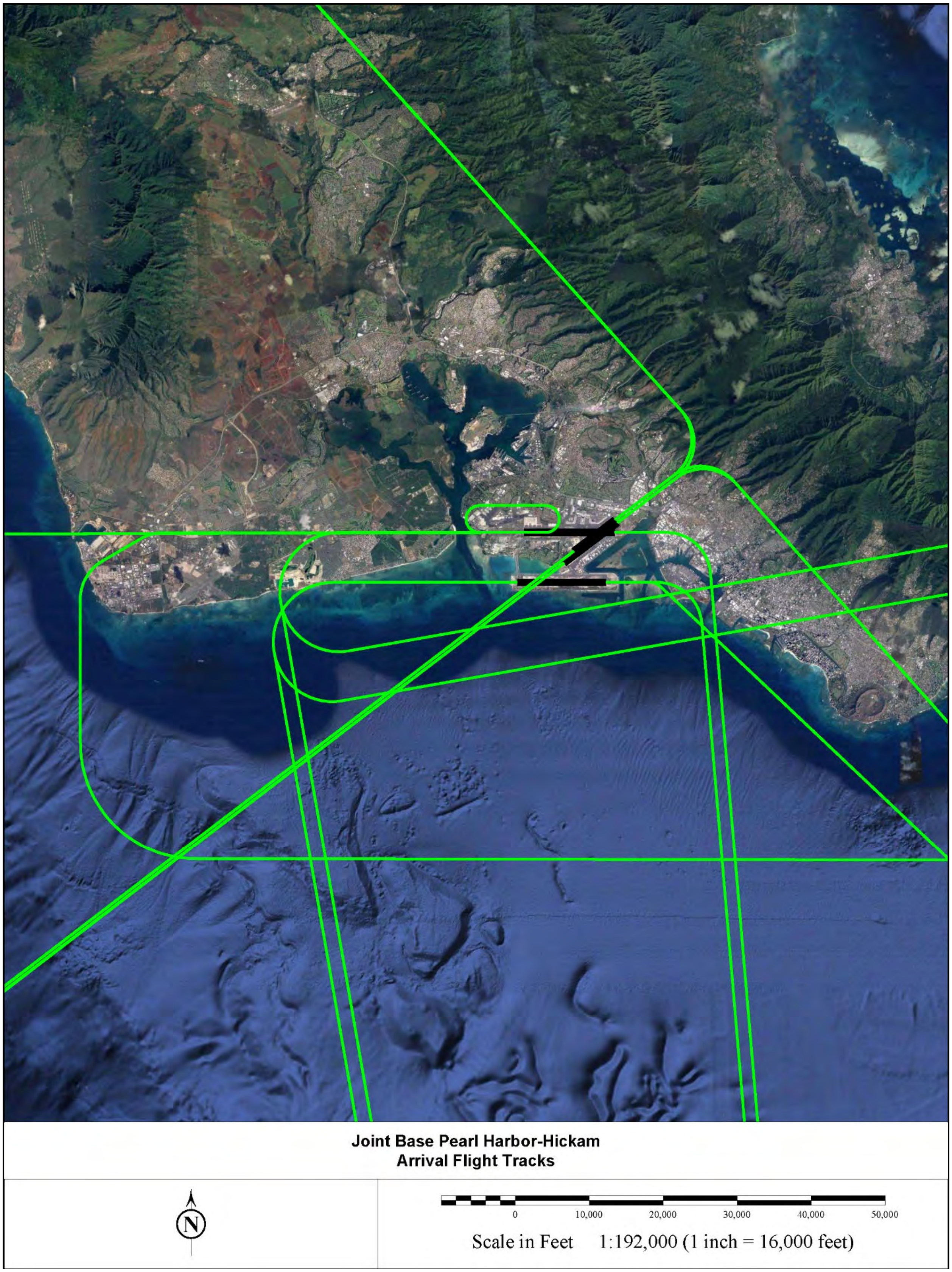


Figure D-14. Arrival Flight Tracks at Joint Base Pearl Harbor-Hickam.

D.2.2.2 Static Operations

Table D-5 details the number, type, and duration of static ground and maintenance engine run-up operations at the JBPHH airfield.

Figure D-15 shows the location of the hush house towards the south end of the field and the location that trim operations (at tie down) are done as well as the F-22 parking ramp. The arming and dearming of aircraft occurs near the end of runway 08R as shown on the figure. The F-22 aircraft perform no trim operations. Only uninstalled engine operations are performed in the hush house for the F-22 engines. **Figure D-16** shows the location where the larger aircraft park and do maintenance operations.

D.2.2.3 Flight Operations

Table D-6 contains the operations modeled for the baseline conditions for JBPHH. These operations, both military and civilian, are taken from the *Final Joint Base Pearl Harbor-Hickam Combat Air Forces Adversary Air Environmental Assessment* (Air Force, 2020). Based F-22 operations have been updated to better reflect expected future utilizations. All other operations listed in the table have not been changed from the counts included in the EA (Air Force, 2020). Representative aircraft types are used to model civilian aircraft operations – a similar aircraft operating out of the airport are grouped together in the noise model using a representative airframe.

Table D-7 contains the operations to be modeled for the proposed action scenario. The only difference between the baseline and Proposed Action is the inclusion of an additional 405 annual F-22 sorties (one sortie is equivalent to two operations – one sortie is made up of one departure and one arrival).

D.2.2.4 Runway Utilization

Table D-8 displays the runway utilization percentages for JBPHH aircraft.

Figure D-15. Maintenance locations at Joint Base Pearl Harbor-Hickam for Trim and Hush House operations, Arm/Dearm Pad, Tie Down, and F-22 parking.

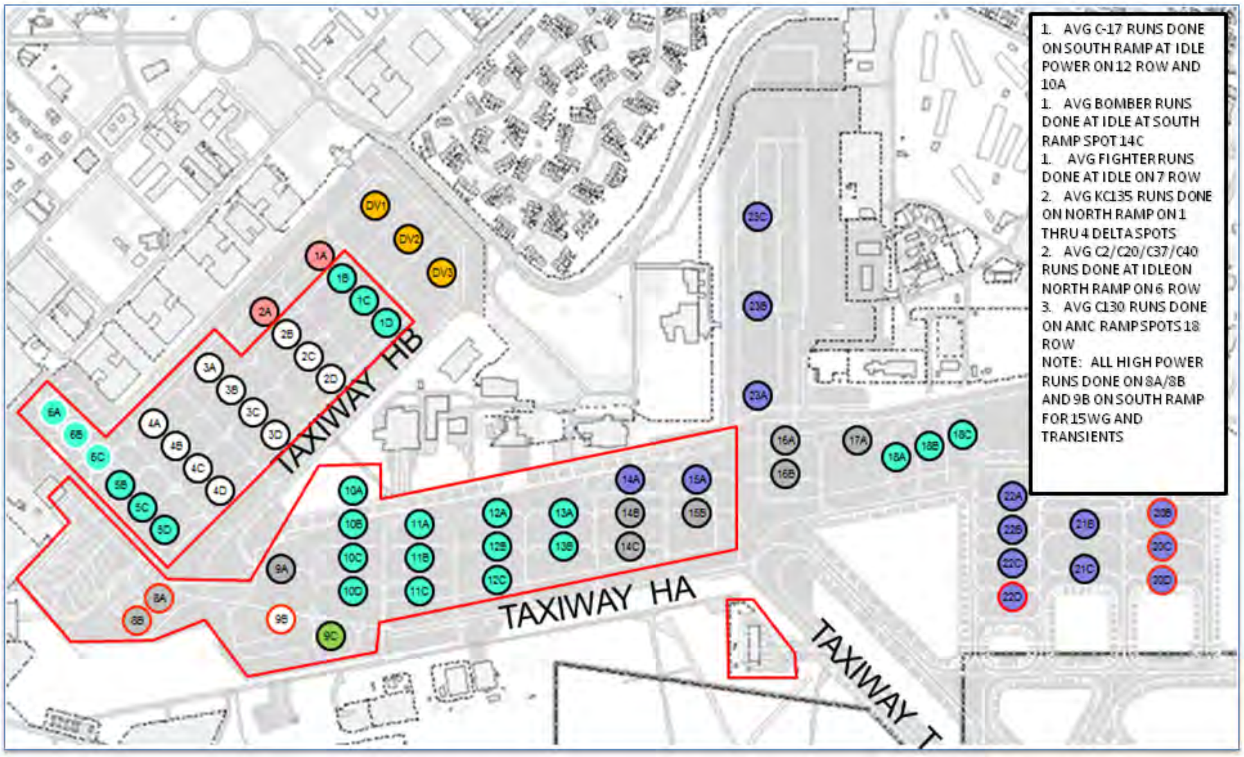


Figure D-16. Parking Locations for Larger Aircraft and High-Power Runs.

Table D-5
Location, Type, and Duration of Ground/Maintenance Run-Up Operations at Joint Base Pearl Harbor-Hickam

Aircraft Type	Engine Type	Run-up Type	2017 Annual Events	Percent Day (0700-2200)	Percent Night (2200-0700)	Run-up Pad ID	Percent Pad used	Magnetic Heading (degrees)	Engine Power Setting	Duration (Minutes) Per Event	# of Engines Running Per Event
C-17	F117-PW-100	Pre/Postflight Engine Run	1/sortie	50%	50%	3A	100.00%	30	77% NC	45	2
		1 Engine Run	18	100%	0%	South/North Ramp	50/50%	30/60	77% NC	30	1
		2 Engine Run	17	100%	0%	South/North Ramp	50/50%	30/60	77% NC	30	2
		3 Engine Run	2	100%	0%	South/North Ramp	50/50%	30/60	77% NC	30	3
		4 Engine Run	50	100%	0%	South/North Ramp	50/50%	30/60	77% NC	30	4
		Reverse Power	17	100%	0%	South/North Ramp	50/50%	30/60	77% NC	60	4
		Ops Check	5	1	0%	8A	1	30	77% NC	30	2
									80% NC	15	
KC-135R	F108-CF-100	Pre/Postflight Engine Run	1/sortie	98.5%	1.5%	South/North Ramp	50/50%	30/60	18.9% RPM	30	4/2
		Ops Check	5	1	0%	North Ramp	1	30	70% RPM	5	4
									80% RPM	5	
									18.9% RPM	20	
F-22[1]	F119-PW-100	Pre/Postflight Engine Run	1/sortie	98.5%	1.5%	F-22 Parking	100%	345/165	Idle	10	2
		Arm/Dearm: Idle	1/sortie	100%	0	AD1-Arm/Dearm Pad	100%	0	Idle	3	2
		Hush House: Uninstalled Run	24	1	0	Hush House	1	280	Idle	10	1
									80% ETR	2	
									Mil	1	
									Idle	10	
ADAIR Category C		Pre/Postflight Engine Run	1/sortie	98.5%	1.5%	7 Row	100%	45	Idle	20	All
		Trim	336	100%	0	Trim Pad facing N/S	50/50%	338/158	Idle	12	1 or 2
									Approach	27	
									Intermediate	9	
									Military	9	
									Afterburner	3	

Notes:
(1) No F-22 trim pad testing done with engine installed. Only done in hush house uninstalled.

Table D-6
Existing Operations at Joint Base Pearl Harbor-Hickam

	Aircraft Category	Aircraft Type	Modeled Aircraft Type (if different)	AB Departure			Standard/MIL Departure			Overhead Arrivals			Straight In Arrivals			Total Annual Operations		
				Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total
Based	Military	F-22		551		551	2,207		2,207	2,482		2,482	268	8	276	5,508	8	5,516
		C-17		-	-	-	547	548	1,095	-	-	-	547	548	1,095	1,094	1,096	2,190
		C-37	Gulfstream IV	-	-	-	144	-	144	-	-	-	122	22	144	266	22	288
		C-40	B-737	-	-	-	144	-	144	-	-	-	122	22	144	266	22	288
		KC-135R		-	-	-	417	-	417	-	-	-	404	13	417	821	13	834
	ADAIR	Category C	F-18E/F	3,100	-	3,100	-	-	-	2,790	-	2,790	217	93	310	6,107	93	6,200
	Gen Aviation	B-737-QN9 (Q)		-	-	-	10,839	5,710	16,549	-	-	-	11,606	4,943	16,549	22,445	10,653	33,098
		B-747-100 (QN)		-	-	-	11,681	2,391	14,072	-	-	-	13,227	845	14,072	24,908	3,236	28,144
		B-757-200-RR		-	-	-	3,893	1,098	4,991	-	-	-	4,441	550	4,991	8,334	1,648	9,982
		B-767-CF6		-	-	-	24,074	3,094	27,168	-	-	-	24,099	3,069	27,168	48,173	6,163	54,336
		BEECH BARON 58P		-	-	-	11,675	76	11,751	-	-	-	11,675	76	11,751	23,350	152	23,502
		CL-601		-	-	-	5,941	735	6,676	-	-	-	6,275	401	6,676	12,216	1,136	13,352
		DC-10-30		-	-	-	13,369	-	13,369	-	-	-	12,701	668	13,369	26,070	668	26,738
		DC-9-30QN9 (Q)		-	-	-	19,777	-	19,777	-	-	-	19,777	-	19,777	39,554	-	39,554
		DHC-830*		-	-	-	2,794	656	3,450	-	-	-	3,278	172	3,450	6,072	828	6,900
		GASEPF FIX		-	-	-	25,799	261	26,060	-	-	-	25,799	261	26,060	51,598	522	52,120
		MD-81		-	-	-	1,612	790	2,402	-	-	-	2,402	-	2,402	4,014	790	4,804
	Based Totals			**3,651**	**-**	**3,651**	**134,913**	**15,359**	**150,272**	**5,272**	**-**	**5,272**	**136,960**	**11,691**	**148,651**	**280,796**	**27,050**	**307,846**
Transient	Sentry Aloha Exercises	F-15	F-15E	-	-	-	333	-	333	300	-	300	23	10	33	656	10	666
		F-16	F-16C	-	-	-	333	-	333	300	-	300	23	10	33	656	10	666
		F-18G	F-18E/F	-	-	-	333	-	333	300	-	300	23	10	33	656	10	666
	NAVOPS	AV-8B		-	-	-	39	-	39	-	-	-	39	-	39	78	-	78
		F-15	F-15E	-	-	-	31	-	31	-	-	-	31	-	31	62	-	62
		F-16	F-16C	-	-	-	345	-	345	-	-	-	345	-	345	690	-	690
		F-18A		-	-	-	125	-	125	-	-	-	125	-	125	250	-	250
		F-18E/F		-	-	-	125	-	125	-	-	-	125	-	125	250	-	250
		F-22		-	-	-	102	-	102	-	-	-	102	-	102	204	-	204
		F-35		-	-	-	16	-	16	-	-	-	16	-	16	32	-	32
		KC-135R		-	-	-	392	-	392	-	-	-	392	-	392	784	-	784
		KC-10A		-	-	-	392	-	392	-	-	-	392	-	392	784	-	784
		Surveillance Aircraft	E-4 - B-747-100	-	-	-	341	-	341	-	-	-	341	-	341	682	-	682
		C-5	C-5M	-	-	-	191	-	191	-	-	-	191	-	191	382	-	382
		C-17		-	-	-	821	-	821	-	-	-	821	-	821	1,642	-	1,642
		C-27	DHC-830	-	-	-	14	-	14	-	-	-	14	-	14	28	-	28
		C-32	B-757	-	-	-	44	-	44	-	-	-	44	-	44	88	-	88
		C-130	C-130H&N&P	-	-	-	396	-	396	-	-	-	396	-	396	792	-	792
		Helos	UH-60	-	-	-	34	-	34	-	-	-	34	-	34	68	-	68
	Transient Totals			**-**	**-**	**-**	**4,407**	**-**	**4,407**	**900**	**-**	**900**	**3,477**	**30**	**3,507**	**8,784**	**30**	**8,814**
Military Totals				**3,651**	**-**	**3,651**	**7,866**	**548**	**8,414**	**6,172**	**-**	**6,172**	**5,157**	**736**	**5,893**	**22,846**	**1,284**	**24,130**
Civilian Totals				**-**	**-**	**-**	**131,454**	**14,811**	**146,265**	**-**	**-**	**-**	**135,280**	**10,985**	**146,265**	**266,734**	**25,796**	**292,530**
Grand Totals				**3,651**	**-**	**3,651**	**139,320**	**15,359**	**154,679**	**6,172**	**-**	**6,172**	**140,437**	**11,721**	**152,158**	**289,580**	**27,080**	**316,660**

Table D-7
Proposed Action Operations at Joint Base Pearl Harbor-Hickam

	Aircraft Category	Aircraft Type	Modeled Aircraft Type (if different)	AB Departure			Standard/MIL Departure			Overhead Arrivals			Straight In Arrivals			Total Annual Operations		
				Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total
Based	Military	F-22		632	-	632	2,531	-	2,531	2,847	-	2,847	307	9	316	6,317	9	6,326
		C-17		-	-	-	547	548	1,095	-	-	-	547	548	1,095	1,094	1,096	2,190
		C-37	Gulfstream IV	-	-	-	144	-	144	-	-	-	122	22	144	266	22	288
		C-40	B-737	-	-	-	144	-	144	-	-	-	122	22	144	266	22	288
		KC-135R		-	-	-	417	-	417	-	-	-	404	13	417	821	13	834
	ADAIR	Category C	F-18E/F	3,100	-	3,100	-	-	-	2,790	-	2,790	217	93	310	6,107	93	6,200
	Gen Aviation	B-737-QN9 (Q)		-	-	-	10,839	5,710	16,549	-	-	-	11,606	4,943	16,549	22,445	10,653	33,098
		B-747-100 (QN)		-	-	-	11,681	2,391	14,072	-	-	-	13,227	845	14,072	24,908	3,236	28,144
		B-757-200-RR		-	-	-	3,893	1,098	4,991	-	-	-	4,441	550	4,991	8,334	1,648	9,982
		B-767-CF6		-	-	-	24,074	3,094	27,168	-	-	-	24,099	3,069	27,168	48,173	6,163	54,336
		BEECH BARON 58P		-	-	-	11,675	76	11,751	-	-	-	11,675	76	11,751	23,350	152	23,502
		CL-601		-	-	-	5,941	735	6,676	-	-	-	6,275	401	6,676	12,216	1,136	13,352
		DC-10-30		-	-	-	13,369	-	13,369	-	-	-	12,701	668	13,369	26,070	668	26,738
		DC-9-30QN9 (Q)		-	-	-	19,777	-	19,777	-	-	-	19,777	-	19,777	39,554	-	39,554
		DHC-830*		-	-	-	2,794	656	3,450	-	-	-	3,278	172	3,450	6,072	828	6,900
		GASEPF FIX		-	-	-	25,799	261	26,060	-	-	-	25,799	261	26,060	51,598	522	52,120
		MD-81		-	-	-	1,612	790	2,402	-	-	-	2,402	-	2,402	4,014	790	4,804
	Based Totals			**3,732**	**-**	**3,732**	**135,237**	**15,359**	**150,596**	**5,637**	**-**	**5,637**	**136,999**	**11,692**	**148,691**	**281,605**	**27,051**	**308,656**
Transient	Sentry Aloha Exercises	F-15	F-15E	-	-	-	333	-	333	300	-	300	23	10	33	656	10	666
		F-16	F-16C	-	-	-	333	-	333	300	-	300	23	10	33	656	10	666
		F-18G	F-18E/F	-	-	-	333	-	333	300	-	300	23	10	33	656	10	666
	NAVOPS	AV-8B		-	-	-	39	-	39	-	-	-	39	-	39	78	-	78
		F-15	F-15E	-	-	-	31	-	31	-	-	-	31	-	31	62	-	62
		F-16	F-16C	-	-	-	345	-	345	-	-	-	345	-	345	690	-	690
		F-18A		-	-	-	125	-	125	-	-	-	125	-	125	250	-	250
		F-18E/F		-	-	-	125	-	125	-	-	-	125	-	125	250	-	250
		F-22		-	-	-	102	-	102	-	-	-	102	-	102	204	-	204
		F-35		-	-	-	16	-	16	-	-	-	16	-	16	32	-	32
		KC-135R		-	-	-	392	-	392	-	-	-	392	-	392	784	-	784
		KC-10A		-	-	-	392	-	392	-	-	-	392	-	392	784	-	784
		Surveillance Aircraft	E-4 - B-747-100	-	-	-	341	-	341	-	-	-	341	-	341	682	-	682
		C-5	C-5M	-	-	-	191	-	191	-	-	-	191	-	191	382	-	382
		C-17		-	-	-	821	-	821	-	-	-	821	-	821	1,642	-	1,642
		C-27	DHC-830	-	-	-	14	-	14	-	-	-	14	-	14	28	-	28
		C-32	B-757	-	-	-	44	-	44	-	-	-	44	-	44	88	-	88
		C-130	C-130H&N&P	-	-	-	396	-	396	-	-	-	396	-	396	792	-	792
		Helos	UH-60	-	-	-	34	-	34	-	-	-	34	-	34	68	-	68
	Transient Totals			**-**	**-**	**-**	**4,407**	**-**	**4,407**	**900**	**-**	**900**	**3,477**	**30**	**3,507**	**8,784**	**30**	**8,814**
Military Totals				**3,732**	**-**	**3,732**	**8,190**	**548**	**8,738**	**6,537**	**-**	**6,537**	**5,196**	**737**	**5,933**	**23,655**	**1,285**	**24,940**
Civilian Totals				**-**	**-**	**-**	**131,454**	**14,811**	**146,265**	**-**	**-**	**-**	**135,280**	**10,985**	**146,265**	**266,734**	**25,796**	**292,530**
Grand Totals				**3,732**	**-**	**3,732**	**139,644**	**15,359**	**155,003**	**6,537**	**-**	**6,537**	**140,476**	**11,722**	**152,198**	**290,389**	**27,081**	**317,470**

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Table D-8
Runway Usage for Based Aircraft at Joint Base Pearl Harbor-Hickam

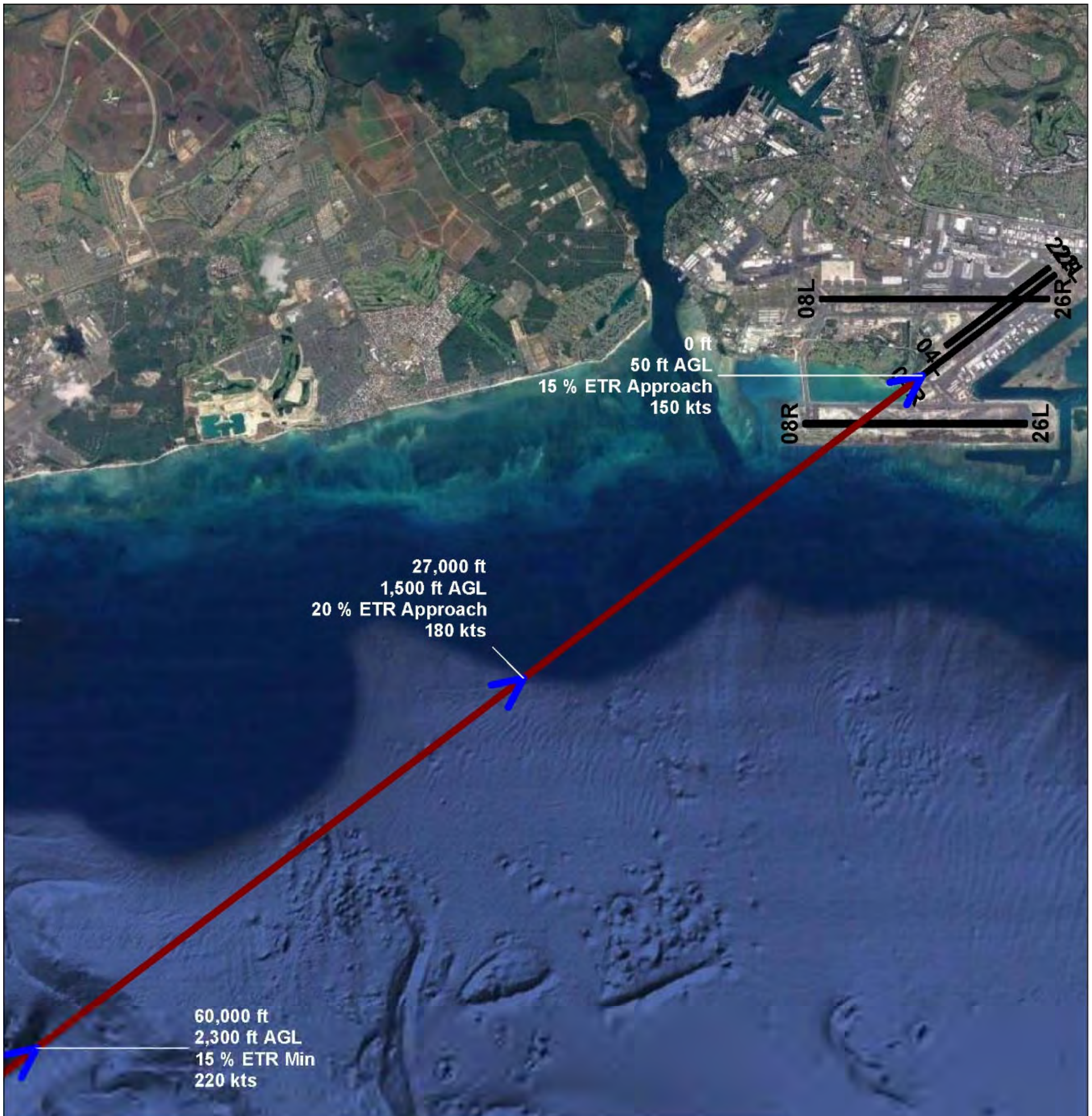
Operation Type	Runway ID	Based Military								Transient Military		Civilian	
		199 & 19 FS F-22		535 AS C-17		203 ARW KC-135R		65th AS C-37&40					
		Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)
Departure	04L	-	-	-	-	-	-	-	-	-	-	15.64%	5.19%
	04R	-	-	-	-	-	-	-	-	-	-	15.64%	5.19%
	08L	-	-	-	-	-	-	5.0%	5.0%	-	-	29.02%	39.85%
	08R	98.0%	98.0%	95.0%	95.0%	100.0%	100.0%	95.0%	95.0%	91.0%	91.0%	28.87%	39.16%
	22L	-	-	-	-	-	-	-	-	-	-	1.93%	0.64%
	22R	-	-	-	-	-	-	-	-	-	-	1.93%	0.64%
	26L	-	-	-	-	-	-	-	-	9.0%	9.0%	3.42%	4.15%
	26R	2.0%	2.0%	5.0%	5.0%	-	-	-	-	-	-	3.54%	5.18%
Arrival	04L	-	-	-	-	-	-	-	-	-	-	15.47%	3.68%
	04R	2.5%	80.0%	-	95.0%	2.5%	96.0%	0.0%	100.0%	-	90.0%	15.47%	3.68%
	08L	95.0%	10.0%	99.0%	0.0%	97.5%	2.0%	94.1%	0.0%	91.0%	-	29.03%	40.82%
	08R	-	-	-	-	-	-	-	-	-	-	29.03%	40.82%
	22L	-	-	-	-	-	-	-	-	-	-	1.91%	0.46%
	22R	-	-	-	-	-	-	-	-	-	-	1.91%	0.46%
	26L	2.5%	10.0%	1.0%	5.0%	5.0%	2.0%	5.9%	0.0%	9.0%	10.0%	3.59%	5.04%
	26R	-	-	-	-	-	-	-	-	-	-	3.59%	5.04%

19 FS = 19th Fighter Squadron; 199 FS = 199th Fighter Squadron; 203 ARW = 203rd Air Refueling Wing; 535 AS = 535th Airlift Squadron; 65 AS = 65th Airlift Squadron

D.2.2.5 Flight Profiles

Representative profiles provide the speed and power setting of each type of aircraft as a function of distance along the flight track for the representative maneuvers. For modeling purposes, the appropriate profile was used for all flight tracks that conform to that maneuver type. For example, all overhead break arrival tracks utilize the representative profile for modeling that maneuver. The following images illustrate representative flight tracks for all JBPHH-based aircraft.

Flight Profiles for the 19th and 199th Fighter Squadrons' F-22s



Flight Profile 04RA221

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	250,000	20,000 AGL	40 Min	350	-5.3 deg, -2680 fpm, 395 sec
b	60,000	2,300 AGL	15 Min	220	-1.4 deg, -490 fpm, 98 sec
c	27,000	1,500 AGL	20 Approach	180	-3.1 deg, -900 fpm, 97 sec
d	0	50 AGL	15 Approach	150	

Flight Profile 04RA221, BASED F-22 - STRAIGHT IN FROM PERLI AFTER 7PM
Based F-22
Flight Track: 4RA1 - STRAIGHT IN

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000

Scale in Feet 1:108,000 (1 inch = 9,020 feet)

N

Flight Profile 26LA221

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	250,000	20,000 AGL	40 Min	350	-5.1 deg, -2930 fpm, 346 sec
b	60,000	3,000 AGL	50 Min	300	-2.8 deg, -1240 fpm, 73 sec
c	29,400	1,500 AGL	15 Approach	200	-3.2 deg, -1080 fpm, 49 sec
d	13,800	620 AGL	20 Approach	180	-2.4 deg, -690 fpm, 50 sec
e	0	50 AGL	15 Approach	150	

Flight Profile 26LA221, BASED F-22 - KONA WINDS STRAIGHT IN ARRIVAL

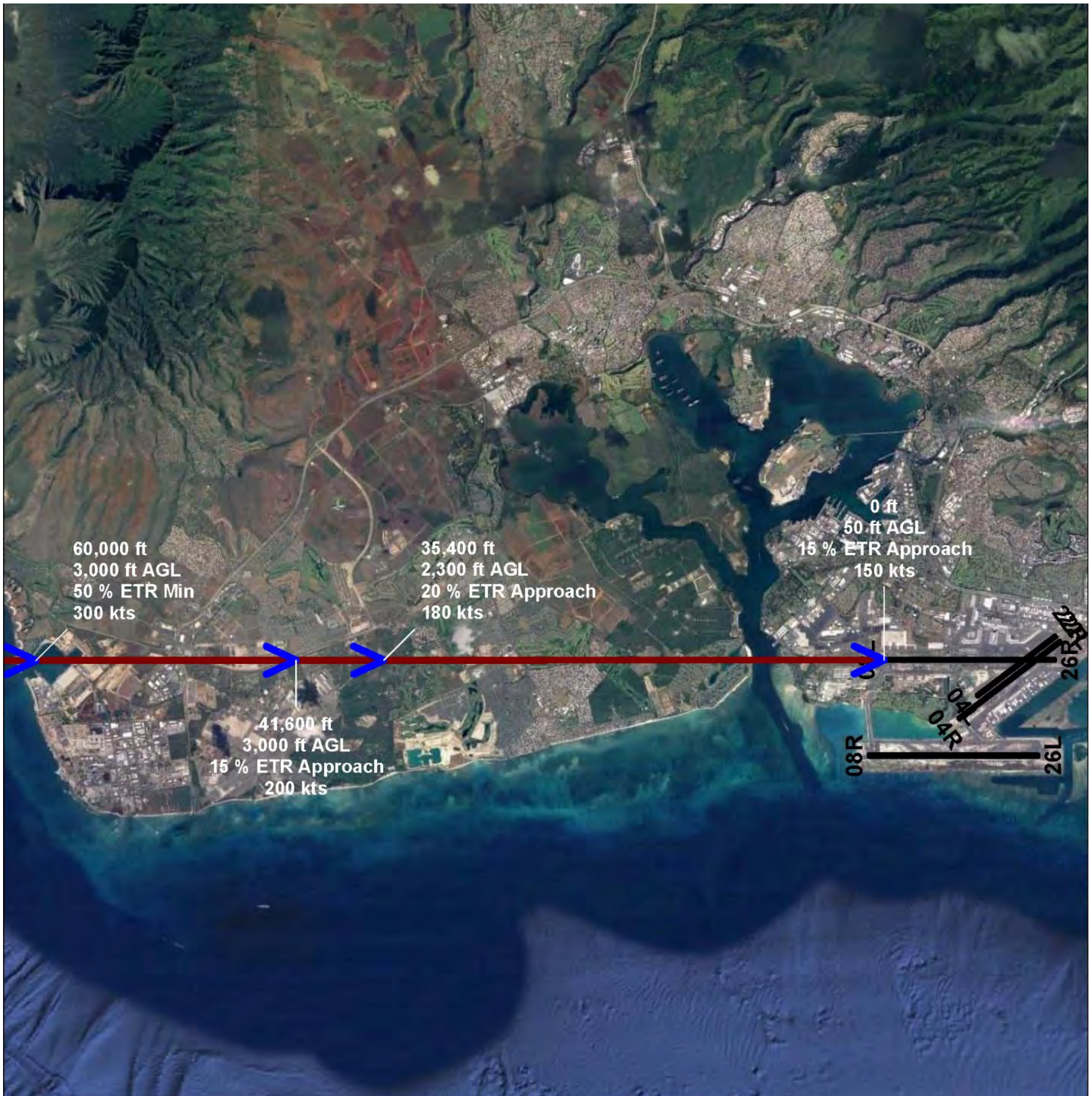
Based F-22

Flight Track: 6LA1 - KONA WINDS

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000

Scale in Feet 1:113,000 (1 inch = 9,430 feet)

N



Flight Profile 08LA221

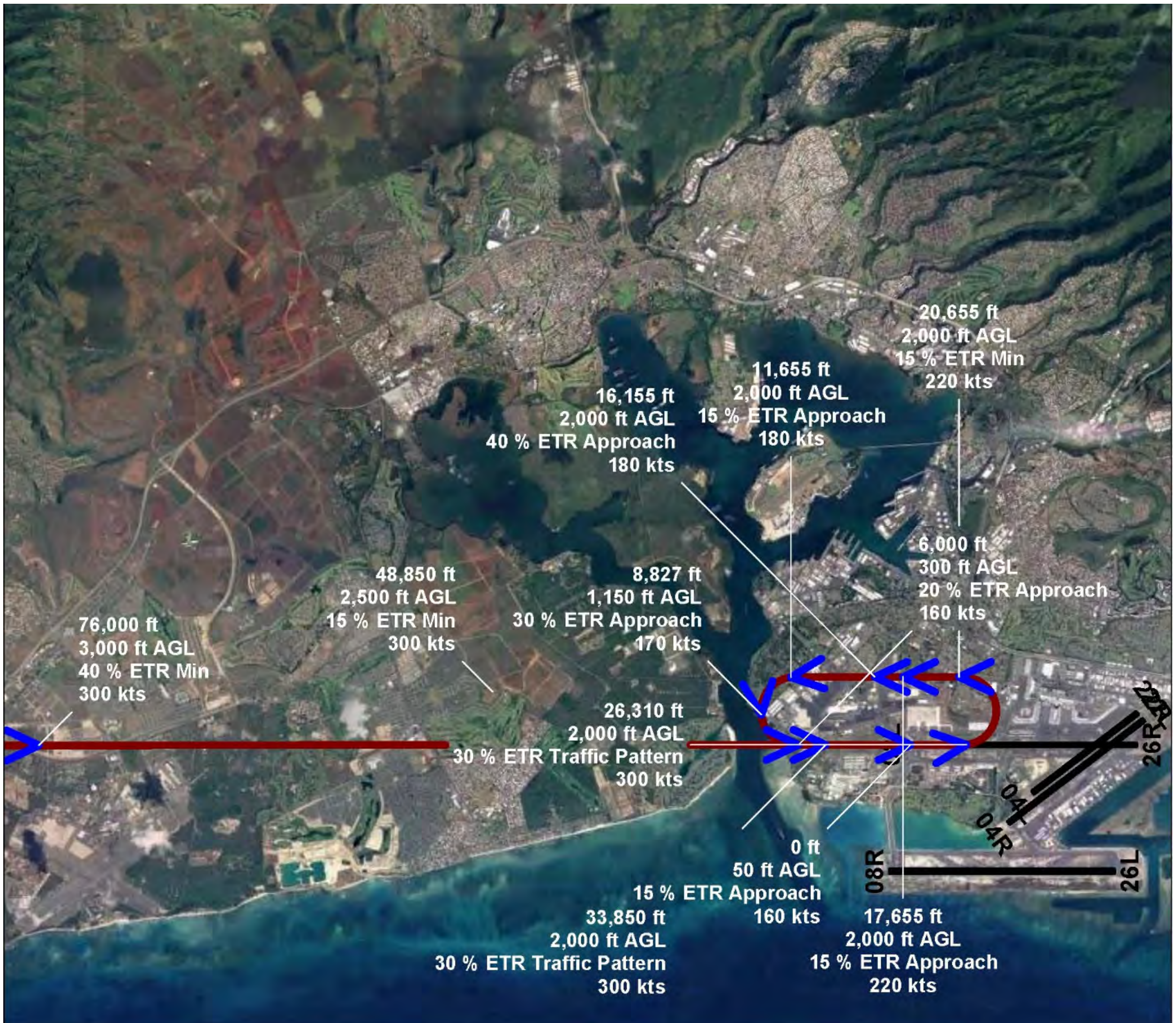
Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	250,000	20,000 AGL	40 Min	350	-5.1 deg, -2930 fpm, 346 sec
b	60,000	3,000 AGL	50 Min	300	0.0 deg, 0 fpm, 44 sec
c	41,600	3,000 AGL	15 Approach	200	-6.4 deg, -2160 fpm, 19 sec
d	35,400	2,300 AGL	20 Approach	180	-3.6 deg, -1060 fpm, 127 sec
e	0	50 AGL	15 Approach	150	

Flight Profile 08LA221, BASED F-22 - STRAIGHT IN ARRIVAL
Based F-22
Flight Track: 8LA1 - BOOKE ARRIVAL 14 DME STRAIGHT IN

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000

Scale in Feet 1:142,000 (1 inch = 11,800 feet)

N



Flight Profile 08LA222

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	200,000	10,000 AGL	50 Min	350	
b	76,000	3,000 AGL	40 Min	300	
c	48,850	2,500 AGL	15 Min	300	
d	33,850	2,000 AGL	30 Traffic Pattern	300	Level off
e	26,310	2,000 AGL	30 Traffic Pattern	300	Break
f	20,655	2,000 AGL	15 Min	220	Begin Downwind
g	17,655	2,000 AGL	15 Approach	220	Gear down
h	16,155	2,000 AGL	40 Approach	180	Increase Power
i	11,655	2,000 AGL	15 Approach	180	End Downwind, Descend from 2000 ft
j	8,827	1,150 AGL	30 Approach	170	90 Position
k	6,000	300 AGL	20 Approach	160	Begin 1 NM Final
l	0	50 AGL	15 Approach	160	Threshold crossing

Flight Profile 08LA222, BASED F-22 - OVERHEAD ARRIVAL
Based F-22
Flight Track: 8LAP - PITCHOUT

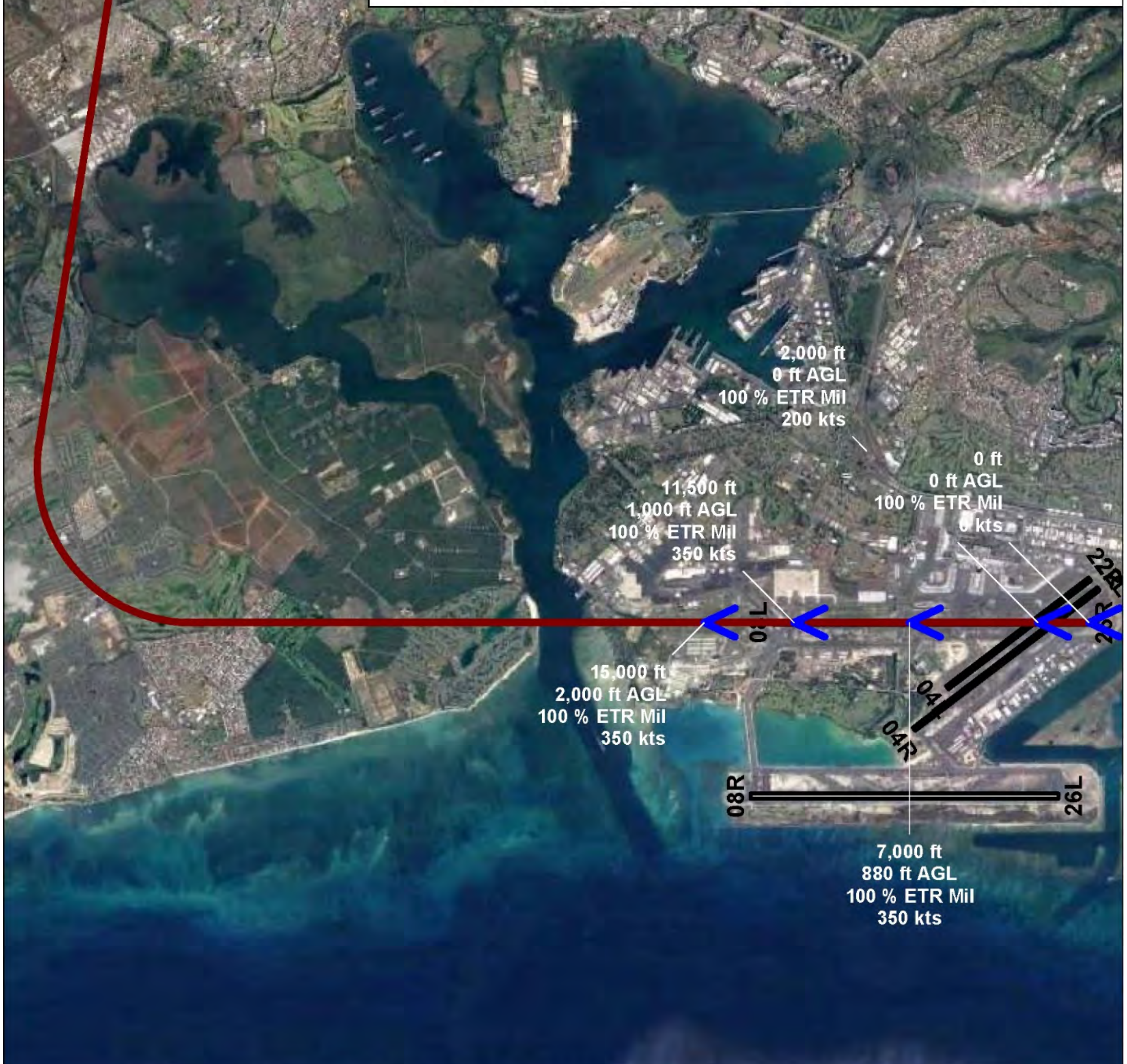
0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:115,000 (1 inch = 9,620 feet)

N

Flight Profile 26RD221

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	100 Mil	0	0.0 deg, 0 fpm, 12 sec
b	2,000	0 AGL	100 Mil	200	10.0 deg, 4830 fpm, 11 sec
c	7,000	880 AGL	100 Mil	350	1.5 deg, 940 fpm, 8 sec
d	11,500	1,000 AGL	100 Mil	350	15.9 deg, 9740 fpm, 6 sec
e	15,000	2,000 AGL	100 Mil	350	9.4 deg, 5760 fpm, 144 sec
f	100,000	16,000 AGL	25 Min	350	0.0 deg, 0 fpm, 169 sec
g	200,000	16,000 AGL	25 Min	350	



Flight Profile 26RD221, BASED F-22 - DEPARTURE TO NORTH -- UNRESTRICTED CLIMB

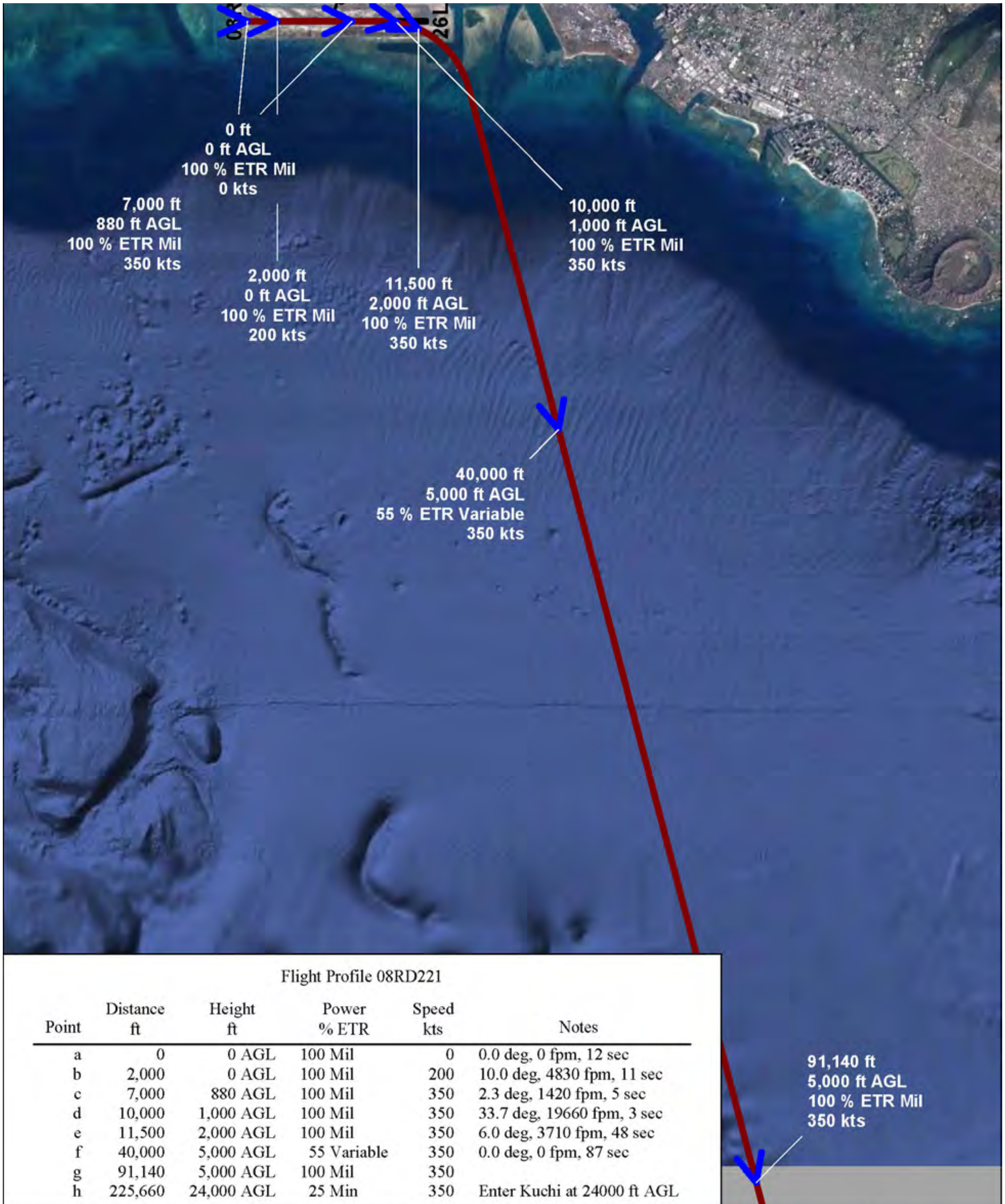
Based F-22

Flight Track: 6ED2 - MELLO 3 FROM TAXIWAY ECHO

0 4,000 8,000 12,000 16,000 20,000 24,000

Scale in Feet 1:80,500 (1 inch = 6,710 feet)

N



Flight Profile 08RD221

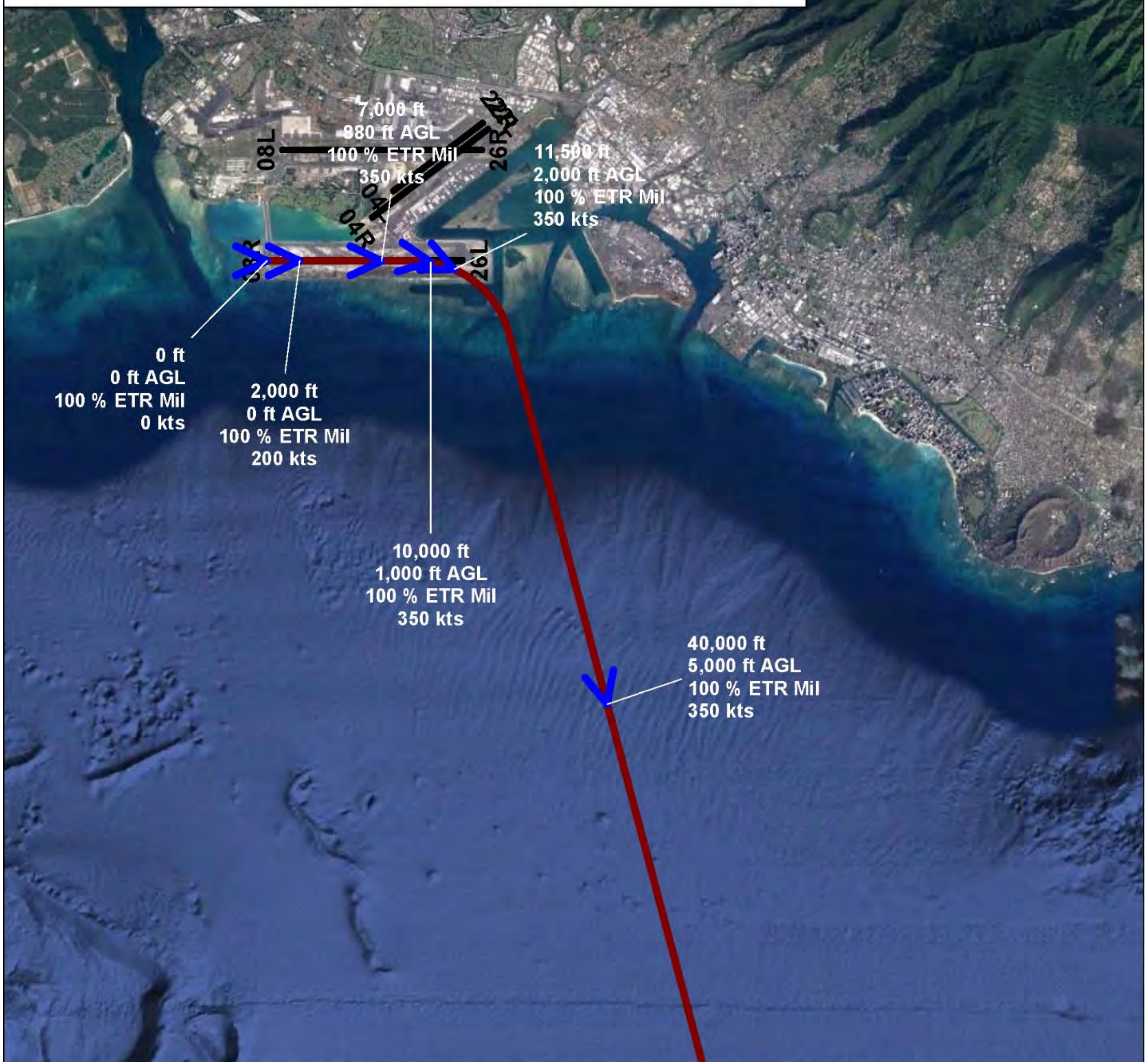
Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	100 Mil	0	0.0 deg, 0 fpm, 12 sec
b	2,000	0 AGL	100 Mil	200	10.0 deg, 4830 fpm, 11 sec
c	7,000	880 AGL	100 Mil	350	2.3 deg, 1420 fpm, 5 sec
d	10,000	1,000 AGL	100 Mil	350	33.7 deg, 19660 fpm, 3 sec
e	11,500	2,000 AGL	100 Mil	350	6.0 deg, 3710 fpm, 48 sec
f	40,000	5,000 AGL	55 Variable	350	0.0 deg, 0 fpm, 87 sec
g	91,140	5,000 AGL	100 Mil	350	
h	225,660	24,000 AGL	25 Min	350	Enter Kuchi at 24000 ft AGL

Flight Profile 08RD221, BASED F-22 - DEPARTURE TO THE SOUTH (CAPPED)
Based F-22
Flight Track: 8RD5 - SOUTH DEPART TO KUCHI

Scale in Feet 1:123,000 (1 inch = 10,200 feet)

Flight Profile 08RD222

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	100 Mil	0	0.0 deg, 0 fpm, 12 sec
b	2,000	0 AGL	100 Mil	200	10.0 deg, 4830 fpm, 11 sec
c	7,000	880 AGL	100 Mil	350	2.3 deg, 1420 fpm, 5 sec
d	10,000	1,000 AGL	100 Mil	350	33.7 deg, 19660 fpm, 3 sec
e	11,500	2,000 AGL	100 Mil	350	6.0 deg, 3710 fpm, 48 sec
f	40,000	5,000 AGL	100 Mil	350	
g	134,380	16,000 AGL	55 Variable	350	7.2 deg, 4420 fpm, 108 sec
h	198,100	24,000 AGL	25 Min	350	Enter Kuchi at 24000



Flight Profile 08RD222, BASED F-22 - DEPARTURE TO THE SOUTH -- UNRESTRICTED CLIMB

Based F-22

Flight Track: 8RD5 - SOUTH DEPART TO KUCHI

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000

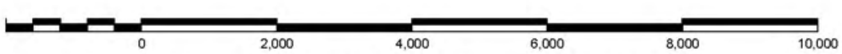
Scale in Feet 1:129,000 (1 inch = 10,700 feet)

N

Flight Profile 08RD223

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	150 Max A/B	0	2.9 deg, 510 fpm, 12 sec
b	2,000	100 AGL	150 A/B Est	200	2.9 deg, 1640 fpm, 15 sec
c	10,000	500 AGL	150 A/B Est	450	72.1 deg, 38550 fpm, 7 sec
d	15,000	16,000 AGL	50 Min	350	0.0 deg, 0 fpm, 232 sec
e	151,900	16,000 AGL	100 Mil	350	7.5 deg, 4630 fpm, 103 sec
f	212,660	24,000 AGL	50 Min	350	

Flight Profile 08RD223, BASED F-22 - HANG 10 DEPARTURE TO THE SOUTH AB
Based F-22
Flight Track: 8RD5 - SOUTH DEPART TO KUCHI



Scale in Feet 1:34,100 (1 inch = 2,840 feet)

Flight Profile 08RD224

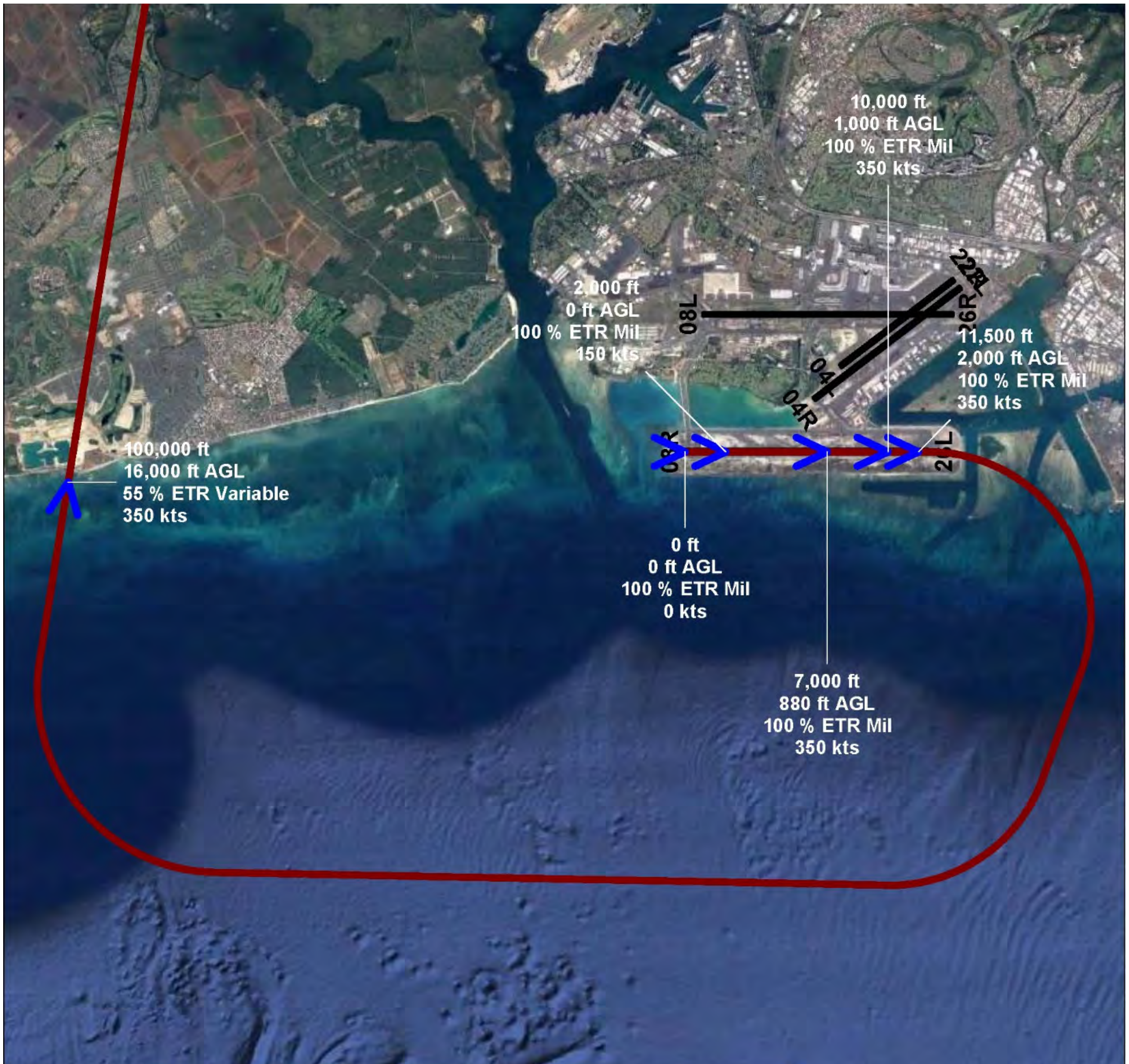
Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	150 Max A/B	0	2.9 deg, 510 fpm, 12 sec
b	2,000	100 AGL	150 A/B Est	200	2.9 deg, 1640 fpm, 15 sec
c	10,000	500 AGL	150 A/B Est	450	72.1 deg, 38550 fpm, 7 sec
d	15,000	16,000 AGL	50 Min	350	0.0 deg, 0 fpm, 232 sec
e	151,900	16,000 AGL	100 Mil	350	7.5 deg, 4630 fpm, 103 sec
f	212,660	24,000 AGL	50 Min	350	

Flight Profile 08RD224, BASED F-22 - HANG 10 DEPARTURE TO NORTH AB
Based F-22
Flight Track: 8RD8 - HANG 10 TO 355

0 2,000 4,000 6,000 8,000 10,000 12,000

Scale in Feet 1:41,200 (1 inch = 3,440 feet)

N



Flight Profile 08RD225

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	100 Mil	0	0.0 deg, 0 fpm, 16 sec
b	2,000	0 AGL	100 Mil	150	10.0 deg, 4390 fpm, 12 sec
c	7,000	880 AGL	100 Mil	350	2.3 deg, 1420 fpm, 5 sec
d	10,000	1,000 AGL	100 Mil	350	33.7 deg, 19660 fpm, 3 sec
e	11,500	2,000 AGL	100 Mil	350	9.0 deg, 5540 fpm, 150 sec
f	100,000	16,000 AGL	55 Variable	350	0.0 deg, 0 fpm, 254 sec
g	250,000	16,000 AGL	55 Variable	350	

Flight Profile 08RD225, BASED F-22 - DEPARTURE TO SOUTH THEN NORTH - UNRESTRICTED CLIMB

Based F-22

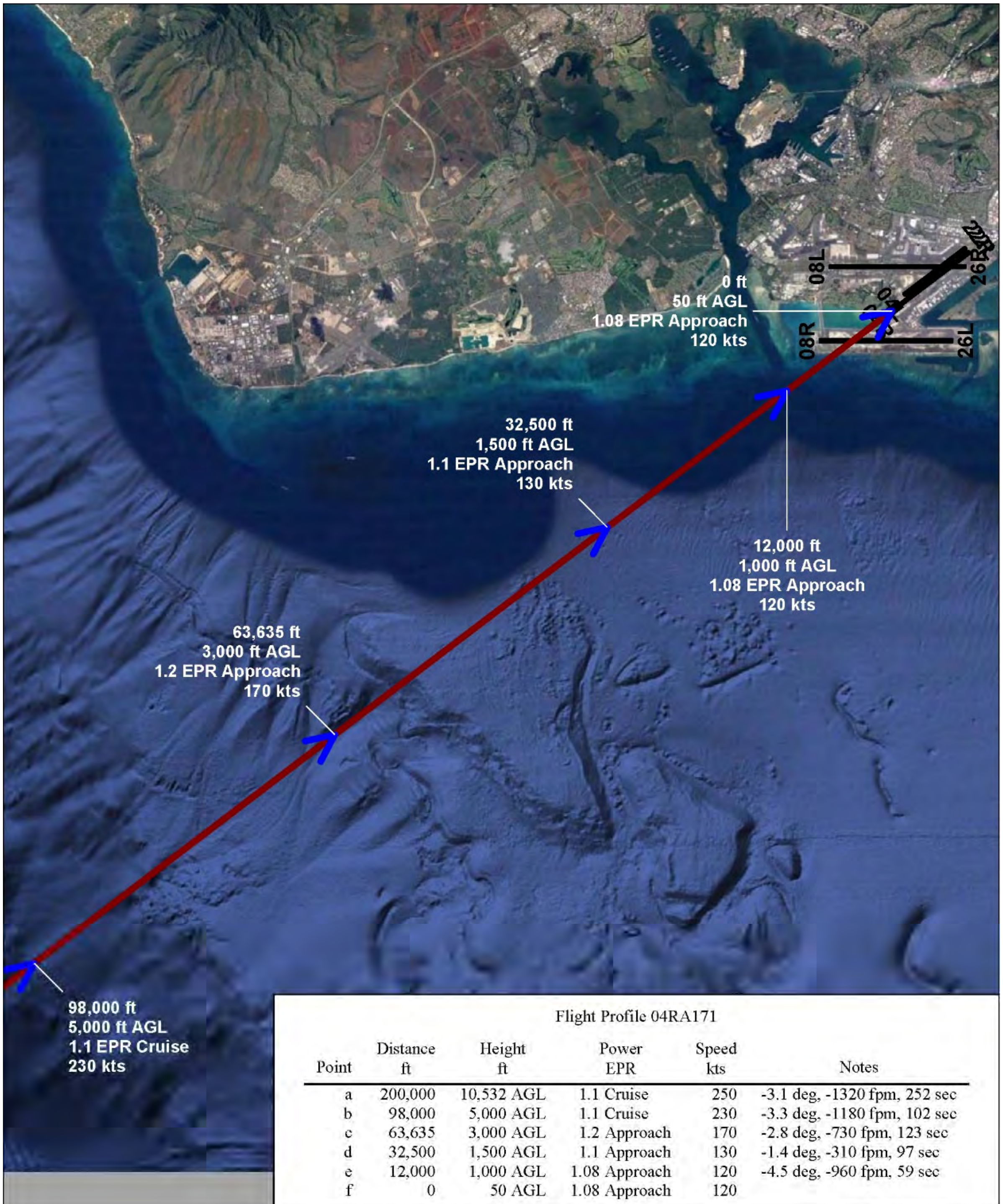
Flight Track: 8RD9 - NORTH

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000

Scale in Feet 1:102,000 (1 inch = 8,500 feet)

N

Flight Profiles for the 535th and 204th Airlift Squadrons' C-17s



Flight Profile 04RA171

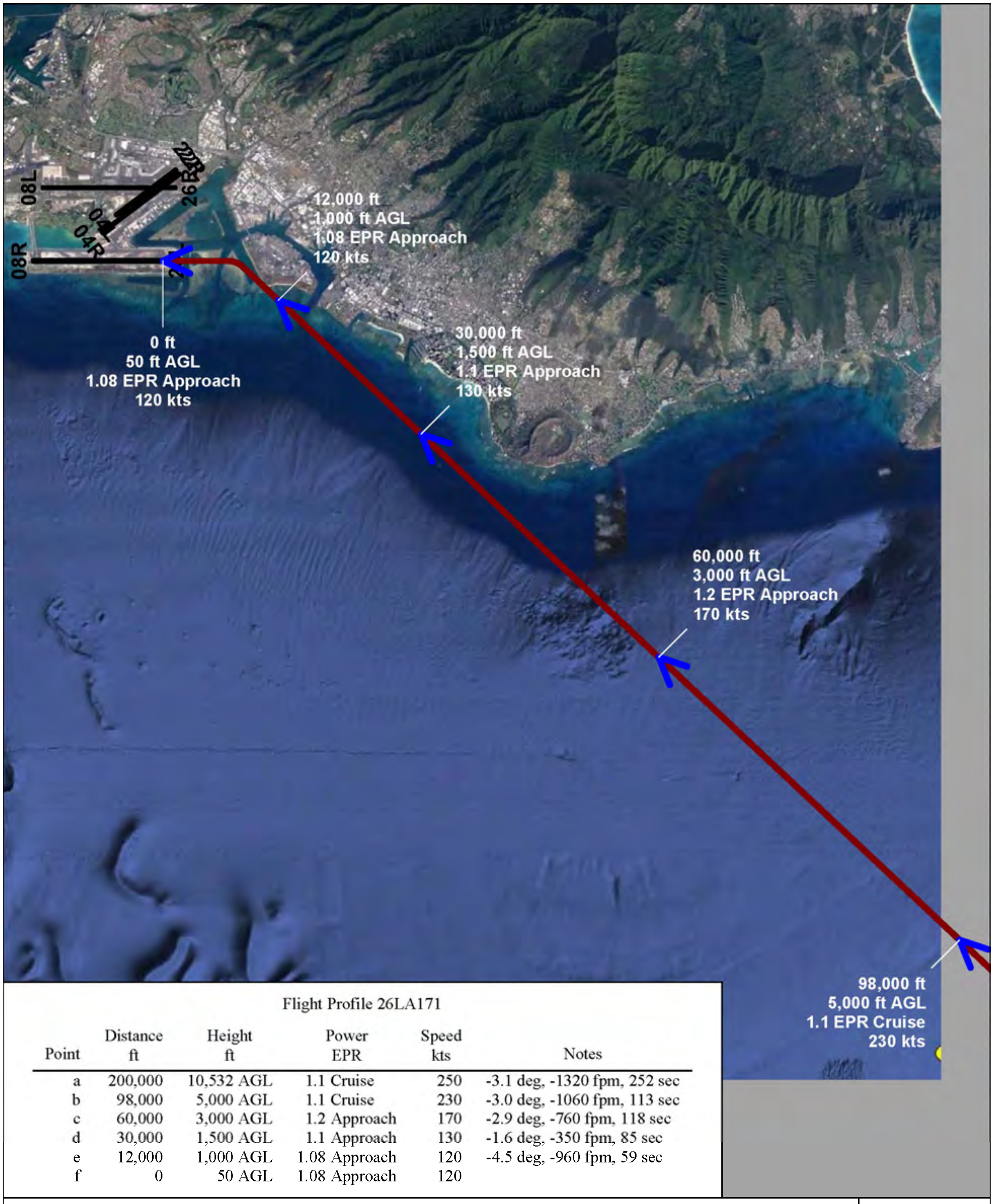
Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	200,000	10,532 AGL	1.1 Cruise	250	-3.1 deg, -1320 fpm, 252 sec
b	98,000	5,000 AGL	1.1 Cruise	230	-3.3 deg, -1180 fpm, 102 sec
c	63,635	3,000 AGL	1.2 Approach	170	-2.8 deg, -730 fpm, 123 sec
d	32,500	1,500 AGL	1.1 Approach	130	-1.4 deg, -310 fpm, 97 sec
e	12,000	1,000 AGL	1.08 Approach	120	-4.5 deg, -960 fpm, 59 sec
f	0	50 AGL	1.08 Approach	120	

Flight Profile 04RA171, BASED C-17 ARRIVAL
Based C-17
Flight Track: 4RA1 - STRAIGHT IN

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:168,000 (1 inch = 14,000 feet)

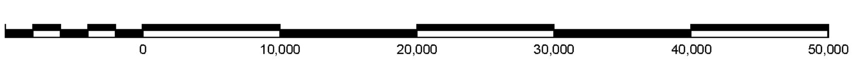
N



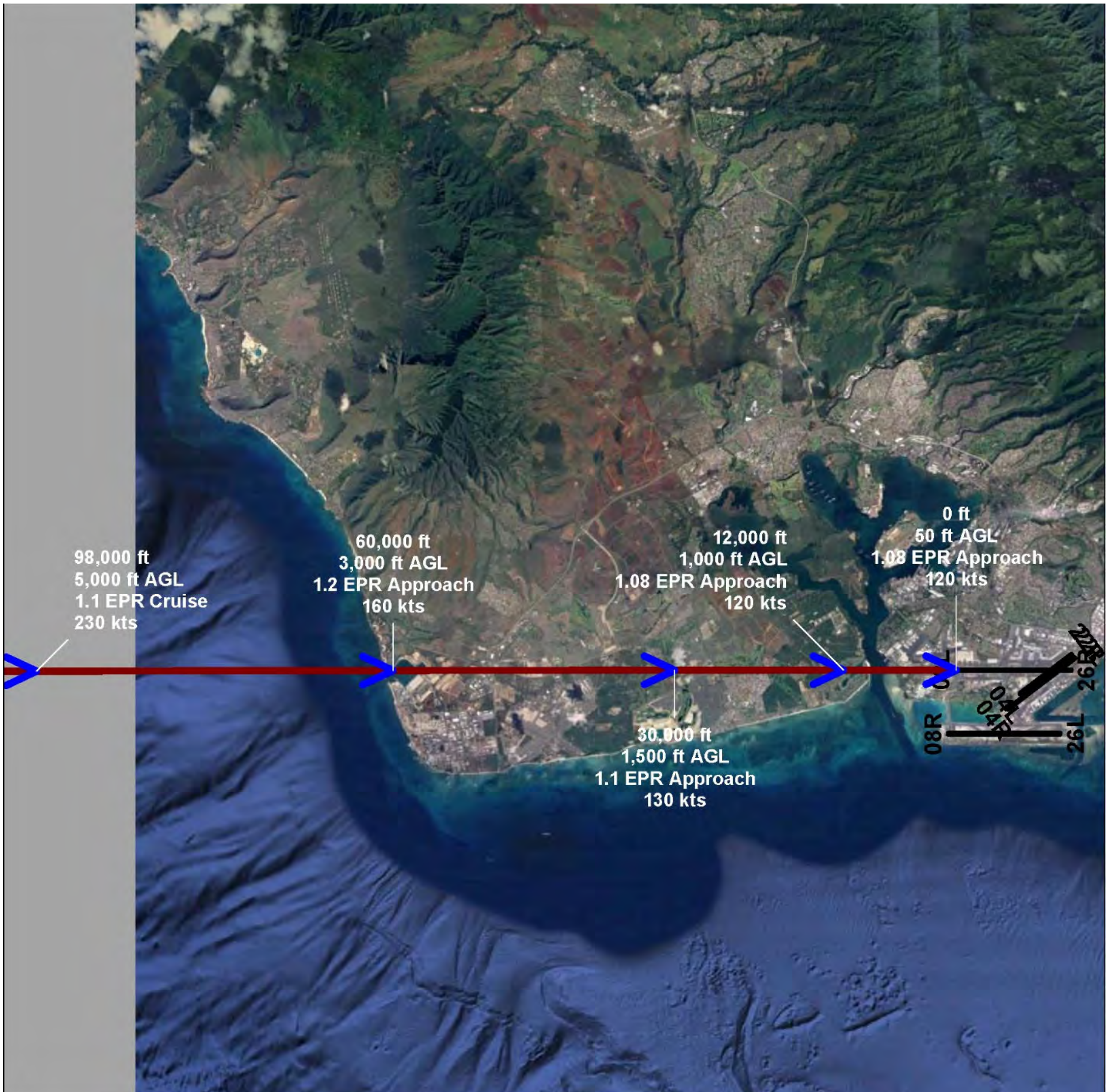
Flight Profile 26LA171

Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	200,000	10,532 AGL	1.1 Cruise	250	-3.1 deg, -1320 fpm, 252 sec
b	98,000	5,000 AGL	1.1 Cruise	230	-3.0 deg, -1060 fpm, 113 sec
c	60,000	3,000 AGL	1.2 Approach	170	-2.9 deg, -760 fpm, 118 sec
d	30,000	1,500 AGL	1.1 Approach	130	-1.6 deg, -350 fpm, 85 sec
e	12,000	1,000 AGL	1.08 Approach	120	-4.5 deg, -960 fpm, 59 sec
f	0	50 AGL	1.08 Approach	120	

Flight Profile 26LA171, BASED C-17 ARRIVAL
Based C-17
Flight Track: 6LA1 - KONA WINDS



Scale in Feet 1:168,000 (1 inch = 14,000 feet)



Flight Profile 08LA172

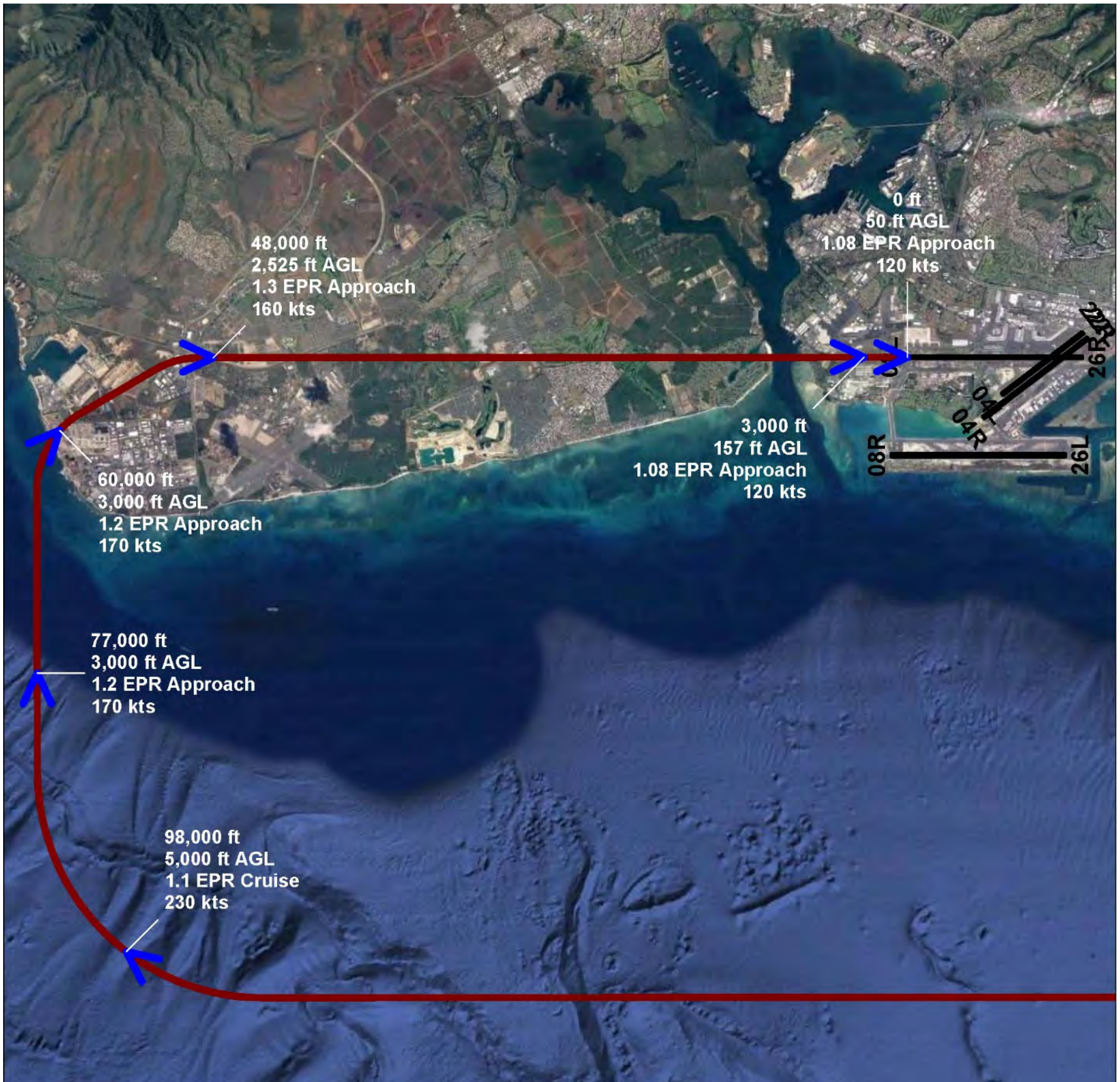
Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	200,000	10,532 AGL	1.1 Cruise	250	-3.1 deg, -1320 fpm, 252 sec
b	98,000	5,000 AGL	1.1 Cruise	230	-3.0 deg, -1040 fpm, 115 sec
c	60,000	3,000 AGL	1.2 Approach	160	-2.9 deg, -730 fpm, 123 sec
d	30,000	1,500 AGL	1.1 Approach	130	-1.6 deg, -350 fpm, 85 sec
e	12,000	1,000 AGL	1.08 Approach	120	-4.5 deg, -960 fpm, 59 sec
f	0	50 AGL	1.08 Approach	120	

Flight Profile 08LA172, BASED C-17 ARRIVAL FROM WEST
Based C-17
Flight Track: 8LA1 - BOOKE ARRIVAL 14 DME STRAIGHT IN

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000

Scale in Feet 1:217,000 (1 inch = 18,000 feet)

N



Flight Profile 08LA171

Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	200,000	10,532 AGL	1.1 Cruise	230	-3.1 deg, -1260 fpm, 263 sec
b	98,000	5,000 AGL	1.1 Cruise	230	-5.4 deg, -1920 fpm, 62 sec
c	77,000	3,000 AGL	1.2 Approach	170	0.0 deg, 0 fpm, 59 sec
d	60,000	3,000 AGL	1.2 Approach	170	-2.3 deg, -660 fpm, 43 sec
e	48,000	2,525 AGL	1.3 Approach	160	-3.0 deg, -740 fpm, 190 sec
f	3,000	157 AGL	1.08 Approach	120	-2.0 deg, -430 fpm, 15 sec
g	0	50 AGL	1.08 Approach	120	

Flight Profile 08LA171, BASED C-17 ARRIVAL FROM EAST
Based C-17
Flight Track: 8LA6 - ARRIVAL FROM EAST INTO 8 MILE FINAL

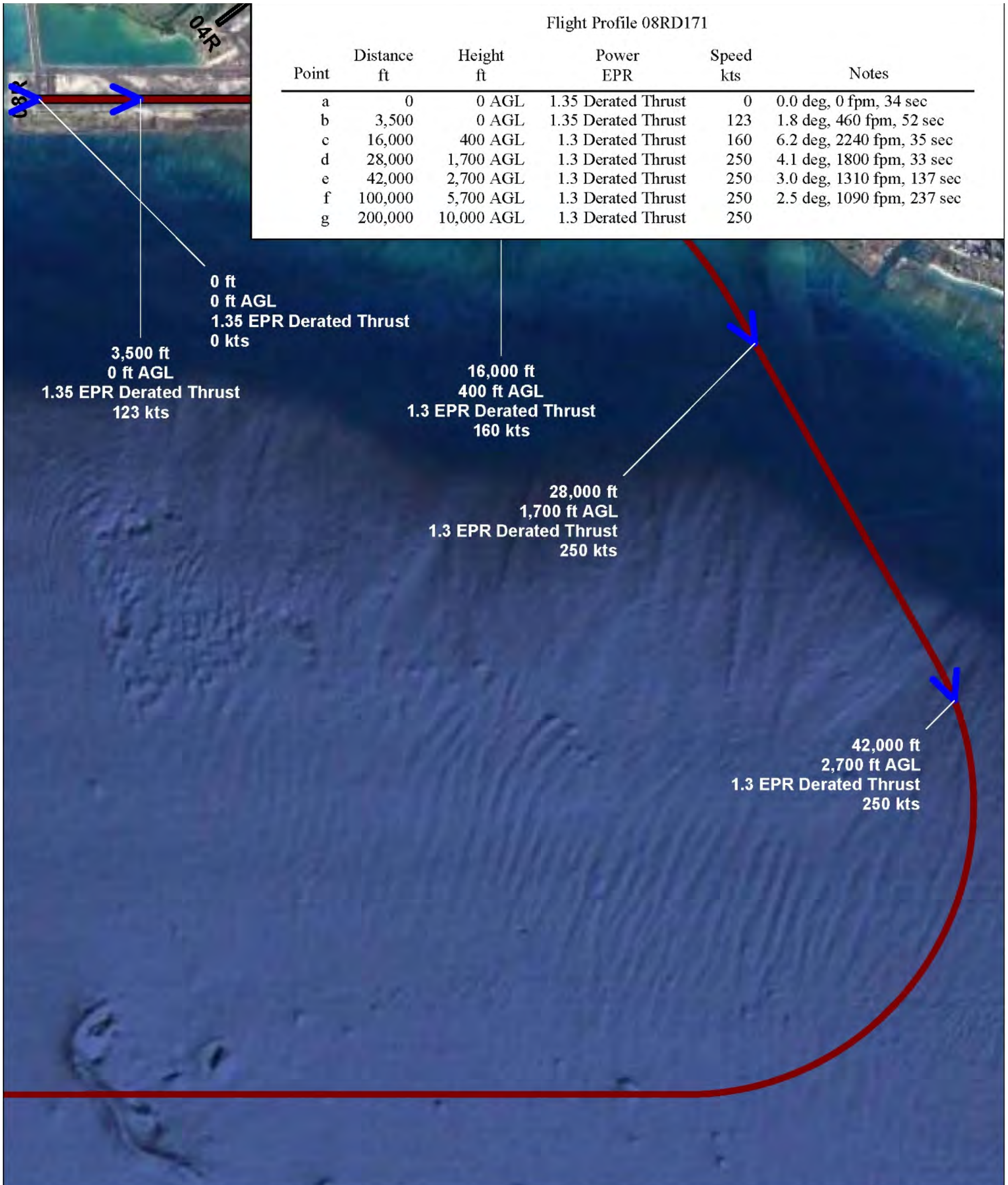
0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000

Scale in Feet 1:142,000 (1 inch = 11,800 feet)

N

Flight Profile 08RD171

Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	0	0 AGL	1.35 Derated Thrust	0	0.0 deg, 0 fpm, 34 sec
b	3,500	0 AGL	1.35 Derated Thrust	123	1.8 deg, 460 fpm, 52 sec
c	16,000	400 AGL	1.3 Derated Thrust	160	6.2 deg, 2240 fpm, 35 sec
d	28,000	1,700 AGL	1.3 Derated Thrust	250	4.1 deg, 1800 fpm, 33 sec
e	42,000	2,700 AGL	1.3 Derated Thrust	250	3.0 deg, 1310 fpm, 137 sec
f	100,000	5,700 AGL	1.3 Derated Thrust	250	2.5 deg, 1090 fpm, 237 sec
g	200,000	10,000 AGL	1.3 Derated Thrust	250	



Flight Profile 08RD171, BASED C-17 DEPARTURE - REPRESENTATIVE TRAINING SORTIE < 400 klbs

Based C-17

Flight Track: 8RD1 - KELOA

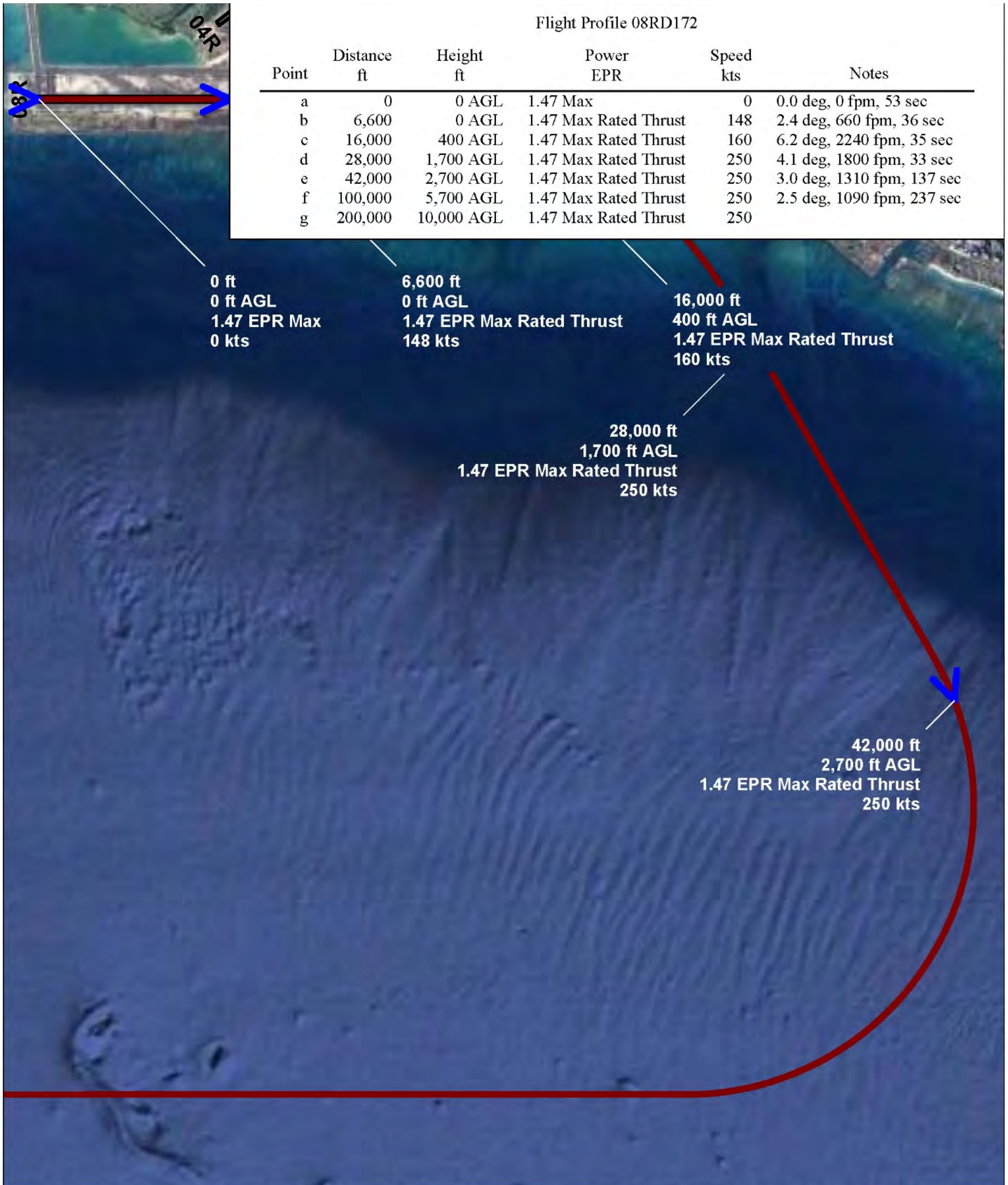
0 4,000 8,000 12,000 16,000 20,000

Scale in Feet 1:63,700 (1 inch = 5,310 feet)

N

Flight Profile 08RD172

Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	0	0 AGL	1.47 Max	0	0.0 deg, 0 fpm, 53 sec
b	6,600	0 AGL	1.47 Max Rated Thrust	148	2.4 deg, 660 fpm, 36 sec
c	16,000	400 AGL	1.47 Max Rated Thrust	160	6.2 deg, 2240 fpm, 35 sec
d	28,000	1,700 AGL	1.47 Max Rated Thrust	250	4.1 deg, 1800 fpm, 33 sec
e	42,000	2,700 AGL	1.47 Max Rated Thrust	250	3.0 deg, 1310 fpm, 137 sec
f	100,000	5,700 AGL	1.47 Max Rated Thrust	250	2.5 deg, 1090 fpm, 237 sec
g	200,000	10,000 AGL	1.47 Max Rated Thrust	250	



Flight Profile 08RD172, BASED C-17 DEPARTURE - REPRESENTATIVE MISSION SORTIE > 400 klbs

Based C-17

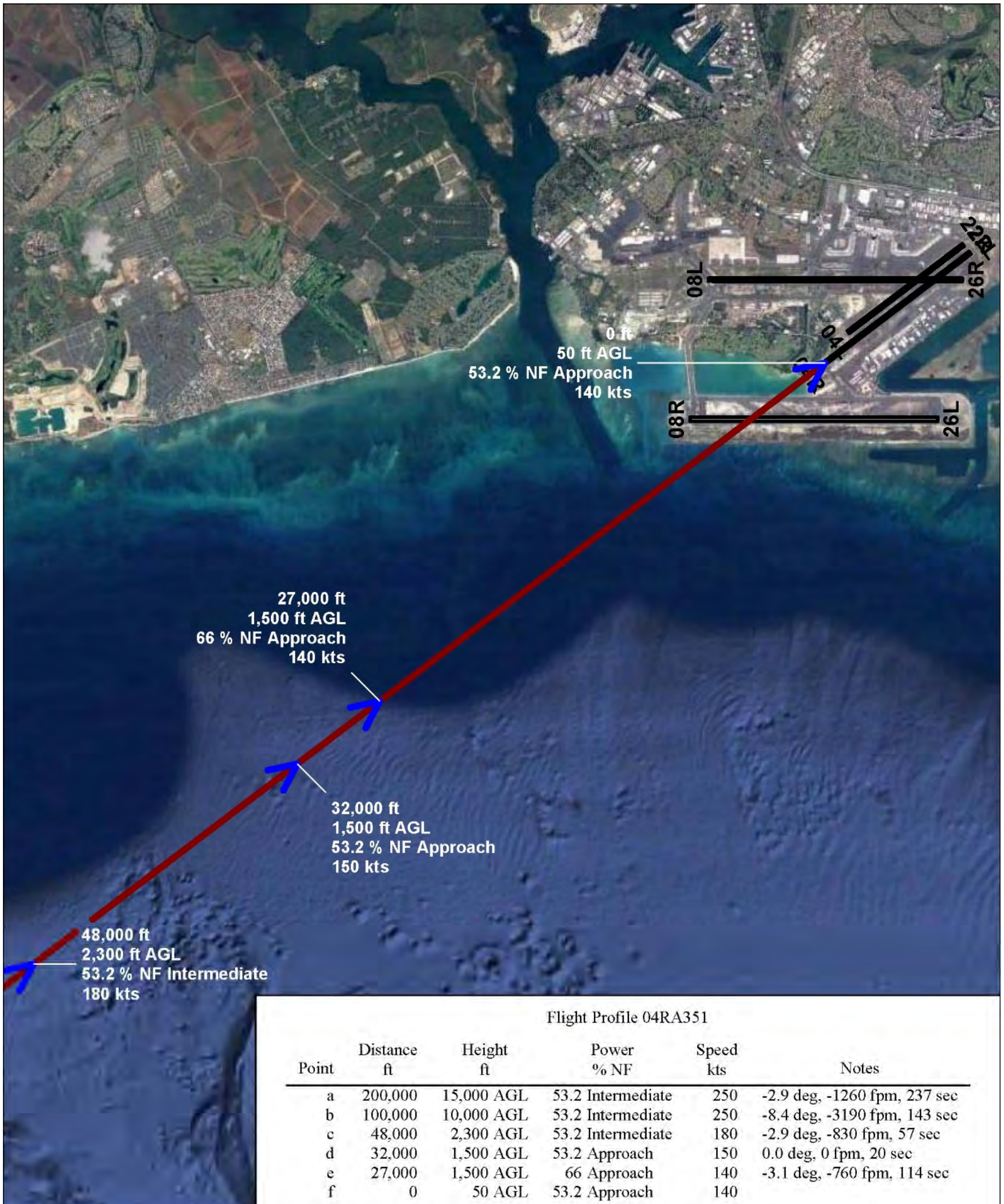
Flight Track: 8RD1 - KELOA

0 4,000 8,000 12,000 16,000 20,000

Scale in Feet 1:63,700 (1 inch = 5,310 feet)

N

Flight Profiles for the 203d Air Refueling Squadron's KC-135Rs



Flight Profile 04RA351

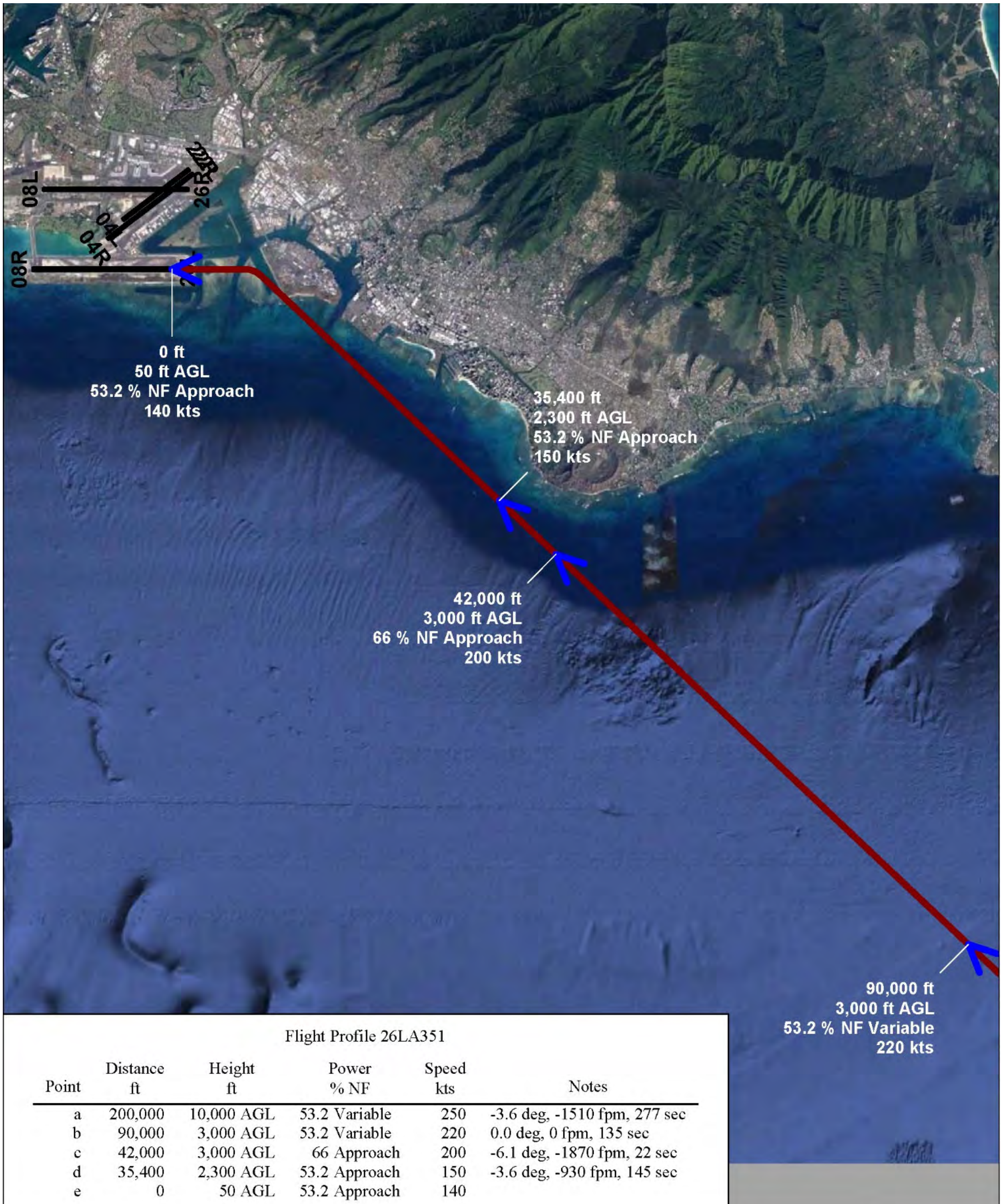
Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	200,000	15,000 AGL	53.2 Intermediate	250	-2.9 deg, -1260 fpm, 237 sec
b	100,000	10,000 AGL	53.2 Intermediate	250	-8.4 deg, -3190 fpm, 143 sec
c	48,000	2,300 AGL	53.2 Intermediate	180	-2.9 deg, -830 fpm, 57 sec
d	32,000	1,500 AGL	53.2 Approach	150	0.0 deg, 0 fpm, 20 sec
e	27,000	1,500 AGL	66 Approach	140	-3.1 deg, -760 fpm, 114 sec
f	0	50 AGL	53.2 Approach	140	

Flight Profile 04RA351, BASED KC-135R - ARRIVAL
Based KC-135R
Flight Track: 4RA1 - STRAIGHT IN

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000

Scale in Feet 1:89,100 (1 inch = 7,430 feet)

N



Flight Profile 26LA351

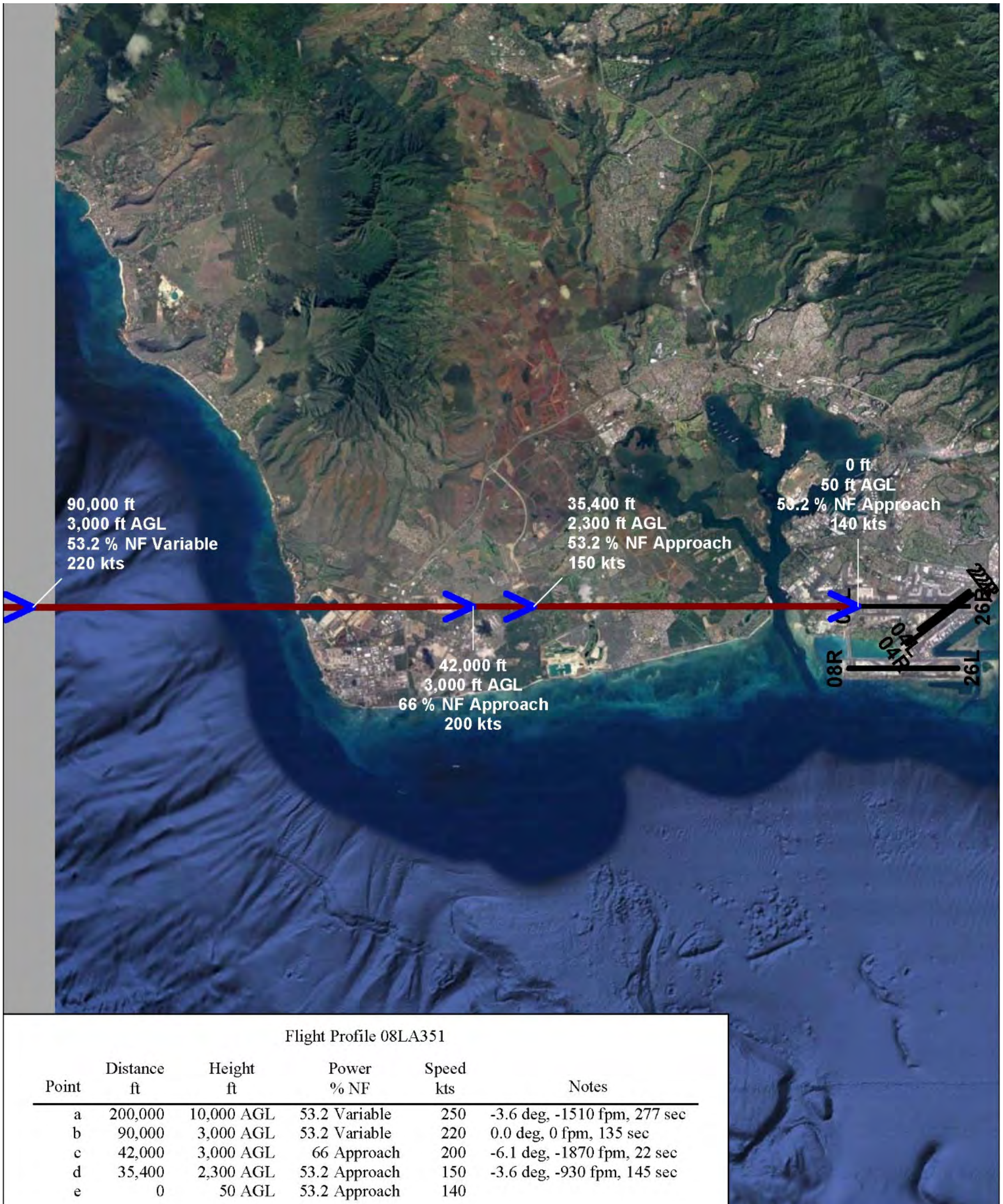
Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	200,000	10,000 AGL	53.2 Variable	250	-3.6 deg, -1510 fpm, 277 sec
b	90,000	3,000 AGL	53.2 Variable	220	0.0 deg, 0 fpm, 135 sec
c	42,000	3,000 AGL	66 Approach	200	-6.1 deg, -1870 fpm, 22 sec
d	35,400	2,300 AGL	53.2 Approach	150	-3.6 deg, -930 fpm, 145 sec
e	0	50 AGL	53.2 Approach	140	

Flight Profile 26LA351, BASED KC-135R - KONA WINDS ARRIVAL
Based KC-135R
Flight Track: 6LA1 - KONA WINDS

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000 52,000

Scale in Feet 1:156,000 (1 inch = 13,000 feet)

N

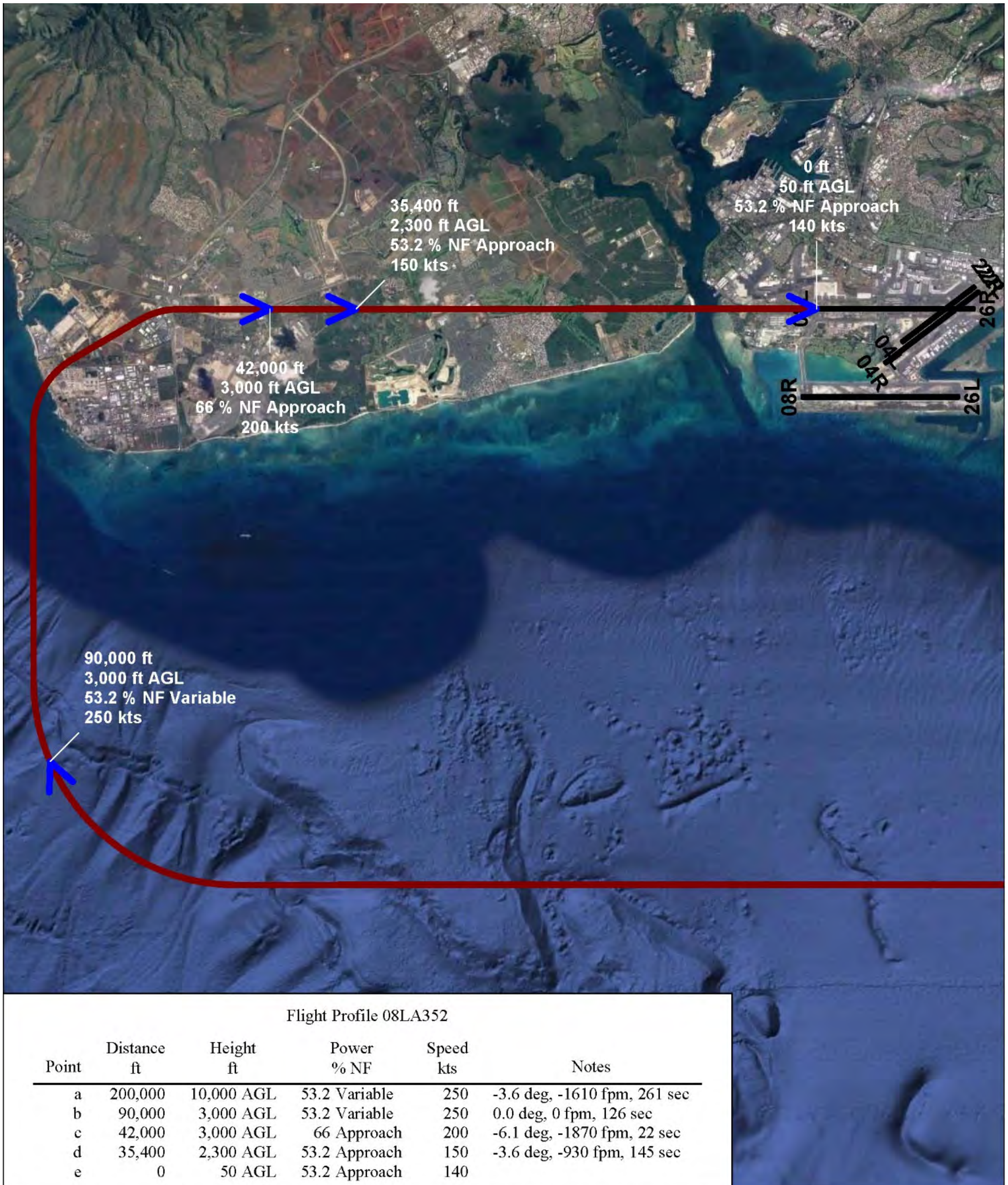


Flight Profile 08LA351

Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	200,000	10,000 AGL	53.2 Variable	250	-3.6 deg, -1510 fpm, 277 sec
b	90,000	3,000 AGL	53.2 Variable	220	0.0 deg, 0 fpm, 135 sec
c	42,000	3,000 AGL	66 Approach	200	-6.1 deg, -1870 fpm, 22 sec
d	35,400	2,300 AGL	53.2 Approach	150	-3.6 deg, -930 fpm, 145 sec
e	0	50 AGL	53.2 Approach	140	

Flight Profile 08LA351, BASED KC-135R - ARRIVAL FROM WEST
Based KC-135R
Flight Track: 8LA1 - BOOKE ARRIVAL 14 DME STRAIGHT IN

Scale in Feet 1:200,000 (1 inch = 16,700 feet)



Flight Profile 08LA352

Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	200,000	10,000 AGL	53.2 Variable	250	-3.6 deg, -1610 fpm, 261 sec
b	90,000	3,000 AGL	53.2 Variable	250	0.0 deg, 0 fpm, 126 sec
c	42,000	3,000 AGL	66 Approach	200	-6.1 deg, -1870 fpm, 22 sec
d	35,400	2,300 AGL	53.2 Approach	150	-3.6 deg, -930 fpm, 145 sec
e	0	50 AGL	53.2 Approach	140	

Flight Profile 08LA352, BASED KC-135R - ARRIVAL FROM EAST INTO 8 MILE FINAL

Based KC-135R

Flight Track: 8LA6 - ARRIVAL FROM EAST INTO 8 MILE FINAL

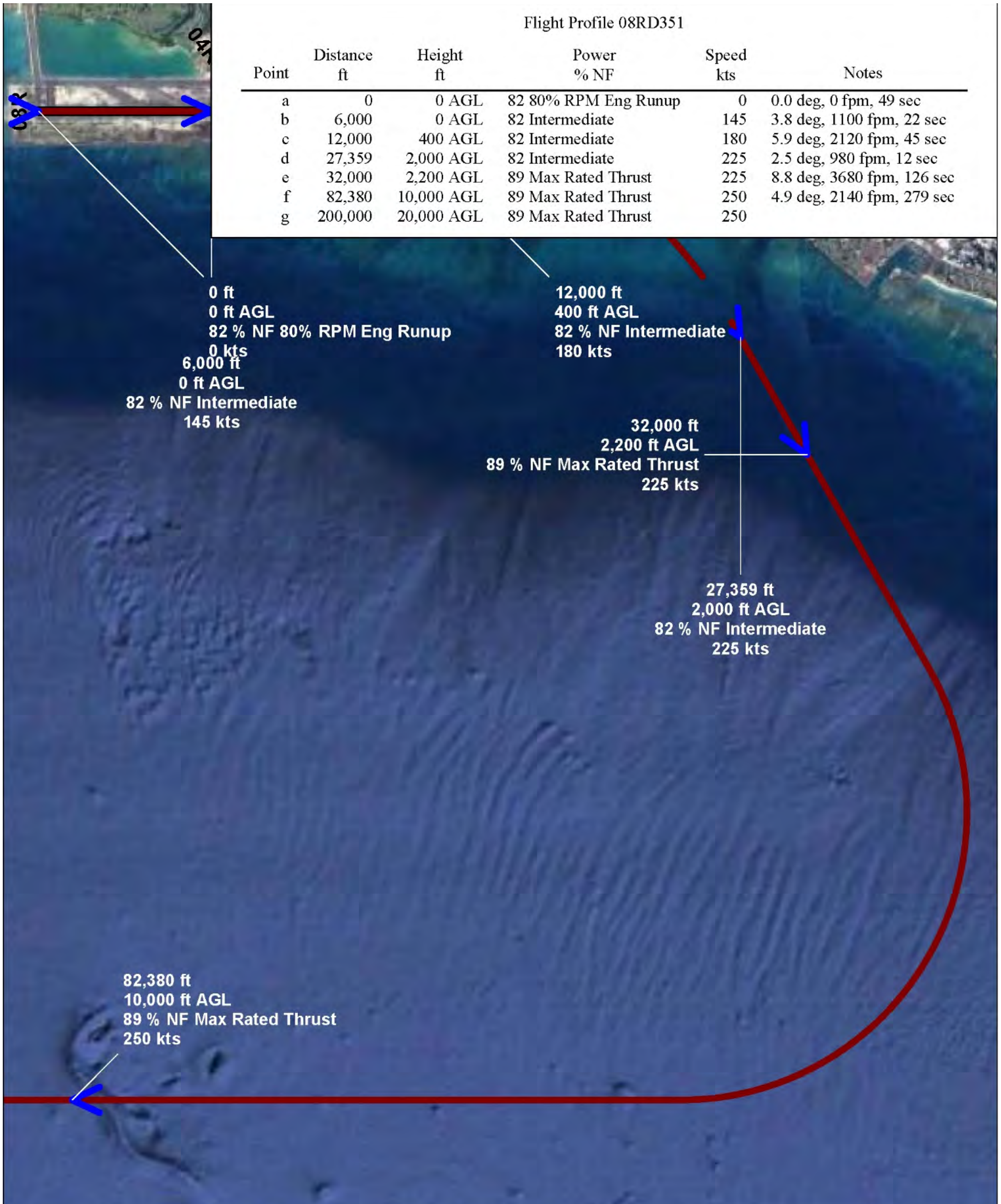
0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000

Scale in Feet 1:142,000 (1 inch = 11,800 feet)

N

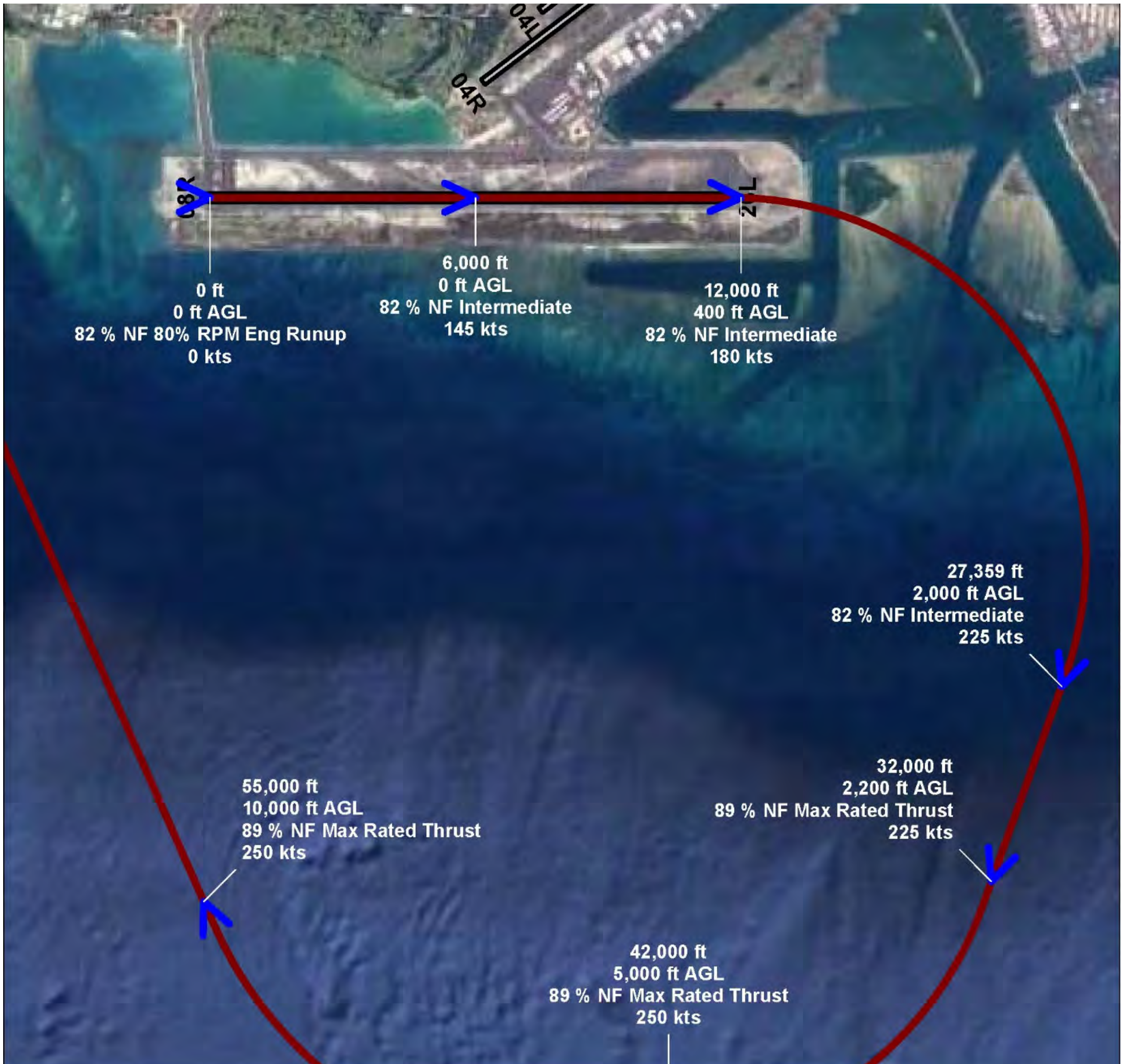
Flight Profile 08RD351

Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	0	0 AGL	82 80% RPM Eng Runup	0	0.0 deg, 0 fpm, 49 sec
b	6,000	0 AGL	82 Intermediate	145	3.8 deg, 1100 fpm, 22 sec
c	12,000	400 AGL	82 Intermediate	180	5.9 deg, 2120 fpm, 45 sec
d	27,359	2,000 AGL	82 Intermediate	225	2.5 deg, 980 fpm, 12 sec
e	32,000	2,200 AGL	89 Max Rated Thrust	225	8.8 deg, 3680 fpm, 126 sec
f	82,380	10,000 AGL	89 Max Rated Thrust	250	4.9 deg, 2140 fpm, 279 sec
g	200,000	20,000 AGL	89 Max Rated Thrust	250	



Flight Profile 08RD351, BASED KC-135R - MISSION SORTIE KELOA
Based KC-135R
Flight Track: 8RD1 - KELOA

Scale in Feet 1:63,700 (1 inch = 5,310 feet)



Flight Profile 08RD352

Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	0	0 AGL	82 80% RPM Eng Runup	0	0.0 deg, 0 fpm, 49 sec
b	6,000	0 AGL	82 Intermediate	145	3.8 deg, 1100 fpm, 22 sec
c	12,000	400 AGL	82 Intermediate	180	5.9 deg, 2120 fpm, 45 sec
d	27,359	2,000 AGL	82 Intermediate	225	2.5 deg, 980 fpm, 12 sec
e	32,000	2,200 AGL	89 Max Rated Thrust	225	15.6 deg, 6480 fpm, 25 sec
f	42,000	5,000 AGL	89 Max Rated Thrust	250	21.0 deg, 9090 fpm, 31 sec
g	55,000	10,000 AGL	89 Max Rated Thrust	250	2.4 deg, 1050 fpm, 344 sec
h	200,000	16,000 AGL	89 Max Rated Thrust	250	

Flight Profile 08RD352, BASED KC-135R - MELLO TO NORTH TRAINING SORTIE

Based KC-135R

Flight Track: 8RD2 - MELLO

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000

Scale in Feet 1:46,600 (1 inch = 3,880 feet)

N

Flight Profile 08RD353

Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	0	0 AGL	82 80% RPM Eng Runup	0	0.0 deg, 0 fpm, 49 sec
b	6,000	0 AGL	82 Intermediate	145	3.8 deg, 1100 fpm, 22 sec
c	12,000	400 AGL	82 Intermediate	180	5.9 deg, 2120 fpm, 45 sec
d	27,359	2,000 AGL	82 Intermediate	225	2.5 deg, 1040 fpm, 12 sec
e	32,000	2,200 AGL	89 Max Rated Thrust	250	18.7 deg, 8130 fpm, 55 sec
f	55,000	10,000 AGL	89 Max Rated Thrust	250	3.9 deg, 1740 fpm, 344 sec
g	200,000	20,000 AGL	89 Max Rated Thrust	250	

Flight Profile 08RD353, BASED KC-135R - MOLOKAI MKK4 TRAINING OPS
Based KC-135R
Flight Track: 8RD3 - MKK4

Scale in Feet 1:99,800 (1 inch = 8,310 feet)

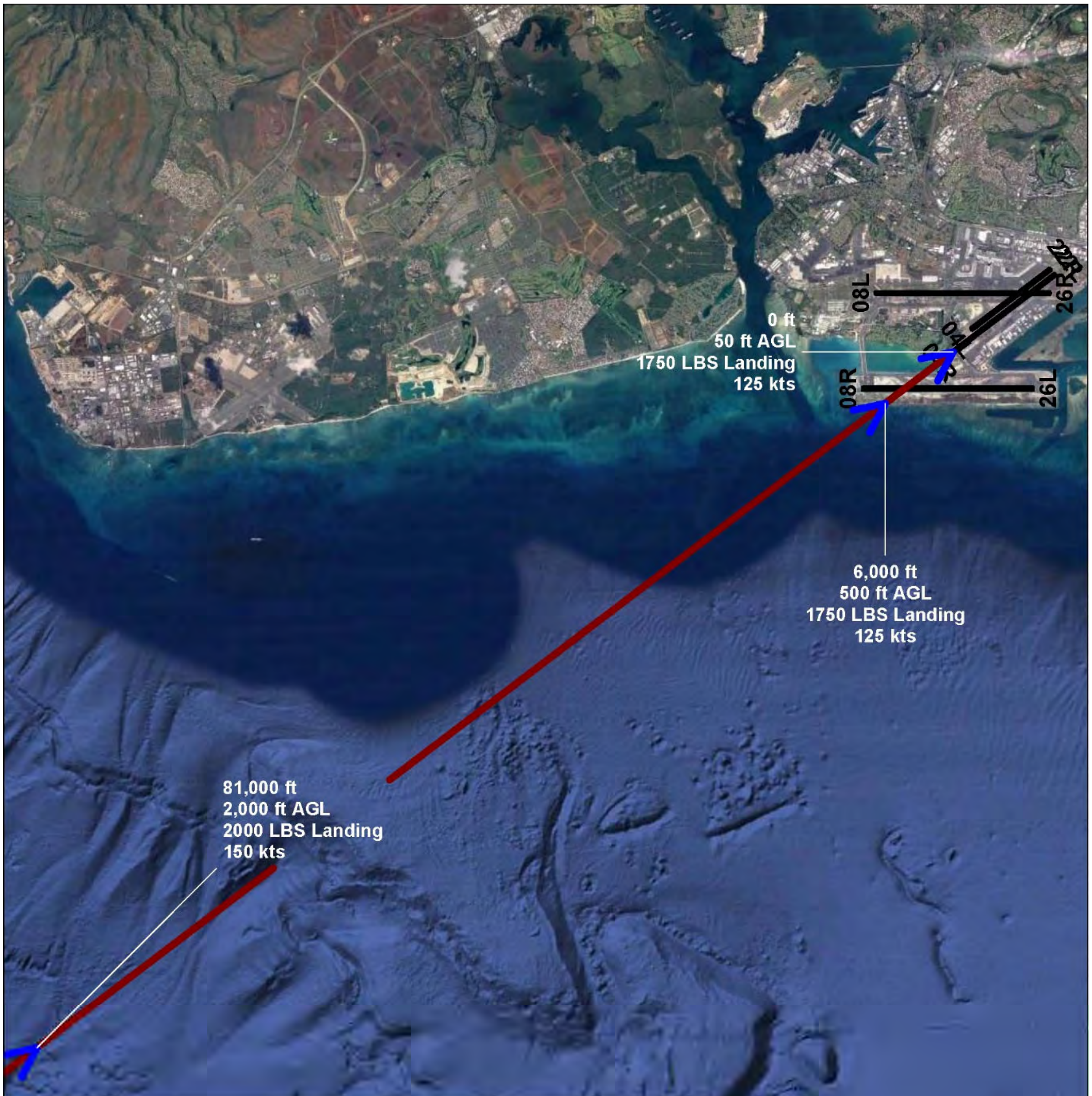
Flight Profile 08RD354

Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	0	0 AGL	82 80% RPM Eng Runup	0	0.0 deg, 0 fpm, 49 sec
b	6,000	0 AGL	82 Intermediate	145	3.8 deg, 1100 fpm, 22 sec
c	12,000	400 AGL	82 Intermediate	180	5.9 deg, 2120 fpm, 45 sec
d	27,359	2,000 AGL	82 Intermediate	225	2.5 deg, 1040 fpm, 12 sec
e	32,000	2,200 AGL	89 Max Rated Thrust	250	18.7 deg, 8130 fpm, 55 sec
f	55,000	10,000 AGL	89 Max Rated Thrust	250	3.9 deg, 1740 fpm, 344 sec
g	200,000	20,000 AGL	89 Max Rated Thrust	250	

Flight Profile 08RD354, BASED KC-135R - (ALANA 3) TO LANAI TRAINING OPS
Based KC-135R
Flight Track: 8RD4 - LANAI

Scale in Feet 1:41,200 (1 inch = 3,430 feet)

Flight Profiles for the 65th Airlift Squadron's C-37 (GIV) and C-40 (B-737)



Flight Profile 04RA401

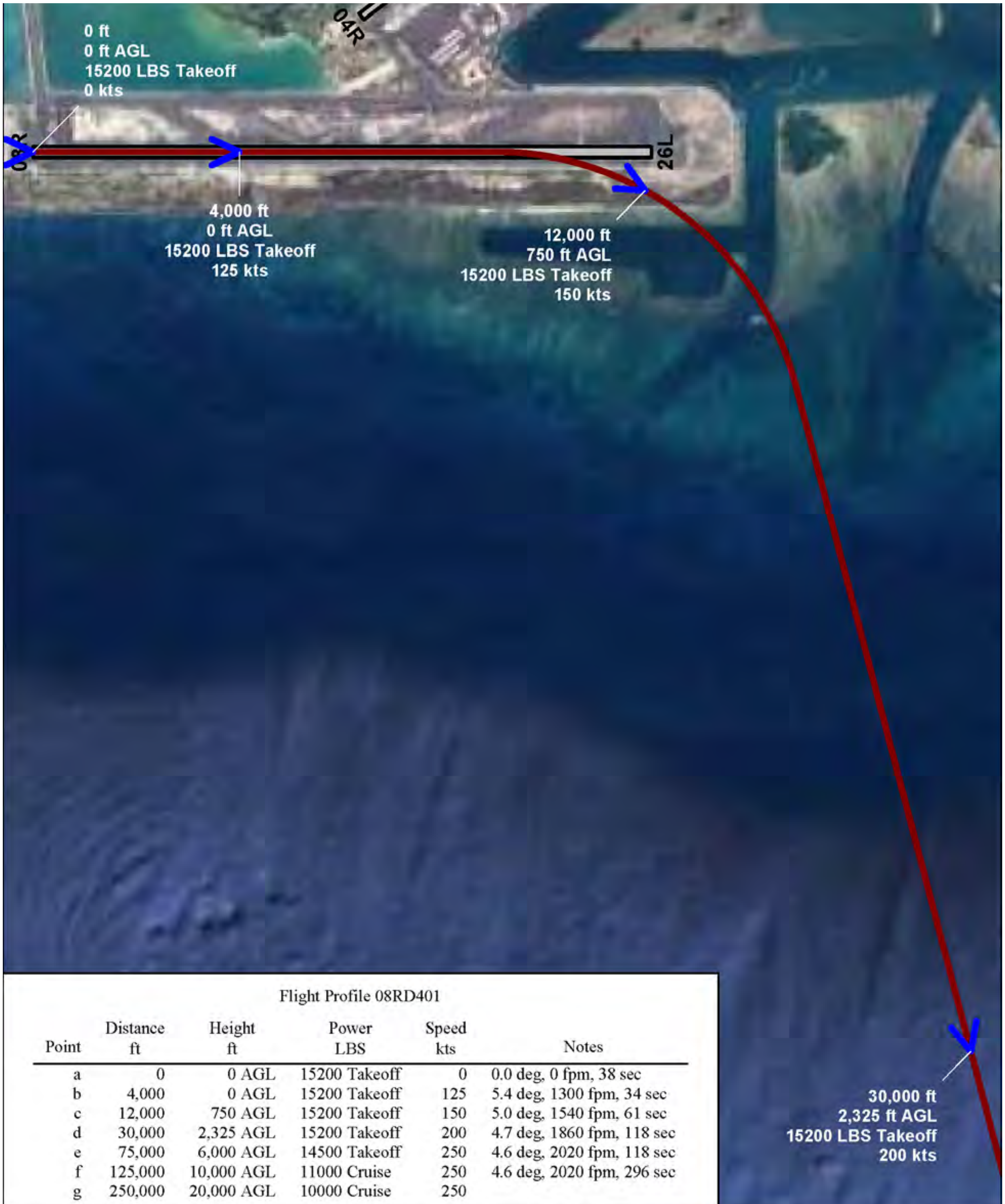
Point	Distance ft	Height ft	Power LBS	Speed kts	Notes
a	250,000	20,000 AGL	11000 Cruise	250	-4.4 deg, -1940 fpm, 308 sec
b	120,000	10,000 AGL	10000 Cruise	250	-11.6 deg, -4070 fpm, 116 sec
c	81,000	2,000 AGL	2000 Landing	150	-1.1 deg, -280 fpm, 323 sec
d	6,000	500 AGL	1750 Landing	125	-4.3 deg, -950 fpm, 28 sec
e	0	50 AGL	1750 Landing	125	

Flight Profile 04RA401, BASED C-40 - REPRESENTATIVE ARRIVAL
Based B-737-QN9 (Q)
Flight Track: 4RA1 - STRAIGHT IN

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000

Scale in Feet 1:141,000 (1 inch = 11,800 feet)

N



Flight Profile 08RD401

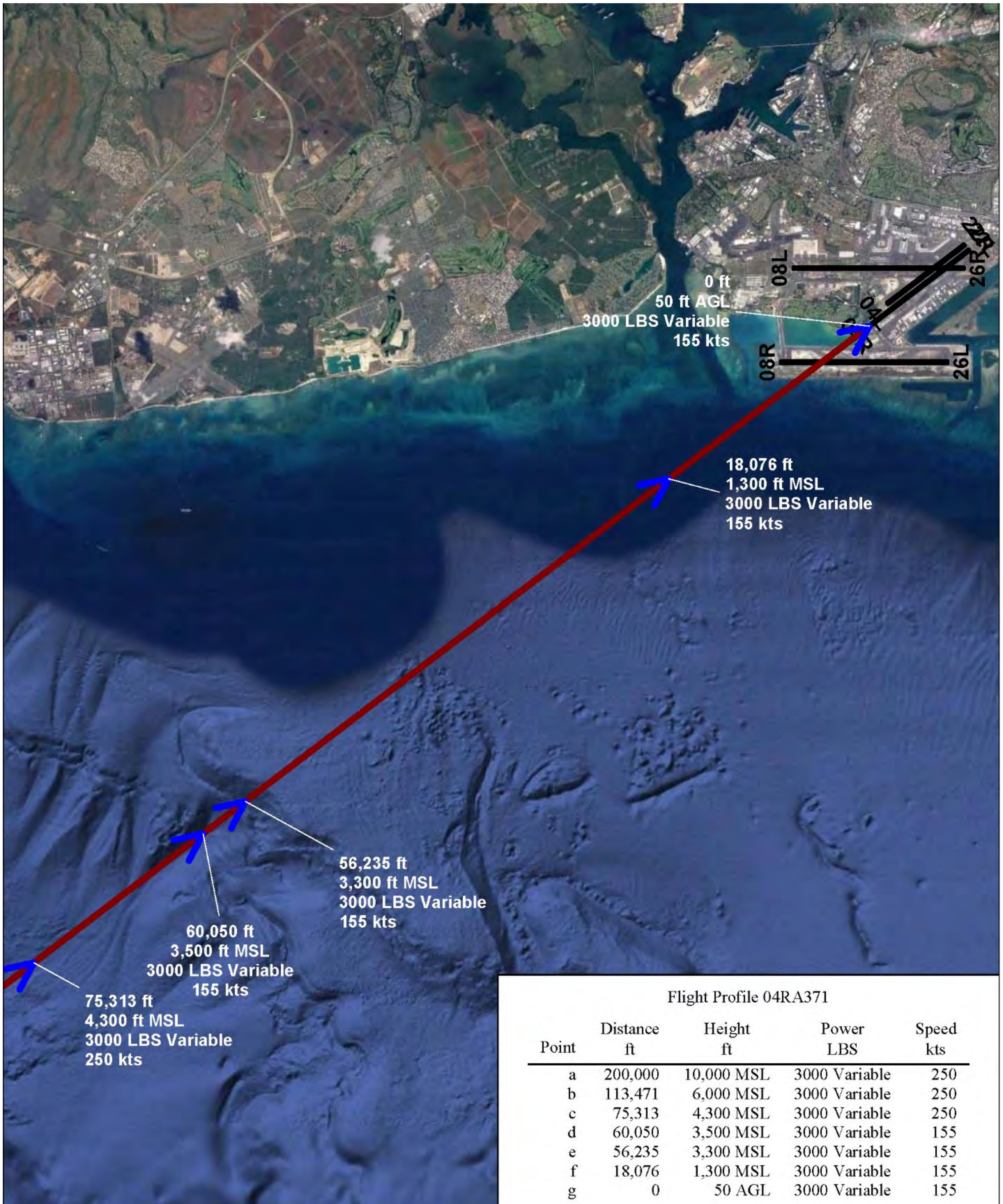
Point	Distance ft	Height ft	Power LBS	Speed kts	Notes
a	0	0 AGL	15200 Takeoff	0	0.0 deg, 0 fpm, 38 sec
b	4,000	0 AGL	15200 Takeoff	125	5.4 deg, 1300 fpm, 34 sec
c	12,000	750 AGL	15200 Takeoff	150	5.0 deg, 1540 fpm, 61 sec
d	30,000	2,325 AGL	15200 Takeoff	200	4.7 deg, 1860 fpm, 118 sec
e	75,000	6,000 AGL	14500 Takeoff	250	4.6 deg, 2020 fpm, 118 sec
f	125,000	10,000 AGL	11000 Cruise	250	4.6 deg, 2020 fpm, 296 sec
g	250,000	20,000 AGL	10000 Cruise	250	

Flight Profile 08RD401, BASED C-40 - REPRESENTATIVE DEPARTURE
Based B-737-QN9 (Q)
Flight Track: 8RD5 - SOUTH DEPART TO KUCHI

0 2,000 4,000 6,000 8,000 10,000

Scale in Feet 1:35,700 (1 inch = 2,980 feet)

N



Flight Profile 04RA371

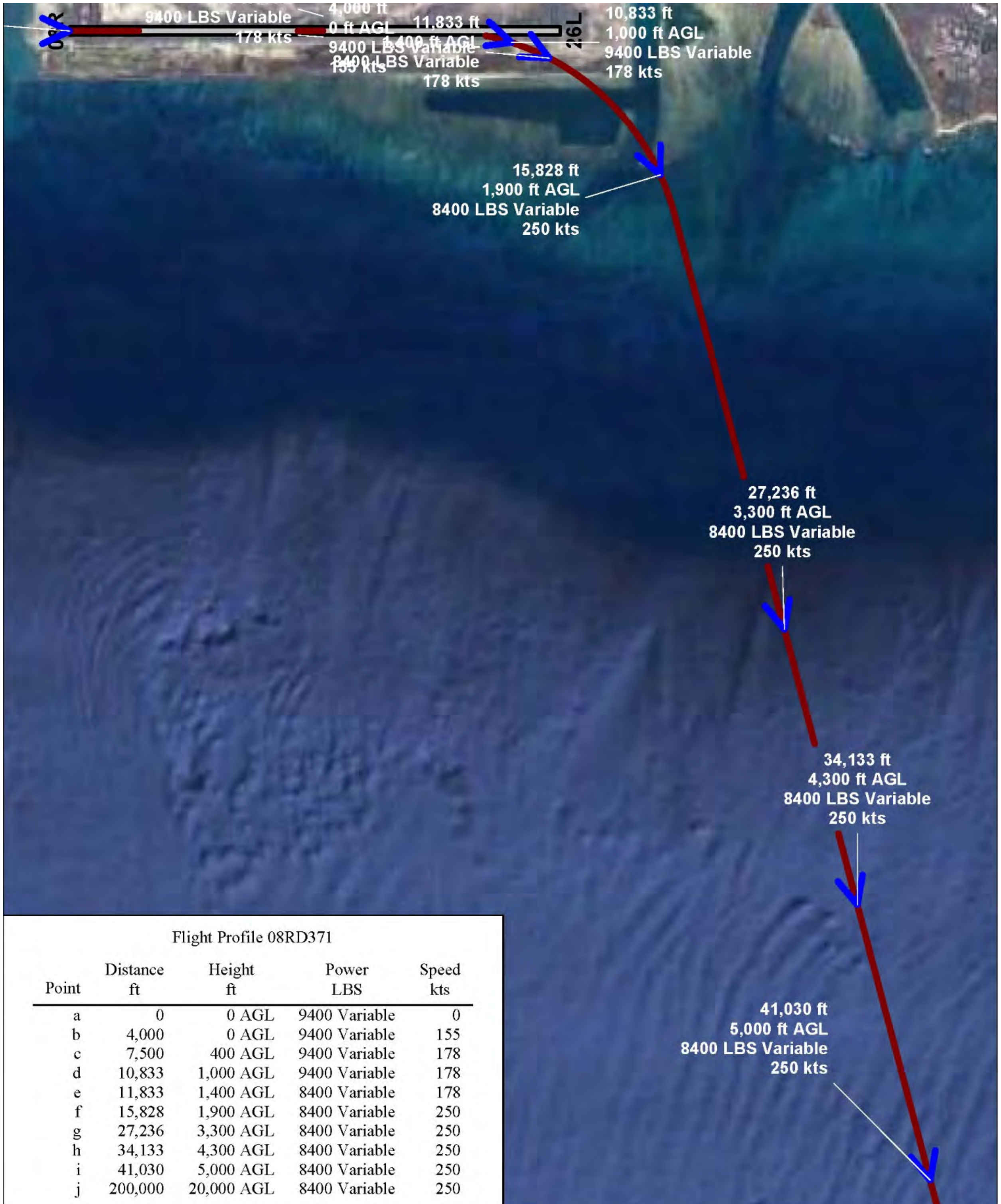
Point	Distance ft	Height ft	Power LBS	Speed kts
a	200,000	10,000 MSL	3000 Variable	250
b	113,471	6,000 MSL	3000 Variable	250
c	75,313	4,300 MSL	3000 Variable	250
d	60,050	3,500 MSL	3000 Variable	155
e	56,235	3,300 MSL	3000 Variable	155
f	18,076	1,300 MSL	3000 Variable	155
g	0	50 AGL	3000 Variable	155

Flight Profile 04RA371, BASED C-37 - REPRESENTATIVE ARRIVAL
Based GIV*
Flight Track: 4RA1 - STRAIGHT IN

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000

Scale in Feet 1:132,000 (1 inch = 11,000 feet)

N



Flight Profile 08RD371

Point	Distance ft	Height ft	Power LBS	Speed kts
a	0	0 AGL	9400 Variable	0
b	4,000	0 AGL	9400 Variable	155
c	7,500	400 AGL	9400 Variable	178
d	10,833	1,000 AGL	9400 Variable	178
e	11,833	1,400 AGL	8400 Variable	178
f	15,828	1,900 AGL	8400 Variable	250
g	27,236	3,300 AGL	8400 Variable	250
h	34,133	4,300 AGL	8400 Variable	250
i	41,030	5,000 AGL	8400 Variable	250
j	200,000	20,000 AGL	8400 Variable	250

Flight Profile 08RD371, BASED C-37 - REPRESENTATIVE DEPARTURE
Based GIV*
Flight Track: 8RD5 - SOUTH DEPART TO KUCHI

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000

Scale in Feet 1:44,900 (1 inch = 3,740 feet)

D.2.3 References

Air Force. 2020. *Final Joint Base Pearl Harbor-Hickam Combat Air Forces Adversary Air Environmental Assessment*. June.

American Speech-Language-Hearing Association. 2005. *Guidelines for Addressing Acoustics in Educational Settings, ASHA Working Group on Classroom Acoustics*.

ANSI. 1985. *Specification for Sound Level Meters, ANSI S1.4A-1985 Amendment to ANSI S1.4-1983*.

ANSI. 1988. *Quantities and Procedures for Description and Measurement of Environmental Sound: Part 1, ANSI S12.9-1988*.

ANSI. 1996. *Quantities and Procedures for Description and Measurement of Environmental Sound: Part 4, ANSI S12.9-1996*.

ANSI. 2002. *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, ANSI S12.60-2002*.

ANSI. 2008. *Methods for Estimation of Awakenings with Outdoor Noise Events Heard in Homes, ANSI S12.9-2008/Part6*.

ANSI. 2010. *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Part 1: Permanent Schools, ANSI/ASA S12.60-2010/Part 1*.

Basner, M., H. Buess, U. Miller, G. Platt, and A. Samuel. 2004. *Aircraft Noise Effects on Sleep: Final Results of DLR Laboratory and Field Studies of 2240 Polysomnographically Recorded Subject Nights*. Internoise 2004, The 33rd International Congress and Exposition on Noise Control Engineering. 22-25 August.

Basner, M., U. Muller, and E.M. Elmenhorst. 2011. *Single and Combined Effects of Air, Road, and Rail Traffic Noise on Sleep and Recuperation*. Sleep 2011(34):11–23.

Basner, M., W. Babisch, A. Davis, M. Brink, C. Clark, S. Janssess. 2014. *Auditory and Non-auditory Effects of Noise on Health*. The Lancet 383(9925):1325-1332.

Berglund, B., and T. Lindvall, eds. 1995. *Community Noise*. Jannes Snabbtryck, Stockholm, Sweden.

Bowles, A.E. 1995. *Responses of Wildlife to Noise*, In *Wildlife and Recreationists: Coexistence through Management and Research*, R.L. Knight and K.J. Gutzwiller, eds. Island Press, Covelo, California, pp. 109-156.

Bradley, J.S. 1985. *Uniform Derivation of Optimum Conditions for Speech in Rooms*. National Research Council, Building Research Note, BRN 239, Ottawa, Canada.

Bradley, J.S. 1993. *NRC-CNRC NEF Validation Study: Review of Aircraft Noise and its Effects*. National Research Council Canada and Transport Canada, Contract Report A-1505.5.

Bronzaft, A.L., and D.P. McCarthy. 1975. *The Effects of Elevated Train Noise on Reading Ability*. Journal of Environment and Behavior 7:517-527.

Clark, C., R. Crombie, J. Head, I. van Kamp, E. van Kempen, and S.A. Stansfeld. 2012. *Does Traffic-Related Air Pollution Explain Associations of Aircraft and Road Traffic Noise Exposure on Children's Health and Cognition? A Secondary Analysis of the United Kingdom Sample from the RANCH Project*. American Journal of Epidemiology 176(4):327–337.

Clark, C., R. Martin, E. van Kempen, T. Alfred, J. Head, H.W. Davies, M.M. Haines, I.L. Barrio, M. Matheson, and S.A. Stansfeld. 2005. *Exposure-Effect Relations Between Aircraft and Road Traffic Noise*

Exposure at School and Reading Comprehension: the RANCH Project. American Journal of Epidemiology 163:27-37.

Clark, C., S.A. Stansfeld, and J. Head. 2009. *The Long-Term Effects of Aircraft Noise Exposure on Children's Cognition: Findings from the UK RANCH Follow-Up Study*. In Proceedings of the Euronoise Conference. Edinburgh, Scotland. October.

Cohen, S., D.C. Glass, and J.E. Singer. 1973. *Apartment Noise, Auditory Discrimination, and Reading Ability in Children*. Journal of Experimental Social Psychology 9:407-422.

Cohen, S., G.W. Evans, and D.S. Krantz. 1980. *Physiological, Motivational, and Cognitive Effects of Aircraft Noise on Children: Moving from Laboratory to Field*. American Psychologist 35:231-243.

Cohen, S., G.W. Evans, and D.S. Krantz. 1981. *Aircraft Noise and Children: Longitudinal and Cross-sectional Evidence on Adaptation to Noise and the Effectiveness of Noise Abatement.* Journal of Personality and Social Psychology 40:331-345.

Cottereau, P. 1978. *The Effect of Sonic Boom from Aircraft on Wildlife and Animal Husbandry*, In *Effects of Noise on Wildlife*, Academic Press, New York, New York, pp. 63-79.

Czech, J.J., and K.J. Plotkin. 1998. *NMAP 7.0 User's Manual*. Wyle Research Report WR 98-13. Wyle Laboratories, Inc. November.

DOD. 1978. *Environmental Protection: Planning in the Noise Environment*. AFMAN 19-10/ TM 5-803-2/NAVFAC P-970.

DOD. 2009a. *Improving Aviation Noise Planning, Analysis, and Public Communication with Supplemental Metrics*. Defense Noise Working Group Technical Bulletin. December.

DOD. 2009b. *Sleep Disturbance from Aviation Noise*. Defense Noise Working Group Technical Bulletin. November.

Eagan, M.E., G. Anderson, B. Nicholas, R. Horonjeff, and T. Tivnan. 2004. *Relation Between Aircraft Noise Reduction in Schools and Standardized Test Scores*. Washington, DC, FICAN.

Evans, G.W., M. Bullinger, and S. Hygge. 1998. *Chronic Noise Exposure and Physiological Response: A Prospective Study of Children Living Under Environmental Stress*. Psychological Science 9:75-77.

FAA. 1985. *Airport Improvement Program (AIP) Handbook*. Order No. 100.38.

FICAN. 1997. *Effects of Aviation Noise on Awakenings from Sleep*. June.

FICAN. 2007. *Findings of the FICAN Pilot Study on the Relationship Between Aircraft Noise Reduction and Changes in Standardized Test Scores*. Washington, DC, FICAN.

FICAN. 2008. *FICAN Recommendation for Use of ANSI Standard to Predict Awakenings from Aircraft Noise*. December.

FICON. 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues*. August.

Fidell, S., and L. Silvati. 2004. *Parsimonious Alternatives to Regression Analysis for Characterizing Prevalence Rates of Aircraft Noise Annoyance*. Noise Control Engineering Journal 52:56–68.

Fidell, S., K. Pearsons, B. Tabachnick, R. Howe, L. Silvati, and D.S. Barber. 1995a. *Field Study of Noise-Induced Sleep Disturbance*. Journal of the Acoustical Society of America 98(2):1025-1033.

Fidell, S., K. Pearsons, R. Howe, B. Tabachnick, L. Silvati, and D.S. Barber. 1994. *Noise-Induced Sleep Disturbance in Residential Settings*. AL/OE-TR-1994-0131, Wright Patterson AFB, OH, Armstrong Laboratory, Occupational and Environmental Health Division.

Fidell, S., R. Howe, B. Tabachnick, K. Pearsons, and M. Sneddon. 1995b. *Noise-induced Sleep Disturbance in Residences near Two Civil Airports*. NASA Contractor Report 198252.

Finegold, L.S., C.S. Harris, and H.E. von Gierke. 1994. *Community Annoyance and Sleep Disturbance: Updated Criteria for Assessing the Impact of General Transportation Noise on People*. Noise Control Engineering Journal 42(1):25-30.

Green, K.B., B.S. Pasternack, and R.E. Shore. 1982. *Effects of Aircraft Noise on Reading Ability of School-Age Children.* Archives of Environmental Health 37(1):24-31.

Griefahn, B. 1978. *Research on Noise Disturbed Sleep Since 1973*. Proceedings of Third International Congress on Noise as a Public Health Problem, pp. 377-390 (as appears in NRC-CNRC NEF Validation Study: (2) Review of Aircraft Noise and Its Effects, A-1505.1, p. 31).

Haines, M.M., S.A. Stansfeld, J. Head, and R.F.S. Job. 2002. *Multilevel Modelling of Aircraft Noise on Performance Tests in Schools around Heathrow Airport London*. Journal of Epidemiology and Community Health 56:139-144.

Harris, C.M. 1979. *Handbook of Noise Control*. McGraw-Hill Book Co.

Horne, J.A., F.L. Pankhurst, L.A. Reyner, K. Hume, and I.D. Diamond. 1994. *A Field Study of Sleep Disturbance: Effects of Aircraft Noise and Other Factors on 5,742 Nights of Actimetrically Monitored Sleep in a Large Subject Sample*. American Sleep Disorders Association and Sleep Research Society: Sleep 17(2):146–195.

Klatte M., K. Bergström, and T. Lachmann. 2013. *Does Noise Affect Learning? A Short Review on Noise Effects on Cognitive Performance in Children*. Frontiers in Psychology 4:578.

Lazarus, H. 1990. *New Methods for Describing and Assessing Direct Speech Communication Under Disturbing Conditions*. Environment International 16:373-392.

Lercher, P., G.W. Evans, and M. Meis. 2003. *Ambient Noise and Cognitive Processes Among Primary School Children*. Journal of Environment and Behavior 35:725-735.

Lind, S.J., K. Pearsons, and S. Fidell. 1998. *Sound Insulation Requirements for Mitigation of Aircraft Noise Impact on Highline School District Facilities*. Volume I, BBN Systems and Technologies, BBN Report No. 8240.

Lucas, Michael J., and Paul T. Calamia. 1997. *Military Operating Area and Range Noise Model MR_NMAP User's Manual*. Wyle Research Report WR 94-12-R. Wyle Laboratories, Inc. March.

Lukas, J.S. 1978. *Noise and Sleep: A Literature Review and a Proposed Criterion for Assessing Effect*, In Daryl N. May, ed., *Handbook of Noise Assessment*, Van Nostrand Reinhold Company: New York, pp. 313-334.

Manci, K.M., D.N. Gladwin, R. Villella, and M.G Cavendish. 1988. *Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis*. US Fish and Wildlife Service National Ecology Research Center, Ft. Collins, Colorado, NERC-88/29. 88 pp.

Márki, F. 2013. *Outcomes of EU COSMA (Community Oriented Solutions to Minimise Aircraft Noise Annoyance) Project.* Budapest University of Technology and Economics, London. May.

Miedema, H.M., and C.G. Oudshoorn. 2001. *Annoyance from Transportation Noise: Relationships with Exposure Metrics DNL and DENL and Their Confidence Intervals*. Environmental Health Perspectives 109.4:409–416.

Miedema, H.M., and H. Vos. 1998. *Exposure-Response Relationships for Transportation Noise*. Journal of the Acoustical Society of America 104(6):3432–3445. December.

National Park Service. 1994. *Report to Congress: Report on Effects of Aircraft Overflights on the National Park System*. Prepared Pursuant to Public Law 100-91, The National Parks Overflights Act of 1987. 12 September.

NATO. 2000. *The Effects of Noise from Weapons and Sonic Booms, and the Impact on Humans, Wildlife, Domestic Animals and Structures*. Final Report of the Working Group Study Follow-up Program to the Pilot Study on Aircraft Noise, Report No. 241. June.

Newman, J.S., and K.R. Beattie. 1985. *Aviation Noise Effects*. US Department of Transportation, Federal Aviation Administration Report No. FAA-EE-85-2.

Ollerhead, J.B., C.J. Jones, R.E. Cadoux, A. Woodley, B.J. Atkinson, J.A. Horne, F. Pankhurst, L. Reyner, K.I. Hume, F. Van, A. Watson, I.D. Diamond, P. Egger, D. Holmes, and J. McKean. 1992. *Report of a Field Study of Aircraft Noise and Sleep Disturbance*. Commissioned by the UK Department of Transport for the 36 UK Department of Safety, Environment and Engineering, London, England: Civil Aviation Authority. December.

Pearsons, K.S., D.S. Barber, and B.G. Tabachnick. 1989. *Analyses of the Predictability of Noise-Induced Sleep Disturbance*. US Air Force Report HSD-TR-89-029. October.

Plotkin, K.J. 1993. *Sonic Boom Focal Zones from Tactical Aircraft Maneuvers*. Journal of Aircraft 30(1). January-February.

Plotkin, K.J. 2002. *Computer Models for Sonic Boom Analysis: PCBoom4, CABoom, BooMap, CORBoom*.

Plotkin, K.J., B.H. Sharp, T. Connor, R. Bassarab, I. Flindell, and D. Schreckenberg. 2011. *Updating and Supplementing the Day-Night Average Sound Level (DNL)*. Wyle Report 11-04, DOT/FAA/AEE/2011-03. June.

Rosenblith, W.A., K.N. Stevens, and Staff of Bolt, Beranek, and Newman. 1953. *Handbook of Acoustic Noise Control, Vol. 2, Noise and Man*. US Air Force Report WADC TR-52-204.

Schreckenberg, D., and R. Schuemer. 2010. *The Impact of Acoustical, Operational and Non-Auditory Factors on Short-Term Annoyance Due to Aircraft Noise*. 39th International Congress on Noise Control Engineering (Inter-Noise 2010), Noise and Sustainability, Lisbon, Portugal. 13 – 16 June 2010.

Schultz, T.J. 1978. *Synthesis of Social Surveys on Noise Annoyance*. Journal of the Acoustical Society of America 64(2):377-405. August.

Sharp, B., T. Connor, D. McLaughlin, C. Clark, S. Stansfeld, and J. Hervey. 2013. *Assessing Aircraft Noise Conditions Affecting Student Learning*, ACRP Web Document 16, http://www.trb.org/Aviation1/Blurbs/170328.aspx Airport Cooperative Research Program, Transportation Research Board, Washington, DC.

Sharp, B.H., and K.J. Plotkin. 1984. *Selection of Noise Criteria for School Classrooms*. Wyle Research Technical Note TN 84-2 for the Port Authority of New York and New Jersey. October.

Smith, D.G., D.H. Ellis, and T.H. Johnston. 1988. *Raptors and Aircraft*, In R.L Glinski, B. Gron-Pendelton, M.B. Moss, M.N. LeFranc, Jr., B.A. Millsap, and S.W. Hoffman, eds., Proceedings of the Southwest Raptor Management Symposium, National Wildlife Federation, Washington, DC, pp. 360-367.

Stansfeld, S.A., and C. Clark. 2015. *Health Effects of Noise Exposure in Children*. Current Environmental Health Reports 2(2):171-178.

Stansfeld, S.A., B. Berglund, and C. Clark, I. Lopez-Barrio, P. Fischer, E. Öhrström, M.M. Haines, J. Head, S. Hygge, and I. van Kamp, B.F. Berry, on Behalf of the RANCH Study Team. 2005. *Aircraft and Road Traffic Noise and Children's Cognition and Health: A Cross-National Study*. Lancet 365:1942-1949.

Stevens, K.N., W.A. Rosenblith, and R.H. Bolt. 1953. *Neighborhood Reaction to Noise: A Survey and Correlation of Case Histories (A).* Journal of the Acoustical Society of America 25:833.

Stusnick, E., K.A. Bradley, J.A. Molino, and G. DeMiranda. 1992. *The Effect of Onset Rate on Aircraft Noise Annoyance, Volume 2: Rented Home Experiment*. Wyle Laboratories Research Report WR 92-3. March.

UKDfES. 2003. *Building Bulletin 93, Acoustic Design of Schools - A Design Guide*. London: The Stationary Office.

USEPA. 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. USEPA Report 550/9-74-004. March.

USEPA. 1978. *Protective Noise Levels*. Office of Noise Abatement and Control, Washington, DC. USEPA Report 550/9-79-100. November.

Wasmer, F. and F. Maunsell. 2006a. BaseOps 7.3 User’s Guide. Wasmer Consulting.

Wasmer, F. and F. Maunsell. 2006b. NMPlot 4.955 User’s Guide. Wasmer Consulting.

Wesler, J.E. 1986. *Priority Selection of Schools for Soundproofing*. Wyle Research Technical Note TN 96-8 for the Port Authority of New York and New Jersey. October.

WHO. 1999. *Guidelines for Community Noise*. Berglund, B., T. Lindvall, and D. Schwela, eds.

Wyle Laboratories. 1970. *Supporting Information for the Adopted Noise Regulations for California Airports*. Wyle Report WCR 70-3(R).

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APPENDIX D-3
AIR QUALITY AND AIR QUALITY IMPACT ANALYSIS

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D.3.1 Air Quality

This appendix presents an overview of the Clean Air Act (CAA) and the relevant state of Hawaii air quality regulations/standards. It also presents calculations, including the assumptions used for the air quality analyses presented in the Air Quality sections of this Environmental Assessment.

D.3.1.1 Definition of the Resource

Under the authority of the CAA and subsequent regulations, the United States () Environmental Protection Agency (USEPA) has divided the country into geographical regions known as Air Quality Control Regions (AQCRs) to evaluate compliance with the National Ambient Air Quality Standards (NAAQS). Joint Base Pearl Harbor-Hickam (JBPHH) is located on the island of Oahu, on the southern coast near Honolulu. Honolulu County (island of Oahu) is in the State of Hawaii AQCR (40 Code of Federal Regulations [CFR] § 81.76) which also includes the following four counties: Hawaii, Kalawao, Kauai, and Maui. The entire State of Hawaii is included within this one AQCR.

For air quality there are two regions of influence, one coinciding with the State of Hawaii AQCR and another coinciding with the Special Use Airspace (SUA) within the six Warning Areas (W-188C, W-189, W-190, W-192, W-193, and W-194) and the two Air Traffic Controlled Assigned Airspace (ATCAA; Nalu and Mela South). For consideration of potential air quality impacts, it is the volume of air extending up to the mixing height (3,000 feet [ft] above ground level [AGL]) and coinciding with the spatial distribution of the regions of influence that is considered in this section. The mixing height is the altitude at which the lower atmosphere will undergo mechanical or turbulent mixing, producing a nearly uniform air mass. The height of the mixing level determines the volume of air within which pollutants can disperse. Pollutants that are released above the mixing height typically will not disperse downward and thus will have little or no effect on ground level concentrations of pollutants. Mixing heights at any one location or region can vary by the season and time of day, but for air quality applications an average mixing height of 3,000 ft AGL is an acceptable default value (40 CFR § 93.153[c][2]).

D.3.1.2 Criteria Pollutants

In accordance with CAA requirements, the air quality in each region or area is measured by the concentration of various pollutants in the atmosphere. Measurements of these “criteria pollutants” in ambient air are expressed in units of parts per million or in units of micrograms per cubic meter. Regional air quality is a result of the types and quantities of atmospheric pollutants and pollutant sources in an area as well as surface topography, the size of the “air basin,” and prevailing meteorological conditions.

The CAA directed the USEPA to develop, implement, and enforce strong environmental regulations that would ensure clean and healthy ambient air quality. To protect public health and welfare, the USEPA developed numerical concentration-based standards, NAAQS, for pollutants that have been determined to impact human health and the environment and established both primary and secondary NAAQS under the provisions of the CAA. NAAQS are currently established for six criteria air pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter (including particulates equal to or less than 10 microns in diameter (PM_{10}) and particulates equal to or less than 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). The primary NAAQS represent maximum levels of background air pollution that are considered safe, with an adequate margin of safety to protect public health. Secondary NAAQS represent the maximum pollutant concentration necessary to protect vegetation, crops, and other public resources in addition to maintaining visibility standards. The primary and secondary NAAQS are presented in **Table D-9**.

Table D-9
National Ambient Air Quality Standards

Pollutant	Standard Value[6]		Standard Type
Carbon Monoxide (CO)			
8-hour average	9 ppm	(10 mg/m^3)	Primary
1-hour average	35 ppm	(40 mg/m^3)	Primary
Nitrogen Dioxide (NO_2)			
Annual arithmetic mean	0.053 ppm	(100 µg/m^3)	Primary and Secondary
1-hour average[1]	0.100 ppm	(188 µg/m^3)	Primary
Ozone (O_3)			
8-hour average[2]	0.070 ppm	(137 µg/m^3)	Primary and Secondary
Lead (Pb)			
3-month average[3]		0.15 µg/m^3	Primary and Secondary
Particulate <10 Micrometers (PM_{10})			
24-hour average[4]		150 µg/m^3	Primary and Secondary
Particulate <2.5 Micrometers ($PM_{2.5}$)			
Annual arithmetic mean[4]		12 µg/m^3	Primary
Annual arithmetic mean[4]		15 µg/m^3	Secondary
24-hour average[4]		35 µg/m^3	Primary and Secondary
Sulfur Dioxide (SO_2)			
1-hour average[5]	0.075 ppm	(196 µg/m^3)	Primary
3-hour average[5]	0.5 ppm	(1,300 µg/m^3)	Secondary

Notes:

1 In February 2010, the USEPA established a new 1-hour standard for NO_2 at a level of 0.100 ppm, based on the 3-year average of the 98th percentile of the yearly distribution concentration, to supplement the then-existing annual standard.

2 In October 2015, the USEPA revised the level of the 8-hour standard to 0.070 ppm, based on the annual 4th highest daily maximum concentration, averaged over 3 years; the regulation became effective on 28 December 2015. The previous (2008) standard of 0.075 ppm remains in effect for some areas. A 1-hour standard no longer exists.

3 In November 2008, USEPA revised the primary Pb standard to 0.15 µg/m^3. USEPA revised the averaging time to a rolling 3-month average.

4 In October 2006, USEPA revised the level of the 24-hour $PM_{2.5}$ standard to 35 µg/m^3 and retained the level of the annual $PM_{2.5}$ standard at 15 µg/m^3. In 2012, USEPA split standards for primary & secondary annual $PM_{2.5}$. All are averaged over 3 years, with the 24-hour average determined at the 98th percentile for the 24-hour standard. USEPA retained the 24-hour primary standard and revoked the annual primary standard for PM_{10}.

5 In 2012, the USEPA retained a secondary 3-hour standard, which is not to be exceeded more than once per year. In June 2010, USEPA established a new 1-hour SO_2 standard at a level of 75 parts per billion, based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations.

6 Parenthetical value is an approximately equivalent concentration for NO_2, O_3, and SO_2.

µg/m^3 = microgram(s) per cubic meter; mg/m^3 = milligram(s) per cubic meter; ppm = part(s) per million; USEPA = United States Environmental Protection Agency

The criteria pollutant O_3 is not usually emitted directly into the air but is formed in the atmosphere by photochemical reactions involving sunlight and previously emitted pollutants, or "O_3 precursors." These O_3 precursors consist primarily of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) that are directly emitted from a wide range of emissions sources. For this reason, regulatory agencies limit atmospheric O_3 concentrations by controlling VOC pollutants (also identified as reactive organic gases) and NO_x.

The USEPA has recognized that particulate matter emissions can have different health affects depending on particle size and, therefore, developed separate NAAQS for coarse particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$). The pollutant $PM_{2.5}$ can be emitted from emission sources directly as very fine dust and/or liquid mist or formed secondarily in the atmosphere as condensable particulate matter, typically forming nitrate and sulfate compounds. Secondary (indirect) emissions vary by region depending upon the predominant emission sources located there and thus which precursors are considered significant for $PM_{2.5}$ formation and identified for ultimate control.

The CAA and USEPA delegated responsibility for ensuring compliance with NAAQS to the states and local agencies. As such, each state must develop air pollutant control programs and promulgate regulations and rules that focus on meeting NAAQS and maintaining healthy ambient air quality levels. When a region or area fails to meet a NAAQS for a pollutant, that region is classified as "non-attainment" for that pollutant. In such cases the affected State must develop a State Implementation Plan (SIP) that is subject to USEPA review and approval. A SIP is a compilation of regulations, strategies, schedules, and enforcement actions designed to move the state into compliance with all NAAQS. Any changes to the compliance schedule or plan (e.g., new regulations, emissions budgets, controls) must be incorporated into the SIP and approved by USEPA.

The CAA required the USEPA draft general conformity regulations that are applicable in nonattainment areas, or in designated maintenance areas (i.e., attainment areas that were reclassified from a previous nonattainment status, which are required to prepare a maintenance plan for air quality). These regulations are designed to ensure that federal actions do not impede local efforts to achieve or maintain attainment with the NAAQS. The General Conformity Rule and the promulgated regulations found in 40 CFR Part 93 exempt certain federal actions from conformity determinations (e.g., contaminated site cleanup and natural disaster response activities). Other federal actions are assumed to conform if total indirect and direct project emissions are below de minimis levels presented in 40 CFR § 93.153. The threshold levels (in tons of pollutant per year) depend upon the nonattainment status that USEPA has assigned to a region. Once the net change in nonattainment pollutants is calculated, the federal agency must compare them to the de minimis thresholds. As the Proposed Action is in an attainment area for all NAAQS, General Conformity does not apply.

Title I of the CAA Amendments of 1990 requires the federal government to reduce emissions from cars, trucks, and buses; from consumer products such as hair spray and window-washing compounds; and from ships and barges during the loading and unloading of petroleum products to address urban air pollution problems of O_3, CO, and PM_{10}. Under Title I, the federal government develops the technical guidance that states need to control stationary sources of pollutants. Title I also allow the USEPA to define boundaries of nonattainment areas. Title V of the CAA Amendments of 1990 requires state and local agencies to implement permitting programs for major stationary sources. A major stationary source is a facility (plant, base, activity, etc.) that has the potential to emit more than 100 tons annually of any one criteria air pollutant in an attainment area.

Federal Prevention of Significant Deterioration (PSD) regulations also define air pollutant emissions from proposed major stationary sources or modifications to be "significant" if a proposed project's net emission increase meets or exceeds the rate of emissions listed in 40 CFR § 52.21(b)(23)(i); or (1) a proposed project is within 10 miles (mi) of any Class I area (wilderness area greater than 5,000 acres or national park greater than 6,000 acres).

Although Titles I and V of the CAA Amendments of 1990 apply to JBPHH, compliance requirements under the relevant regulations would not apply. This is because virtually all of the emissions increase from the Proposed Action would occur from mobile sources which are not governed by Titles I and V; therefore, the requirements originating from Titles I and V are not considered.

D.3.1.3 Greenhouse Gases

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. These emissions are generated by both natural processes and human activities. The accumulation of GHGs in the atmosphere helps regulate the earth's temperature and are believed to contribute to global climate change. GHGs include water vapor, carbon dioxide (CO_2), methane, nitrous oxide, O_3, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated global warming potential (GWP), which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the earth's surface. The GWP of a particular gas provides a relative basis for calculating its carbon dioxide equivalent (CO_2e) or the amount of CO_2e to the emissions of that gas. CO_2 has a GWP of 1 and is, therefore, the standard by which all other GHGs are measured. Potential impacts associated with GHG emissions are discussed in **Section 3.4.7**.

In Hawaii, the USEPA regulates GHG primarily through a permitting program known as the GHG Tailoring Rule. This rule applies to GHG emissions from stationary sources. As virtually all of the emissions increase from the Proposed Action would occur from mobile sources, this rule would not apply here. As such, this rule is not discussed further.

In addition to the GHG Tailoring Rule in 2009, the USEPA promulgated a rule requiring sources to report their GHG emissions if they emit more than 25,000 metric tons or more of CO_2e per year (40 CFR § 98.2[a][2]). Again, this only applies to stationary sources of emissions.

D.3.2 Air Quality Impact Analysis

D.3.2.1 Air Quality Program Overview

To protect public health and welfare, the USEPA has developed numerical concentration-based standards, or NAAQS, for six “criteria” pollutants (based on health-related criteria) under the provisions of the CAA Amendments of 1970. There are two kinds of NAAQS: Primary and Secondary standards. Primary standards prescribe the maximum permissible concentration in the ambient air to protect public health, including the health of “sensitive” populations such as asthmatics, children, and the elderly. Secondary standards prescribe the maximum concentration or level of air quality required to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings (40 CFR Part 50).

The CAA gives states the authority to establish air quality rules and regulations. These rules and regulations must be equivalent to, or more stringent than, the federal program. The State of Hawaii, Department of Health, Clean Air Branch (CAB), oversees the state’s air pollution control program under the authority of the federal CAA and amendments, federal regulations, and state laws. Hawaii has adopted the federal NAAQS (Hawaii Administrative Rules Title 11, Chapter 59). These standards are shown in **Table D-9**.

The CAB operates and maintains an ambient air monitoring network that uses the methods and procedures approved by the USEPA. Based on measured ambient air pollutant concentrations, the USEPA designates areas of the United States as having air quality better than (attainment) the NAAQS, worse than (nonattainment) the NAAQS, and unclassifiable. The areas that cannot be classified (on the basis of available information) as meeting or not meeting the NAAQS for a particular pollutant are “unclassifiable” and are treated as attainment until proven otherwise. Attainment areas can be further classified as “maintenance” areas, which are areas previously classified as nonattainment but where air pollutant concentrations have been successfully reduced to below the standard. Maintenance areas are under special maintenance plans and must operate under some of the nonattainment area plans to ensure compliance with the NAAQS.

Direct emissions are those that occur as a direct result of the action. For example, emissions from new equipment that are a permanent component of the completed action (e.g., boilers, heaters, generators, paint booths) are considered direct emissions. Indirect emissions are those that occur at a later time or at a distance from the Proposed Action. For example, increased vehicular/commuter traffic because of the action is considered an indirect emission. Construction emissions must also be considered. For example, the emissions from vehicles and equipment used to clear and grade building sites, build new buildings, and construct new roads must be evaluated. These types of emissions are considered direct emissions.

Each state is required to develop a SIP that sets forth how CAA provisions will be imposed within the state. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain the NAAQS within each state and includes control measures, emissions limitations, and other provisions required to attain and maintain the ambient air quality standards. The purpose of the SIP is twofold. First, it must provide a control strategy that will result in the attainment and maintenance of the NAAQS. Second, it must demonstrate that progress is being made in attaining the standards in each nonattainment area.

In attainment areas, major new or modified stationary sources of air emissions on and in the area are subject to PSD review to ensure that these sources are constructed without causing significant adverse deterioration of the clean air in the area. A major new source is defined as one that has the potential to emit any pollutant regulated under the CAA in amounts equal to or exceeding specific major source thresholds; that is, 100 or 250 tons/year based on the source's industrial category. These thresholds are applicable to stationary sources. A major modification is a physical change or change in the method of operation at an existing major source that causes a significant "net emissions increase" at that source of any regulated pollutant. **Table D-11** provides a tabular listing of the PSD significant emissions rate thresholds for selected criteria pollutants (USEPA, 1990). Air quality modeling analysis for a PSD proposed facility is required to demonstrate that its emissions of specific pollutants will not cause or significantly contribute to a violation of any ambient air quality standard.

Table D-10
Criteria Pollutant Significant Emissions Rate Increases Under Prevention of Significant Deterioration Regulations

Pollutant	Significant Emission Rate (ton/year)
PM_{10}	15
$PM_{2.5}$	10
Total Suspended Particulate	25
SO_2	40
NO_x	40
Ozone (Volatile Organic Compounds)	40
CO	100

Source: Title 40 CFR Part 52 Subpart A, § 52.21

CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulates equal to or less than 2.5 microns in diameter ; PM_{10} = particulates equal to or less than 10 microns in diameter; SO_2 = sulfur dioxide

The goals of the PSD program are to (1) ensure economic growth while preserving existing air quality; (2) protect public health and welfare from adverse effects that might occur even at pollutant levels better than the NAAQS; and (3) preserve, protect, and enhance the air quality in areas of special natural recreational, scenic, or historic value, such as national parks and wilderness areas. Sources subject to PSD review are required by the CAA to obtain a permit before commencing construction. The permit process requires an extensive review of all other major sources within a 50-mi radius and all Class I areas within a 62-mi radius of the facility. Emissions from any new or modified source must be controlled using Best Available Control Technology. The air quality, in combination with other PSD sources in the area, must not exceed the maximum allowable incremental increase identified in **Table D-12**. National parks and wilderness areas are designated as Class I areas, where any appreciable deterioration in air quality is considered significant. Class II areas are those where moderate, well-controlled industrial growth could be permitted. Class III areas allow for greater industrial development. There are no Class I areas near JBPHH including Papahānaumokuākea Marine National Monument, which is located in Hawaii, but well outside the 50-mi radius.

Table D-11
Federal Allowable Pollutant Concentration Increases Under Prevention of Significant Deterioration Regulations

Pollutant	Averaging Time	Maximum Allowable Concentration (µg/m³)		
		Class I	Class II	Class III
$PM_{2.5}$	Annual	1	4	8
	24-hour	2	9	18
PM_{10}	Annual	4	17	34
	24-hour	8	30	60
SO_2	Annual	2	20	40
	24-hour	5	91	182
	3-hour	25	512	700
NO_2	Annual	2.5	25	50

Source: Title 40 CFR Part 52 Subpart A, § 52.21

µg/m³ = microgram(s) per cubic meter; NO_2 = nitrogen dioxide; $PM_{2.5}$ = particulates equal to or less than 2.5 microns in diameter; PM_{10} = particulates equal to or less than 10 microns in diameter; SO_2 = sulfur dioxide

The Air Quality Monitoring Program monitors ambient air throughout the state. The purpose is to monitor, assess and provide information on statewide ambient air quality conditions and trends as specified by the state and federal CAA. The Air Quality Monitoring Program works in conjunction with local air pollution agencies and some industries, measuring air quality throughout the states.

The air quality monitoring network is used to identify areas where the ambient air quality standards are being violated and plans are needed to reduce pollutant concentration levels to be in attainment with the standards. Also included are areas where the ambient standards are being met, but plans are necessary to ensure maintenance of acceptable levels of air quality in the face of anticipated population or industrial growth.

The USEPA has specific requirements for a minimum number of monitoring sites, known as National Air Monitoring Sites. Hawaii has augmented these with additional sites, called Air Surveillance and Analysis, to provide additional air quality data for Department of Health needs. Locations of these monitoring sites are determined by factors such as emissions sources, population density, permitting needs, modeling results, and site accessibility.

The result of this attainment/maintenance analysis is the development of local and statewide strategies for controlling emissions of criteria air pollutants from stationary and mobile sources. The first step in this process is the annual compilation of the ambient air monitoring results, and the second step is the analysis of the monitoring data for general air quality, exceedances of air quality standards, and pollutant trends.

D.3.2.2 Assumptions

The following are assumptions were used in the air quality analysis for the proposed action:

1. The integration of the additional F-22A aircraft would require construction of new facilities and repair of existing facilities that would be located around the existing airfield and runway. This includes demolition, construction, earth moving, coatings and paving. Emissions were considered only from construction equipment and/or vehicles and from worker commute for projects that include minor interior building fabrication, interior painting, or upgrades to building heating and cooling systems.
2. Start date for construction was assumed to be January 2022. All construction would be completed within a year. Duration for demolition, coating and paving activities for the proposed projects is assumed to be 15 days. For construction and/or repair projects, duration is assumed to be 3 or 6 months, based on the nature of the project.

3. Some of the data related to construction (building construction area, estimated area for paving, grading and trenching square-foot area) were inferred based on a review of site plan diagrams, information contained in DD1391 Forms, and a general description of project, if specific information was not available. Also, if unavailable, building heights used for Air Conformity Applicability Model (ACAM) inputs were assumed, based on engineering judgements or heights used in other similar projects.
4. For proposed grading activity, assumed entire building construction area would be graded and 10 percent of total graded area for material hauled in and material hauled out.
5. For proposed projects that would require the construction of concrete pads, a building height of one foot is assumed for ACAM modeling.
6. No installation of new boilers or generators.
7. No new storage tanks would be installed – additional Jet-A fuel to be used for the F-22A aircraft would be calculated based on additional number of sorties, and an historical average engine fuel consumption rate for F-22A aircrafts. The data on historical use were provided by the 154th Logistics Readiness Squadron Fuels Superintendent, Hawaii Air National Guard (HIANG). Fuel storage emissions were estimated using ACAM defaults. Fuel loading emissions were manually estimated based on USEPA-approved emission factors and engineering calculations.
8. No new Hush House/Engine Test Cell facilities would be installed. Existing hush house/engine test cell facilities would be used for the additional F-22A aircraft engine testing. Hush house operating hours and F119-PW-100 engine time in mode for the additional F-22A aircraft were estimated based on a 3-year average engine run data that are tracked for the air quality permit. The data were obtained from the HIANG 154 Maintenance Squadron Hush House personnel.
9. No new paint booth facilities would be installed. Existing corrosion control facilities and paint booths would be used for the additional F-22A aircraft. Amounts of solvents and coatings that would be used for the additional F-22A aircraft were estimated based on a 3-year average use data that are tracked for the air quality permit. The material type and use information were obtained from aircraft maintenance personnel (HIANG F-22 Low Observable Shop Supervisor) and the 154 HIANG environmental manager. Emissions in ACAM were estimated based on the physical/ chemical data for a representative material (solvent and paint) and a total annual usage provided for each of the paint shop. Individual emission estimates were not performed.
10. For the purposes of modeling, all construction and F-22A additional aircraft flight operations are assumed to start in January 2022. Construction and repair projects would be completed in a year and flight operations would become permanent.
11. Additional F-22A aircraft landing and takeoff (LTO) cycles - use/assume ACAM default "times in mode" to be conservative.
12. Assume once an aircraft is out of the LTO cycle the time (5 to 10 minutes) spent traveling to/from the Warning Areas or ATCAA is at an altitude above 3,000 ft.
13. Assume mixing height is 3,000 ft (this matches USEPA and US Air Force [Air Force] Guidance).
14. Current Air Force training sorties would not increase or decrease as result of this action. Roles may change; however, the change (increase) in emissions for air operations (AOPs) would be strictly due to the addition of the F-22A additional aircraft and associated ground and maintenance activities.
15. For Aerospace Ground Equipment (AGE) – AGE equipment type (model) and hours of operation for each unit per month were obtained from HIANG maintenance personnel. Based on these data, additional operational hours per year were estimated for each additional LTO. For AGE equipment not in ACAM list of equipment, appropriate defaults would be used based on the F-22A aircraft and engine type, or its equivalent.
16. For Auxiliary Power Units (APUs) – APU equipment type (model) and hours of operation for each unit per month were obtained from HIANG maintenance personnel. Based on these data, additional operational hours per year were estimated for each additional LTO. For APU model not found in ACAM list of equipment, appropriate defaults would be used based on the F-22A aircraft and engine type, or its equivalent.
17. There are no touch-and-gos (Closed Patterns) allowed at Daniel K. Inouye International Airport; therefore, these are not included in the analyses.
18. For trim tests, ACAM defaults will be assumed based on surrogate aircraft and engine type.

19. Assume all new personnel (pilots and maintenance staff) would live off-base and commute to the base 5 days per week. Will use ACAM defaults for commute distances.
20. All training sorties would utilize chaff and flares. Only RR-188 chaff and M206 flares would be utilized (no other materials will be considered in the analysis).
21. Assume air quality impacts from chaff releases under actual flight conditions would be low and will have negligible impact on the PM_{10} and $PM_{2.5}$ NAAQS (Air Force, 1997); thus, only the use of flares and impulse cartridges (if applicable) used at or below 3,000 ft will be considered in the air quality analysis. Flares used above 3,000 ft will disperse and not affect air quality in the lowest 3,000 ft above sea level (ASL).
22. All F-22A additional aircraft related training at JBPHH would occur in the Warning Areas or ATCAA.
23. Estimated amount of time each F-22A aircraft would spend within the Warning Areas or ATCAA at or below 3,000 ft ASL is proportioned based on percent time spent between 500 ft (surface) to 3,000 ft. Assuming an average mission time of 90 minutes, the time spent at or below 3,000 ft ASL would be 1.8 minutes (see **Table D-13**). Activity in SUA extending beyond the mixing height (3,000 ft AGL/ASL) is not considered for AQ analysis. Also, open-ocean SUA, outside 12 nautical miles from land, are not considered.
24. ACAM does not have separate inputs for time spent within a Warning Area or ATCAA. To represent the time spent at or below 3,000 ft, 1.8 minutes was assigned to climb out/intermediate power mode within the ACAM LTO input fields. No time was assigned to any other power modes, but default ACAM output also lists Trim Tests and touch-and-gos; however, all inputs for these fields were set to zero (see **Table D-14**).
25. Assume the time spent below 3,000 ft would be the same for all sorties.
26. No changes to current aircraft baseline AOPs (sorties) due to the addition of the proposed F-22A additional aircraft.
27. No/little changes to transit and civilian AOPs due to the additional F-22A additional aircraft.
28. For consideration of potential air quality impacts, it is the volume of air extending up to the mixing height (3,000 ft AGL/ASL) and coinciding with the spatial distribution of the region of influence that is considered. Pollutants that are released above the mixing height typically would not disperse downward and thus would have little or no effect on ground level concentrations of pollutants. The mixing height is the altitude at which the lower atmosphere undergoes mechanical or turbulent mixing, producing a nearly uniform air mass. The height of the mixing level determines the volume of air within which pollutants can disperse. Mixing heights at any one location or region can vary by the season and time of day, but for air quality applications an average mixing height of 3,000 ft AGL is an acceptable default value (40 CFR § 93.153[c][2]).
29. **Tables D-13** and **D-14** show the data and assumptions used as input to ACAM for flight operations.

Table D-12
Special Use Airspace Assumptions and Air Conformity Applicability Model Data Inputs

SUA	No. of Sorties in SUA[a]	Mission Altitude	Total Mission Time (minutes) ≤3,000 ft AGL	Power Mode[c]
W-188C, W-189A & B, and W-190	270	Surface to FL600	1.8[2]	Intermediate/Climb out
Nalu ATCAA	0	5,500 ft AGL to FL290	Not Assigned (>3,000 ft AGL)	N/A
W-192, W-193, and W-194	135	Surface to FL600	1.8[b]	Intermediate/Climb out
Mela South ATCAA	0	1,200 ft MSL to FL600	Not Assigned (Open Ocean and higher than 3,000 ft AGL altitudes)	N/A

Notes:
[a] Based on 405 total sorties in warning areas and ATCAA (Source: HIANG F-22 Plus-up Final DOPAA (Mar 2021), where 67% would operate in the Northern waring areas and 33% would operate in the Southern warning areas.
[b] Based on 90 minutes per sortie and based on percent of time (2%) spent operating in SUA of 3,000 ft AGL or less (i.e., 2% * 90 mins=1.8 mins/sortie). (Source: Data on percent time spent is from *Joint Base Pearl Harbor-Hickam Noise Data Validation for F-22 Plus-Up Environmental Assessment*, 5 March 2021, Table 6, Page 56 of 57)
[c] ACAM does not have separate inputs for time spent within a Warning Area. To represent the time spent within a Warning Area, the expected flight time at or below 3,000 ft (1.8 minutes) was assigned to Intermediate/Climb out power mode within the ACAM LTO input fields. No time was assigned to any other power modes.

ACAM = Air Conformity Applicability Model; AGL = above ground level; ASL = above sea level; ft = feet; ATCAA = Air Traffic Controlled Assigned Airspace; LTO = landing and takeoff; N/A = not applicable; SUA = Special Use Airspace

Table D-13
Times in Mode[a] (minutes) for Aircraft Operations

Type of Operation	Number of Sorties	Taxi/Idle (out)	Takeoff (Military and/or Afterburn)	Climb Out	Approach	Taxi/Idle(in)
LTO	405	18.5	0.4	0.8	3.5	11.3
TGO[b]	-	-	-	-	-	-

Notes:
[a] Given time in mode are ACAM defaults.
[b] No TGOs (Closed Patterns) allowed at Daniel K. Inouye International Airport; therefore, these are not included in the analyses.

LTO = landing and takeoff; TGO = touch-and-go

D.3.2.3 Regulatory Comparisons

Emissions from the Proposed Action in the vicinity of the JBPHH were assessed in **Chapter 3.4** of the Environmental Assessment and compared to applicable significance indicators. An overview of ACAM inputs and the methodologies used to estimate emissions are summarized in **Section D.3.4** of this appendix.

D.3.3 References

Air Force. 1997. *Environmental Effects of Self-protection Chaff and Flares: Final Report*. Prepared for Headquarters Air Combat Command, Langley Air Force Base, Virginia. August.

USEPA. 1990. Office of Air Quality Planning and Standards. *Draft New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Permitting.* October.

USEPA. 2016. *NAAQS Table*. <https://www.epa.gov/criteria-air-pollutants/naaqs-table>. 20 December.

D.3.4 Detailed Air Conformity Applicability Model Report

1. General Information

- Action Location
Base: HICKAM AFB
State: Hawaii
County(s): Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: F-22A Aircraft Plus-up at Joint Base Pearl Harbor-Hickam, Hawaii

- Project Number/s (if applicable):

- Projected Action Start Date: 1 / 2022

- Action Purpose and Need:

The purpose of the Proposed Action is to integrate a total of seven Air Force F-22A Raptors from Tyndall AFB into the current fleet of the HIANG 199 FS until permanent disposition of the aircraft is determined. This would include six Primary Aerospace Vehicle Authorized (PAA) and one Backup Aircraft Inventory (BAI). The Proposed Action would result in an increase in the total F-22A aircraft assigned to the 199 FS from 18 PAA plus 2 BAI to 24 PAA plus 3 BAI.

The devastation caused by Hurricane Michael rendered Tyndall AFB incapable of hosting F-22A aircraft for the foreseeable future and the Proposed Action rectifies the need for these aircraft to be located on an existing F-22 unit to maintain operational readiness.

- Action Description:

The Proposed Action would integrate a total of seven F-22A aircraft to the 199 FS located at JBPHH, that were previously assigned to Tyndall AFB, to increase operational readiness. An estimated 150 additional pilots, maintenance, and support personnel would be needed to support the Proposed Action. New construction and repair of some existing facilities would also be needed to support the additional aircraft and personnel. The Proposed Action would include the increased use of countermeasure chaff and flare

- Point of Contact
Name: Radhika Narayanan
Title: Environmental Scientist
Organization: Versar, LLC
Email: rnarayanan@versar.com
Phone Number:

- Activity List:

Activity Type		Activity Title
2.	Aircraft	Airfield Operations from F-22A Plus Ups
3.	Aircraft	Airspace Operations from F-22 Plus Ups Warning Areas (W-188C, W-189A & B, W-190)
4.	Aircraft	Airspace Operations from F-22 Plus Ups Warning Areas (W-192, W-193 & W-194)
5.	Paint Booth	F-22 Plus Up additional aircraft maintenance (coatings)
6.	Paint Booth	F-22 Plus Up additional aircraft maintenance (solvents)
7.	Tanks	F-22 Plus Up Jet A Storage
8.	Personnel	Additional Personnel Commute due to F-22 Plus Up

9.	Construction / Demolition	Project 1- F-22 Sierra Ramp Construction and Repair Project to Support F-22 Plus-Up
10.	Construction / Demolition	Project 2- Squadron Operations, Building 342 Repair and Reconfigure Project to Support F-22 Plus-Up
11.	Construction / Demolition	Project 3- Munition Maintenance & Inspection Add-on Construction Project to Support F-22 Plus-Up
12.	Construction / Demolition	Project 4- Add Munitions Cube Storage Facility Construction Project to Support F-22 Plus-Up
13.	Construction / Demolition	Project 5- Egress Facility Construction Project to Support F-22 Plus-Up
14.	Construction / Demolition	Project 6-Aircraft Support Equipment Facility Add-on Construction Project to Support F-22 Plus-Up
15.	Construction / Demolition	Project 7-F-22 Intel Vault Construction Project to Support F-22 Plus-Up
16.	Construction / Demolition	Project 8-F-22 Alter Corrosion Control Building 3407 Repair Project to Support F-22 Plus-Up
17.	Construction / Demolition	Project 9-F-22 Maintenance Deployment Facility Construction Project to Support F-22 Plus-Up
18.	Construction / Demolition	Project 5-Concrete pad construction for GOX pad

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: Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Airfield Operations from F-22A Plus Ups

- Activity Description:
Includes F-22A Plus Up activity at the airfield for the additional 405 additional sorties using TIM defaults. For AGE activity, type of AGE, number of units and actual hours of operation for each AGE was obtained from HIANG maintenance personnel. If actual AGE was not found in ACAM list of AGE, default AGE or similar equipment was used in lieu of actual equipment type.
For engine test cells, average TIM and average number of engines that would be tested were estimated based on the past three years data on actual hush house usage. The data on actual use was provided by HIANG personnel.
For APU activity, actual operational hours and number of APU per aircraft provided by HIANG maintenance personnel is used.

- Activity Start Date
Start Month: 1
Start Year: 2022

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	2.941753
SO_x	3.021089
NO_x	30.228462
CO	48.478025
PM 10	3.284928

Pollutant	Emissions Per Year (TONs)
PM 2.5	2.876550
Pb	0.000000
NH_3	0.000000
CO_2e	5287.6

- Activity Emissions [Flight Operations (includes Trim Test & APU) part]:

Pollutant	Emissions Per Year (TONs)
VOC	0.537718
SO_x	1.282560
NO_x	11.510370
CO	20.992307
PM 10	1.841428

Pollutant	Emissions Per Year (TONs)
PM 2.5	1.479350
Pb	0.000000
NH_3	0.000000
CO_2e	3740.1

- Activity Emissions [Test Cell part]:

Pollutant	Emissions Per Year (TONs)
VOC	0.005693
SO_x	0.022929
NO_x	0.369364
CO	0.171631
PM 10	0.028194

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.023423
Pb	0.000000
NH_3	0.000000
CO_2e	69.3

- Activity Emissions [Aerospace Ground Equipment (AGE) part]:

Pollutant	Emissions Per Year (TONs)
VOC	2.398341
SO_x	1.715601
NO_x	18.348728
CO	27.314087
PM 10	1.415306

Pollutant	Emissions Per Year (TONs)
PM 2.5	1.373777
Pb	0.000000
NH_3	0.000000
CO_2e	1478.2

2.2 Aircraft & Engines

2.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine

Aircraft Designation: F-22A
Engine Model: F119-PW-100
Primary Function: Combat
Aircraft has After burn: Yes
Number of Engines: 2

- 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 Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	1377.00	1.67	1.07	3.01	48.15	2.42	1.76	3234
Approach	2740.00	0.05	1.07	6.59	7.92	1.96	1.73	3234
Intermediate	10110.00	0.03	1.07	12.40	2.14	1.40	1.09	3234
Military	18612.00	0.01	1.07	19.81	0.75	1.12	0.97	3234
After Burn	50170.00	0.00	1.07	7.37	16.10	0.85	0.75	3234

2.3 Flight Operations

2.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 7
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 405
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 12

- Default Settings Used: Yes

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out [Idle] (mins): 18.5 (default)
Takeoff [Military] (mins): 0.2 (default)
Takeoff [After Burn] (mins): 0.2 (default)
Climb Out [Intermediate] (mins): 0.8 (default)
Approach [Approach] (mins): 3.5 (default)
Taxi/Idle In [Idle] (mins): 11.3 (default)

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test
Idle (mins): 12 (default)
Approach (mins): 27 (default)
Intermediate (mins): 9 (default)
Military (mins): 9 (default)
AfterBurn (mins): 3 (default)

2.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year
AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year

$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year

$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year

$AEPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year

$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

2.4 Auxiliary Power Unit (APU)

2.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: No

- Auxiliary Power Unit (APU)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer
1	0.186	No	3800100-4	

2.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
3800100-4	272.6	0.493	0.289	1.216	3.759	0.131	0.037	910.8

2.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year
$APU_{POL} = APU * OH * LTO * EF_{POL} / 2000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

2.5 Aircraft Engine Test Cell

2.5.1 Aircraft Engine Test Cell Assumptions

- Engine Test Cell
Total Number of Aircraft Engines Tested Annually: 13

- Default Settings Used: Yes

- Annual Run-ups / Test Durations
Annual Run-ups (Per Aircraft Engine): 1 (default)
Idle Duration (mins): 22 (default)
Approach Duration (mins): 0 (default)
Intermediate Duration (mins): 0 (default)
Military Duration (mins): 9 (default)
After Burner Duration (mins): 0 (default)

2.5.2 Aircraft Engine Test Cell Emission Factor(s)

- See Aircraft & Engines Emission Factor(s)

2.5.3 Aircraft Engine Test Cell Formula(s)

- Aircraft Engine Test Cell Emissions per Pollutant & Power Setting (TONs)
$TestCellPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * ARU / 2000$

$TestCellPS_{POL}$: Aircraft Engine Test Cell Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Total Number of Engines (For All Aircraft)
ARU: Annual Run-ups (Per Aircraft Engine)
2000: Conversion Factor pounds to TONs

- Aircraft Engine Test Cell Emissions per Year

$TestCell = TestCellPS_{IDLE} + TestCellPS_{APPROACH} + TestCellPS_{INTERMEDIATE} + TestCellPS_{MILITARY} + TestCellPS_{AFTERBURN}$

TestCell: Aircraft Engine Test Cell Emissions (TONs)
$TestCellPS_{IDLE}$: Aircraft Engine Test Cell Emissions for Idle Power Setting (TONs)
$TestCellPS_{APPROACH}$: Aircraft Engine Test Cell Emissions for Approach Power Setting (TONs)
$TestCellPS_{INTERMEDIATE}$: Aircraft Engine Test Cell Emissions for Intermediate Power Setting (TONs)
$TestCellPS_{MILITARY}$: Aircraft Engine Test Cell Emissions for Military Power Setting (TONs)
$TestCellPS_{AFTERBURN}$: Aircraft Engine Test Cell Emissions for After Burner Power Setting (TONs)

2.6 Aerospace Ground Equipment (AGE)

2.6.1 Aerospace Ground Equipment (AGE) Assumptions

- Default Settings Used: No

- AGE Usage
Number of Annual LTO (Landing and Take-off) cycles for AGE: 405

- Aerospace Ground Equipment (AGE)

Total Number of AGE	Operation Hours for Each LTO	Exempt Source?	AGE Type	Designation
1	1.2	No	Air Compressor	MC-1A - 18.4hp
2	2.4	No	Air Compressor	MC-7 - 52hp
1	1.2	No	Bomb Lift	MJ-1B
2	1.2	No	Generator Set	A/M32A-86D
2	1.2	No	Heater/Air Conditioner	B-1B Heater/Air Conditioner
1	0.5	No	Hydraulic Test Stand	A/M27T-13
1	1.2	No	Hydraulic Test Stand	MJ-2/TTU-228 - 130hp
7	4.1	No	Light Cart	NF-2
4	5.2	No	Start Cart	A/M32A-60A

2.6.2 Aerospace Ground Equipment (AGE) Emission Factor(s)

- Aerospace Ground Equipment (AGE) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
MC-1A - 18.4hp	1.1	0.267	0.008	0.419	0.267	0.071	0.068	24.8
MC-7 - 52hp	3.3	0.057	0.023	1.285	0.642	0.109	0.105	75.0
MJ-1B	0.0	3.040	0.219	4.780	3.040	0.800	0.776	141.2
A/M32A-86D	6.5	0.294	0.046	6.102	0.457	0.091	0.089	147.0
B-1B Heater/Air Conditioner	17.1	0.258	0.121	7.659	1.409	0.152	0.148	389.3

A/M27T-13	0.0	0.280	0.051	0.180	12.250	0.109	0.105	36.8
MJ-2/TTU-228 - 130hp	7.4	0.195	0.053	3.396	0.794	0.089	0.086	168.8
NF-2	0.0	0.010	0.043	0.110	0.080	0.010	0.010	22.1
A/M32A-60A	0.0	0.270	0.306	1.820	5.480	0.211	0.205	221.1

2.6.3 Aerospace Ground Equipment (AGE) Formula(s)

- Aerospace Ground Equipment (AGE) Emissions per Year
$AGE_{POL} = AGE * OH * LTO * EF_{POL} / 2000$

AGE_{POL}: Aerospace Ground Equipment (AGE) Emissions per Pollutant (TONs)
AGE: Total Number of Aerospace Ground Equipment
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

3. Aircraft

3.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

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

- Activity Title: Airspace Operations from F-22 Plus Ups Warning Areas (W-188C,W-189A & B, W-190)

- Activity Description:
Includes F-22 Plus Up activity in W-188C, W-189A & B & W-190 airspaces based on expected flight of time spent at or below 3,000 ft AGL.

- Activity Start Date
Start Month: 1
Start Year: 2022

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.002621
SO_x	0.087623
NO_x	1.015448
CO	0.175247
PM 10	0.114566

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.089261
Pb	0.000000
NH_3	0.000000
CO_2e	264.8

- Activity Emissions [Flight Operations (includes Trim Test & APU) part]:

Pollutant	Emissions Per Year (TONs)
VOC	0.002621
SO_x	0.087623
NO_x	1.015448
CO	0.175247
PM 10	0.114566

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.089261
Pb	0.000000
NH_3	0.000000
CO_2e	264.8

3.2 Aircraft & Engines

3.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: F-22A
Engine Model: F119-PW-100
Primary Function: Combat
Aircraft has After burn: Yes
Number of Engines: 2

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

3.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	1377.00	1.67	1.07	3.01	48.15	2.42	1.76	3234
Approach	2740.00	0.05	1.07	6.59	7.92	1.96	1.73	3234
Intermediate	10110.00	0.03	1.07	12.40	2.14	1.40	1.09	3234
Military	18612.00	0.01	1.07	19.81	0.75	1.12	0.97	3234
After Burn	50170.00	0.00	1.07	7.37	16.10	0.85	0.75	3234

3.3 Flight Operations

3.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 7
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 270
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out [Idle] (mins): 0
Takeoff [Military] (mins): 0
Takeoff [After Burn] (mins): 0
Climb Out [Intermediate] (mins): 1.8
Approach [Approach] (mins): 0
Taxi/Idle In [Idle] (mins): 0

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test

Idle (mins):	0
Approach (mins):	0
Intermediate (mins):	0
Military (mins):	0
AfterBurn (mins):	0

3.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year

AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year

AE_{LTO} = AEM_{IDLE_IN} + AEM_{IDLE_OUT} + $AEM_{APPROACH}$ + $AEM_{CLIMBOUT}$ + $AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year

AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year

AE_{TGO} = $AEM_{APPROACH}$ + $AEM_{CLIMBOUT}$ + $AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL}$ = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
AE_{TRIM} = $AEPS_{IDLE}$ + $AEPS_{APPROACH}$ + $AEPS_{INTERMEDIATE}$ + $AEPS_{MILITARY}$ + $AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

3.4 Auxiliary Power Unit (APU)

3.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: Yes

- Auxiliary Power Unit (APU) (default)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

3.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

3.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year
APU_{POL} = APU * OH * LTO * EF_{POL} / 2000

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

4. Aircraft

4.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

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

- Activity Title: Airspace Operations from F-22 Plus Ups Warning Areas (W-192, W-193 & W-194)

- Activity Description:
Includes F-22 Plus Up activity in W-192, W-193 & W-194 airspaces based on expected flight of time spent at or below 3,000 ft AGL.

- Activity Start Date
Start Month: 1
Start Year: 2022

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.001310
SO_x	0.043812
NO_x	0.507724
CO	0.087623
PM 10	0.057283

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.044631
Pb	0.000000
NH_3	0.000000
CO_2e	132.4

- Activity Emissions [Flight Operations (includes Trim Test & APU) part]:

Pollutant	Emissions Per Year (TONs)
VOC	0.001310
SO_x	0.043812
NO_x	0.507724
CO	0.087623
PM 10	0.057283

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.044631
Pb	0.000000
NH_3	0.000000
CO_2e	132.4

4.2 Aircraft & Engines

4.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: F-22A
Engine Model: F119-PW-100
Primary Function: Combat
Aircraft has After burn: Yes
Number of Engines: 2

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

4.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	1377.00	1.67	1.07	3.01	48.15	2.42	1.76	3234
Approach	2740.00	0.05	1.07	6.59	7.92	1.96	1.73	3234
Intermediate	10110.00	0.03	1.07	12.40	2.14	1.40	1.09	3234
Military	18612.00	0.01	1.07	19.81	0.75	1.12	0.97	3234
After Burn	50170.00	0.00	1.07	7.37	16.10	0.85	0.75	3234

4.3 Flight Operations

4.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 7
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 135
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out [Idle] (mins): 0
Takeoff [Military] (mins): 0
Takeoff [After Burn] (mins): 0
Climb Out [Intermediate] (mins): 1.8
Approach [Approach] (mins): 0
Taxi/Idle In [Idle] (mins): 0

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test
Idle (mins): 0
Approach (mins): 0
Intermediate (mins): 0
Military (mins): 0
AfterBurn (mins): 0

4.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year
$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)

1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year
$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year
$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year
$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)

$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

4.4 Auxiliary Power Unit (APU)

4.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: Yes

- Auxiliary Power Unit (APU) (default)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

4.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

4.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year

$APU_{POL} = APU * OH * LTO * EF_{POL} / 2000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

5. Paint Booth

5.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

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

- Activity Title: F-22 Plus Up additional aircraft maintenance (coatings)

- Activity Description:
This activity is for maintenance for the Plus Up aircraft. Average coatings throughput for the F-22 aircraft are estimated based on paint usage data from previous years provided by HIANG maintenance personnel. Includes total annual paint usage estimated for B3428 and LOCRF. VOC content and specific gravity for a representative military-use coating was used.

- Activity Start Date
  Start Month: 1
  Start Year: 2022

- Activity End Date
  Indefinite: Yes
  End Month: N/A
  End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.675958
SO_x	0.000000
NO_x	0.000000
CO	0.000000
PM 10	0.000000

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.000000
Pb	0.000000
NH_3	0.000000
CO_2e	0.0

5.2 Paint Booth Assumptions

- Paint Booth
  Coating throughput (gallons/year): 390.7

- Default Settings Used: No

- Paint Booth Consumption
  Coating used: Quick Dry Enamel
  Specific gravity of coating: 1.48
  Coating VOC content by weight (%): 28
  Efficiency of control device (%): 0

5.3 Paint Booth Formula(s)

- Paint Booth Emissions per Year

PBE_{VOC}= (VOC / 100) * CT * SG * 8.35 * (1 - (CD / 100)) / 2000

PBE_{VOC}: Paint Booth VOC Emissions (TONs per Year)
VOC: Coating VOC content by weight (%)
(VOC / 100): Conversion Factor percent to decimal
CT: Coating throughput (gallons/year)
SG: Specific gravity of coating
8.35: Conversion Factor the density of water
CD: Efficiency of control device (%)
(1 - (CD / 100)): Conversion Factor percent to decimal (Not effected by control device)
2000: Conversion Factor pounds to tons

6. Paint Booth

6.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

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

- Activity Title: F-22 Plus Up additional aircraft maintenance (solvents)

- Activity Description:
This activity is for maintenance for the Plus Up aircraft. Average solvent throughput for the F-22 aircraft are estimated based on solvent usage data from previous years provided by HIANG maintenance personnel. Includes total asolvent paint usage estimated for B3428 and LOCRF. VOC content and specific gravity for a representative solvent was used.

- Activity Start Date
Start Month: 1
Start Year: 2022

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.664652
SO_x	0.000000
NO_x	0.000000
CO	0.000000
PM 10	0.000000

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.000000
Pb	0.000000
NH_3	0.000000
CO_2e	0.0

6.2 Paint Booth Assumptions

- Paint Booth
Coating throughput (gallons/year): 202.8

- Default Settings Used: No

- Paint Booth Consumption
Coating used: Quick Dry Enamel
Specific gravity of coating: 0.785
Coating VOC content by weight (%): 100
Efficiency of control device (%): 0

6.3 Paint Booth Formula(s)

- Paint Booth Emissions per Year
PBE_{VOC}= (VOC / 100) * CT * SG * 8.35 * (1 - (CD / 100)) / 2000

PBE_{VOC}: Paint Booth VOC Emissions (TONs per Year)
VOC: Coating VOC content by weight (%)
(VOC / 100): Conversion Factor percent to decimal
CT: Coating throughput (gallons/year)
SG: Specific gravity of coating
8.35: Conversion Factor the density of water
CD: Efficiency of control device (%)

(1 - (CD / 100)): Conversion Factor percent to decimal (Not effected by control device)
2000: Conversion Factor pounds to tons

7. Tanks

7.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

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

- Activity Title: F-22 Plus Up Jet A Storage

- Activity Description:
Activity is for additional amount of Jet A fuel that would be handled at the installation due to F-22 Plus Up activity.
Actual Jet A (gallons) issued for F-22 for previous two years were provided by POL personnel at HIANG and additional fuel throughput for F-22 Plus Up aircraft were estimated based on average historical fuel use and number of additional F-22 Plus Up sorties.

- Activity Start Date
Start Month: 1
Start Year: 2022

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.084152
SO_x	0.000000
NO_x	0.000000
CO	0.000000
PM 10	0.000000

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.000000
Pb	0.000000
NH_3	0.000000
CO_2e	0.0

7.2 Tanks Assumptions

- Chemical
Chemical Name: Jet kerosene (JP-5, JP-8 or Jet-A)
Chemical Category: Petroleum Distillates
Chemical Density: 7
Vapor Molecular Weight (lb/lb-mole): 130
Stock Vapor Density (lb/ft^3): 0.000170775135930213
Vapor Pressure: 0.00725
Vapor Space Expansion Factor (dimensionless): 0.068

- Tank
Type of Tank: Horizontal Tank
Tank Length (ft): 28

Tank Diameter (ft): 11
Annual Net Throughput (gallon/year): 875164

7.3 Tank Formula(s)

- Vapor Space Volume

VSV = (PI / 4) * D^2 * L / 2

VSV: Vapor Space Volume (ft^3)
PI: PI Math Constant
D^2: Tank Diameter (ft)
L: Tank Length (ft)
2: Convertion Factor (Vapor Space Volume is assumed to be one-half of the tank volume)

- Vented Vapor Saturation Factor

VVSF = 1 / (1 + (0.053 * VP * L / 2))

VVSF: Vented Vapor Saturation Factor (dimensionless)
0.053: Constant
VP: Vapor Pressure (psia)
L: Tank Length (ft)

- Standing Storage Loss per Year

SSL_{VOC} = 365 * VSV * SVD * VSEF * VVSF / 2000

SSL_{VOC}: Standing Storage Loss Emissions (TONs)
365: Number of Daily Events in a Year (Constant)
VSV: Vapor Space Volume (ft^3)
SVD: Stock Vapor Density (lb/ft^3)
VSEF: Vapor Space Expansion Factor (dimensionless)
VVSF: Vented Vapor Saturation Factor (dimensionless)
2000: Conversion Factor pounds to tons

- Number of Turnovers per Year

NT = (7.48 * ANT) / ((PI / 4.0) * D * L)

NT: Number of Turnovers per Year
7.48: Constant
ANT: Annual Net Throughput
PI: PI Math Constant
D^2: Tank Diameter (ft)
L: Tank Length (ft)

- Working Loss Turnover (Saturation) Factor per Year

WLSF = (18 + NT) / (6 * NT)

WLSF: Working Loss Turnover (Saturation) Factor per Year
18: Constant
NT: Number of Turnovers per Year
6: Constant

- Working Loss per Year

WL_{VOC} = 0.0010 * VMW * VP * ANT * WLSF / 2000

0.0010: Constant
VMW: Vapor Molecular Weight (lb/lb-mole)

VP: Vapor Pressure (psia)
ANT: Annual Net Throughput
WLSF: Working Loss Turnover (Saturation) Factor
2000: Conversion Factor pounds to tons

8. Personnel

8.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

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

- Activity Title: Additional Personnel Commute due to F-22 Plus Up

- Activity Description:
For the F-22A plus-up, 150 additional Guard and civilian personnel would be permanently assigned. Includes pilots, maintenance, and support personnel. Assumed approximately 14% (21) are ANG personnel. Rest are support contractor personnel (maintenance staff, pilots)

- Activity Start Date
Start Month: 1
Start Year: 2022

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.321183
SO_x	0.002195
NO_x	0.265228
CO	3.819411
PM 10	0.005508

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.004971
Pb	0.000000
NH_3	0.020177
CO_2e	327.0

8.2 Personnel Assumptions

- Number of Personnel
Active Duty Personnel: 0
Civilian Personnel: 0
Support Contractor Personnel: 129
Air National Guard (ANG) Personnel: 21
Reserve Personnel: 0

- Default Settings Used: Yes

- Average Personnel Round Trip Commute (mile): 20 (default)

- Personnel Work Schedule

Active Duty Personnel:	5 Days Per Week (default)
Civilian Personnel:	5 Days Per Week (default)
Support Contractor Personnel:	5 Days Per Week (default)
Air National Guard (ANG) Personnel:	4 Days Per Week (default)
Reserve Personnel:	4 Days Per Month (default)

8.3 Personnel On Road Vehicle Mixture

- On Road Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	37.55	60.32	0	0.03	0.2	0	1.9
GOVs	54.49	37.73	4.67	0	0	3.11	0

8.4 Personnel Emission Factor(s)

- On Road Vehicle Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

8.5 Personnel Formula(s)

- Personnel Vehicle Miles Travel for Work Days per Year

$VMT_P = NP * WD * AC$

VMT_P: Personnel Vehicle Miles Travel (miles/year)
NP: Number of Personnel
WD: Work Days per Year
AC: Average Commute (miles)

- Total Vehicle Miles Travel per Year

$VMT_{Total} = VMT_{AD} + VMT_C + VMT_{SC} + VMT_{ANG} + VMT_{AFRC}$

VMT_{Total}: Total Vehicle Miles Travel (miles)
VMT_{AD}: Active Duty Personnel Vehicle Miles Travel (miles)
VMT_C: Civilian Personnel Vehicle Miles Travel (miles)
VMT_{SC}: Support Contractor Personnel Vehicle Miles Travel (miles)
VMT_{ANG}: Air National Guard Personnel Vehicle Miles Travel (miles)
VMT_{AFRC}: Reserve Personnel Vehicle Miles Travel (miles)

- Vehicle Emissions per Year

$V_{POL} = (VMT_{Total} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{Total}: Total Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Personnel On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

9. Construction / Demolition

9.1 General Information & Timeline Assumptions

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

- Activity Title: Project 1- F-22 Sierra Ramp Construction and Repair Project to Support F-22 Plus-Up

- Activity Description:
Assume Grading of entire pavement construction area even though DD1491 did not account for grading activity. Assume 10% of total area for material hauled in & material hauled out.
For construction of airfield pavement it is assumed that the airfield pavement will be concrete with one foot thickness.
There may be some minimal trenching as there is a plan to install up to 4 underground electrical conduits for each shelter location that will be installed for future electrical requirements, however no trenching is assumed as no actual data is available.

- Activity Start Date
Start Month: 1
Start Month: 2022

- Activity End Date
Indefinite: False
End Month: 6
End Month: 2022

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.167984
SO_x	0.002697
NO_x	1.016194
CO	1.203933
PM 10	0.364503

Pollutant	Total Emissions (TONs)
PM 2.5	0.042077
Pb	0.000000
NH_3	0.000922
CO_2e	262.0

9.1 Site Grading Phase

9.1.1 Site Grading Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 1
Number of Days: 0

9.1.2 Site Grading Phase Assumptions

- General Site Grading Information
Area of Site to be Graded (ft^2): 32400
Amount of Material to be Hauled On-Site (yd^3): 3240
Amount of Material to be Hauled Off-Site (yd^3): 3240

- Site Grading Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Graders Composite	1	6
Other Construction Equipment Composite	1	8
Rubber Tired Dozers Composite	1	6
Tractors/Loaders/Backhoes Composite	1	7

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

9.1.3 Site Grading Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Graders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0806	0.0014	0.4657	0.5731	0.0217	0.0217	0.0072	132.92
Other Construction Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0507	0.0012	0.2785	0.3488	0.0105	0.0105	0.0045	122.61
Rubber Tired Dozers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.1919	0.0024	1.3611	0.7352	0.0536	0.0536	0.0173	239.51
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621

LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

9.1.4 Site Grading Phase Formula(s)

- Fugitive Dust Emissions per Phase
$PM10_{FD}$ = (20 * ACRE * WD) / 2000

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase
CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
VMT_{VE} = (HA_{OnSite} + $HA_{OffSite}$) * (1 / HC) * HT

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
VMT_{WT} = WD * WT * 1.25 * NE

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

9.2 Building Construction Phase

9.2.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 6
Number of Days: 0

9.2.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Commercial or Retail
Area of Building (ft^2): 32400
Height of Building (ft): 1
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cranes Composite	1	6
Forklifts Composite	2	6
Generator Sets Composite	1	8
Tractors/Loaders/Backhoes Composite	1	8
Welders Composite	3	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 40 (default)

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

9.2.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Cranes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0797	0.0013	0.5505	0.3821	0.0203	0.0203	0.0071	128.81
Forklifts Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0274	0.0006	0.1265	0.2146	0.0043	0.0043	0.0024	54.457
Generator Sets Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0340	0.0006	0.2783	0.2694	0.0116	0.0116	0.0030	61.069
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884
Welders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0260	0.0003	0.1557	0.1772	0.0077	0.0077	0.0023	25.661

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

9.2.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = BA * BH * (0.32 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)

(0.32 / 1000): Conversion Factor ft^3 to trips (0.32 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
VMT_{WT} = WD * WT * 1.25 * NE

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase
VMT_{VT} = BA * BH * (0.05 / 1000) * HT

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.05 / 1000): Conversion Factor ft^3 to trips (0.05 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

10. Construction / Demolition

10.1 General Information & Timeline Assumptions

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

- Activity Title: Project 2- Squadron Operations, Building 342 Repair and Reconfigure Project to Support F-22 Plus-Up

- Activity Description:
Construction includes only construction worker commute and construction vehicle and equipment use.
Architectural coating is assumed.
No grading and trenching assumed as it is exterior and interior repair and reconfigure project.

- Activity Start Date
Start Month: 1
Start Month: 2022

- Activity End Date
Indefinite: False
End Month: 4
End Month: 2022

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.181018
SO_x	0.000792
NO_x	0.235396
CO	0.315290
PM 10	0.008917

Pollutant	Total Emissions (TONs)
PM 2.5	0.008871
Pb	0.000000
NH_3	0.000293
CO_2e	76.2

10.1 Building Construction Phase

10.1.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 3
Number of Days: 0

10.1.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (ft^2): 12000
Height of Building (ft): 15
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Forklifts Composite	2	6
Other Material Handling Equipment Composite	1	6
Pressure Washers Composite	1	6
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 40

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

10.1.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour)

Forklifts Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0274	0.0006	0.1265	0.2146	0.0043	0.0043	0.0024	54.457
Other Material Handling Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0812	0.0015	0.5158	0.4377	0.0191	0.0191	0.0073	141.37
Pressure Washers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0075	0.0001	0.0606	0.0539	0.0024	0.0024	0.0006	9.4305
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

10.1.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase
$VMT_{VT} = BA * BH * (0.38 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

10.2 Architectural Coatings Phase

10.2.1 Architectural Coatings Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 0
Number of Days: 15

10.2.2 Architectural Coatings Phase Assumptions

- General Architectural Coatings Information
Building Category: Non-Residential
Total Square Footage (ft^2): 12000
Number of Units: N/A

- Architectural Coatings Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

10.2.3 Architectural Coatings Phase Emission Factor(s)

- Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

10.2.4 Architectural Coatings Phase Formula(s)

- Worker Trips Emissions per Phase
$VMT_{WT} = (1 * WT * PA) / 800$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
1: Conversion Factor man days to trips (1 trip / 1 man * day)
WT: Average Worker Round Trip Commute (mile)
PA: Paint Area (ft^2)
800: Conversion Factor square feet to man days (1 ft^2 / 1 man * day)

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
$VOC_{AC} = (AB * 2.0 * 0.0116) / 2000.0$

VOC_{AC}: Architectural Coating VOC Emissions (TONs)
BA: Area of Building (ft^2)
2.0: Conversion Factor total area to coated area (2.0 ft^2 coated area / total area)
0.0116: Emission Factor (lb/ft^2)
2000: Conversion Factor pounds to tons

11. Construction / Demolition

11.1 General Information & Timeline Assumptions

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

- Activity Title: Project 3- Munition Maintenance & Inspection Add-on Construction Project to Support F-22 Plus-Up

- Activity Description:
Construction of new facility. Assumed building height to be 10 ft. Have not assumed separate SF for concrete pad construction for MAC as not sure if included in square footage. No area is provided for pad separately.
Architectural coating is assumed to occur.
No area provided, but new asphalt pavement is included. Assumed average width of pavement is 12 feet and facility will need an average of 30 linear feet of pavement.

- Activity Start Date
Start Month: 1
Start Month: 2022

- Activity End Date
Indefinite: False
End Month: 5
End Month: 2022

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.076564
SO_x	0.000707
NO_x	0.229587
CO	0.317495
PM 10	0.009281

Pollutant	Total Emissions (TONs)
PM 2.5	0.009273
Pb	0.000000
NH_3	0.000223
CO_2e	68.1

11.1 Building Construction Phase

11.1.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 3
Number of Days: 0

11.1.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Commercial or Retail
Area of Building (ft^2): 3000
Height of Building (ft): 10
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cranes Composite	1	4
Forklifts Composite	2	6
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 40 (default)

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

11.1.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Cranes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0797	0.0013	0.5505	0.3821	0.0203	0.0203	0.0071	128.81
Forklifts Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0274	0.0006	0.1265	0.2146	0.0043	0.0043	0.0024	54.457
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

11.1.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (0.32 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.32 / 1000): Conversion Factor ft^3 to trips (0.32 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase
$VMT_{VT} = BA * BH * (0.05 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.05 / 1000): Conversion Factor ft^3 to trips (0.05 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

11.2 Architectural Coatings Phase

11.2.1 Architectural Coatings Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 0
Number of Days: 15

11.2.2 Architectural Coatings Phase Assumptions

- General Architectural Coatings Information
Building Category: Non-Residential
Total Square Footage (ft^2): 3000
Number of Units: N/A

- Architectural Coatings Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

11.2.3 Architectural Coatings Phase Emission Factor(s)

- Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

11.2.4 Architectural Coatings Phase Formula(s)

- Worker Trips Emissions per Phase
$VMT_{WT} = (1 * WT * PA) / 800$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
1: Conversion Factor man days to trips (1 trip / 1 man * day)
WT: Average Worker Round Trip Commute (mile)
PA: Paint Area (ft^2)
800: Conversion Factor square feet to man days (1 ft^2 / 1 man * day)

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
VOC_{AC} = (AB * 2.0 * 0.0116) / 2000.0

VOC_{AC}: Architectural Coating VOC Emissions (TONs)
BA: Area of Building (ft^2)
2.0: Conversion Factor total area to coated area (2.0 ft^2 coated area / total area)
0.0116: Emission Factor (lb/ft^2)
2000: Conversion Factor pounds to tons

11.3 Paving Phase

11.3.1 Paving Phase Timeline Assumptions

- Phase Start Date
Start Month: 5
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 0
Number of Days: 15

11.3.2 Paving Phase Assumptions

- General Paving Information
Paving Area (ft^2): 360

- Paving Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cement and Mortar Mixers Composite	4	6
Pavers Composite	1	7
Rollers Composite	1	7
Tractors/Loaders/Backhoes Composite	1	7

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

11.3.3 Paving Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.569	000.008	000.606	005.120	000.008	000.007		000.034	00381.013
LDGT	000.807	000.010	001.051	008.641	000.009	000.008		000.034	00508.378
HDGV	001.513	000.016	002.777	026.893	000.020	000.018		000.046	00789.086
LDDV	000.207	000.003	000.305	003.836	000.006	000.006		000.008	00391.624
LDDT	000.520	000.005	000.815	007.812	000.008	000.008		000.008	00609.856
HDDV	000.593	000.014	006.848	002.466	000.375	000.345		000.026	01559.210
MC	002.959	000.008	000.696	014.613	000.026	000.023		000.049	00391.464

11.3.4 Paving Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (ft^2)
0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

- V_{POL}: Vehicle Emissions (TONs)
- VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
- 0.002205: Conversion Factor grams to pounds
- EF_{POL}: Emission Factor for Pollutant (grams/mile)
- VM: Worker Trips On Road Vehicle Mixture (%)
- 2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
VOC_P = (2.62 * PA) / 43560

- VOC_P: Paving VOC Emissions (TONs)
- 2.62: Emission Factor (lb/acre)
- PA: Paving Area (ft^2)
- 43560: Conversion Factor square feet to acre (43560 ft2 / acre)^2 / acre)

12. Construction / Demolition

12.1 General Information & Timeline Assumptions

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

- Activity Title: Project 4- Add Munitions Cube Storage Facility Construction Project to Support F-22 Plus-Up

- Activity Description:
Building height is assumed to be 10 ft. Architectural coating is assumed for new facility. No grading, trenching is assumed.
For paving, no area provided, but new asphalt pavement is included. Assumed average width of pavement is 20 feet and facility will need an average of 12 linear feet of pavement.

- Activity Start Date
Start Month: 1
Start Month: 2022

- Activity End Date
Indefinite: False
End Month: 5
End Month: 2022

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.049522
SO_x	0.000706
NO_x	0.229257
CO	0.319184
PM 10	0.009262

Pollutant	Total Emissions (TONs)
PM 2.5	0.009256
Pb	0.000000
NH_3	0.000230
CO_2e	68.1

12.1 Building Construction Phase

12.1.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 3
Number of Days: 0

12.1.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (ft^2): 660
Height of Building (ft): 10
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cranes Composite	1	4
Forklifts Composite	2	6
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 40 (default)

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

12.1.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Cranes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0797	0.0013	0.5505	0.3821	0.0203	0.0203	0.0071	128.81
Forklifts Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0274	0.0006	0.1265	0.2146	0.0043	0.0043	0.0024	54.457
Tractors/Loaders/Backhoes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

12.1.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

VMT_{VE} = BA * BH * (0.42 / 1000) * HT

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
VMT_{WT} = WD * WT * 1.25 * NE

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase
VMT_{VT} = BA * BH * (0.38 / 1000) * HT

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

12.2 Architectural Coatings Phase

12.2.1 Architectural Coatings Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 0
Number of Days: 15

12.2.2 Architectural Coatings Phase Assumptions

- General Architectural Coatings Information
Building Category: Non-Residential
Total Square Footage (ft^2): 660
Number of Units: N/A

- Architectural Coatings Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

12.2.3 Architectural Coatings Phase Emission Factor(s)

- Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

12.2.4 Architectural Coatings Phase Formula(s)

- Worker Trips Emissions per Phase

$VMT_{WT} = (1 * WT * PA) / 800$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
1: Conversion Factor man days to trips (1 trip / 1 man * day)
WT: Average Worker Round Trip Commute (mile)
PA: Paint Area (ft^2)
800: Conversion Factor square feet to man days (1 ft^2 / 1 man * day)

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase

$VOC_{AC} = (AB * 2.0 * 0.0116) / 2000.0$

VOC_{AC}: Architectural Coating VOC Emissions (TONs)
BA: Area of Building (ft^2)
2.0: Conversion Factor total area to coated area (2.0 ft^2 coated area / total area)
0.0116: Emission Factor (lb/ft^2)
2000: Conversion Factor pounds to tons

12.3 Paving Phase

12.3.1 Paving Phase Timeline Assumptions

- Phase Start Date
Start Month: 5
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 0
Number of Days: 15

12.3.2 Paving Phase Assumptions

- General Paving Information
Paving Area (ft^2): 240

- Paving Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cement and Mortar Mixers Composite	4	6
Pavers Composite	1	7
Rollers Composite	1	7
Tractors/Loaders/Backhoes Composite	1	7

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

12.3.3 Paving Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.569	000.008	000.606	005.120	000.008	000.007		000.034	00381.013
LDGT	000.807	000.010	001.051	008.641	000.009	000.008		000.034	00508.378
HDGV	001.513	000.016	002.777	026.893	000.020	000.018		000.046	00789.086
LDDV	000.207	000.003	000.305	003.836	000.006	000.006		000.008	00391.624
LDDT	000.520	000.005	000.815	007.812	000.008	000.008		000.008	00609.856

HDDV	000.593	000.014	006.848	002.466	000.375	000.345		000.026	01559.210
MC	002.959	000.008	000.696	014.613	000.026	000.023		000.049	00391.464

12.3.4 Paving Phase Formula(s)

- Construction Exhaust Emissions per Phase
CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (ft^2)
0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
VMT_{WT} = WD * WT * 1.25 * NE

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
VOC_P = (2.62 * PA) / 43560

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (lb/acre)
PA: Paving Area (ft^2)
43560: Conversion Factor square feet to acre $(43560 \text{ ft2 / acre})^2$ / acre)

13. Construction / Demolition

13.1 General Information & Timeline Assumptions

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

- Activity Title: Project 5- Egress Facility Construction Project to Support F-22 Plus-Up

- Activity Description:
Assume building height for new facility is 10 ft. The total area is for construction of EGRESS Shop (2,500 SF) and GOX Canopy Shelter (2,500 SF). Architectural coating is assumed. No grading or trenching is assumed.
For paving, no area provided, but new asphalt pavement is included. SF area deduced from SitePlan-KNMD209087_Egress Shop Proj 5.pdf.

- Activity Start Date
Start Month: 1
Start Month: 2022

- Activity End Date
Indefinite: False
End Month: 5
End Month: 2022

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.099972
SO_x	0.000715
NO_x	0.231859
CO	0.318368
PM 10	0.009387

Pollutant	Total Emissions (TONs)
PM 2.5	0.009371
Pb	0.000000
NH_3	0.000240
CO_2e	69.1

13.1 Building Construction Phase

13.1.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 3
Number of Days: 0

13.1.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (ft^2): 5000
Height of Building (ft): 10
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cranes Composite	1	4
Forklifts Composite	2	6
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 40 (default)

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

13.1.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Cranes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0797	0.0013	0.5505	0.3821	0.0203	0.0203	0.0071	128.81
Forklifts Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0274	0.0006	0.1265	0.2146	0.0043	0.0043	0.0024	54.457
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

13.1.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

VMT_{VE} = BA * BH * (0.42 / 1000) * HT

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

VMT_{WT} = WD * WT * 1.25 * NE

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)

VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase
VMT_{VT} = BA * BH * (0.38 / 1000) * HT

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

13.2 Architectural Coatings Phase

13.2.1 Architectural Coatings Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 0
Number of Days: 15

13.2.2 Architectural Coatings Phase Assumptions

- General Architectural Coatings Information
Building Category: Non-Residential
Total Square Footage (ft^2): 5000
Number of Units: N/A

- Architectural Coatings Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

13.2.3 Architectural Coatings Phase Emission Factor(s)

- Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

13.2.4 Architectural Coatings Phase Formula(s)

- Worker Trips Emissions per Phase

VMT_{WT} = (1 * WT * PA) / 800

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
1: Conversion Factor man days to trips (1 trip / 1 man * day)
WT: Average Worker Round Trip Commute (mile)
PA: Paint Area (ft^2)
800: Conversion Factor square feet to man days (1 ft^2 / 1 man * day)

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase

VOC_{AC} = (AB * 2.0 * 0.0116) / 2000.0

VOC_{AC}: Architectural Coating VOC Emissions (TONs)
BA: Area of Building (ft^2)
2.0: Conversion Factor total area to coated area (2.0 ft^2 coated area / total area)
0.0116: Emission Factor (lb/ft^2)
2000: Conversion Factor pounds to tons

13.3 Paving Phase

13.3.1 Paving Phase Timeline Assumptions

- Phase Start Date
Start Month: 5
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 0
Number of Days: 15

13.3.2 Paving Phase Assumptions

- General Paving Information
Paving Area (ft^2): 850

- Paving Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cement and Mortar Mixers Composite	4	6
Pavers Composite	1	7
Rollers Composite	1	7
Tractors/Loaders/Backhoes Composite	1	7

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

13.3.3 Paving Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.569	000.008	000.606	005.120	000.008	000.007		000.034	00381.013
LDGT	000.807	000.010	001.051	008.641	000.009	000.008		000.034	00508.378
HDGV	001.513	000.016	002.777	026.893	000.020	000.018		000.046	00789.086
LDDV	000.207	000.003	000.305	003.836	000.006	000.006		000.008	00391.624
LDDT	000.520	000.005	000.815	007.812	000.008	000.008		000.008	00609.856
HDDV	000.593	000.014	006.848	002.466	000.375	000.345		000.026	01559.210
MC	002.959	000.008	000.696	014.613	000.026	000.023		000.049	00391.464

13.3.4 Paving Phase Formula(s)

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)

EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (ft^2)
0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase

$VOC_P = (2.62 * PA) / 43560$

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (lb/acre)
PA: Paving Area (ft^2)
43560: Conversion Factor square feet to acre (43560 ft2 / $acre)^2$ / acre)

14. Construction / Demolition

14.1 General Information & Timeline Assumptions

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

- Activity Title: Project 6-Aircraft Support Equipment Facility Add-on Construction Project to Support F-22 Plus-Up

- Activity Description:
Facility building height is assumed to be 10 ft. Square footagefor new facility add-on is from diagram in SitePlan-KNMD209088_Add Alter ASE Proj 6.pdf. Architectural coating is assumed. No trenching or grading is assumed. Based on the diagram there is already existing pavement. So no paving assumed.

- Activity Start Date
Start Month: 1
Start Month: 2022

- Activity End Date
Indefinite: False
End Month: 4
End Month: 2022

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.042300
SO_x	0.000606
NO_x	0.183472
CO	0.260190
PM 10	0.006855

Pollutant	Total Emissions (TONs)
PM 2.5	0.006849
Pb	0.000000
NH_3	0.000187
CO_2e	58.5

14.1 Building Construction Phase

14.1.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 3
Number of Days: 0

14.1.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (ft^2): 750
Height of Building (ft): 10
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cranes Composite	1	4
Forklifts Composite	2	6
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 40 (default)

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

14.1.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Cranes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0797	0.0013	0.5505	0.3821	0.0203	0.0203	0.0071	128.81
Forklifts Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0274	0.0006	0.1265	0.2146	0.0043	0.0043	0.0024	54.457
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

14.1.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase
$VMT_{VT} = BA * BH * (0.38 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

14.2 Architectural Coatings Phase

14.2.1 Architectural Coatings Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 0
Number of Days: 15

14.2.2 Architectural Coatings Phase Assumptions

- General Architectural Coatings Information
Building Category: Non-Residential
Total Square Footage (ft^2): 750
Number of Units: N/A

- Architectural Coatings Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

14.2.3 Architectural Coatings Phase Emission Factor(s)

- Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

14.2.4 Architectural Coatings Phase Formula(s)

- Worker Trips Emissions per Phase

VMT_{WT} = (1 * WT * PA) / 800

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
1: Conversion Factor man days to trips (1 trip / 1 man * day)
WT: Average Worker Round Trip Commute (mile)
PA: Paint Area (ft^2)
800: Conversion Factor square feet to man days (1 ft^2 / 1 man * day)

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase

VOC_{AC} = (AB * 2.0 * 0.0116) / 2000.0

VOC_{AC}: Architectural Coating VOC Emissions (TONs)
BA: Area of Building (ft^2)
2.0: Conversion Factor total area to coated area (2.0 ft^2 coated area / total area)
0.0116: Emission Factor (lb/ft^2)
2000: Conversion Factor pounds to tons

15. Construction / Demolition

15.1 General Information & Timeline Assumptions

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

- Activity Title: Project 7-F-22 Intel Vault Construction Project to Support F-22 Plus-Up

- Activity Description:
Existing building is to be demolished. Assumed building height for demolition to be 15 ft.
Assumed new SCIF facility building height to be 15 feet. The total area is for construction of Munitions M&I (4,790 SF) and SCIF (1,210 SF). Architectural coating is assumed. No trenching or grading is assumed.

- Activity Start Date
Start Month: 1
Start Month: 2022

- Activity End Date
Indefinite: False
End Month: 4
End Month: 2022

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.109210
SO_x	0.000717
NO_x	0.225386
CO	0.308181
PM 10	0.019426

Pollutant	Total Emissions (TONs)
PM 2.5	0.008685
Pb	0.000000
NH_3	0.000251
CO_2e	69.8

15.1 Demolition Phase

15.1.1 Demolition Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 0
Number of Days: 15

15.1.2 Demolition Phase Assumptions

- General Demolition Information
Area of Building to be demolished (ft^2): 3400
Height of Building to be demolished (ft): 15

- Default Settings Used: Yes

- Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Concrete/Industrial Saws Composite	1	8
Rubber Tired Dozers Composite	1	1
Tractors/Loaders/Backhoes Composite	2	6

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

15.1.3 Demolition Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Concrete/Industrial Saws Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0410	0.0006	0.2961	0.3743	0.0148	0.0148	0.0037	58.556
Rubber Tired Dozers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.1919	0.0024	1.3611	0.7352	0.0536	0.0536	0.0173	239.51
Tractors/Loaders/Backhoes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

15.1.4 Demolition Phase Formula(s)

- Fugitive Dust Emissions per Phase

$PM10_{FD}$ = (0.00042 * BA * BH) / 2000

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
0.00042: Emission Factor (lb/ft^3)
BA: Area of Building to be demolished (ft^2)
BH: Height of Building to be demolished (ft)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

VMT_{VE} = BA * BH * (1 / 27) * 0.25 * (1 / HC) * HT

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building being demolish (ft^2)
BH: Height of Building being demolish (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
0.25: Volume reduction factor (material reduced by 75% to account for air space)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
VMT_{WT} = WD * WT * 1.25 * NE

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

15.2 Building Construction Phase

15.2.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 3
Number of Days: 0

15.2.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (ft^2): 6000
Height of Building (ft): 15
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cranes Composite	1	4
Forklifts Composite	2	6
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust

Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips

Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips

Average Vendor Round Trip Commute (mile): 40 (default)

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

15.2.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Cranes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0797	0.0013	0.5505	0.3821	0.0203	0.0203	0.0071	128.81
Forklifts Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0274	0.0006	0.1265	0.2146	0.0043	0.0043	0.0024	54.457
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

15.2.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase

$VMT_{VT} = BA * BH * (0.38 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

15.3 Architectural Coatings Phase

15.3.1 Architectural Coatings Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 0
Number of Days: 15

15.3.2 Architectural Coatings Phase Assumptions

- General Architectural Coatings Information
Building Category: Non-Residential
Total Square Footage (ft^2): 6000
Number of Units: N/A

- Architectural Coatings Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

15.3.3 Architectural Coatings Phase Emission Factor(s)

- Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

15.3.4 Architectural Coatings Phase Formula(s)

- Worker Trips Emissions per Phase
VMT_{WT} = (1 * WT * PA) / 800

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
1: Conversion Factor man days to trips (1 trip / 1 man * day)
WT: Average Worker Round Trip Commute (mile)
PA: Paint Area (ft^2)
800: Conversion Factor square feet to man days (1 ft^2 / 1 man * day)

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
VOC_{AC} = (AB * 2.0 * 0.0116) / 2000.0

VOC_{AC}: Architectural Coating VOC Emissions (TONs)
BA: Area of Building (ft^2)
2.0: Conversion Factor total area to coated area (2.0 ft^2 coated area / total area)
0.0116: Emission Factor (lb/ft^2)
2000: Conversion Factor pounds to tons

16. Construction / Demolition

16.1 General Information & Timeline Assumptions

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

- Activity Title: Project 8-F-22 Alter Corrosion Control Building 3407 Repair Project to Support F-22 Plus-Up

- Activity Description:
Facility conversion from existing F-15 to F-22 corrosion/fuels hangar. Construction equipment type and hours usage altered to reflect repair rather than construction. Building height assumed to be 20 ft. Architectural coating is assumed.

- Activity Start Date
Start Month: 1
Start Month: 2022

- Activity End Date
Indefinite: False
End Month: 4
End Month: 2022

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.285033
SO_x	0.001659
NO_x	0.483012
CO	0.546016
PM 10	0.017306

Pollutant	Total Emissions (TONs)
PM 2.5	0.017221
Pb	0.000000
NH_3	0.000469
CO_2e	162.5

16.1 Building Construction Phase

16.1.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
- **Start Month:** 1
- **Start Quarter:** 1
- **Start Year:** 2022

- Phase Duration
- **Number of Month:** 3
- **Number of Days:** 0

16.1.2 Building Construction Phase Assumptions

- General Building Construction Information
- **Building Category:** Office or Industrial
- **Area of Building (ft^2):** 17114
- **Height of Building (ft):** 20
- **Number of Units:** N/A

- Building Construction Default Settings
- **Default Settings Used:** No
- **Average Day(s) worked per week:** 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Forklifts Composite	2	6
Off-Highway Trucks Composite	1	6
Other Material Handling Equipment Composite	2	6
Skid Steer Loaders Composite	1	4
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
- **Average Hauling Truck Round Trip Commute (mile):** 20

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
- **Average Worker Round Trip Commute (mile):** 20

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 40

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

16.1.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour)

Forklifts Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0274	0.0006	0.1265	0.2146	0.0043	0.0043	0.0024	54.457
Off-Highway Trucks Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.1303	0.0026	0.6573	0.5446	0.0215	0.0215	0.0117	260.37
Other Material Handling Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0812	0.0015	0.5158	0.4377	0.0191	0.0191	0.0073	141.37
Skid Steer Loaders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0203	0.0003	0.1484	0.2114	0.0034	0.0034	0.0018	30.321
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

16.1.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)

(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase
$VMT_{VT} = BA * BH * (0.38 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

16.2 Architectural Coatings Phase

16.2.1 Architectural Coatings Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 0
Number of Days: 15

16.2.2 Architectural Coatings Phase Assumptions

- General Architectural Coatings Information
Building Category: Non-Residential
Total Square Footage (ft^2): 17114
Number of Units: N/A

- Architectural Coatings Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

16.2.3 Architectural Coatings Phase Emission Factor(s)

- Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

16.2.4 Architectural Coatings Phase Formula(s)

- Worker Trips Emissions per Phase
$VMT_{WT} = (1 * WT * PA) / 800$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
1: Conversion Factor man days to trips (1 trip / 1 man * day)
WT: Average Worker Round Trip Commute (mile)
PA: Paint Area (ft^2)
800: Conversion Factor square feet to man days (1 ft^2 / 1 man * day)

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
$VOC_{AC} = (AB * 2.0 * 0.0116) / 2000.0$

VOC_{AC}: Architectural Coating VOC Emissions (TONs)
BA: Area of Building (ft^2)
2.0: Conversion Factor total area to coated area (2.0 ft^2 coated area / total area)
0.0116: Emission Factor (lb/ft^2)
2000: Conversion Factor pounds to tons

17. Construction / Demolition

17.1 General Information & Timeline Assumptions

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

- Activity Title: Project 9-F-22 Maintenance Deployment Facility Construction Project to Support F-22 Plus-Up

- Activity Description:
Warehouse construction, building height assumed to be 25 feet to allow for fork lift. Architectural coating is assumed. Paving access for the fork lift of 850 square feet conservatively assumed, based on communication from the facility.
No grading or trenching assumed.

- Activity Start Date
Start Month: 1
Start Month: 2022

- Activity End Date
Indefinite: False
End Month: 5
End Month: 2022

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.135565
SO_x	0.000749
NO_x	0.241218
CO	0.321961
PM 10	0.009823

Pollutant	Total Emissions (TONs)
PM 2.5	0.009773
Pb	0.000000
NH_3	0.000309
CO_2e	73.0

17.1 Building Construction Phase

17.1.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 3
Number of Days: 0

17.1.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (ft^2): 8000
Height of Building (ft): 25
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cranes Composite	1	4
Forklifts Composite	2	6
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 40 (default)

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

17.1.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Cranes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0797	0.0013	0.5505	0.3821	0.0203	0.0203	0.0071	128.81
Forklifts Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0274	0.0006	0.1265	0.2146	0.0043	0.0043	0.0024	54.457

Tractors/Loaders/Backhoes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**Pb**	**NH_3**	**CO_2e**
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

17.1.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase
VMT_{VT} = BA * BH * (0.38 / 1000) * HT

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

17.2 Architectural Coatings Phase

17.2.1 Architectural Coatings Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 0
Number of Days: 15

17.2.2 Architectural Coatings Phase Assumptions

- General Architectural Coatings Information
Building Category: Non-Residential
Total Square Footage (ft^2): 8000
Number of Units: N/A

- Architectural Coatings Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

17.2.3 Architectural Coatings Phase Emission Factor(s)

- Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

17.2.4 Architectural Coatings Phase Formula(s)

- Worker Trips Emissions per Phase

VMT_{WT} = (1 * WT * PA) / 800

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
1: Conversion Factor man days to trips (1 trip / 1 man * day)
WT: Average Worker Round Trip Commute (mile)
PA: Paint Area (ft^2)
800: Conversion Factor square feet to man days (1 ft^2 / 1 man * day)

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase

VOC_{AC} = (AB * 2.0 * 0.0116) / 2000.0

VOC_{AC}: Architectural Coating VOC Emissions (TONs)
BA: Area of Building (ft^2)
2.0: Conversion Factor total area to coated area (2.0 ft^2 coated area / total area)
0.0116: Emission Factor (lb/ft^2)
2000: Conversion Factor pounds to tons

17.3 Paving Phase

17.3.1 Paving Phase Timeline Assumptions

- Phase Start Date

Start Month: 5
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 0
Number of Days: 15

17.3.2 Paving Phase Assumptions

- General Paving Information
Paving Area (ft^2): 850

- Paving Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cement and Mortar Mixers Composite	4	6
Pavers Composite	1	7
Rollers Composite	1	7
Tractors/Loaders/Backhoes Composite	1	7

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

17.3.3 Paving Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.569	000.008	000.606	005.120	000.008	000.007		000.034	00381.013
LDGT	000.807	000.010	001.051	008.641	000.009	000.008		000.034	00508.378
HDGV	001.513	000.016	002.777	026.893	000.020	000.018		000.046	00789.086
LDDV	000.207	000.003	000.305	003.836	000.006	000.006		000.008	00391.624
LDDT	000.520	000.005	000.815	007.812	000.008	000.008		000.008	00609.856
HDDV	000.593	000.014	006.848	002.466	000.375	000.345		000.026	01559.210
MC	002.959	000.008	000.696	014.613	000.026	000.023		000.049	00391.464

17.3.4 Paving Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (ft^2)
0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
VOC_P = (2.62 * PA) / 43560

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (lb/acre)
PA: Paving Area (ft^2)
43560: Conversion Factor square feet to acre $(43560\ ft2 / acre)^2$ / acre)

18. Construction / Demolition

18.1 General Information & Timeline Assumptions

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

- Activity Title: Project 5-Concrete pad construction for GOX pad

- Activity Description:
The total area is for construction of GOX Canopy Shelter pad is 2,500 SF. Assumed concrete pad height to be approximately one feet.

- Activity Start Date
Start Month: 1
Start Month: 2022

- Activity End Date
Indefinite: False
End Month: 3
End Month: 2022

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.033358
SO_x	0.000603
NO_x	0.182967
CO	0.257274
PM 10	0.006836

Pollutant	Total Emissions (TONs)
PM 2.5	0.006832
Pb	0.000000
NH_3	0.000170
CO_2e	58.2

18.1 Building Construction Phase

18.1.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2022

- Phase Duration
Number of Month: 3
Number of Days: 0

18.1.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (ft^2): 2500
Height of Building (ft): 1
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cranes Composite	1	4
Forklifts Composite	2	6
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 40 (default)

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

18.1.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Cranes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0797	0.0013	0.5505	0.3821	0.0203	0.0203	0.0071	128.81
Forklifts Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0274	0.0006	0.1265	0.2146	0.0043	0.0043	0.0024	54.457
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.280	000.002	000.208	003.467	000.005	000.005		000.023	00332.267
LDGT	000.373	000.003	000.374	004.989	000.007	000.006		000.024	00427.713
HDGV	000.801	000.005	000.972	016.626	000.015	000.013		000.046	00789.621
LDDV	000.079	000.003	000.127	002.707	000.004	000.004		000.008	00325.337
LDDT	000.218	000.004	000.362	004.629	000.007	000.006		000.008	00461.106
HDDV	000.300	000.013	003.537	001.358	000.165	000.152		000.026	01490.613
MC	002.824	000.003	000.676	013.057	000.025	000.023		000.053	00392.231

18.1.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)

VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase

$VMT_{VT} = BA * BH * (0.38 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

D.3.5 Summary Air Conformity Applicability Model Report Record of Air Analysis (ROAA)

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Manual 32-7002, Environmental Compliance and Pollution Prevention; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:
Base: HICKAM AFB
State: Hawaii
County(s): Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: F-22A Aircraft Plus-up at Joint Base Pearl Harbor-Hickam, Hawaii

c. Project Number/s (if applicable):

d. Projected Action Start Date: 1 / 2022

e. Action Description:

The Proposed Action would integrate a total of seven F-22A aircraft to the 199 FS located at JBPHH, that were previously assigned to Tyndall AFB, to increase operational readiness. An estimated 150 additional pilots, maintenance, and support personnel would be needed to support the Proposed Action. New construction and repair of some existing facilities would also be needed to support the additional aircraft and personnel. The Proposed Action would include the increased use of countermeasure chaff and flare

f. Point of Contact:
Name: Radhika Narayanan
Title: Environmental Scientist
Organization: Versar, LLC
Email: rnarayanan@versar.com
Phone Number:

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total net direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the start of the action through achieving "steady state" (i.e., net gain/loss upon action fully implemented) emissions. The ACAM analysis used the latest and most accurate emission estimation techniques available; all algorithms, emission factors, and methodologies used are described in detail in the USAF Air Emissions Guide for Air Force Stationary Sources, the USAF Air Emissions Guide for Air Force Mobile Sources, and the USAF Air Emissions Guide for Air Force Transitory Sources.

"Insignificance Indicators" were used in the analysis to provide an indication of the significance of potential impacts to air quality based on current ambient air quality relative to the National Ambient Air Quality Standards (NAAQSs). These insignificance indicators are the 250 ton/yr Prevention of Significant Deterioration (PSD) major source threshold for actions occurring in areas that are "Clearly Attainment" (i.e., not within 5% of any NAAQS) and the GCR de minimis values (25 ton/yr for lead and 100 ton/yr for all other criteria pollutants) for actions occurring in areas that are "Near Nonattainment" (i.e., within 5% of any NAAQS). These indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for all criteria pollutant is considered so insignificant that the action will not cause or contribute to an exceedance on one or more NAAQSs. For further detail on insignificance indicators see chapter 4 of the Air Force Air Quality Environmental Impact Analysis Process (EIAP) Guide, Volume II - Advanced Assessments.

The action's net emissions for every year through achieving steady state were compared against the Insignificance Indicator and are summarized below.

Analysis Summary:

2022

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	5.872	250	No
NOx	35.275	250	No
CO	56.728	250	No
SOx	3.165	250	No
PM 10	3.924	250	No
PM 2.5	3.144	250	No
Pb	0.000	25	No
NH3	0.023	250	No
CO2e	6977.5		

2023 - (Steady State)

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	4.692	250	No
NOx	32.017	250	No
CO	52.560	250	No
SOx	3.155	250	No
PM 10	3.462	250	No
PM 2.5	3.015	250	No
Pb	0.000	25	No
NH3	0.020	250	No
CO2e	6011.9		

None of estimated annual net emissions associated with this action are above the insignificance indicators, indicating no significant impact to air quality. Therefore, the action will not cause or contribute to an exceedance on one or more NAAQSs. No further air assessment is needed.

Radhika

_______________________________________ ___05/02/2022____
Radhika Narayanan, Environmental Scientist DATE

APPENDIX D-4
HEALTH AND SAFETY

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D.4.1 Definition of the Resource

Safety concerns associated with ground, explosive, and flight activities are considered in this section. Ground safety considers issues associated with ground operations and maintenance activities that support unit operations including arresting gear capability, jet blast/maintenance testing, and safety danger. Aircraft maintenance testing occurs in designated safety zones. Ground safety also considers the safety of personnel and facilities on the ground that may be placed at risk from flight operations in the vicinity of the airfield and in the Special Use Airspace, as well as activities associated with facility construction and repair activities. Safety zones, which include Runway Protection Zones and Quantity-Distance (QD) arcs, around the airfield restrict the public's exposure to areas where there is a higher accident potential.

Flight Safety. Flight safety considers aircraft flight risks such as midair collision, bird/wildlife-aircraft strike hazard, and in-flight emergency. Proposed Action planes would follow United States Air Force (Air Force) safety procedures and aircraft specific emergency procedures based on the aircraft design which are produced by the original equipment manufacturer of the aircraft. Basic airmanship procedures also exist for handling any deviations to Air Traffic Control procedures due to an in-flight emergency; these procedures are defined in Air Force Instruction 11-202 (Volume 3), *General Flight Rules*, and established aircraft flight manuals. The Flight Crew Information File is a safety resource for aircrew day-to-day operations which is composed of air and ground operation rules and procedures.

Although ground and flight safety are addressed separately, in the immediate vicinity of the runway, risks associated with safety-of-flight issues are interrelated with ground safety concerns. Runway Protection Zones are areas identified at the end of runways that serve to increase the protection of people and property in the event an aircraft lands or crashes beyond the runway end.

Ground Safety. Occupational Safety and Health Administration Standards (29 CFR) govern general safety requirements relating to general industry practices (§ 1910), construction (§ 1926), and elements for federal employees (§ 1960). These standards include guidance for entry into areas in which a hazard may exist. Air Force Occupational Safety and Health requirements are identified within Department of the Air Force Instruction 91-202 (2020), The *US Air Force Mishap Prevention Program*, and Department of the Air Force Manual 91-203 (2022), *Air Force Occupational Safety, Fire, and Health Standards*. The Air Force Occupational Safety and Health program's purpose is to minimize loss of Air Force resources and protect Air Force personnel from occupational deaths, injuries, or illnesses by managing risks and ensure all Air Force workplaces meet Occupational Safety and Health Administration requirements.

Explosives Safety. Explosives safety relates to the management and safe use of ordnance and munitions. Air Force Policy, as outlined in Defense Explosives Safety Regulation (DESR) 6055.09_AFMAN 91-201, *Explosive Safety Standards*, is to provide the maximum protection possible to personnel and property, both on and off the installation, from the destructive consequences of potential accidents involving ammunition and explosives. The primary method to meet this requirement is the establishment of QD requirements to protect an exposed site (ES) from a potential explosion site (PES) and is based on an acceptable level of damage between a PES and an ES. On Joint Base Pearl Harbor-Hickam, QD zones encompass each PES and extend outward from individual sites. The distance a QD arc extends from an individual PES is based upon

- the construction and type of PES;
- the hazard division (also known as explosive hazard classification/division) of net explosive weight for QD determination of ammunition and explosives in the PES;
- the construction and type of ES;
- the distance separating the PES from the ES; and
- in some instances, the orientation of the PES and the ES.

There are several types of separation requirements that are based on the specific type and use of the PES and include

- Inhabited Building Distance – Facilities and personnel not directly related to explosive storage and operations;

- Public Traffic Route Distance – the minimum distance required to protect public traffic routes and other designated exposures; further classified by the traffic density these routes typically experience;
- Intraline Distances – the minimum distance required to protect activities associated with explosive storage and operations; this separation recognizes that there are operational needs for some people need to be in the proximity of explosives while at the same time preserving some mission capability in the event of an explosion; and
- Intermagazine Distance – the minimum distance between PESs needed to prevent one PES from simultaneously detonating an adjacent PES.

APPENDIX D-5
LAND USE AND COASTAL ZONE MANAGEMENT

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D.5.1 Definition of the Resource

D.5.1.1 Land Use

The term "land use" refers to real property classifications that indicate either natural conditions or the types of human activity occurring on a parcel. In many cases, land use descriptions are codified in local zoning laws; however, no nationally recognized convention or uniform terminology has been adopted for describing land use categories. As a result, the meanings of various land use descriptions, labels, and definitions vary among jurisdictions.

The Joint Base Pearl Harbor-Hickam (JBPHH) Installation Development Plan consolidates the installation's Area Development Plans and Network Plans (e.g., transportation, utility plans) into one plan and establishes the installation-wide planning vision. The plan serves as guidance for future development within the installation's eleven planning districts (JBPHH, 2013).

The location(s) and extent of the Proposed Action is evaluated for potential effects from the use of the proposed buildings and 7 Row and land uses adjacent to these facilities on JBPHH. There would be no effect on land use compatibility associated with the Special Use Airspace that would be used for Proposed Action training as training areas are over open water. As such, there is no land use discussion associated with the Special Use Airspace. The foremost factor affecting a proposed action in terms of land use is its compliance with any applicable land use or zoning regulations. Other relevant factors include existing land use at the project site, the types of land use on adjacent properties and their proximity to a proposed action, the duration of a proposed activity, and its "permanence."

D.5.1.2 Coastal Zone Management Program

The coastal zone refers to coastal waters and the adjacent shorelines, including islands, transition and intertidal areas, salt marshes, wetlands, and beaches, extending to the outer limit of State title and ownership under the Submerged Lands Act (i.e., 3 nautical miles). The National Oceanic and Atmospheric Administration oversees the Coastal Zone Management Program (CZMP) for the federal government. Coastal areas in the United States receive special land use protections through the federal CZMP. Authorized by the Coastal Zone Management Act of 1972 (16 United States Code § 1451 et seq., as amended), this federal program addresses the coastal issues of the United States through a voluntary partnership among the federal government and the coastal and Great Lakes states and territories. The program's purpose is to protect, restore, and responsibly develop the nation's diverse coastal communities and resources.

The Hawaii CZMP (Hawaii Revised Statutes, Chapter 205A, *Coastal Planning and Management*) was approved by National Oceanic and Atmospheric Administration in 1978. The lead agency for the program is the State of Hawaii, Department of Business, Economic Development and Tourism and consists of a network of authorities and partnerships for implementing the regulations including the planning departments of the Hawaii, Kauai, and Maui Counties and the City and County of Honolulu. There are 10 objectives of the Hawaii CZMP to balance and manage coastal resources, these include managing development, economic uses, public participation, coastal hazards, beach protection, recreational resources, historic resources, scenic and open space resources, coastal ecosystems, and marine resources (State of Hawaii, 2011). The Coastal Zone Management (CZM) area encompasses the entire State of Hawaii because of the land-sea connection and the effect of the land on coastal waters (State of Hawaii, 2021). The CZM area also extends seaward to the limit of the State's police power and management authority to include the territorial sea. This legal seaward boundary definition is consistent with Hawaii 's historic claims over the Hawaiian archipelagic waters based on ancient transportation routes and submerged lands. JBPHH and much of the area surrounding the airfield are within the Hawaii coastal zone.

The Coastal Zone Management Act, Section 307 requires any activities or development projects undertaken by federal agencies within the coastal zone to be in a manner consistent to the maximum extent practicable with the state's CZMP. To meet this requirement, the federal consistency provision ensures a federal agency will not act without regard for, or in conflict with, the state's CZMP policies. Actions that may affect a state's coastal use or resources must be reviewed by the state CZMP to ensure consistency with the state's enforceable policies. An Application for CZM Federal Consistency Review and CZMP Federal Consistency Assessment Form were completed and forwarded to State of Hawaii, Department of Business, Economic Development and Tourism as part of the Environmental Assessment and are attached above.

D.5.2 References

JBPHH. 2013. *Installation Development Plan Training Practicum Report Volume I*. 5 August.

State of Hawaii. 2011. *Hawai'i Coastal Zone Management Program, Sustainable Management of the Islands*. December.

State of Hawaii. 2021. *State CZM Program, Office of Planning*. <http://planning.hawaii.gov/czm/>. Accessed March 2021.

APPENDIX D-6
EARTH RESOURCES

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D.6.1 Definition of the Resource

Earth resources consist of the Earth's surface and subsurface materials. Within a given physiographic province, these resources typically are described in terms of topography and physiography, geology, soils, and, where applicable, geologic hazards. Topography and physiography pertain to the general shape and arrangement of the land surface, including its height and the position of its natural and man-made features. Geology is the study of the Earth's composition and provides information on the structure and configuration of surface and subsurface features.

Soils are the unconsolidated materials overlying bedrock or other parent material. Soils typically are described in terms of their complex type, slope, and physical characteristics. Differences among soil types, in terms of their structure, elasticity, strength, shrink-swell potential, and erosion potential, affect their abilities to support certain applications or uses. In appropriate cases, soil properties must be examined for their compatibility with particular construction activities or types of land use.

Prime farmland is protected under the Farmland Protection Policy Act (FPPA) of 1981. The intent of the FPPA is to minimize the extent that federal programs contribute to the unnecessary conversion of high-quality farmland to nonagricultural uses. The FPPA also ensures that federal programs are administered in a manner that, to the extent practicable, is compatible with private, state, and local government programs and policies to protect farmland. The implementing procedures of the FPPA (7 Code of Federal Regulations Part 658) require federal agencies to evaluate the adverse effects (direct and indirect) of their activities on farmland, which includes prime farmland, unique farmland, and farmland of statewide or local importance, and to consider alternative actions that could avoid adverse effects.

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APPENDIX D-7
WATER RESOURCES

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D.7.1 Definition of the Resource

Water resources are natural and man-made sources of water that are available for use by, and for the benefit of, humans and the environment. Water resources relevant to Joint Base Pearl Harbor-Hickam include groundwater, surface water, floodplains, and wetlands. Evaluation of water resources examines the quantity and quality of the resource and its demand for various purposes and ensures compliance with the Clean Water Act (CWA) of 1972 (33 [US] Code [U.S.C.] § 1251 *et seq*.).

D.7.1.1 Groundwater

Groundwater is water that exists in the saturated zone beneath the Earth's surface that collects and flows through aquifers. Groundwater is an essential resource that functions to recharge surface water and is used for drinking, irrigation, and industrial purposes. Groundwater typically can be described in terms of depth from the surface, aquifer or well capacity, water quality, recharge rate, and surrounding geologic formations.

Groundwater quality and quantity are regulated under several federal and state programs. Groundwater resources are regulated on the federal level by the US Environmental Protection Agency (USEPA) under the Safe Drinking Water Act (SDWA), 42 U.S.C. § 300f *et seq*. The federal Underground Injection Control regulations, authorized under the SDWA, require a permit for the discharge or disposal of fluids into a well. The USEPA's Sole Source Aquifer Program, authorized by the SDWA, further protects aquifers that are designated as critical to water supply and makes any proposed federal or federal financially assisted project that has the potential to contaminate the aquifer subject to USEPA review. The State of Hawaii Drinking Water Rules, which incorporate the federal SDWA, are outlined in Hawaii Administrative Rules, Title 11, Chapter 20, *Public Water Systems*.

D.7.1.2 Surface Water

Surface water includes natural, modified, and man-made water confinement and conveyance features above groundwater that may or may not have a defined channel and discernable water flow. These features are generally classified as streams, springs, wetlands, natural and artificial impoundments (e.g., ponds, lakes), and constructed drainage canals and ditches. Stormwater is surface water generated by precipitation events that may percolate into permeable surficial sediments or flow across the top of impervious or saturated surficial areas, a condition known as runoff. Stormwater is an important component of surface water systems because of its potential to introduce sediments and other contaminants that could degrade surface waters, such as lakes, rivers, or streams. Proper management of stormwater flows, which can be intensified by high proportions of impervious surfaces associated with buildings, roads, and parking lots, is important to the management of surface water quality and natural flow characteristics.

The CWA regulates discharges of pollutants in surface waters of the United States. Jurisdictional waters, including surface water resources as defined in 33 Code of Federal Regulations § 328.3, are regulated under § 401 and § 404 of the CWA and § 10 of the Rivers and Harbors Act. Man-made features not directly associated with a natural drainage, such as upland stock ponds and irrigation canals, are generally not considered jurisdictional waters. The CWA establishes federal limits, through the National Pollutant Discharge Elimination System (NPDES) permit process, for regulating point (end of pipe) and nonpoint (e.g., stormwater) discharges of pollutants into the Waters of the United States and quality standards for surface waters. The term "Waters of the United States" includes wetlands. The USEPA delegated authority to the Hawaii Department of Health to administer their own NPDES permitting program for wastewater and stormwater discharge associated with industrial activity, construction activity, and Municipal Separate Storm Sewer System activity. The Hawaii Department of Health issued a comprehensive NPDES permit to for Joint Base Pearl Harbor-Hickam (Commander, Navy Region Hawaii 2020).

Energy Independence Security Act (EISA) Section 438 (42 U.S.C. § 17094) establishes into law stormwater design requirements for federal development projects that disturb a footprint of greater than 5,000 square feet. EISA Section 438 requirements are independent of stormwater requirements under the CWA. The project footprint consists of all horizontal hard surface and disturbed areas associated with project development. Under these requirements, predevelopment site hydrology must be maintained or restored to the maximum extent technically feasible with respect to temperature, rate, volume, and duration of flow. Predevelopment hydrology would be modeled or calculated using recognized tools and must include site-specific factors, such as soil type, ground cover, and ground slope.

Additionally, Low-Impact Development (LID) features need to be incorporated into new construction activities to comply with the restrictions on stormwater management promulgated by EISA Section 438. LID is a stormwater management strategy designed to maintain site hydrology and mitigate the adverse impacts of stormwater runoff and nonpoint source pollution. LIDs can manage the increase in runoff between pre- and post-development conditions on the project site through interception, infiltration, storage, and evapotranspiration processes before the runoff is conveyed to receiving waters. Examples of LID methods are outlined in the Unified Facilities Criteria 3-210-10, *Low Impact Development* and include bioretention, permeable pavements, cisterns/recycling, and green roofs (Department of Defense, 2010).

D.7.1.3 Floodplains

Floodplains are areas of low, level ground present along rivers, stream channels, or coastal waters that are subject to periodic or infrequent inundation due to rain or melting snow. Floodplain ecosystem functions include natural moderation of floods, flood storage and conveyance, groundwater recharge, nutrient cycling, water quality maintenance, and provision of habitat for a diversity of plants and animals. Flood potential is evaluated by the Federal Emergency Management Agency, which defines the 100-year floodplain as an area within which there is a 1 percent chance of inundation by a flood event in a given year, or a flood event in the area once every 100 years. The risk of flooding is influenced by local topography, the frequencies of precipitation events, the size of the watershed above the floodplain, and upstream development. Federal, state, and local regulations often limit floodplain development to passive uses, such as recreation and conservation activities, to reduce the risks to human health and safety. Executive Order (EO) 11988, *Floodplain Management*, provides guidelines that agencies should carry out as part of their decision-making on projects that have potential impacts to or within the floodplain. This EO requires federal agencies avoid, to the extent possible, the long- and short-term, adverse impacts associated with the occupancy and modification of flood plains and avoid direct and indirect support of floodplain development wherever there is a practicable alternative. EO 13690, *Establishing a Flood Risk Management Standard and Process for Further Soliciting and Considering Stakeholder Input*, signed in January 2015, established a Federal Flood Risk Management Standard and a process for further soliciting and considering stakeholder input.

D.7.1.4 Wetlands

The USACE defines wetlands as “those areas that are inundated or saturated with ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions” (US Environmental Laboratory, 1987). Wetlands generally include swamps, marshes, bogs, and similar areas (33 Code of Federal Regulations Part 328). Section 404 of the CWA establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Federal protection of wetlands is promulgated under EO 11990, *Protection of Wetlands*, the purpose of which is to reduce adverse impacts associated with the destruction or modification of wetlands. This order directs federal agencies to provide leadership in minimizing the destruction, loss, or degradation of wetlands.

D.7.2 References

Commander, Navy Region Hawaii. 2020. *Storm Water Program*. <https://www.cnic.navy.mil/regions/cnrh/om/environmental/water_quality_information.html>. Accessed March 2021.

Department of Defense. 2010. *Unified Facilities Criteria (UFC) 3-210-10 Low Impact Develop*. 15 November.

US Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Wetlands Research Program Technical Report Y-87-1. USACE, Waterways Experiment Station. January.

USACE. 2021. *Federal Flood Risk Management Standard*. <https://www.iwr.usace.army.mil/Missions/Flood-Risk-Management/Flood-Risk-Management-Program/About-the-Program/Policy-and-Guidance/Federal-Flood-Risk-Management-Standard/>. Accessed March 2021.

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APPENDIX D-8
BIOLOGICAL RESOURCES

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D.8.1 Definition of the Resource

Biological resources include native, nonnative, and invasive plants and animals; sensitive and protected floral and faunal species; and the habitats, such as wetlands, forests, and grasslands, in which they exist. Habitat can be defined as the resources and conditions in an area that support a defined suite of organisms. As defined in Executive Order 13112, *Invasive Species*, are “an alien species whose introduction does or is likely to cause economic or environmental harm to human health.” Invasive species are highly adaptable and oftentimes displace native species. The characteristics that enable them to do so include high reproduction rates, resistance to disturbances, lack of natural predators, efficient dispersal mechanisms, and the ability to outcompete native species. The following is a description of the primary federal statutes that form the regulatory framework for the evaluation of biological resources.

D.8.1.1 Endangered Species Act

The Endangered Species Act (ESA) of 1973 (16 United States [US] Code [U.S.C.] § 1531 et seq.) established protection over and conservation of threatened and endangered species and the ecosystems upon which they depend. Sensitive and protected biological resources include plant and animal species listed as threatened, endangered, or special status by the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). Under the ESA (16 U.S.C. § 1536), an “endangered species” is defined as any species in danger of extinction throughout all, or a large portion, of its range. A “threatened species” is defined as any species likely to become an endangered species in the foreseeable future. The USFWS maintains a list of species considered to be candidates for possible listing under the ESA. The ESA also allows the designation of geographic areas as critical habitat for threatened or endangered species. Although candidate species receive no statutory protection under the ESA, the USFWS has attempted to advise government agencies, industry, and the public that these species are at risk and may warrant protection under the ESA.

Section 9 of the ESA prohibits the take of federally listed species. “Take” as defined under the ESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” Section 7 of the ESA prohibits any federal agency from engaging in any action that is likely to "jeopardize" the continued existence of listed endangered or threatened species or that destroys or adversely affects the critical habitat of such species. Any federal agency proposing an action which may adversely impact an endangered or threatened species must "consult" with USFWS or NMFS (on an informal or formal basis, as appropriate) before carrying out that action would place a listed species and/or its critical habitat in jeopardy.

D.8.1.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) of 1918 makes it unlawful for anyone to take migratory birds or their parts, nests, or eggs unless permitted to do so by regulations. Per the MBTA, “take” is defined as to “pursue, hunt, shoot, wound, kill, trap, capture, or collect” (50 Code of Federal Regulations § 10.12). Migratory birds include nearly all species in the United States, with the exception of some upland game birds and nonnative species.

Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, requires all federal agencies undertaking activities that may negatively impact migratory birds to follow a prescribed set of actions to further implement the MBTA.

D.8.1.3 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. § 668 to 668c) prohibits the “take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle (*Haliaeetus leucocephalus*) or golden eagle (*Aquila chrysaetos*), alive or dead, or any part, nest, or egg thereof.” “Take” is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb," and "disturb" is defined as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, injury to an eagle, a decrease in productivity by substantially interfering with the eagle's normal breeding, feeding or sheltering behavior, or nest abandonment by substantially interfering with the eagle's normal breeding, feeding or sheltering behavior." The Bald and Golden Eagle Protection Act also prohibits activities around an active or inactive nest site that could result in an adverse impact on the eagle.

D.8.1.4 Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) of 1972 (16 U.S.C. Chapter 31) protects all marine mammals: dugongs (*Dugong dugon*) and manatees (*Trichechus* spp.), cetaceans (dolphins, porpoises, and whales), pinnipeds (seals, sea lions, and walruses), polar bears (*Ursus maritimus*), marine otters (*Lutra felina*), and sea otters (*Enhydra lutris*). The MMPA prohibits the "take" of marine mammals in US waters and by US citizens on the high seas, as well as the importation of marine mammals and marine mammal products into the United States. "Take" is defined under the MMPA as "to hunt, harass, capture, or kill" any marine mammal or attempt to do so. The NMFS administers the MMPA in protecting dolphins, porpoises, seals, sea lions, and whales. USFWS administers the MMPA for the protection of dugongs, manatees, walruses, otters, and polar bears. Military readiness activities are not subject to the MMPA provisions of harassment. The "specified geographic area" requirement and the small numbers provision do not apply to military readiness activities or scientific research activities conducted by or on behalf of the federal government.

D.8.1.5 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act of 1976 (16 U.S.C. § 1801 et seq.) and amended by the Sustainable Fisheries Act in 1996, requires the identification and conservation of Essential Fish Habitat (EFH). EFH includes those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. This can include areas that were historically used by fish. Federal agencies are required to consult with NMFS and prepare an EFH Assessment if potential adverse effects on EFH are anticipated from the Proposed Action.

D.8.2 Threatened and Endangered Species/Critical Habitat

Table D-15 provides a complete list of federally and state listed threatened and endangered species that could occur at Joint Base Pearl Harbor-Hickam (JBPHH) and in the Special Use Airspace. This species list is derived from the JBPHH Integrated Natural Resources Management Plan; USFWS Information for Planning and Consultation; NMFS Listed Species Lists; NMFS *Informal ESA Consultation on Joint Base Pearl Harbor Hickam Combat Air Forces Adversary Air Support (PIR-2020-00337; I-PI-20-1825-AG)* (NMFS, 2020); and the State of Hawaii, Division of Forestry and Wildlife Species of Greatest Conservation Need list.

Table D-15
Federal and State Listed Species with the Potential to Occur in or near Joint Base Pearl Harbor-Hickam and the Special Use Airspace

Species	Federal Status[1]	Hawaii State Status[2]	JBPHH	Special Use Airspace
Birds				
Band-rumped storm-petrel (*Oceanodroma castro*)	E	E		X
Hawaiian common gallinule (*Gallinula galeata sandviciensis*)	E	E	X	
Hawaiian coot (*Fulica alai*)	E	E	X	
Hawaiian duck (*Anas wyvilliana*)	E	E	X	
Hawaiian short-eared owl (*Asio flammeus sandwichensis*)	-	E	X	
Hawaiian black-necked stilt (*Himantopus mexicanus knudseni*)	E	E	X	

Table D-15
Federal and State Listed Species with the Potential to Occur in or near Joint Base Pearl Harbor-Hickam and the Special Use Airspace

Species	Federal Status[1]	Hawaii State Status[2]	JBPHH	Special Use Airspace
Iiwi (*Drepanis coccinea*)	T	E	X	
Newell's Townsend's shearwater (*Puffinus auricularis newelli*)	T	T		X
Oahu creeper (*Paroreomyza maculata*)	E	E	X	
Oahu elepaio (*Chasiempis ibidis*)	E	E	X	
Short-tailed albatross (*Phoebastria* [=*Diomedea*] *albatrus*)	E	E		X
White tern (*Gygis alba*)	-	T	X	
Mammals				
Blue whale (*Balaenoptera musculus*)	E	-		X
False killer whale – Main Hawaiian Islands Insular DPS (*Pseudorca crassidens*)	E	E		X
Fin whale (*Balaenoptera physalus*)	E	E		X
Hawaiian monk seal (*Monachus schauinslandi*)	E	E	X	X
Hawaiian hoary bat (*Lasiurus cinereus semotus*)	E	E	X	
Sei whale (*Balaenoptera borealis*)	E	-		X
Sperm whale (*Physeter macrocephalus*)	E	-		X
Reptiles				
Green turtle – Central North Pacific (*Chelonia mydas*)	T	T	X	X
Hawksbill turtle (*Eretmochelys imbricata*)	E	E	X	X
Leatherback turtle (*Dermochelys coriacea*)	E	E		X
Loggerhead turtle - North Pacific Ocean DPS (*Caretta caretta*)	E	T	X	X
Olive ridley turtle (*Lepidochelys olivacea)*	T	T		X
Fish				
Giant manta ray (*Manta birostris*)	T	-		X
Oceanic whitetip shark (*Carcharhinus longimanus*)	T	-		X
Plants				
Kauila (*Colubrina oppositifolia*)	E	-	X	

Source:
[1] USFWS, 2021
[2] JBPHH, 2011; Hawaii DLNR, 2015

DLNR = Department of Land and Natural Resources; DPS = Distinct Population Segment; E = Endangered; JBPHH = Joint Base Pearl Harbor Hickam; T = Threatened

There is no suitable terrestrial habitat at JBPHH for any federally or state listed species. The entire base is developed and is located in urban Honolulu; however, federally and state listed species that occur in estuarine and coastal habitats near JBPHH could potentially be affected. One federally listed endangered waterbird, the Hawaiian black-necked stilt (*Himantopus mexicanus knudseni*), is common in coastal wetland areas at JBPHH. Hawaiian duck (*Anas wyvilliana*) X mallard (*Anas platyrhynchos*) hybrids, and potentially Hawaiian ducks, are also frequently observed in ponding areas around base. The Hawaiian common gallinule (*Gallinula galeata sandviciensis*) and Hawaiian coot (*Fulica alai*) have been observed on base. Hawaiian monk seals (*Monachus schauinslandi*) are occasionally observed at JBPHH beaches and injured green turtles (*Chelonia mydas*) occasionally wash up on shore. There is suitable marine habitat in the Warning Areas for a number of federally listed avian, mammal, reptile, and fish species.

There is no designated critical habitat on or immediately adjacent to JBPHH.

Designated critical habitat for the Hawaiian monk seal (*Monachus schauinslandi*) includes the marine environment with a seaward boundary that extends from the 200-meter (m) depth contour line (relative to mean lower low water), including the seafloor and all subsurface waters and marine habitat within 10 m of the seafloor, through the water's edge 5 m into the terrestrial environment. Designated critical habitat partially overlaps Warning Areas W-188B and W-189B. The essential features for the conservation of the Hawaiian monk seal are

- terrestrial areas and adjacent shallow, sheltered aquatic areas with characteristics preferred by monk seals for pupping and nursing;
- marine areas from 0 to 200 meters in depth that support adequate prey quality and quantity for juvenile and adult monk seal foraging; and
- significant areas used by monk seals for hauling out, resting, or molting.

Critical habitat for the Main Hawaiian Island insular false killer whale (*Pseudorca crassidens*) includes the geographic area of the 45-m depth contour to the 3,200-m depth contour in waters that surround the Main Hawaiian Islands from Niihau east to the Island of Hawaii. Designated critical habitat partially overlaps Warning Areas W-189A and W-189B. Critical habitat for the main Hawaiian Islands insular false killer whale consists of one essential feature comprised of four characteristics:

- space for movement and use within shelf and slope habitat
- prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth
- waters free of pollutants of a type and amount harmful to Main Hawaiian Island insular false killer whales
- sound levels that would not significantly impair Main Hawaiian Island false killer whales' use or occupancy

Band-Rumped Storm-Petrel. The band-rumped storm-petrel (*Oceanodroma castro*) Hawaiian Distinct Population Segment is federally and state listed Endangered. The band-rumped storm-petrel breeds on Kauai, Maui, the island of Hawaii, and Lehus, at elevations of 2,000 feet (ft) or higher. This petrel forages over water and feeds on small fish, squid, and crustaceans, primarily while sitting on the water or dipping prey while flapping. It is the smallest and rarest of sea birds to breed in Hawaii (Hawaii Department of Land and Natural Resources [DLNR], 2021c). The band-rumped storm-petrel would not occur at JBPHH but could be present in the Warning Areas while foraging.

Hawaiian Black-Necked Stilt. Hawaiian black-necked stilts (also known as Hawaiian stilts) are federally listed endangered, endemic, slim, wading birds that can be found along the shoreline, estuarine, and freshwater habitats of Pearl Harbor including JBPHH. They primarily feed on insects and crustaceans. In Pearl Harbor, the primary stilt habitat includes the Honouliuli and Waiawa Units of the Pearl Harbor National Wildlife Refuge (PHNWR), as well as other shallow mudflats along the intertidal areas of Pearl City Peninsula and Naval Magazine Pearl Harbor West Loch Branch (JBPHH, 2011).

Hawaiian Common Gallinule. Hawaiian common gallinules are federally listed endangered, endemic, small, black waterbirds that can be found along the shoreline, estuarine, and freshwater habitats of Pearl Harbor including JBPHH. They are opportunistic feeders and their diet varies with habitat but may include algae, grass seeds, plant material, insects, and snails. Hawaiian common gallinules are very secretive and, thus, are hard to monitor. Population estimates indicate there are up to 300 common gallinules in existence (JBPHH, 2011).

Hawaiian Coot. Hawaiian coots are federally listed endangered, endemic, plump, chicken-like birds that can be found along the shoreline, estuarine, and freshwater habitats of Pearl Harbor including JBPHH. The species is somewhat gregarious and uses freshwater and brackish wetlands, including agricultural (e.g., taro fields) wetlands and aquaculture ponds. They have a broad diet that includes snails, crustaceans, insects, small fish, tadpoles, leaves, and seeds. Nesting habitats includes freshwater and brackish ponds, irrigation ditches, and taro fields. Floating nests are constructed of aquatic vegetation and found in open water or anchored to emergent vegetation (JBPHH, 2011).

Hawaiian Duck. The Hawaiian duck is a federally listed endangered, endemic waterbird that historically was found along the shoreline, estuarine, and freshwater habitats of Pearl Harbor. They were generally observed in the Honouliuli and Waiawa Units of the PHNWR and at the mouth of streams that flow into the harbor. They primarily feed on freshwater vegetation, insects, and mollusks. Biologists believe that the Hawaiian duck has largely been replaced with a hybrid between the Hawaiian duck and mallard. State waterbird biannual survey efforts indicate that the hybridized duck numbers do dominate the Island of Oahu; however, as recently as 2005, a Hawaiian duck was documented on Oahu, through genetic testing, as result of an airstrike incident with a commercial airliner at Daniel K. Inouye International airport (JBPHH, 2011).

Hawaiian Hoary Bat. The Hawaiian hoary bat (*Lasiurus cinereus semotus*) is both federally and state listed as endangered. It is the only native terrestrial mammal to Hawaii and have a wingspan of approximately 1 ft. Based on limited information about the species and its habitat requirements, roosting has typically been observed in native and nonnative vegetation. They forage just before or after sunset and feed on flying insects. Only specimen records exist for the island of Oahu and this species may be extirpated from Oahu (Hawaii DLNR, 2021b). It is highly unlikely that this species would occur at JBPHH as there are no recent observation records from Oahu.

Hawaiian Short-Eared Owl. The Hawaiian short-eared owl (*Asio flammeus sandwichensis*) is state listed as an endangered species on Oahu and was recorded at Waipiʻo Peninsula and PHNWR. It is an endemic subspecies of one of the world's most widely distributed medium-sized owls. They primarily consume small mammals. Females build nests on the ground constructed of simple scraps in the ground lined with grasses and feather down. Population is unknown as few of the owls were detected during previous forest bird surveys (JBPHH, 2011).

Iiwi. The iiwi (*Drepanis coccinea*) is a Hawaiian forest bird, federally listed as threatened and state listed as endangered, and found primarily in closed canopy, montane wet or montane mesic forests of tall stature, dominated by native ohia trees (*Metrosideros polymorpha*) or both ohia and koa trees (*Acacia koa*). iiwi are nectarivorus and feed primarily on flowering ohia; ohia trees are also used for nesting (USFWS, 2016) Iiwi occur above 4,100 ft on the islands of Hawaii, Maui, and Kauai and at reduced densities below 3,300 ft. Three small, isolated populations occur on Oahu, and a relict population occurs on Molokai (Hawaii DLNR, 2021a). The iiwi would not be expected to occur at JBPHH.

Newell's Townsend's Shearwater. The Newell's Townsend's shearwater (*Puffinus newelli*) is a medium-sized shearwater with a glossy black top, a white bottom, and a black bill that is sharply hooked. They live in open tropical seas and offshore waters near breeding grounds where they plunge-dive for prey such as squid and fish. During the breeding season, they nest in burrows under ferns on forested mountain slopes. They forage over the open ocean. The primarily occur in the southern portion of the Hawaiian Islands but could be present in all of the Warning Areas (US Navy, 2018).

Oahu Creeper. The Oahu creeper (*Paroreomyza maculata*) is a small bird that is both federally and state listed as endangered and is endemic to Oahu. Female birds are gray to grayish green above and yellowish white below and usually have white wingbars. Males are olive-green above and golden yellow below and do not have wingbars. The Oahu creeper feeds exclusively on insects and probes the bark of large tree branches and tree trunks for insects. The Oahu creeper has not been sighted since 1985 and is likely extinct (Hawaii DLNR, 2021d; USFWS, 2021). The Oahu creeper would not be expected to occur at JBPHH.

Oahu Elapaio. The Oahu elapaio (*Chasiempis ibidis*) is a small monarch flycatcher that is both federally and state listed as endangered. The Oahu elapaio is endemic to Oahu at the subspecies level. They are dark brown above and white below, with light brown streaks on their breast. They primarily feed on arthropods by flycatching. Oahu elepaio occur in the Ko‘olau Range from 325 to 1,800 ft and in the Wai‘anae Range between 1,625 to 2,775 ft (Hawaii DLNR, 2021e; USFWS, 2021). The Oahu elapaio would not be expected to occur at JBPHH.

White (Fairy) Tern. White (fairy) tern (*Gygis alba*) is a state listed threatened bird species that was recorded at PHNWR. It is a small, entirely white tern that primarily feeds on small fish, squid, and crustaceans. Individuals have dark eyes and a thick, sharply pointed black bill with an electric blue bae. They do not construct nests but instead lay a single egg in a suitable depression including tree branches, building, rock ledges, or on the ground. On Oahu, the number of pairs has increased from one to greater than 250 between 1961 and 2005 (JBPHH, 2011).

Short-Tailed Albatross. The short-tailed albatross (*Phoebastria* [=*Diomedea*] *albatrus*) is a large, white seabird with a 7-ft wingspan, black and white wings, and a large, pink bill. It forages across the entire North Pacific, but its nesting habitat is isolated to islands in Japan. Its diet consists of squid, fish, and shrimp. Currently, the short-tailed albatross population is estimated at approximately 1,200 individuals. Of these, the total number of breeding age birds is thought to be approximately 600 individuals. At-sea sightings since the 1940s indicate that the short-tailed albatross, while very few in number today, is distributed widely throughout its historical foraging range of the temperate and subarctic North Pacific Ocean and is often found close to the United States coast (USFWS, 2019). The short-tailed albatross could travel and forage in the Warning Areas.

Blue Whale. The blue whale (*Balaenoptera musculus*) is a baleen whale primarily feeding on krill that occurs globally and the largest animal to have ever lived on Earth. Females are slightly larger than males. Blue whales are listed as a federally endangered species. Blue whales inhabit all oceans and typically occur near the coast over the continental shelf; they have also been recorded in oceanic waters (US Navy, 2018). The blue whale could occur in the Warning Areas with peak abundance in the winter.

False Killer Whale. The Main Hawaiian Islands Insular Stock Distinct Population Segment (DPS) of the false killer whale (*Pseudorca crassidens*) is listed as federally endangered. False killer whales feed primarily on deep sea cephalopods and fish and have been known to attack other cetaceans, including dolphins and large whales. This species is found regularly within Hawaiian waters and has been reported in groups of up to 100 and would occur in the Warning Areas (US Navy, 2018).

Fin Whale. The federally endangered fin whale (*Balaenoptera physalus*) has a v-shaped head and a tall, hooked dorsal fin that rises at a shallow angle from its back. It is the second largest whale species. The fin whale feeds by gulping a wide variety of organisms including small schooling fish, squid, and crustaceans (including krill). Fin whales are found in all of the world's oceans and could occur rarely in deep offshore waters in the Warning Areas (US Navy, 2018).

Hawaiian Monk Seal. The federally listed, endangered Hawaiian monk seal is a pinniped, of the family Phocidae. Adult monk seals measure about 7 to 8 ft in length and weigh about 400 to 600 pounds with females often being larger than males. Mature Hawaiian monk seals are a silver or slate gray on their dorsal side and have a cream coloring on their stomach, chest, and throat. They feed on fish, cephalopods, and crustaceans. Current population estimates of Hawaiian monk seals indicate approximately 1,200 seals remaining. Haul-out areas for pupping, nursing, and resting are primarily sandy beaches, but virtually all substrates, including emergent reef and shipwrecks, are used at various islands. Hawaiian monk seals frequently haul out primarily on a sandy beach at Iroquois Point-Pu‘uloa Beach (versus emergent reef across the Pearl Harbor Entrance Chanel from JBPHH); however, one seal has been observed hauled out in the vicinity of Marine Railway No. 2 at the Shipyard (JBPHH, 2011). Hawaiian monk seals could occur in the Warning Areas.

Sei Whale. The sei whale (*Balaenoptera boreali*) is mostly dark-gray in color with a lighter belly, often with mottling on the back. The major prey species for the sei whale are copepods and krill. Sei whales occur in very low population numbers. They typically occur in deep, oceanic waters of the cool temperate zone and prefer regions of steep bathymetric relief, such as the continental shelf break, canyons, or basins between banks and ledges. They occur in the warmer waters of the Warning Areas in the winter and have only been detected in the Hawaiian Islands on a few occasions (US Navy, 2018).

Sperm Whale. The sperm whale (*Physeter microcephalus*) is the largest of the toothed whales and is distinguished by an extremely large head and a single blowhole located on the left side of its head (asymmetrical) near the tip. The sperm whale is mostly dark-gray, with some sperm whales having white patches on the belly. The sperm whale preys on large mesopelagic squids and other cephalopods, demersal fish, and benthic invertebrates. Sperm whales are globally distributed and occur in deep offshore waters. Sperm whales are listed as federally endangered. They occur in offshore waters of Hawaii during most of the year but do migrate to equatorial waters in the winter (US Navy, 2018).

Green Turtle. The Central North Pacific and East Pacific Ocean DPS green turtle (*Chelonia mydas*) occur in the Warning Areas. The green turtle has a smooth black, gray-green, brown, and yellow top shell and a yellowish-white bottom shell. Its diet consists mostly of seagrasses and algae. The green turtle was listed under the federal ESA in July 1978. Similar to the loggerhead turtle, the green turtle is globally distributed, is the most common sea turtle in the waters of the main Hawaiian Islands and occurs in waters near JBPHH including the Pearl Harbor Entrance Channel and in the Warning Areas year round (US Navy, 2018; NMFS, 2018).

Hawksbill Turtle. The hawksbill turtle (*Eretmochelys imbricata*) is a small- to medium-sized sea turtle, has the longest measured dive times of any sea turtle, and is omnivorous during its later juvenile stage, feeding on encrusting organisms such as sponges, tunicates, bryozoans, algae, mollusks, and a variety of other items such as crustaceans and jellyfish; however, older juveniles and adults are more specialized, feeding primarily on sponges, which comprise as much as 95 percent of their diet in some locations. Hawksbill sea turtles are migratory, and hatchlings may prefer the open ocean with juveniles returning to coastal habitats and nearshore foraging grounds (US Navy, 2018). The hawksbill turtle would occur in the Warning Areas.

Leatherback Turtle. The leatherback turtle (*Dermochelys coriacea*) is the largest and deepest-diving sea turtle. Leatherback turtles feed throughout the epipelagic and into the mesopelagic zones of the water column on gelatinous zooplankton such as cnidarians (jellyfish and siphonophores) and tunicates (salps and pyrosomas). Leatherback turtles' nest along the Pacific coast of the Americas and along the along the Indo-Pacific coastlines. Leatherback turtles could occur throughout the Warning Areas as they migrate across the Pacific past Hawaii. They are sighted in offshore waters typically beyond the 3,800-ft depth contour and especially off the southeastern end of the Hawaiian Islands (US Navy, 2018). Leatherback turtles could occur in the Warning Areas.

Loggerhead Turtle. Loggerhead turtles (*Caretta caretta*) are the most abundant species of sea turtle found in US coastal waters. Loggerhead turtles have a top shell that is slightly heart-shaped and reddish-brown with a pale, yellowish bottom shell. Their diet primarily consists of whelks and conch. Loggerhead turtles are circumglobal, occurring throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Pelagic juveniles and feeding adults can occur in the Warning Areas as they use the entire North Pacific during development and as they make transoceanic crossing to and from nesting grounds in Japan (US Navy, 2018; NMFS, 2018).

Olive Ridley Turtle. The olive ridley turtle (*Lepidochelys olivacea*) has a heart-shaped, grayish-green top shell and has a broad diet consisting of shrimp, fish, lobster, crabs, tunicates, mollusks, and algae. They are globally distributed. The olive ridley turtle was listed as threatened under the ESA in July 1978. This species is globally distributed and requires international protection. Cooperation between countries, as well as individual country initiative has led to various international treaties and agreements as well as federal laws for olive ridley sea turtle conservation (National Oceanic and Atmospheric Administration [NOAA] Fisheries, 2019d). The olive ridley turtle is known to occur in waters in the Warning Areas and has been documented to nest on the Hawaiian Islands three times (US Navy, 2018).

Giant Manta Ray. The giant manta ray (*Manta birostris*), the largest ray in the world, is listed as Threatened. It is a filter feeder and eats large quantities of zooplankton. Giant manta rays are migratory with small, highly fragmented populations that are sparsely distributed across the world. The main threat to the giant manta ray is commercial fishing, with the species both targeted and caught as bycatch in a number of global fisheries throughout its range (NOAA Fisheries, 2019b). The giant manta ray is found throughout the waters off of the Hawaiian Islands and large aggregations are known to occur along the Kona coast off the Big Island (US Navy, 2018). The giant manta ray does occur in the Warning Areas.

Oceanic Whitetip Shark. The oceanic whitetip shark (*Carcharhinus longimanus*) is listed as Threatened, found in tropical and subtropical oceans throughout the world, and long-lived and late maturing. They feed on a wide variety of bony fishes including mackerel and tuna as well as sea birds, sea turtles, stingrays, and squid. Their fins are highly valued in the international trade for shark products. This along with being caught as bycatch in commercial fisheries are the likely causes of their population declines (NOAA Fisheries, 2019c). The oceanic whitetip shark could be present in the Warning Areas.

Scalloped Hammerhead Shark. The Eastern Pacific DPS of the scalloped hammerhead shark (*Sphyrna lewini*) is federally listed as endangered. It occurs in coastal and semioceanic temperate and tropical waters from the surface to approximately 900 ft in depth. Scalloped hammerhead sharks feed primarily at night on a wide variety of fishes and invertebrates. They occur in the waters off the Hawaiian Islands and would occur in the Warning Areas (US Navy, 2018).

Kauila. Kauila (*Colubrina oppositifolia*) is a flowering tree in the Rhamnaceae (buckthorn) family. It is federally listed as endangerd. It is 16 to 43 ft tall, has opposite, stalked, oval, thin, pinnately veined, toothless leaves. It has between 10 and 12 bisexual flowers clustered at the end of a main stalk; each flower has a stalk which elongates in fruit. The small fruit is similar to a capsule and opens explosively when mature (USFWS, 2021). The kauila was not observed during the January 2021 biological resources surveys of the proposed facility project areas at JBPHH and is not expected to occur at JBPHH.

D.8.3 Regional Biological Setting

JBPHH. All nine proposed facility construction and repair project sites were surveyed for biological resources in January 2021. In general, all proposed project sites are located within well-maintained grassy/landscaped areas or on existing paved areas (**Table D-16**). The grassy/landscaped areas are mowed approximately once a month; however, several proposed project sites are proximate to existing drainages, outfalls, and/or detention basins. The proposed facility construction and repair project sites mostly support nonnative plant and wildlife species. No federally or state listed as endangered or threatened plant or wildlife species were observed during the general biological survey; however, anecdotally, Hawaiian black-necked stilt has been observed in the vicinity of the proposed Munition Maintenance and Inspection Add-on (Project ID 3).

Table D-16
Biological Conditions of Each of the Proposed Facility Projects

Project ID	Proposed Project Site Name	Proposed Project Site Biological Conditions
1	Construct F-22 Sierra Ramp	Well-maintained grassy area with an existing catch basin and drainage along the eastern boundary.
2	Repair and Reconfigure Squadron Operations, Building 3428	Well-maintained landscaped area surrounding the building; proposed work would occur within the building.
3	Munition Maintenance and Inspection Add-on	Well-maintained grassy area; the western portions has an existing detention basin immediately to the north and an existing drainage across an existing paved access road to the west; water was not present during the general biological survey, but anecdotally this area floods into the Mamala Bay Golf Course to the south.
4	Add Munitions Cube Storage Facility	Paved area; north and south of the existing paved access road are existing drainages between Project ID 3 and Project ID 4; water was present during the general biological survey.

Project ID	Proposed Project Site Name	Proposed Project Site Biological Conditions
5	Construct Egress Facility	Well-maintained grassy area; the northwestern and northeastern portions have existing drainages; the northeastern portion drainage flows into an existing detention basin to the east; water was present during the general biological survey.
6	Aircraft Support Equipment Facility Add-on	Well-maintained grassy area; anecdotally the site was used as a de-watering station for a previous construction project.
7	Construct F-22 Intel Vault	Paved area; the surrounding area was being utilized as storage during the general biological survey.
8	F-22 Alter Corrosion Control Building 3407	Well-maintained landscaped area surrounding the building; proposed work would occur within the building.

Marine Setting. The Insular Pacific-Hawaiian Large Marine Ecosystem encompasses an area of approximately 386,000 square miles. This marine ecosystem extends 1,500 miles from the main Hawaiian Islands to the outer northwestern Hawaiian Islands (US Navy, 2018; Aquarone and Adams, 2009). This Ecosystem is characterized by limited ocean nutrients, leading to high biodiversity but low sustainable yields for fisheries (US Navy, 2018; Aquarone and Adams, 2009).

Circulation in the North Pacific Ocean is driven by the clockwise motion of the North Pacific Subtropical Gyre (US Navy, 2018; Tomczak and Godfrey, 2003). The North Pacific Subtropical Gyre occurs between the equator and 50 degrees North and is defined to the north by the North Pacific Current, to the east by the California Current, to the south by the North Equatorial Current, and to the west by the Kuroshio Current (US Navy, 2018; Tomczak and Godfrey, 2003). The Warning Areas are within the North Pacific Subtropical Gyre.

Bathymetric features in the Warning Areas are dominated by the Hawaiian Archipelago, which were formed from volcanic eruptions. The Hawaiian Archipelago does not have a continental shelf (US Navy, 2018). The Hawaiian Archipelago is composed of high islands, reefs, banks, atolls (coral reef islands surrounding a shallow lagoon), and seamounts (deep seafloor underwater mountains) (US Navy, 2018; Polovina et al., 1995; Rooney et al., 2008). Submarine canyons are present within the Warning Areas, which reach depths greater than 6,000 ft. Further from the archipelago, bathymetric features of the open-ocean areas of the Hawaii Range Complex include a variety of bottom types, including seamounts and submarine canyons (US Navy, 2018; Vetter et al., 2010).

The Proposed Action is limited to aircraft overflights and the use of defensive countermeasures by aircraft in the Warning Areas; therefore, a discussion of biological resources is limited to those species that could be found on the ocean surface, primarily marine mammals and sea turtles. All sea turtles are federally listed under the ESA and are discussed in the Threatened and Endangered Species section.

There are 23 cetacean and 1 pinniped species that could occur within the Special Use Airspace (**Table D-17**). Some cetacean species are resident year-round while others occur seasonally as they migrate through the area.

Table D-17
Marine Mammals with the Potential to Occur in the Special Use Airspace

Common Name	Scientific Name	Endangered Species Act Listing	Occurrence in the Special Use Airspace[a]
Cetaceans			
False killer whale	*Pseudorca crassidens*	Endangered	Occurs year round
Fin whale	*Balaenoptera physalus*	Endangered	Rare in occurrence in the Warning Areas
Sei whale	*Balaenoptera borealis*	Endangered	Rare in occurrence in the Warning Areas

Sperm whale	*Physeter macrocephalus*	Endangered	Occurs year round in deep waters
Minke whale	*Balaenoptera acutorostrata*	-	Rare in occurrence in the Warning Areas
Pygmy sperm whale	*Kogia breviceps*	-	Occurs year round
Dwarf sperm whale	*Kogia sima*	-	Occurs year round
Killer whale	*Orcinus orca*	-	Rare in occurrence and primarily in winter
Short-finned pilot whale	*Globicephala macrorhynchus*	-	Occurs year round
Melon-headed whale	*Peponocephala electra*	-	Occurs year round
Cuvier's beaked whale	*Ziphius cavirostris*	-	Occurs year round
Blainville's beaked whale	*Mesoplodon densirostris*	-	Occurs year round
Longman's beaked whale	*Indopacetus pacificus*	-	Occurs year round
Ginkgo-toothed beaked whale	*Mesoplodon ginkgodens*	-	Potential to occur in Warning Areas although no records of this species exist off Hawaii
Hubbs' beaked whale	*Mesoplodon carlhubbsi*	-	Potential to occur in Warning Areas although no records of this species exist off Hawaii
Common bottlenose dolphin	*Tursiops truncatus*	-	Occurs year round
Pantropical spotted dolphin	*Stenella attenuata*	-	Occurs year round
Striped dolphin	*Stenella coeruleoalba*	-	Occurs year round
Spinner dolphin	*Stenella longirostris*	-	Occurs year round
Rough-toothed dolphin	*Steno bredanensis*	-	Occurs year round
Fraser's dolphin	*Lagenodelphis hosei*	-	Occurs year round
Risso's dolphin	*Grampus griseus*	-	Occurs year round
Pinnipeds			
Hawaiian monk seal	*Neomonachus schauinslandi*	Endangered	Occurs in nearshore waters

Notes:
[a] Source: US Navy, 2018; National Marine Fisheries Service, 2020

D.8.4 References

Aquarone, M.C., and S. Adams. 2009. *Xiv-44 California Current LME*. *In* K. Sherman & G. Hempel (Eds.): *The UNEP Large Marine Ecosystem Report: A perspective on Changing Conditions in LMEs of the World's Regional Seas* (pp. 591–604). United Nations Environmental Programme, Nairobi, Kenya.

Hawaii Department of Land and Natural Resources (DLNR). 2015. State Wildlife Action Plan. <https://dlnr.hawaii.gov/wildlife/hswap/>.

Hawaii DLNR. 2021a. *'I'iwi Fact Sheet.* <https://dlnr.hawaii.gov/wildlife/hswap/fact-sheets/>. Accessed February 2021.

Hawaii DLNR. 2021b. *'Ope'apa'a or Hawaiian Hoary Bat Fact Sheet.* <https://dlnr.hawaii.gov/wildlife/hswap/fact-sheets/>. Accessed February 2021.

Hawaii DLNR. 2021c. *Band-rumped Storm-petrel Fact Sheet.* <https://dlnr.hawaii.gov/wildlife/hswap/fact-sheets/>. Accessed February 2021.

Hawaii DLNR. 2021d. *O'ahu 'Alauahio or O'ahu Creeper Fact Sheet.* <https://dlnr.hawaii.gov/wildlife/hswap/fact-sheets/>. Accessed February 2021.

Hawaii DLNR. 2021e. *O'ahu 'Elepaio Fact Sheet.* <https://dlnr.hawaii.gov/wildlife/hswap/fact-sheets/>. Accessed February 2021.

JBPHH. 2011. *Joint Base Pearl Harbor Hickam Integrated Natural Resources Management Plan*. September.

NMFS. 2018. *Find a Species*. <https://www.fisheries.noaa.gov/find-species>. Accessed May 2018.

NMFS. 2020. Informal ESA Consultation on Joint Base Pearl Harbor Hickam Combat Air Forces Adversary Air Support (PIR-2020-00337; I-PI-20-1825-AG).

NOAA Fisheries. 2019b. *Species Directory: Giant Manta Ray*. <https://www.fisheries.noaa.gov/species/giant-manta-ray>. Accessed April 2019.

NOAA Fisheries. 2019c. *Species Directory: Oceanic Whitetip Shark*. <https://www.fisheries.noaa.gov/species/oceanic-whitetip-shark>. Accessed April 2019.

NOAA Fisheries. 2019d. *Species Directory: Olive Ridley Turtle*. <https://www.fisheries.noaa.gov/species/olive-ridley-turtle>. Accessed April 2019.

Polovina, J.J., W.R. Haight, R.B. Moffitt, and F.A. Parrish. 1995. The Role of Benthic Habitat, Oceanography, and Fishing on the Population Dynamics of the Spiny Lobster, Panulirus marginatus (Decapoda, Palinuridae), in the Hawaiian Archipelago. Crustaceana 68(2):203–212.

Rooney, J., P. Wessel, R. Hoeke, J. Weiss, J. Baker, F. Parrish, C.H. Fletcher, J. Chojnacki, M. Garcia, R. Brainard, and P. Vroom. 2008. Geology and Geomorphology of Coral Reefs in the Northwestern Hawaiian Islands. In B. M. Riegl and R. E. Dodge (Eds.): Coral reefs of the U.S.A. Coral Reefs of the World (Vol. 1, pp. 515–567). Springer.

Tomczak, M., and J.S. Godfrey. 2003. The Pacific Ocean Regional Oceanography: An Introduction (2nd ed., pp. 105–174). Daya Publishing House.

US Department of Interior. 2017. *Memorandum M-Opinion 37050, The Migratory Bird Treaty Act Does Not Prohibit Incidental Take*. 22 December.

US Navy. 2018. *Hawaii-Southern California Training and Testing Final Environmental Impact Statement/ Overseas Environmental Impact Statement*. October.

USFWS. 2016. *Iiwi (Drepanis coccinea) Special Status Species Report. Pacific Islands Fish and Wildlife Office, US Fish and Wildlife Service Region 1.* December.

USFWS. 2019. *Species Profile for Short-Tailed Albatross (Phoebastria (=diomedea) albatrus)*. <https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B00Y>. Accessed February 2019.

USFWS. 2021. *US Fish and Wildlife Service Information for Planning and Consultation*. <https://ecos.fws.gov/ipac/>. Accessed February 2021.

Vetter, E.W., C.R. Smith, and F.C. De Leo. 2010. Hawaiian Hotspots: Enhanced Megafaunal Abundance and Diversity in Submarine Canyons on the Oceanic Islands of Hawaii. Marine Ecology 31(1):183–199.

APPENDIX D-9
CULTURAL RESOURCES

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D.9.1 Definition of the Resource

Cultural resources are any prehistoric or historic district, site, building, structure, or object considered important to a culture or community for scientific, traditional, religious, or other purposes. These resources are protected and identified under several federal laws and Executive Orders.

Cultural Resources include the following subcategories:

- Archaeological (i.e., prehistoric or historic sites where human activity has left physical evidence of that activity, but no structures remain standing);
- Architectural (i.e., buildings or other structures or groups of structures, or designed landscapes that are of historic or aesthetic significance); and
- Traditional Cultural Properties (resources of traditional, religious, or cultural significance to Native American tribes and other communities).

Historic properties are cultural resources that have been listed in or determined eligible for listing in the National Register of Historic Places (NRHP). To be eligible for the NRHP, properties must be 50 years old and have national, state, or local significance in American history, architecture, archaeology, engineering, or culture. They must possess sufficient integrity of location, design, setting, materials, workmanship, feeling, and association to convey their historical significance, and meet at least one of four criteria (National Park Service, 2002):

- Associated with events that have made a significant contribution to the broad patterns of our history (Criterion A);
- Associated with the lives of persons significant in our past (Criterion B);
- Embody distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction (Criterion C); and/or
- Have yielded or be likely to yield information important in prehistory or history (Criterion D)

Properties that are less than 50 years old can be considered eligible for the NRHP under Criterion Consideration G if they possess exceptional historical importance. Those properties must also retain historic integrity and meet at least one of the four NRHP Criteria for Evaluation (Criterion A, B, C, or D). The term “Historic Property” refers to National Historic Landmarks, NRHP-listed, and NRHP-eligible cultural resources.

Federal laws protecting cultural resources include the Archaeological and Historic Preservation Act of 1960 as amended, the American Indian Religious Freedom Act of 1978, the Archaeological Resources Protection Act of 1979, the Native American Graves Protection and Repatriation Act of 1990, and the National Historic Preservation Act (NHPA), as amended through 2016, and associated regulations (36 Code of Federal Regulations [CFR] Part 800). The NHPA requires federal agencies to consider effects of federal undertakings on historic properties prior to making a decision or taking an action and to integrate historic preservation values into their decision-making process. Federal agencies fulfill this requirement by completing the Section 106 consultation process, as set forth in 36 CFR Part 800. Section 106 of the NHPA also requires agencies to consult with federally recognized Native Hawaiian organizations or Indian tribes with a vested interest in the undertaking.

Section 106 of the NHPA requires all federal agencies to seek to avoid, minimize, or mitigate adverse effects on historic properties (36 CFR § 800.1[a]). For cultural resource analysis, the Area of Potential Effects (APE) is used as the region of influence. APE is defined as the “geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist,” (36 CFR § 800.16[d]) and thereby diminish their historic integrity. There are two APEs: 1) the areas of proposed facility repair, reconfiguration, and construction at Joint Base Pearl Harbor-Hickam and 2) the Special Use Airspace described in **Section 2.1** of the Environmental Assessment.

D.9.2 References

National Park Service. 2002. *How to Apply the National Register Criteria for Evaluation*. National Register Bulletin 15. Washington, DC, US Department of the Interior, National Park Service, Interagency Resources Division. <https://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_4.htm>. Accessed February 2018.

APPENDIX D-10
INFRASTRUCTURE, TRANSPORTATION, AND UTILITIES

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D.10.1 Definition of the Resource

Infrastructure consists of the systems and physical structures that enable a population in a specified area to function. Infrastructure is wholly man-made, with a high correlation between the type and extent of infrastructure and the degree to which an area is characterized as "urban" or developed. The availability of infrastructure and its capacity to support growth are generally regarded as essential to the economic growth of an area. The infrastructure information in this section was primarily obtained from the 2013 Installation Development Plan (Joint-Base Pearl Harbor-Hickam, 2013) and provides a brief overview of each infrastructure component and comments on its existing general condition.

The infrastructure components discussed in this section include transportation, utilities, and solid waste management. Transportation is defined as the system of roadways, highways, and transit services that are in the vicinity of the installation and could be reasonably expected to be potentially affected by the Proposed Action. Utilities include electrical, natural gas, liquid fuel, water supply, sanitary sewage/wastewater, stormwater handling, and communications systems. Solid waste management primarily relates to the availability of landfills to support a population's residential, commercial, and industrial needs.

D.10.2 Reference

Joint-Base Pearl Harbor-Hickam. 2013. *Installation Development Plan Training Practicum Report for Joint Base Pearl Harbor-Hickam, Honolulu, Hawaii*. August.

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APPENDIX D-11
HAZARDOUS MATERIALS AND WASTES, ENVIRONMENTAL RESTORATION PROGRAM, AND TOXIC SUBSTANCES

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D.11.1 Definition of the Resource

Hazardous materials (HAZMAT) are defined as any substance with physical properties of ignitability, corrosivity, reactivity, or toxicity that might cause an increase in mortality, serious irreversible illness, and incapacitating reversible illness, or that might pose a substantial threat to human health or the environment. HAZMAT is also defined under Section 1802 of the Hazardous Materials Transportation Act as “a substance or material in a quantity and form which may pose an unreasonable risk to health and safety or property when transported in commerce” (49 United States [US] Code [U.S.C.] §§ 5101-5127). Occupational Safety and Health Administration (OSHA) is responsible for enforcement and implementation of federal laws and regulations pertaining to worker health and safety under 29 Code of Federal Regulations (CFR) Part 1910. OSHA also includes the regulation of HAZMAT in the workplace and ensures appropriate training in their handling.

The Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act, which was further amended by the Hazardous and Solid Waste Amendments, defines hazardous wastes. Hazardous waste is defined as any solid, liquid, contained gaseous, or semisolid waste, or any combination of wastes, that pose a substantial present or potential hazard to human health or the environment. In general, both HAZMAT and hazardous wastes include substances that, because of their quantity, concentration, physical, chemical, or infectious characteristics, might present substantial danger to public health and welfare or the environment when released or otherwise improperly managed.

HAZMAT are often stored in bulk quantities in aboveground or underground storage tanks and fueling operations such as required for aircraft operations require the bulk storage of HAZMAT such as petroleum, oils, and lubricants. Therefore, the evaluation of HAZMAT and hazardous wastes focuses on underground storage tanks and aboveground storage tanks as well as the storage, transport, and use of pesticides, fuels, oils, and lubricants. Evaluation might also extend to generation, storage, transportation, and disposal of hazardous wastes when such activity occurs at or near the project site of a proposed action. In addition to being a threat to humans, the improper release of HAZMAT and hazardous wastes can threaten the health and well-being of wildlife species, botanical habitats, soil systems, and water resources. In the event of release of HAZMAT or hazardous wastes, the extent of contamination varies based on type of soil, topography, weather conditions, and water resources.

Through the Environmental Restoration Program (ERP) (formerly the Installation Restoration Program) initiated in 1980, a subcomponent of the Defense ERP that became law under the Superfund Amendments and Reauthorization Act, each Department of Defense installation is required to identify, investigate, and clean up hazardous waste disposal or release sites. Remedial activities for ERP sites follow the Hazardous and Solid Waste Amendment of 1984 under the Resource Conservation and Recovery Act Corrective Action Program and Comprehensive Environmental Response, Compensation, and Liability Act. The ERP provides a uniform, thorough methodology to evaluate past disposal sites, control the migration of contaminants, minimize potential hazards to human health and the environment, and clean up contamination through a series of stages until it is decided that no further remedial action is warranted.

Description of ERP activities provides a useful gauge of the condition of soils, water resources, and other resources that might be affected by contaminants. It also aids in identification of properties and their usefulness for given purposes (e.g., activities dependent on groundwater usage might be foreclosed where a groundwater contaminant plume remains to complete remediation).

Toxic substances might pose a risk to human health but are not regulated as contaminants under the hazardous waste statutes. Included in this category are asbestos-containing materials, lead-based paint (LBP), radon, and polychlorinated biphenyls (PCBs). The presence of special hazards or controls over them might affect, or be affected by, a proposed action. Information on special hazards describing their locations, quantities, and condition assists in determining the significance of a proposed action.

Asbestos. Asbestos is regulated by the US Environmental Protection Agency (USEPA) with the authority promulgated under OSHA, 29 U.S.C. § 669 et seq. Section 112 of the Clean Air Act regulates emissions of asbestos fibers to ambient air. USEPA policy is to leave asbestos in place if disturbance or removal could pose a health threat.

Lead-based Paint. Human exposure to lead has been determined an adverse health risk by agencies such as OSHA and the USEPA. Sources of exposure to lead are dust, soils, and paint. In 1973, the Consumer Product Safety Commission established a maximum lead content in paint of 0.5 percent by weight in a dry film of newly applied paint. In 1978, under the Consumer Product Safety Act (Public Law 101-608, as implemented by 16 CFR Part 1303), the Consumer Product Safety Commission lowered the allowable lead level in paint to 0.06 percent (600 parts per million). The Act also restricted the use of LBP in nonindustrial facilities. The Department of Defense implemented a ban of LBP use in 1978; therefore, it is possible that facilities constructed prior to or during 1978 may contain LBP.

Radon. The US Surgeon General defines radon as an invisible, odorless, and tasteless gas, with no immediate health symptoms, that comes from the breakdown of naturally occurring uranium inside the earth (US Surgeon General, 2005). Radon that is present in soil can enter a building through small spaces and openings, accumulating in enclosed areas such as basements. No federal or state standards are in place to regulate residential radon exposure at the present time, but guidelines were developed. Although 4.0 picocuries per liter is considered an “action” limit, any reading over 2 picocuries per liter qualifies as a “consider action” limit. The USEPA and the US Surgeon General have evaluated the radon potential around the country to organize and assist building code officials in deciding whether radon-resistant features are applicable in new construction. Radon zones can range from 1 (high) to 3 (low).

Polychlorinated Biphenyls. PCBs are a group of chemical mixtures used as insulators in electrical equipment, such as transformers and fluorescent light ballasts. Chemicals classified as PCBs were widely manufactured and used in the United States until they were banned in 1979. The disposal of PCBs is regulated under the federal TSCA (15 U.S.C. § 2601 et seq., as implemented by 40 CFR Part 761), which banned the manufacture and distribution of PCBs, with the exception of PCBs used in enclosed systems.

The TSCA regulates and the USEPA enforces the removal and disposal of all sources of PCBs containing 50 parts per million or more; the regulations are more stringent for PCB equipment than for PCB-contaminated equipment.

APPENDIX D-12
SOCIOECONOMICS

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D.12.1 Definition of the Resource

Socioeconomics is the relationship between economics and social elements, such as population levels and economic activity. There are several factors that can be used as indicators of economic conditions for a geographic area, such as demographics, median household income, unemployment rates, percentage of families living below the poverty level, employment, and housing data. Data on employment identify gross numbers of employees, employment by industry or trade, and unemployment trends. Data on industrial, commercial, and other sectors of the economy provide baseline information about the economic health of a region. Economic data are typically presented at county, state, and United States levels to characterize baseline socioeconomic conditions in the context of regional, state, and national trends.

Executive Orders (EOs) direct federal agencies to identify and assess environmental health and safety risks to children. EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, states that each federal agency "(a) shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and (b) shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks."

For the purposes of this project youth populations are identified as children under the age of 18 years.

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APPENDIX E
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